CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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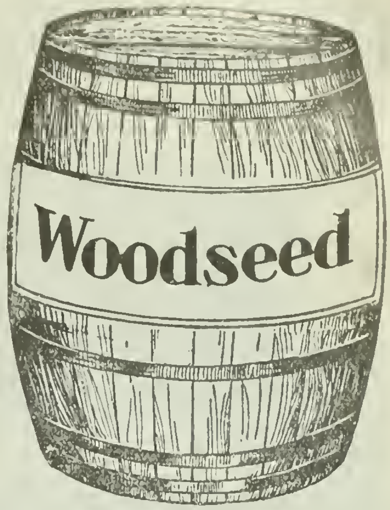

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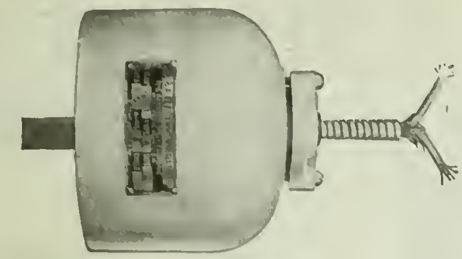

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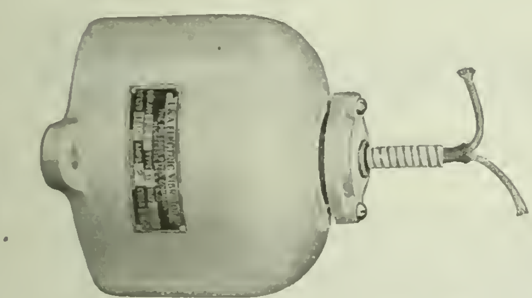

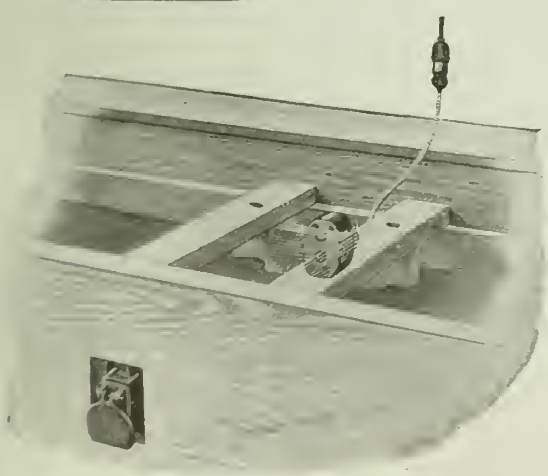

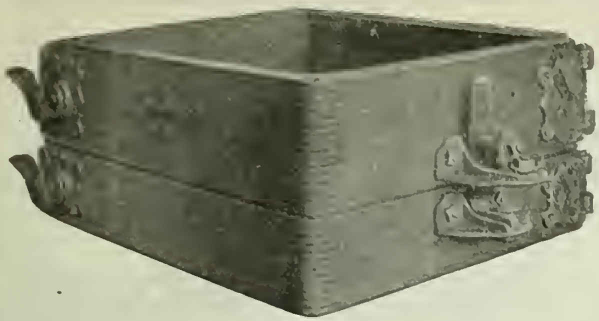

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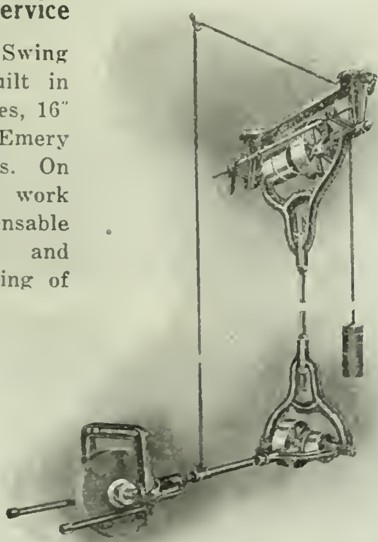

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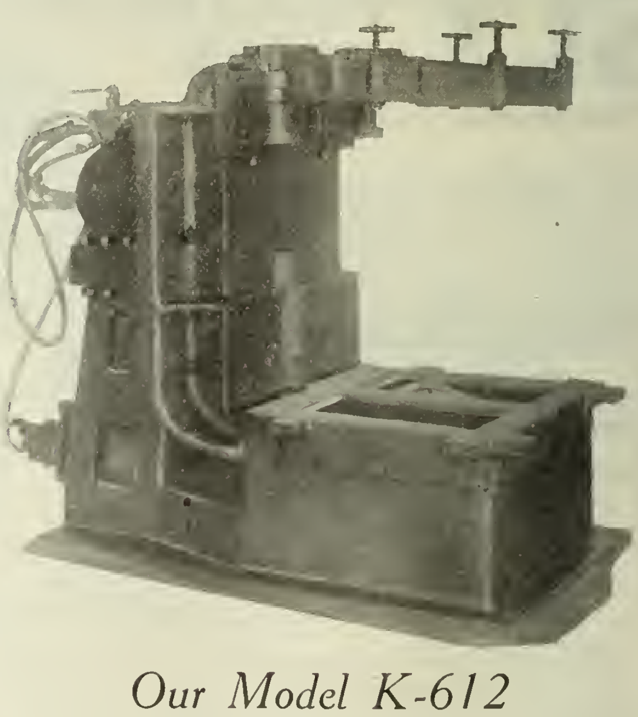

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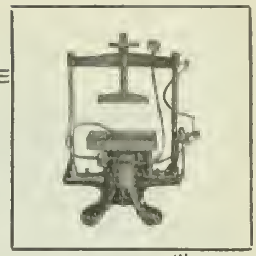

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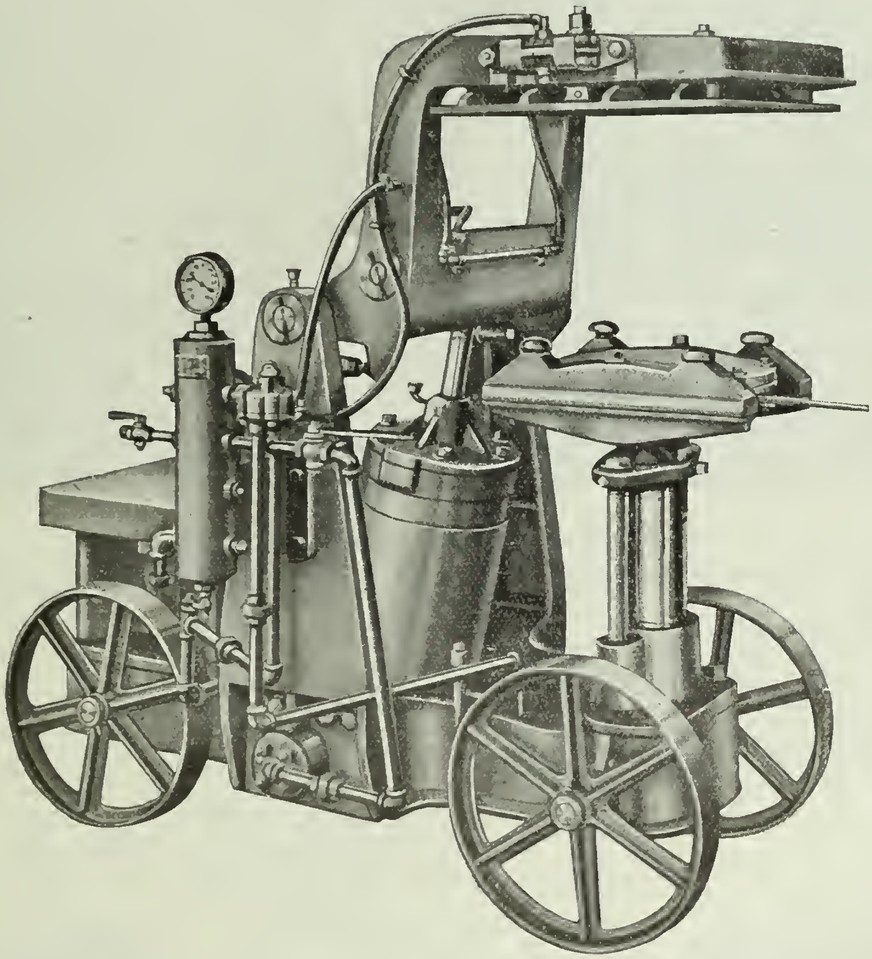

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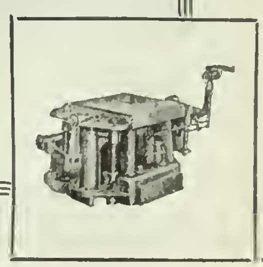


CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Melting the Metal in a Montreal Bell Foundry

Including the Process of Moulding, Melting and Pouring the Metal at the Works of C. O. Clarke & Bro., Montreal

By F. H. BELL

Without a shadow of doubt the most interesting and amusing sample of a brass and bronze foundry which it has been our pleasure to witness in many a long day is that of C. O. Clarke & Bro., Montreal. This company makes a specialty of bells of every description, but chiefly sleigh bells, and in their list will be found every conceivable style of sleigh bell, from the little dinky bells which are simply used to cover the law, up to the magnificently embossed, polished and nickel-plated bells for the most elaborate traineau.

Ships bells, school bells, farm bells, every or any kind of bells up to about eighteen inches in diameter are also made here. In fact bells, bells, bells, and more bells is the order here.

What bells have been made in Canada during the last sixty years were made in this establishment.

Some sixty odd years ago the Messrs. Clarke came over to Montreal from Connecticut and established a Canadian branch of their business in that city, which has continued to thrive incessantly ever since, until the present substantial business has been the reward.

Of course the C. O. Clarke & Bro. of today are not the ones who came over from Connecticut, but they are lineal descendants of the original founders.

As a natural result of the introduction of automobiles and motor trucks, the sleigh business would be expected to suffer, and in a direct way the sleigh bell would follow suit, but so far very little effect has been shown.

Moulding the Bells

The moulding of a bell presents very few difficulties. In fact a bell would be considered a very simple casting to make. The sound of a bell is mostly from the part known as the lip, and here is where the best and densest metal must be. This makes it necessary to cast it with the open side down, which is, incidentally, the easiest way to mould it. This, however, puts the outside uppermost where it will receive and show up any dirt or impurities which might be in the melted metal, and for polished or plated work this is not permissible, so it will be seen that there is something to keep the bell founder on the alert the same as any other foundryman.

The moulding of a bell, as will be seen, is not particularly different from the moulding of any other class of work. The little globular bells with the loose ball on the inside are cored out to make them hollow. The ball, which is of cast iron, is put into the core when the core is being made. When the core is rapped out of the casting the ball remains on the inside. In making a bell with a staple or loop on the top, the staple is made ahead of time and is rammed into the mould with the ends projecting into the pattern so as to be cast into the bell.

Bells which do not require to be polished may be cast from metal which is melted in a crucible in an ordinary brass furnace, but for bells which require to be polished and nickel-plated and when the casting must be perfectly clean a different style of furnace is used. This shop is provided with two furnaces of the standard crucible type, but these will require no comments as they are the same as are used in most of the brass foundries.

The Swedish Furnace

The furnace shown in Fig. 1 is the furnace in which the high-class metal is melted, and it is about this furnace that we will endeavor to interest our readers. This is what is known as a Swedish furnace, and is the only one of its kind in Canada. It cannot be considered as an economical furnace in the ordinary sense of the word, but the difference in the quality of the castings and the absence of rejected castings more than compensates for any possible loss of metal in melting.

As will be seen, it is essentially a chimney with a hood similar to that used in a blacksmith's forge. In reality there are two hoods connected to the one chimney, so that two furnaces can be operated at the same time, but we will only consider one.

In the left bottom corner will be seen what is really the

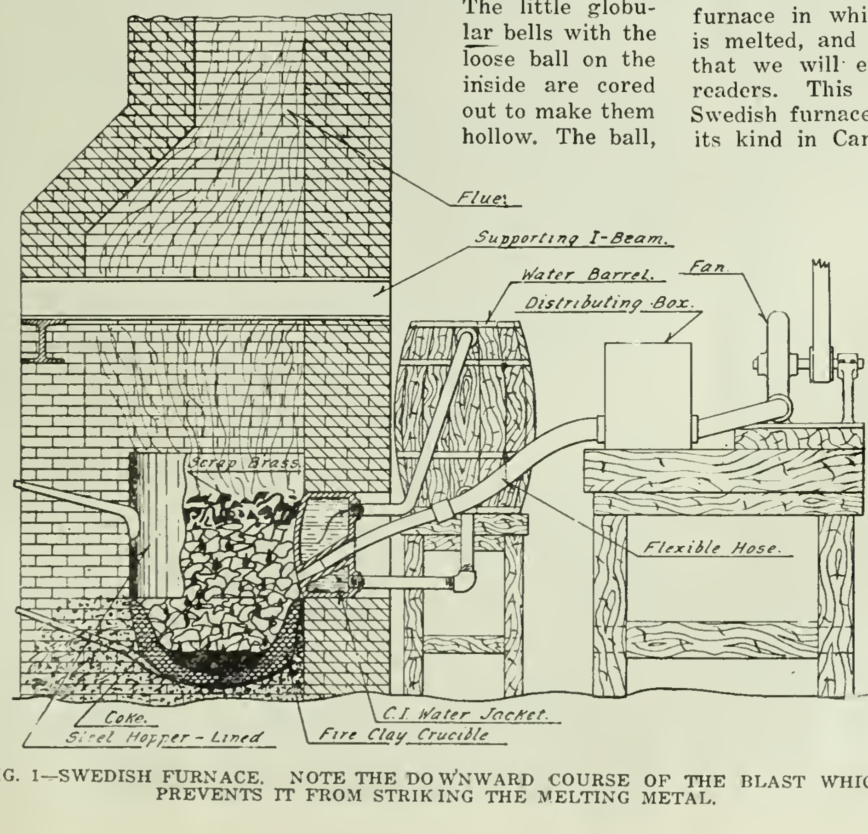


FIG. 1—SWEDISH FURNACE. NOTE THE DOWNWARD COURSE OF THE BLAST WHICH PREVENTS IT FROM STRIKING THE MELTING METAL.

furnace. This consists of an iron dish-shaped bottom (see Fig. 3), on top of which the fire-clay crucible shown in Fig. 1 is built, and on top of crucible the sheet iron shell or hopper (Fig. 2). This shell, which is also shown in Fig. 1, has an opening in the back where it fits up against the wall. From this it will be understood that by placing it against the wall the open side is closed and it is really a small cupola furnace with an iron bottom, covered on the inside with fire clay, which constitutes the basin or crucible. On top of this, and as a part of it, is a fire-clay wall, which constitutes the melting zone, and on top of this is the sheet iron part which contains the charge of coke which has not yet been lit through, and also the charge of metal. This type of furnace depends on artificial blast the same as is used for melting iron. This is supplied by a blower in the rear of the chimney, and which is driven by electricity. In the brick wall at the point where the open part spoken of in the sheet iron comes, is a water back similar to what is used in a range for heating bath water, etc. This is connected up to a tank of water in the rear and the water circulates through the water-back the same as through the ones referred to in ranges, but not for the purpose of heating the water but for the purpose of keeping the iron fire-back cool. This idea of circulating cold water through the iron affair is to avoid continually repairing the wall with firebrick or fire cement. The blast pipe enters the front of the wall in a downward course, through the water-chamber, and the blast is forced into the fire through the opening in the back of the sheet metal portion of the furnace. The melting and refining of the metal from this on would appear to be similar to that of the Bessemer process of making steel, only all combined into one operation. The blast strikes the fire at the top of the crucible, which is full of burning coke; rapid combustion takes place, and 150 pounds of metal can be melted down in about 7 minutes. As the metal melts and runs down through the burning fuel it gathers in the crucible bottom and continues to fill the crucible until the top of the melted metal, over which a covering of slag will by this time have formed, rises up to the level of where the blast enters, and the blast will now be forced against the top of the metal, and to a certain extent under the surface, in a similar manner to the Tropenas converter in a steel foundry. The melted brass is, however, not superheated as is melted steel, for the reason that non-ferrous metals or alloys do not contain carbon, and consequently there is nothing to support combustion. It must also be remembered that when the melted metal rises to this height the burning fuel has been forced entirely above the blast, which now blows between the fire and the metal, making it unlikely to be any further heated.

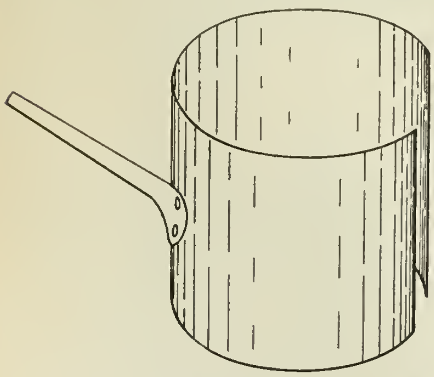
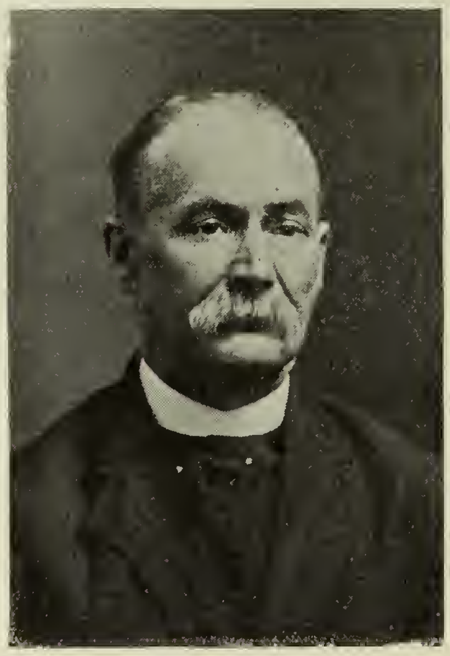


FIG. 2—SHEET METAL HOPPER WHICH HOLDS THE STOCK DURING MELTING PROCESS.

Bessemerizing Effects

To those who understand the process of converting cast iron into Bessemer steel it will be easily understood, but for the benefit of those who do not we will explain that the cold air is blown through the melting iron, which is only melted to a red heat. The oxygen in the air combines with the carbon in the iron and causes perfect combustion, burning out the carbon, and at the same time heating the metal to a white heat, but as we have already pointed out, this does not occur in brass mixtures (technically known as non-ferrous alloys) because there is no carbon in them. If, however, it was desired to melt brass turnings containing iron or steel chips, it is not necessary to use the magnet to remove the objectionable metal, because this metal is no longer objectionable; the Bessemerizing action which takes place thoroughly decarbonizes the iron and leaves the soft iron, which mixes perfectly with the other metal and actually improves it.



HENRI BOUDRIAS.
Champion long service brass melter, having 52 years continuous work to his credit, and still hale and hearty and good for many years to come.

Objectionable Features

The chief objections which could be advanced regarding this style of melting would be that the blast would oxidize the copper, and that the melting of copper in a fire is wasteful on the metal. To combat this it must be remembered that fire is no worse than any other heat unless it is too hot a fire, and that metal is not burned in an ordinary fire unless it comes in contact with the blast. As this fire is arranged the melting metal is above the fire, while the blast is pointing downward, and as the metal melts and drops down through the current of air, the blast actually assists it in its downward course, giving it very little time to be affected, and as has been stated the blast and the fire do not strike it at the same time. The only real damaging effect being a considerable reduction in the tin or zinc content of the alloy, and also a contamination of the copper from the effect of the oxygen, for which it has a strong affinity, but this is easily overcome by the introduction of zinc after the blast is taken off which deoxidizes the copper.

When the metal is all melted the sheet metal hopper is pulled off and the metal is skimmed off clean and the zinc and any other alloy which is required is dropped in and stirred through. A hand-grip attachment is put on to the shank of the crucible shown in the illustrations, and an additional shank is attached to the opposite side for lifting purposes. The crucible is now lifted bodily and the pouring is done direct from it into the moulds.

Commendable Features

There is much to commend this style of furnace for other classes of brass and bronze work than bells, inasmuch as it is a decarbonizer. It could be utilized in melting iron—copper mixtures to be used in special castings where iron is desired. That it will melt the metal and produce pure, sound castings is no exaggeration as the proof is before the eyes of anyone who visits the plant. Bells must be clean and pure; so well is this known, that the expression "Clear as a bell" is a common expression, denoting that the name "bell" stands as the emblem of purity.

The Employees

A few words about the men who do the work will not be amiss. Many of the employees, like their employers, have remained in connection with this business even to the third and fourth generation, and some of the old originals are still on the job. Perhaps none of the men who were engaged the first year are here still, but some who were engaged by the original founders are still to be seen regularly on duty. John T. Maddon, an old "faithful," who has been with the company for nearly half a century, is still a regular attendant, being in charge of the plating department. Another, and one whom we believe holds

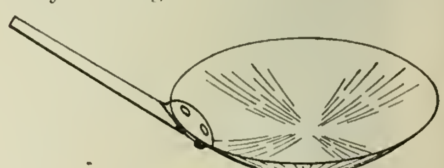


FIG. 3—BOTTOM ON WHICH FIRE CLAY CRUCIBLE IS BUILT.

the plume, not only in Canada but in the world, for long service as a brass melter, is Mr. Henri Boudrias, who has gone considerably beyond the half century mark in this establishment.

Mr. Boudrias, whose portrait is shown, was born in Montreal in 1853. At the age of 14 he was apprenticed to Messrs. Clarke to learn the trade of moulding. He began as core maker, and worked his way up step by step until, at the age of 17, he became the melter, which position he has held continuously ever since, making in all fifty-two years in this one foundry, and forty-nine years steadily employed at mixing, melting, and pouring the metal.

Mr. Boudrias is a typical French-Canadian, overflowing with good nature and politeness, he gladly gave us all possible information about the furnace and its peculiarities, and incidentally about his own career. He reluctantly allowed us to have his picture, only yielding when he found that it was absolutely essential to the success of our story. Mr. Boudrias has with him his two sons, one cousin, and one nephew, all practical bell founders.

The fact that men will spend their entire lives in the one establishment and that their families follow in their footsteps, would certainly speak well of Messrs. C. O. Clarke & Bro. as employers of labor, and the fact that they have operated continuously for sixty years speaks for itself regarding their business ability.

In addition to the founding of brass and bronze bells the Messrs. C. O. Clarke & Bros. do small brass castings for the trade. They also have a stamping business and manufacture stamped steel bells and padlocks, and, as previously mentioned, they have an up-to-date nickel-plating plant.

Practical Hints for the Brass Founder

MELTING TIN AND LEAD

In a former issue of CANADIAN FOUNDRYMAN was an interesting article on bismuth, tin and lead, in which it was shown that the temperature required to melt this alloy was less than the mean temperature required to melt the separate metals. This is the case in all non-ferrous alloys, and is a phenomena which is hard to explain; but if we do a little bit of experimenting, we will find things which are really harder to explain. Take the two metals tin and lead, and mix them in equal proportions, and we have ordinary solder, which melts at a temperature of 370 degrees Fahr. As lead melts at 612 degrees and tin at 440, it will be seen that the solder melts at a lower temperature than even the tin.

Now, as we would naturally expect, the tin being the easiest to melt, if we change the mixture to 40 lead and 60 tin, the resultant alloy would melt at a lower temperature, which in reality it does, requiring only 334 degrees to melt it. But this is the limit which we can go. If we go beyond this the table changes, and if we increase the tin so as to have two parts of tin to one part of lead, it will require 340 degrees to melt it, being a slightly higher temperature, in spite of the increased tin content of the alloy.

FUSIBLE ALLOYS

In the article just spoken of, it was shown that if five parts bismuth, two parts tin and three parts lead are mixed together, they will melt at a temperature of 197 degrees, or 15 degrees below the boiling point of water. This makes a good standard metal for fusible plugs in steam boilers, in electrical wiring as current interruptors or fuses, and for automatic fire extinguishers, and is safe enough to not melt out too easily.

But this temperature of 197 degrees can be greatly reduced, and in a manner least expected. If the tin, which is the most easily melted of any of the constituent parts, is omitted and antimony, which melts at 810 degrees, is substituted, an alloy can be produced which will melt at a temperature of 150 degrees Fahr. This alloy is known as expanding alloy, and consists of lead 66.7. bismuth 8.3, antimony 25. This alloy expands slightly on cooling.

WOOD'S ALLOY

An alloy which will melt at a temperature of 140 degrees, and which is the lowest yet known, is Wood's Alloy. It is composed of bismuth 50, lead 25, tin 12½, cadmium 12½.

CADMIUM

Cadmium is a comparatively rare, white, ductile, malleable metal. It is usually found as a sulphide accompanying the ores of zinc. It scarcely tarnishes in the air, but it will burn readily when heated in the air. It was discovered in the year 1818. Its specific gravity is 8.6, and it melts at a temperature of 315 degrees. As a metal it is chiefly used to lower the melting temperature of other metals; but in chemistry it is used to a much greater extent. Cadmium sulphide is a bright yellow powder, and is used in the manufacture of yellow paint and dye. Cadmium chloride, bromide and iodide are white, soluble salts, used in photography.

ANTIMONY

Antimony is a grayish white metal having a slight bluish shade and very brilliant. Its texture is lamellated, and exhibits plates crossing each other in every direction. Its surface is covered with herborizations (the figure or appearance of plants) and foliage. Its specific gravity is 6.702. It is sufficiently hard to scratch all the soft metals; it is very brittle, easily broken, and pulverizable. It melts at 810 degrees Fahr. It can be volatilized, and burns by a strong heat. It unites with sulphur and phosphorous. It will unite by fusion with gold, and renders it pale and brittle. Antimony can be alloyed with platinum, silver, lead, bismuth, nickel, copper, arsenic, iron, cobalt, tin or zinc, forming compounds more or less brittle.

TO FIND THE MELTING POINT OF ALLOYS

The melting point of alloys which melt at a low temperature may be found by tying a small wire to a piece of the alloy and suspending it in a pot of water which is gradually heated. A thermometer is kept in the water, and as the temperature raises the thermometer is watched until the alloy melts. This temperature is noted as the melting point of the alloy.

As 212 degrees Fahr. is the limit to which water can be heated, paraffine wax is substituted for alloys which require a temperature above 212 degrees.

ALUMINUM BRONZE

Aluminum bronze contains from 1¼ to 11 per cent. aluminum and the remainder copper. It varies from a tensile strength of 25,000 pounds for the 1¼ per cent. aluminum to 90,000 pounds for the 11 per cent. aluminum alloy. More than 11 per cent. aluminum produces a brittle alloy. Aluminum bronze shrinks more than ordinary brass in casting, and hence care is required in pouring it into the molds. Aluminum bronze containing less than 7½ per cent. aluminum can be rolled, swedged, shorn or drawn.

ZINC IS ZINC

The American Zinc Institute, recently formed, has, as one of its objects, to free zinc from its many nicknames, and is making an effort to discourage the use of such names as spelter, blende, jack, and like misnomers. The institute has now over 140 members, representing practically every zinc mining and zinc smelting interest in the United States. Many trade journals, the United States Geological Survey, and the Bureau of Mines, have already agreed to call zinc by its right name.

The Moulding and Pouring of Marine Engine Bed

Describing the Method Employed on a Triple Expansion Engine Bed, Either Cast in Sections or in One Complete Casting

By JOHN H. EASTHAM

THE bedplate casting shown in photograph at Figs. 1 and 2 is of triple expansion type, cast in one piece, and, as indicated by the figures chalked on the casting in the end view, weighs twenty-eight thousand, three hundred and fifty pounds (28,350), and is naturally, from it very large area and complicated design, a highly important unit in marine engine construction from the foundry standpoint.

FIG. 1 SIDE VIEW OF MARINE ENGINE BED PLATE, WEIGHING 14¼ TONS.

The making drying, and assembly of the cores used in a casting of this design, numbering over one hundred, backed up by the risk of warping or cracking through unequal contraction, raise the question as to the wisdom of producing these castings without a joint, hence the method of turning them out in units of a single crankpit, with consequent less risk in the foundry and possibly more freedom of action while machining. Fig. 3 is a bedplate of larger size than the former examples, being 16 feet 8 inches wide and 3 feet 1 inch deep over all, assembled after machining ready for the erection of the columns. A set of these castings stacked up in the foundry alongside the cope flask used in their manufacture, is shown at Fig. 4, the method of gating being plainly shown by the oblong patches left after chipping the runner fillets flush with the body of the casting. In foundries specializing on marine work a waterproof tank or pit is usually installed for the convenient handling of heavy work, binding loops or eye bolts being attached to the sides or bottom of the tank, their upper ends about level with the foundry floor.

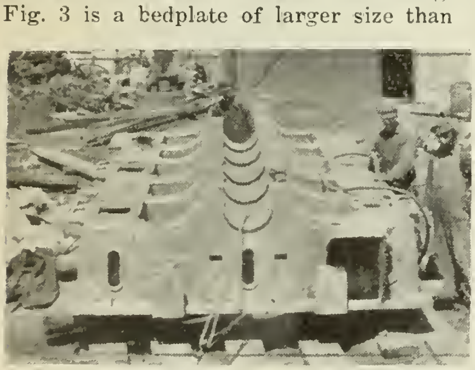


FIG. 2 END VIEW OF MARINE ENGINE BED-PLATE. NOTE WEIGHT ON CASTING.

A cinder bed is laid over the tank floor, vent pipes being sloped from the bed around the sides and ends of the pit to the floor level at convenient points, the more pipes the less risk of scabs on the castings, and if at its installation you cover the coke bed with good old bags, you need not worry about a new coke bed for years. Floor sand is next rammed fairly hard all over the pit area up to the level shown at "bed level" in the sketch of the assembled mould at Fig. 5, and a level bed struck off at this elevation, the space to receive the shaft bearings being then cut away, following which the bed is levelled off finally with a facing sand mixture, carrying a sufficient core compound or flour content to withstand skin drying and the rush of the five and a half tons of metal used in pouring each section, local conditions and amount of clay in sand used governing the proportion of binder added.

Moulder's opinions vary as to whether a bed of this kind should be vented down to the cinders before or after spreading the facing sand, but either method will serve equally well if the vents are in sufficient number, and each one plugged with the finger before the last sweep off, about three-quarters of an inch from the face of the mould being the best distance for practical purposes. The pattern is now lowered to place, the pads being roughly bedded in temporarily, the bearings being next rammed up, and at this point alternative methods present themselves.

The side sectional view of the finished mould at Fig. 6 shows the facing pads at the shaft bearings made in slab cores, strengthened by light cast iron grids or arbors drawn in detail in the same position at Fig. 5. Earlier experiments having the facing pads dowelled to the main pattern, and drawn inwards after its removal from the sand, gave so much trouble on account of their comparative inaccessibility, that the slab core method was decided on as being much the cheaper and safer method, the cores being laid to the pattern and sand rammed round them, a strong oil-bound sand and the grid above mentioned removing most of the risk of breakage through rough usage when ramming up or drawing the pattern. At, or a little above the upper faces of the slab cores on the inside of the pattern a soft bed is roughed up covering the full area of the crankpit, the lifting plate shown in perspective at Fig. 7 being next stamped down to position and rammed up to the top of the pattern as outlined at Fig. 6, the inner mould or core thus formed being reinforced at suitable intervals by loose rods as is customary in deep moulds or pockets.

Incidentally the inner flange on the pattern should be loose, to allow the lifting plate to be of full length and width, the need for loose rods being thereby considerably decreased.

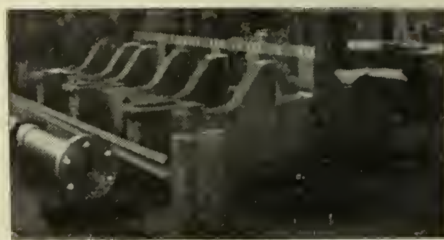


FIG. 3—THREE PIECE MARINE BED PLATE ASSEMBLED READY FOR COLUMNS.

The flanges and brackets encasing the column seatings shown in photo at Fig. 3 and at Fig. 8 are also formed in cores, their position being marked "cover core" at the end of the finished mould at Fig. 5, these cores being rammed up outside

FIG. 4—THREE SECTIONS OF MARINE BED PLATE STACKED UP IN FOUNDRY. COPE ALONG SIDE USED IN PRODUCTION.

the pattern in the same way as the slab cores at the bearing facings.

Following these details the mould is rammed up to the joint, all bracket corners being rodded and hand hole dowel pins removed as encountered, a parting made, and the cope flask rammed up, risers, vent plugs, and runner pins in position.

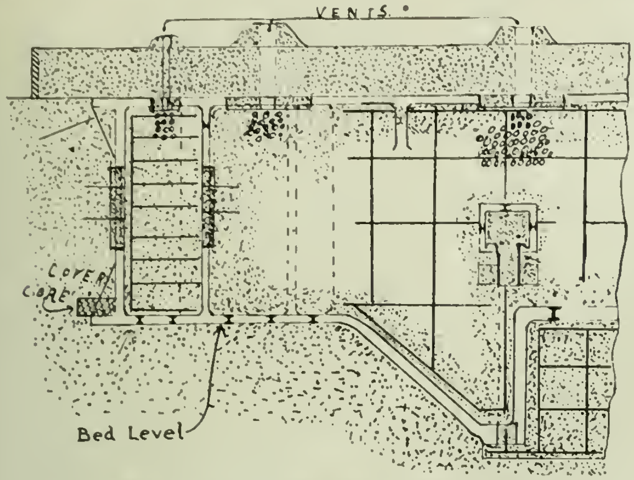


FIG. 5—SIDE SECTION VIEW OF ASSEMBLED MOULD, MARINE ENGINE BED.

In this connection a set-off is made at the parting, the upper runner pins being placed a few inches away from those reaching from the parting downward, these latter being of course directly connected to the horizontal inlet gates, which may be either drawn inward when finishing the drag mould or rammed up in core. A frame core-box with the gate-pin drawn endways, making a standard inlet for bottom poured castings, the area of the gate about three inches by five-eighths of an inch, and ten or twelve inches long, is a useful asset in any jobbing foundry, saving a lot of trouble where a casting is gated at the lower extremity of a narrow flange or foot.

The cope flask, after stacking and ramming are concluded, is removed, and where convenient, finished while hanging in the crane before lowering it down on blocks at each corner, careful wedging being essential upon lowering so as to prevent undue twist or strain, with consequent danger of a drop-out.

Incidentally, the style of flask shown in the photograph at Fig. 4 is of a good type, and fairly cheaply made the sides and ends being cast loose, of double-flanged or "channel bar" design, suitable boltholes one-eighth larger than the bolts to bo used being cored out where needed. The open sand method of casting these parts being quite in order when sufficient care is exercised. The box bars are slotted at intervals, so far as may fairly be done without weakening the entire structure, the cross bars being cast on the main bars at suitable distances apart.

The usual scratch and vertical vents around the pattern having been provided, the joint is swabbed and the pattern drawn after being rapped, lifting straps, "S" hooks and turnbuckles on four chains giving the best results. The centre lifting plate is next taken out by the same arrangement and carefully lowered on rails placed across the cope flask, valuable floor space being thus saved for other purposes, finishing operations being then commenced from the joint downwards in accordance with the best of foundry practice.

The areas adjacent to the inlet gates and all loose pieces in the way of brackets and hand-hole prints are carefully nailed before the withdrawal of these parts, care being taken that the nails be driven far enough at all places where fillets are required to allow of their proper cutting and rounding.

As in the case of most other pit work of a similar nature, all prints in the lower parts of the mould are left in till the last few minutes before applying the blackwash, an operation best perform in shops with compressed air facilities by a nozzle and spray arrangement, an even coat in all brackets and out-of-the-way corners being thus assured. Failing the use of compressed air, the time-honored system of swab or camel-hair brush must be resorted to, the mould being afterwards dried overnight by a soft coal, wood, or charcoal fire, the cope being hung over the whole and dried at the same time, at a sufficient height to prevent burning.

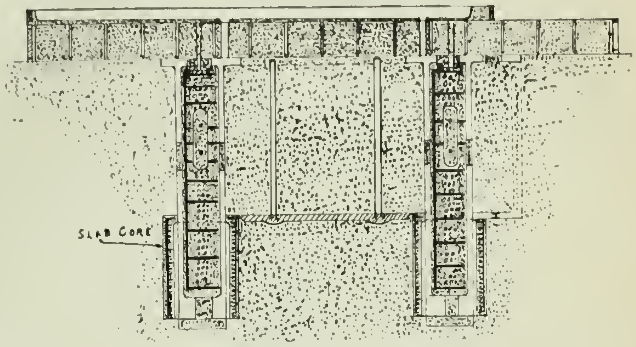


FIG. 6—SECTION VIEW OF MOULD SHOWING MAIN BEARING CORES AND CENTER LIFTING-PLATE.

Actually the cope mould needs no drying, the area not cut through by cores being very small, not much top face being presented to the metal but taking into consideration the heavy paste roll placed on each lightening core to secure a firm touch and minimize the risk of metal entering vents, the safety-first method is advisable. The centre lifting plate section is run into the core oven for a night's drying simultaneously with the drying of the cope and drag moulds. Assembly of the numerous cores and the mould parts is begun immediately after removal of the little ash and dust de-

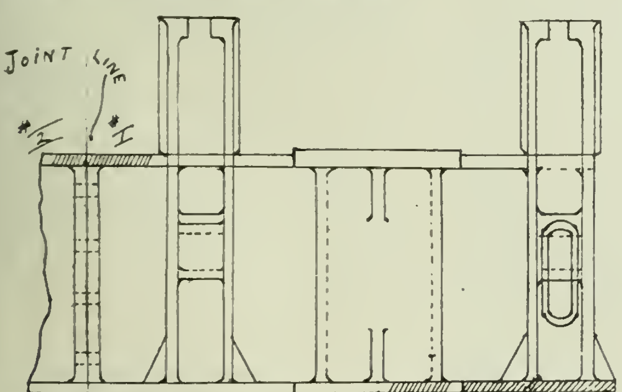


FIG. 8—MAIN ENGINE BEDPLATE SECTIONS ASSEMBLED AT JOINT LINE.

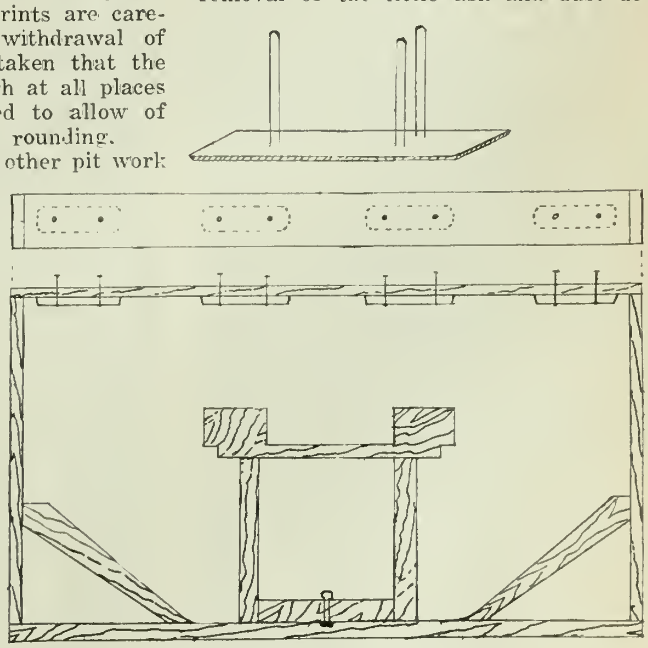


FIG. 7—MAIN BEARING CORE BOX AND PERSPECTIVE VIEW OF CENTER PLATE.

posit in the mould corners, the compressed air hose being here pressed into service the morning following drying operations. The "T" headed cores forming space for the main bearing cap bolts are first lowered to place and secured, the gases from them being conducted down to the coke bed by roomy vents, paste rolls ensuring a through connection without danger of any metal strain entering the vents on account of the very heavy static pressure set up in a mould of this description. The centre plate is next lowered to place, and the placing of the main bearing and lightening cores begun, their respective positions being shown at Fig. 5.

The system used in making the larger cores varies in different shops, the skeleton frame method exemplified at Fig. 7 being perhaps the most economical both for pattern shop and foundry. As stacking up on the core oven car is necessary on account of the large area covered by the main bearing cores when laid flat, special core plates of exact size are provided, cast, of course, open sand, as one good face on each plate is all that is necessary. They are very cheaply made, a bed being levelled on two straight edges in the usual way, softened up about six inches deep, the surface being patted with the flat of a spade before strickling off, a little fine riddled sand then spread across the bed and patted with the strickle before the final sweep off, the core frame being now laid on the bed and its outside rammed up in floor sand a couple of inches deep, a runner being made up at one end and vents driven under from each side before removig the frame. Lifting lugs are then cut in each side of the mould, each lug about four inches square, a one-and-three-quarters or two inch round core stuck in each lug providing a means of lifting the plates on edge easily when so required, while a flow-off gap cut in the side at whatever thickness the plate is needed will ensure correct dimensions when pouring.

The core grids or arbors are made by laying the core frames on a soft bed and stamping out the design in the usual way, the prods being pushed in by means of a pointed bar. wrought iron loops being cast in where necessary for lifting the cores when dried.

Coke vents are employed in all the larger cores, quick drying and speedy exit of the gases when pouring being thus assured, the cores being rammed up directly on the plates, their upper faces being struck off level, the frames being then unscrewed and taken apart and the fillets cut and rounded where possible. the application of the blackwash before or after drying to those faces visible being a matter of taste and convenience.

In shops equipped with more than one crane a "double pour" is advisable, the strain being thus more evenly divided, whilst the risk of cold shuts is also greatly reduced, and obviously, should the whole bedplate be cast in a single unit, its enormous area would make such a course imperative. In that event two copes are generally employed on a single mould, a parting of the sunk variety one and a half or two inches deep being made, that portion at the meeting of the two box parts in the centre of the casting being best controlled by a concave lift in one and a convex design in the other, friction and the necessity for much clearance and consequent waste stuffing being thus abolished. The usual type of girder binders hold down the copes when pouring, hook bolts passing down through them to the loops attached to the pit tank previously mentioned. The metal charges used should be reasonably soft to prevent the danger of cracking the casting in cooling, while possessing considerable tensile strength, the following analysis being approximately correct:

Silicon per cent.	Sulphur per cent	Phosphorus per cent.	Manganese per cent.
1.25 to 1.75	under 0.10	0.30 to 0.60	0.60 to 0.80

The foregoing methods, other conditions in the way of melting equipment, due allowance for shrinkage in all core arbors well regulated core sand, etc., being equal, will make wasters conspicuous by their absence, one per cent. losses being usually considered excessive.

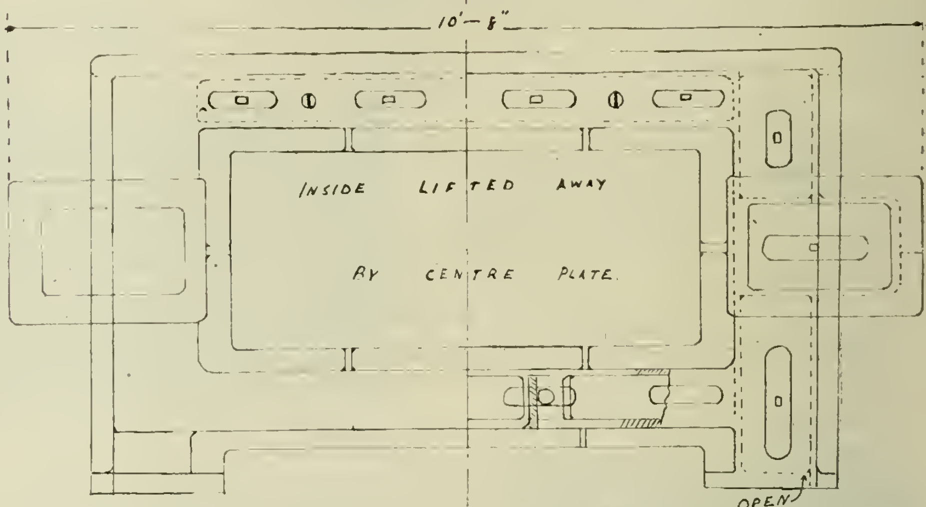


FIG. 9—PLAN VIEW OF MARINE ENGINE BED.

Falling Down of Cope Face

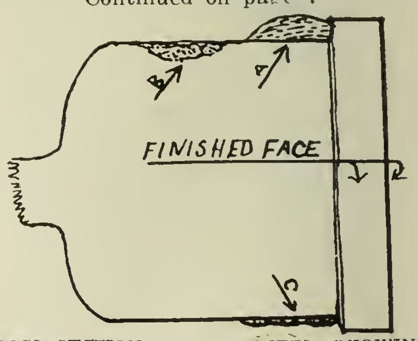
The Heat of the Melted Metal Makes Trouble Which is Frequently Attributed to Scabbing

THIS may not be the name by which this trouble is always known, but I think it will be understood by this name, and I believe that practically every moulder will remember having had the same trouble at certain periods of his experience.

What I mean is that the cope dries out before the mould is filled and falls down into the melted metal.

I remember making flywheels with the rim of practically a square section to which was added a finishing part at the outer face, giving it something of the appearance of the sketch shown. The castings ranged from two hundred pounds up to eight hundred, and I had good luck with them all excepting the eight-hundred pound ones, and these were invariably bad on the top face. Everybody had suggestions and remedies, but none of them were of any use. The principal argument was that I had the mould too hard, but I didn't have them any harder than the others, and, anyway, my experience had always been that the under part was the most likely to scab if the ramming was to blame, and I settled it in my mind that it was not scabbed in the sense in which the expression is generally used. The whole trouble was that the facing sand was not strong enough in bond, and this particular wheel, having a bigger body of metal, would have more heat units and would also take longer to fill, and this left the face of the cope exposed for a longer period of time to a greater heat than was the case with the smaller wheels, with the result that it was dried to dust, and the part A, where the arrow points to, being the least secure, would let go and fall on top of the metal just before the metal got to it, and

Continued on page 7



CROSS SECTION OF FLY-WHEEL, SHOWING HOW SAND ACTS UNDER THE INFLUENCE OF MOLTEN IRON.

Moulding Large-Diameter Five-Way Flanged Pipe

Being a Continuation of an Article in December Issue in Which a Small-Diameter Pipe Was Made. As in the Former Case, This is Made in Loam

By C. THOMAS

THE accompanying illustrations show the method adopted for dealing with a large-diameter loam pattern of a similar design to the smaller pipe discussed in a previous article. In this case the branch is made loose and fits into a seating or recess in the main body core. The core for the branch is made slightly over size at the end where the flange is fitted and slightly under size at the seat end. The method of sweeping up is shown in Fig. 6. Two circular plates are cast, one for the top and the other for the bottom, and lifting staples, lugs, etc., for bolting together, are provided in both plates. It will be observed that the core is made the wrong side up for use, and as a result of having the lifting staples in both plates, it is quite easy to turn this over. Care must be taken to screw the bolts up tightly to clamp the brickwork together, or otherwise, when turning over, this brickwork is liable to move.

The thickness of the branch core is formed by wrapping the core loosely with straw bands, and after cutting the thickness out of the core board, the core is swept up again in the usual way. The length of the thickened core should be left 1-8 in. or 3-16 in. longer than required, so as to allow for adjustment when assembling the pattern. The brackets for fastening on the core plates are made 1½ in. higher than the top of the angle, as shown in Fig. 2, and a recess is cast in the centre of each plate to take the wood bar carrying the centre pin used for sweeping out the seating to receive the branch core. Before making this seating, the main core is made the correct height to the branch joint. This is done by using a strickle, as shown at A, in Figs. 3 and 4.

This strickle runs on the brackets, and the recesses in these are filled up with loose pieces of wood to allow the strickle to pass over them. When this has been done, the pieces are taken out and the long wooden bar, marked B in Fig. 2, is placed in position. This carries the centre pin on which revolves the "sweep," shown in Fig. 5. At this stage it is advisable to rough out the shape of the seating in the main core and also the outside diameter. After drying, care must be taken to trim the top to the long strickle A, after which operation the sweep and centre bar are placed in position. It will be noticed from Fig. 3 that a block of wood marked C, with a recess or groove down the side is fastened to the top side of the arm that carries the sweep. On the under side of the arm at each end two pieces of wood are fastened, of a thickness equal to the depth of the strickle from the top of the brackets. By keeping these down on the true face left by the strickle A, the block C is kept at right angles to this face. After sweeping the seat up, the strip of wood marked D, Fig. 3, is placed in the recess or groove in the block C. By moving this up and down the groove, the whole of the outside diameter of the branch seating may be swept up. A radius on the end of this strip is also necessary to form the angle. If the branch flange is fastened or weighted down when the patten is rammed up, and the straw bands have not been too tightly wrapped, the core can be drawn through the cope before this is lifted off. It is then an easy matter to remove the thickness from the mould when the cope is lifted off. This method will leave a much better mould than drawing the whole branch together with the thickness through the cope. The core should be well packed down and also rammed with sand before casting. See figure 1.

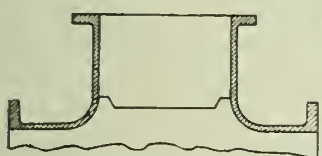


Fig. 1.

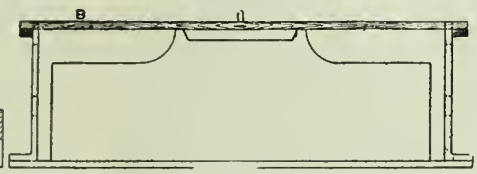


Fig. 2.

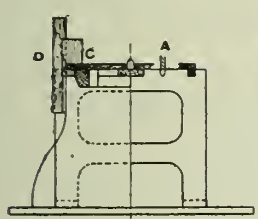


Fig. 3.

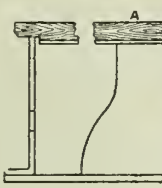


Fig. 4.

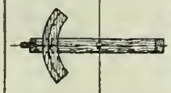


Fig. 5.

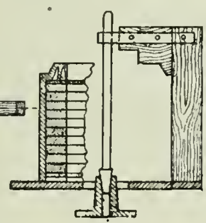


Fig. 6.

FALLING DOWN OF COPE FACE

(Continued from page 6)

would be moved a few inches and then forced up again, as at B. Had that part of the facing sand contained any kind of core binder, or even molasses water or clay wash, and left in the green state, the iron would have dried it to a crust instead of to dust, and would have made not only a casting with all its parts intact, but also a casting with a superior face, similar to a dry sand mould.

Another preventative is coal oil. Coal oil can be sprayed on in abundance, even to using a sponge to put it on, and it will burn and do no harm in the way of blowing, but will do a lot of good in forming a crust which will not fall of. If the face is sprayed with molasses water and then plumbagoed and afterwards sprayed with coal oil, it will hold up against an enormous heat and will be dry enough for the iron to lie peaceably against by the time the mould is full.

Scabbing

If the mould was rammed too hard or was too wet, or for any reason it should scab, it would probably be at the bottom, as at C. Gas trying to escape from the sand will break through into the mould, tearing the face, but gas from the cope will seldom crowd downward, as there is little gas formed until the mould is filled with metal.

A FAIRLY GOOD-SIZED CASTING

The Canadian General Electric Company, Limited, as every one knows, turns out some enormous electrical machinery, but little credit is ever given to the foundry end of the work. In connection with a 12,000 horse power horizontal, alternating current generator, which this company is building for the Hydro-Electric Power Commission of Ontario, the castings for which are being made at their Rockfield works near Montreal, there is one casting which figures up to some twenty tons, and which required the better part of a month in making the mould.

This piece was moulded entirely in brick and loam, with incidentally a considerable number of cores. No pattern is required in this class of moulding, but a considerable degree of skill, coupled with the greatest of care, is required. While we gladly give credit to those who have done so much to advance the science of electricity we must not forget that the moulder and founder is still in the foreground.

Making Match Plates and Sprays of Patterns

The Match Plate Has Advantages, so Has the Spray of Patterns. A Combination of the Two Will Sometimes Have Advantages Over Either

EVERY moulder or at any rate most every moulder knows what a match plate is and how it is made, as well as some of its shortcomings. That the match plate has advantages not possessed by any other kind of a pattern is an established fact. Yet, with all of its good features, it has its bad ones. The match plate can be used on almost any class of work, but its greatest advantage is in the moulding of small pieces where a great many patterns can be fastened together on the plate and gated with light gates, the gates not requiring to be a support for the patterns as they would be if a spray of patterns were used instead of the match plate. For squeezer work, the plate has additional advantages in that it keeps the two bodies of sand apart, viz., the cope and nowel, before either part is squeezed. In using the match plate on a squeezer the bottom boards are made the size of the inside of the snap flask, and when the sand is put into the nowel it is struck off and the bottom board put into place while the sand is yet soft. The snap is now rolled over and the sand put into the cope and this is likewise struck off. A top board with hole in it to fit the gate pin or to punch the gate through with a tube is now put on. The pressure is now applied and both parts are squeezed at the same time. The cope is now lifted off and the match plate withdrawn and the cope replaced when the mould is done.

The mould is done, of course, provided we had a clean lift and a clean draw, but this is not always guaranteed. An electric or pneumatic vibrator attached to the match plate or even to the bench will often overcome the trouble though. Where the vibrator is not to be had, a second man is frequently requisitioned with a mallet, but even then it is none too sure.

One great drawback to the match plate is in getting a clean draw on a small hole, such as rivet holes in small novelty work. The sand has to be tight enough to prevent washing and if so it is almost sure to be too tight to let go when the plate is being drawn. If the

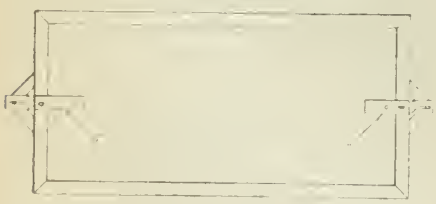


FIG. 1—FRAME FOR MATCH.

vibrator is worked to an extent sufficient to loosen it, the chances are that it will be more than loose from the rest of the mould and the mould will be all shook out of order. This is really the only serious drawback to the match plate, but this is SO serious that many manufacturers of small hardware and novelties consider it more advantageous to use the spray of patterns and the sand match.

In Fig. 1 will be seen a convenient contrivance to overcome many difficulties. The frame is made of brass or aluminum or, in fact, any material which is strong enough. It is similar to the pattern which would be used in making a match

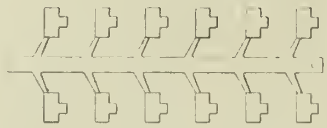


FIG. 2—SPRAY OF PATTERNS.

platé of the ordinary type. The projections AA are adjustable endwise. Fig. 2 is a spray of small patterns fastened to a gate which projects beyond the ends and has holes to match the holes in the adjustable parts AA, Fig. 1. These holes are aligned and the parts fastened to each other. Fig. 3 shows the spray of patterns fastened into the frame, making it to all intents and purposes the same as a match plate, only that it is all open. It is now ready to be fitted to a sand match or fallow-board, after which the nowel can be rammed, squeezed or jolted the same as any pattern. It is rolled over on a bottom board and parting sand applied and the cope rammed up as with any mold. The vibrator can be attached if required, and after lifting the cope the frame and patterns are drawn as with a complete match plate. The vibrator may be used if needed and the holes can be seen and made to stay down. The fact that the top of the hole is open gives it air and relieves it, which is not the case with the plate. When the cope is closed on, the joint comes together the same as with any mould; the only difference being that the flask is separated to the thickness of the frame, but when the flask is taken off, the mould looks the same as any snap mould. This is a handy arrangement for jobbing foundries. The pieces AA being movable can be so adjusted as to fit any pattern within reasonable limit of size. It does away with the necessity of having steady pins on the pattern, the flask pins taking the place when drawing the pattern. The one point which must not be overlooked is the opening which will be left between the gate and the outside. This will require to have a pinch of sand put into it to keep the metal from running out unless the pattern is such that a core print can be made to come at this point, in which case the core will fill the space. The making of match plates such as we spoke

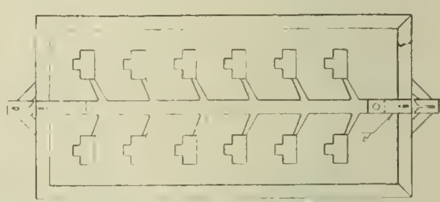


FIG. 3—SPRAY FASTENED TO FRAME.

of in the first of our paper is perhaps too well understood to require any explanations, but for the benefit of those who never learned that part of the trade we will describe it in a later issue.

Coremaking is an Essential

Every Good Moulder Should Be a Good Coremaker as Well

Coremaking is, to molding, what the boy is to the man, and as no man can exist without first having been a boy neither can a molder have much of an existence unless he has first been a coremaker. The molder who does not understand core work is only a partly finished product. He may be as good as the best at some lines of work, but on the whole he is working under a terrible handicap; he is simply a specialty man, and while the specialty man is the man who fills the bulk of the positions in industrial plants he is nevertheless simply a tool, and a special tool at that. To be a good molder, capable of picking his job, a man should make it a point to learn coremaking as thoroughly as possible. Coremaking to be sure is the first job of the apprentice in some shops, but he usually spends about six months on the simplest kind of cores and during this period he helps at casting time and in a general way gets himself used to the shop, after which he proceeds to learn green sand moldings, but his ability as a coremaker is very limited. In the bulk of foundries the apprentice does not get a chance at coremaking at all and as a general thing he does not want it. In real high-class work the coremaking is the biggest part of the job.

Some of the points to be considered in studying up this work in after years by men who were denied this part of their apprenticeship, includes the shape and size of the grain, heat-resisting qualities of the sand and the binder or bonding material to be used.

In order to understand what sand and what binder to use it is important to know for what purpose the core is to be used. Some binders shrink under the influence of heat while others would.

appear to expand, but in reality there is not much expansion. Take for instance "flour"; this is the old reliable binder of years ago, and its expansive qualities were its worst qualities, yet no one seems to have given it a thought to ascertain where the material came from which could make it expand. A little experimenting will show it up. If a sack of flour is submerged in a cask of water it might remain there for days and the water will only penetrate a short distance into it and the interior will remain dry, which shows that flour is a poor absorbent of water. If dry flour and dry sand are mixed together and tempered with water the water does not go very deep into the flour until after the core is heated in the oven, and the water is converted into steam, when it will saturate the flour, causing it to expand. If this core sand mixture could have been heated to a steam heat before being made into cores it could be cooled off and used any time for coremaking and the cores would be relieved of this undesirable feature. Mixing molding sand with core sand is simply the same as mixing fine, sharp sand with clay wash. Molding sand is about 90 per cent. sharp sand and 10 per cent. clay. To mix in molding sand in any large quantity and use flour as a binder the core is not suitable for very high-class work. If mixed with rosin or any dry binder with a gum base, molding sand may be used to good advantage, so may clay wash. The main point to be considered is to have a core which will stand the heat of the metal and at the same time be porous enough to allow the gas to escape from the surface to the vent holes without causing any commotion where the iron comes in contact with the surface of the core. Venting the core does not count for much unless the material of which the core is made is open enough to allow the gas from the part which is being burned to get to the vent holes.

It became public at the recent annual convention of the American Federation of Labor that its membership at present is 3,250,068. There is a cash balance in its treasury of $192,490, the receipts for the year being $654,687, and the expenditures $587,518.

Advertisements are meant to "pull." In the course of the war an office manager, according to the "Nation's Business," tried to put pulling power into his advertised desire for a messenger. The advertisement he printed read: "Boy wanted—Young or Old—either Sex."

Moulding the Bed for a Screw-Cutting Machine

Showing How Green Sand Cores May Be Reinforced By Using Part Dry Sand Where Required

THE sketch shown in Fig. 1 is that of a bed or frame of a pipe-threading machine. In construction it is similar to a lath bed, but in the one section is a complete bottom so that the lubricant used in the cutting operation may be held in this chamber to be pumped over and over again. These castings can be made in complete flasks and clamped to a bottom board and the inside can be cored out with dry cores, but it is not necessary to go to all of this trouble and expense. It will be seen by the sketch that the bottom in the oil chamber is on a slant so that the oil will all run to one place. The cavity under this bottom could be made in green sand, in which case the roll-over flask would be an advantage, but as the chaplets which held up the core above the button would have to protrude through this to the bottom (when I say bottom, I mean bottom of mould, but top of casting when in use) there would be more or less risk of damage to the green part, which might cause the casting to be lost. The portion of overhanging sand at the big end of this bottom core might also make trouble as it would be easy for it to give way.

I have found it most satisfactory to have a core print on the bottom of each section and have a solid pattern and three separate core boxes.

For the open section an anchor plate to fit into the bottom of the print is required with one or more screws reaching to the top. This can be rammed up entirely from green sand by being careful to have all corners and overhanging sand well rodded. For the closed section the bottom part should be made with a dry core. It does not require any high grade of material for this, provided it has a good solid top surface and is properly supported with rods to insure against breaking. For the upper part of this section I would first place the core box on a flat plate and ram up about two inches of oil sand, well secured with rods, and after thoroughly drying this replace the core box and ram up the remaining portion with green sand. Anchor plates with draw screws would have to be rammed in.

This oil-sand bottom to the green sand core answers for an anchor to lift it by and also makes a solid bearing on which to hold up its weight. Stud chaplets are placed on the bottom core and the upper one is rested upon the chaplets. These chaplets make the thickness for the bottom and can be reinforced with pieces of tin if required to make the top parting come right to match the cope, or core can be moved slightly up or down the slant if a very slight change is required.

In the case of the dry sand core which I have mentioned as being in the underside of the slanting bottom and on which the chaplets rest to hold up the upper part of the core, I have made it hollow as shown in the engraving, which is to say, I place the core box on the core plate, and instead of ramming it full of core sand I just rub core sand up to the box and leave it open in the centre without either top or bottom, and when it is dry I fill in the centre with moulding sand. This method saves binder and also makes the core easy to dry, and it is sufficient bearing for the chaplets which hold up the other part.

The gating and pouring would be the same as with any bed, namely a gate on each side of the bottom so arranged as to enter without striking either the inside or the outside sand. An overflow would be at the other end and on the top parting.

Many heavy cored jobs can be done by leaving the core open in the centre and filling it with moulding sand, which is easily vented and troweled into shape. In making panelled sides the mouldings are temporarily tacked on, the tacks withdrawn as the ramming proceeds, and the mouldings withdrawn after the pattern has been drawn.

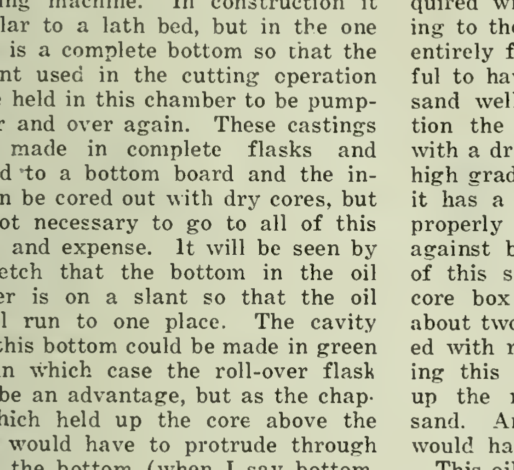


FIG. 1—BED FOR SCREW MACHINE.

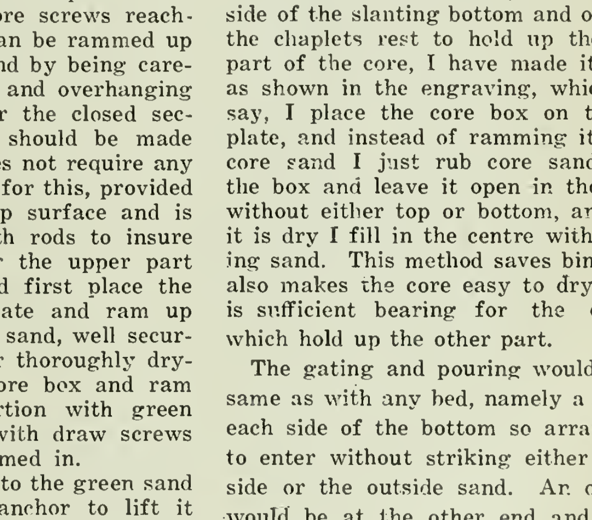


FIG. 2—CROSS-SECTION OF MOLD.

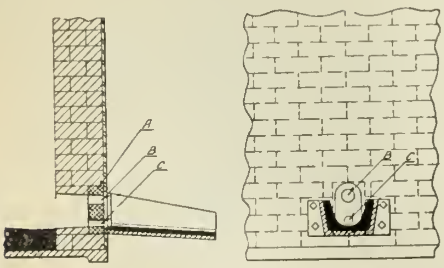
A Few Good Points in the Handling of Melted Iron

To Properly Melt and Handle Large Quantities of Melted Iron With the Minimum of Trouble and the Maximum of Efficiency is the Idea at the Cockshutt Plant

TO describe in detail all of the interesting sights to be seen in a visit to a plant such as that of the Cockshutt Plow Co. of Brantford, Ont., would make a story of sufficient magnitude to cover many volumes, and many of the points touched upon, while being of exceptional interest would of necessity be repetitions of former articles and would also be of a class understood by most of the foundry fraternity, we will therefore confine ourselves to a few items which seemed of most interest to us, and hope that they will be of equally as much interest to our readers.

As every one knows there is no more important item in connection with a foundry than the melted iron. To have the iron properly melted and properly drawn from the furnace without having it too considerably mixed with slag and dirt is one big item. To take it from the spout at a pace which will keep up to a hundred odd moulders without confusion is another point. And to provide the moulders with the means of pouring their work without undue fatigue is to any right thinking person a still greater and more important point.

The Cockshutt plant is provided with two cupolas; one 8 feet in diameter and the other 7 feet. These two are not required at the same time, but according to the weight of metal being melted one or the other is used. Either one will provide melted iron at a rate which will keep a good bunch of moulders on the jump. To take the iron from a cupola of such large dimensions requires a fairly large tap hole, and if the tap hole is large enough to do the job properly it is apt to be too large if the least thing happens to hinder the melting for an instant, thus letting the slag down onto the bottom and into the tap hole. Once this happens the rest of the heat will be in a mess. How this is overcome will be a good subject to begin with.



CROSS SECTION OF CUPOLA, SHOWING DOUBLE TAP-HOLE.

Most foundrymen who have had experience in agricultural iron work will know of the tilting spout, but for the benefit of those who do not, we will include this also.

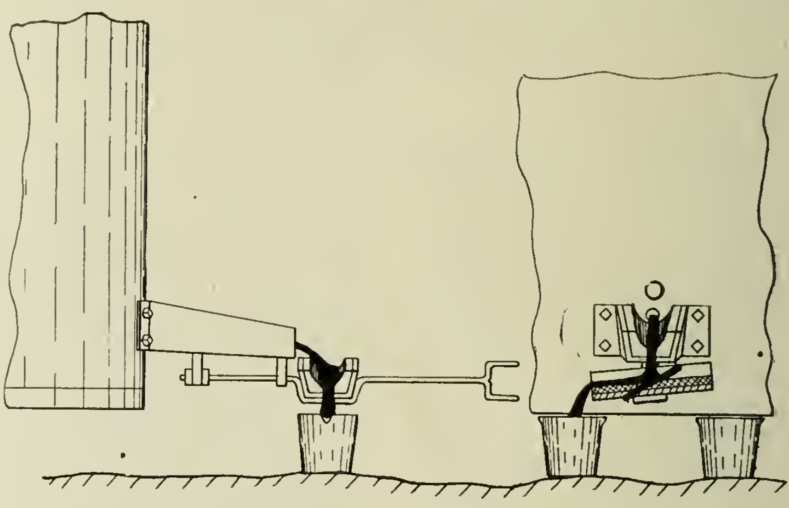
In Fig. 1 will be seen a sketch of how the whole thing looks from a front view, and to begin with we will explain how they regulate the flow of metal. This is done by means of a double tap hole. The old familiar method of ramming in the breast with a round stick to form the tap hole on being withdrawn is not adhered to. Instead of this a firebrick with two holes in it, as shown in the sketch, is used. This firebrick is put in place when the melter is ramming in the bottom. It is so placed that the bottom hole is in line with the trough, the same as with the ordinary tap hole. The second hole is an inch or more above this. Both holes are stopped up when the blast is put on, and when sufficient metal is melted the bottom one is tapped and pouring begins. This bottom hole is intentionally a little smaller than would be required to accommodate the melting capacity of the furnace. As the melting proceeds and the melted metal which is accumulating in the furnace is getting high up, the upper hole, which is somewhat larger than the other, is tapped and the reserved metal brought down, after which this hole is again stopped up. It is not necessary to tap the upper one at any particular time; on the contrary, opportunities are watched to tap this when it is most convenient to use the surplus metal. The bottom hole, which is never stopped after being tapped, supplies the iron for continuous pouring.

Now I hope I have made this plain. If one hole is made big enough to always keep the iron down it would be necessary to stop it ocasionally, and in so doing delay the men, while overdoing their ability when tapped again. With the double hole the iron runs continuously and the slag is kept floating so as to be drawn from the slag spout while the top hole is used as a safety device, and an all round convenience as well as always having the iron clean.

The Tilting Spout

The tilting or double spout is simply an attachment which is added to any cupola spout. It consists of an iron trough from two to three feet in length and about the same dimensions as the spout of the cupola. It is open at both ends and is attached to the cupola spout by means of a trunnion or swivel in such a manner as to have the top of it slightly below the bottom of the cupola spout, and so situated that the iron, as it flows from the spout, strikes it in the centre, A lever is attached to it for tiltage. Overhead trolley tracks lead to all of the floors and the metal is conveyed to the moulders in large trolley ladles from which it is poured into their ladles. The cupola, which is to one side of the shop, is served by two separate trolley tracks which run lengthwise of the shop over the gangway, one from each end of the shop and turning at the line of the cupola where they come up to it, one on each side of the spout. These tracks are also so arranged that the ladle can be transferred from one to the other by switches on the main track. From this it will be understood that the trolley ladle can be shoved from one end of the shop to the other without turning in at the cupola or the ladle of iron can be brought away from the cupola on one side and transferred to the track on the opposite side if for any reason it has been found necessary.

As we have said, the metal is delivered to the moulders, who, in turn, have it transferred to their ladles, after which they pour it either by hand ladle or bull ladle, or by another trolley system on the floor. This pouring device for individual moulders is one of the latest innovations in labor-saving machinery.



TILTING SPOUT, SHOWING HOW METAL CAN BE RUN IN A CONTINUOUS STREAM BY USING A LADLE ON EACH SIDE.

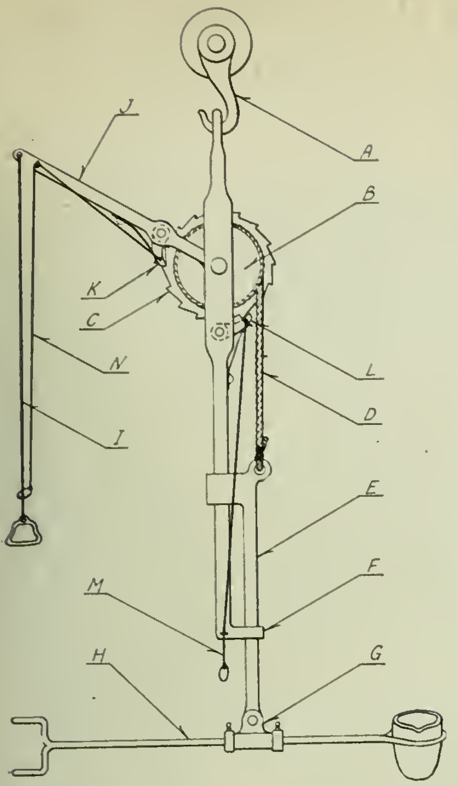
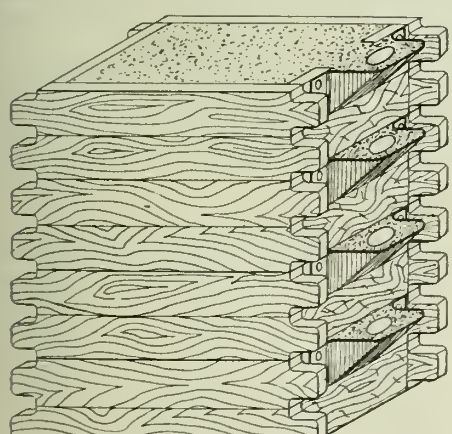


FIG. 2—THIS IS NOT THE SAME AS THE ONE USED IN THE COCKSHUTT FOUNDRY, BUT WILL SERVE TO DEMONSTRATE THE IDEA—A DESCRIPTION OF THIS ONE FOLLOWS.

The hook A that carries the fixture is supported on a monorail or other overhead traveller. The main hanger has a slot that carries the small drum B and the ratchet wheel C. The cable D supports the piece E that slides vertically on the main rod, the lower end of which is slotted to align the piece E. At the lower end of this piece is the fitting G, which permits the ladle to be tilted in any direction by the movement of the handle H. To raise the ladle the rope I is pulled down, bringing the lever J with it. Attached to this lever is the small pawl K that is kept in contact with the ratchet teeth by the action of the spring shown. When pouring, the ratchet is engaged by the pawl L that holds the device in a fixed position. To lower the ladle, the cable I is brought down after the pawl K has been released by a pull on the small cord N. When lowered, this pawl is again engaged and the pawl L released. This allows the cable I to be raised and the cable D unwound from the drum. This action is repeated until the ladle is at the desired level. The lever J is kept in a raised position by the action of the spring O.



The flasks used in plow point work are small iron flasks, but these will also serve to show how stacked molds can be poured without trouble.

In Fig. 2 will be seen a system of pouring plow points without having to carry any iron. These moulds are machine made and are stacked several tiers high. The cope has a projection on one end in which the gate is situated. This makes it possible to stack them straight above each other without covering the gate up. The row of moulds is placed in line with the trolley track which serves the floor, and an arrangement similar to Fig. 2 is suspended between the trolley and the ladle. By means of this arrangement the ladle can be lowered down to take the metal from the large ladle, and by simply pulling the string the ladle is lifted to the proper height to pour which ever row is to be poured. This system of pouring could be utilized in pouring many different jobs in any foundry and is a great saving on the energy of the man.

Through the courtesy of the genial Mr. Fred Wedlake, foundry foreman of the Cockshutt plant, we were enabled to get the above information.

MELTING STEEL IN THE CUPOLA

Being a subscriber to your paper, I am taking the liberty of asking for information.

I have a number of castings to make requiring a 30 per cent. steel mixture, and wish to know if I can melt it in the cupolas. I have a 5-ton furnace.

If it is possible to do so, will you please give me directions for charging it?

I would not want more than about five hundred pounds per heat.

Answer.—To properly melt steel in a cupola along with cast iron is certainly possible, but it is a procedure which requires some study, and if it is the intention to do it on a considerable scale, it is advisable to take a course on semi-steel practice, as there are so many different classes of work calling for semi-steel; but for small amounts, such as you speak of, the main point to be considered is to get it sufficiently hot without burning it.

To prevent it from contaminating the remainder of the heat, and also to be sure that the other iron is not contaminating it, put it on the first charge. As it is difficult to depend on the first metal being sufficiently hot, make your coke bed considerably higher than usual, say 10 inches higher. This may seem like extravagance, but it will pay a big dividend. Charge your heavy cast scrap and pig near the bricks, and fill in the centre with the lighter cast and steel scrap. By this means, the blast does not strike the steel. By having the high bed of coke, the melting zone is heated to an incandescent heat by the time the metal has been lowered down to it, and the melted metal will be melted to a sufficiently high temperature to be easily run into the thinnest section, and also to make a clean, sound casting.

Be sure and have your ladles heated in advance, as steel mixtures set easily and will bung up a cold ladle.

POURING LARGE IRON CASTINGS IN SOUTH AFRICA

Not much iron or steel is made in South Africa but it appears that a very large cast-iron casting, for that country, has recently been made there. The following account of how it was accomplished at a plant known as the Salt River Works is interesting. The casting was a receiver block for a 30 cwt. steam hammer for the Pretoria Railway worshops and consists of a single block of metal weighing 14 tons. The work was offered to other foundries but, on account of the difficulties of casting, they had to decline the task. The foundry at Salt River is equipped with two cupolas, one with a melting capacity of 8 to 10 tons of metal per hour and the other of 4 to 6 tons. There are two cranes, one capable of lifting 7 tons, the other 2 tons. The largest ladle in the shop holds 3 tons of molten metal. To pour the metal into the mold in one continuous stream in the ordinary way would have required two ladles of 7 tons capacity, with cranes able to lift them. To solve this problem it was decided to make the mold in the floor 15 ft. away from the larger cupola. A reservoir, with a plug in it, was then built on one end of the mold, with a capacity of 11½ tons of molden metal, which was run direct from the cupola to the reservoir. On the other side of the mold provision was made for receiving metal from the 3-ton ladle, which was filled from the smaller cupola and taken to the mold by the crane. One and a half hours after melting was commenced the reservoir was filled and the ladle placed in position. The reservoir was then tapped and the metal allowed to flow into the mold and, when drained, the ladle was brought into operation until the mold was filled. The casting took seven days to cool, and was lifted out of the ground by hydraulic jacks.

This is quite an accomplishment, according to the writer of the above article and we have no desire to belittle it, but still I am inclined to the belief that the article described in the May issue of CANADIAN FOUNDRYMAN is equally as interesting. In this article a 2¼-ton piece was poured in a similar manner, only without the use of a crane of any kind and with only a 22 in. cupola. The piece to be poured was 14 feet long which would make it more difficult to run than an anvil. However, the idea is well worth keeping track of as good paying jobs can frequently be had in shops where the equipment is not any too good.

BRITISH MOULDERS REJECT WAGE COMPROMISE

London, Jan. 8.—Members of the Iron Moulders' Union, who have been on strike for wage increases since September 20, have rejected the compromise offer of employers by a vote of 16,718 to 9,631, it was announced here to-day.

HOW DO THEY GET THAT WAY?

Stranger: "I hear you want to hire a man. What will you pay?"

Employer: "All you are worth."

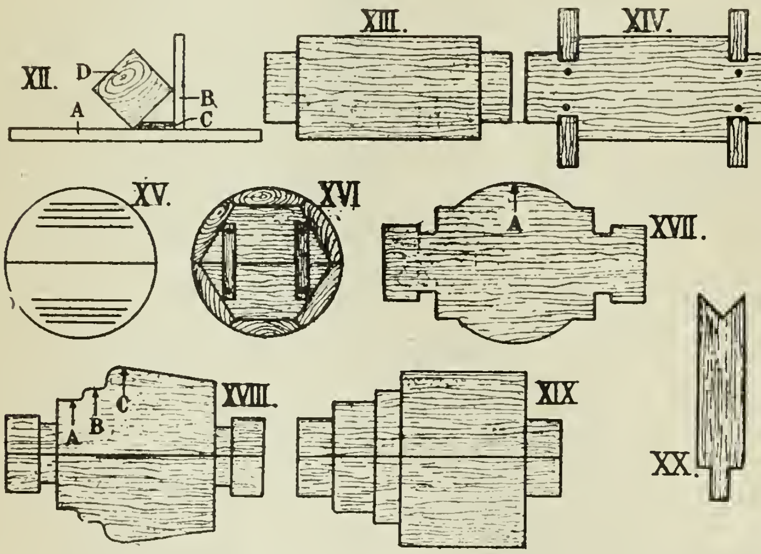
Stranger: "I don't believe I could live on that."

The Pattern-Maker's Page—Turning Patterns

Some Valuable Information on Centered Work by an Expert British Workman

By JAMES EDGAR

WHEN a pattern, such as a bush or liner, has to be made, the first consideration is, whether it will be moulded longitudinally in a two-part box, or on end. The latter is the method preferred whenever possible, as a head for dirty metal can be cast on, and a less spongy casting is obtained. If the pattern is to be moulded longitudinally, it ought to be made in halves, but if on end, a solid pattern is better. It happens frequently, of course, that a moulder will make the work in a two-part box, then tilt the box on end for casting, the runners and risers being made for end casting. It is simpler to turn work solid than in halves. If the diameter is small, say 3 in. or 4 in., it is not necessary to screw hard wood centres on the ends, but if greater than 4 in., special centres for both the butterfly and the fixed centre ought to be made. These special centres are usually made about ¾ in. thick, of baywood or beech, and centre lines squared on both sides. Patterns are usually made of yellow pine, which is soft timber, and the work revolving at a high speed will tear itself free from the centres if it is heavy. Before the work is placed between the centres the corners ought to be taken off. This can be easily done on a bandscrew or a circular saw. If on the latter, a strip of thin wood can be set on the table and against the fence, which will keep the work firm and render it impossible to tilt over. The arrangement is seen in Fig. 12. A is the saw-table. B the fence. C the thin wood distance piece, and D the job. All work that is to be turned between the centres, except staved barrels, ought to be got out about 4 in. longer than the finished size, so that there shall be no screw holes or centre holes on the ends of the pattern, and about ⅜ in. should be left on the longest diameter for turning. When turning a small liner, like Fig. 13, it is better to turn the full length to the large diameter first. A short distance at each end should be callipered, and a straight edge afterwards applied. The prints at each end may then be turned, and the end of the liner left to the last. Both the liner and the prints should be slightly tapered. A job like this ought to be roughed down first with the gouge, which should be held at the proper angle with the thumb of the left hand, and should skim the work above the centre. A cutting chisel, of course, will finish the body, and the prints can be turned with scraping tools. Either a diamond point or side cutters are suitable for turning the ends of the liner. The side cutters are more dangerous, because the angle at the point is more acute. If the work is in halves, no matter how small it is, hard wood centres should be screwed on the end. In addition to this, a screw should be put in at each end outside of the prints, otherwise the job will open in the lathe.



In turning small pipes like Fig. 14, some craftsmen leave the body of the pipe and the prints rough until after the flanges are screwed on. It is better to turn the body and the prints, however, before the work is taken out of the lathe to fit the flanges. If it is properly dowelled, and care is taken not to move the hard wood centres, it will run quite true when it is replaced in the lathe, and it is not wise to have any more turning than is necessary after flanges are on. In small work, it is usually possible to get one screw only into the flanges from the joint, and if the turner is clumsy the joint will, open, or, perhaps, the flanges come off. In turning a liner in halves without branches or flanges, it may not matter if it is not truly centred, that is, if one half is slightly larger than the other, but accuracy is important if branches have to be fitted on the body.

A pattern with either the body or the branches turned unequally causes trouble in the foundry. It is not possible for the moulder to get a uniform thickness. To make sure the work is centred, some pattern-makers take it out, after rough turning the ends, and calliper each half. This is slow work, and the operation may have to be repeated many times before satisfaction is obtained. If a few gauge lines are drawn on the ends of a job, as shown in Fig 15, before the hard wood centres are screwed on, the turner can see at a glance without removing the job whether it is right. Usually a tap with a hammer will put it right.

The operation of turning a large barrel does not materially differ from turning a small pipe. Instead of the hard wood centres the iron plates are screwed on the ends, and if it is very large it may be wise to fix battens on the ends, like Fig. 16. If this is not done, dogs should be driven into the middle of the length to keep the joint from opening, but this is rather risky, as the dogs may fly out and inflict serious injury on the turner. They also prevent a straight edge being applied from end to end of the barrel. tI is good practice to turn about an inch of each end of the barrel to the finished diameter, and then plane through cn a straight line. The work, if the plane will clear the headstock, need not be removed from the lathe to do this. If this planed piece is colored black or blue, the turner can practically finish the work without again using the straight edge. It is best to do the first turning of large barrels with the gouge, and finish off with a spare scarping chisel.

The speed of the lathe is an important concern of the turner. In turning small work the same speed may be used for both roughing and finishing, but for medium sized and large work, it is wise to rough down and finish on a fast speed. If work is well screwed and carefully set between the centres or on a face plate, the best turning speed is the fastest that does not cause the lathe to vibrate.

For straight work templets are not needed. Indeed, on all work where it is possible to do without them, they should not be used. It is quicker testing work with callipers, as, with care, callipers can be applied more easily when the work is running. In turning most patterns, however, templets are essential. In turning valve bodies, like Figs. 17 and 18, templets should be made. The prints will have to be turned first and the templet applied till the ends of the templet are down on the prints. Even when a templet is used it is generally quicker to turn some diameters with callipers. In turning a valve body, like Fig. 17, the diameter A should be callipered, and in turning a body like Fig. 18, the diameters A, B, C should be callipered. The work for the valve body, before the templet is used, would be like Fig. 19. In turning any class of work the T-rest should be set close against the work, and repeatedly moved closer as the work proceeds. If it is kept a distance off, and the tool catches, it will either be broken or the work will be spoiled, but if close, probably no great damage will be done.

Rather difficult work to turn are the stanchions and rails used on the decks of ships. They are very long and of small diameter, and there is great danger of their breaking in the middle. It is only on a fast speed and with very sharp tools that the work can be done satisfactorily, and yet the faster the speed the more the work vibrates. The turner must take his time over the work if it is to be done well. An improvised rest, like Fig. 20, ought to be rigged up in the centre of the work, and the short distance which bears on this rest need not be quite finished till the work is taken from the lathe. It can be easily planed through at the bench. The centre bearing should be well supplied with lubricant. An easy and good way of keeping the fast centre from getting hot, is to tie a piece of oily waste loosely round the mandril. The fast centre should be screwed up tight into the work, then eased back a little, until the lathe turns easily, with the hand on the pulley, and yet there is no play.

Very small work has occasionally to be done which cannot be fixed between the centres, because the end has to be turned, and which is also too small to screw to a face plate. It can easily be done by getting the timber sufficiently long and driving the end into the hollow mandril.

Tender Core Prints on Turned Patterns and How to Avoid Them

By O. B. SERVER

I imagine most pattern makers, in the early part of their training, have had the unpleasant experience of the pattern they were turning, and which had probably a small cored hole in the end, go to pieces before the small core print was down to size.

Theoretically, every journeyman pattern maker ought to know all about the business, but as one of our men said the other day when he had picked up a split pattern and examined it, "We are always learning"; so this little bit of experience is for all, both old and young, who have trouble along the line indicated. Our method of solving the problem of the small core print is, to leave it larger, usually the same size as the boss containing the hole, or to any size convenient, and then we jig the core box to match. The illustration in Fig. 1 will make the matter clear. When I began my apprenticeship it was the custom to dig a core box, like the one shown, Fig. 2, out of the solid, for there were no leather fillets in those days, but now we make it in sections and fasten the parts to a bottom board and put thin pieces along each side to bind it together and protect it against the rapping. Fig. 3 shows a section of the present-day construction.

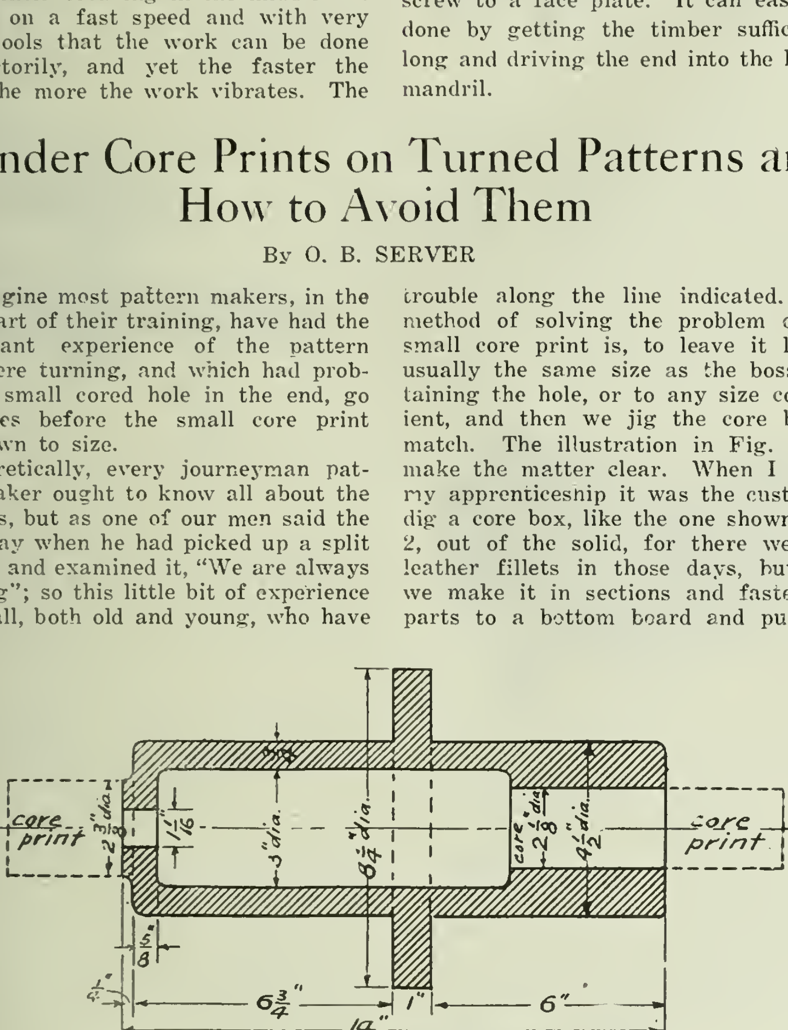


Fig. 1

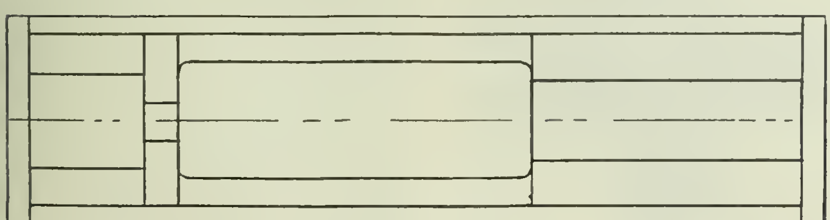


Fig. 2

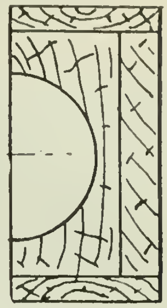


Fig. 3

A PRACTICAL BLUE-PRINT PROTECTOR

Blue-prints are always getting dirty, wet, greasy, or torn while being handled by workmen using them.

An inventive genius has designed a very practical blue-print protector of simple construction and low cost.

A sheet of transparent sheeting—the same material used for lights in auto curtains—is cut to desired size. A piece of light-weight leather substitute is then cut about a half-inch larger all around than the piece of sheeting. This extra half-inch allows for a lap-over on all but the top side of the protector. A sewing machine stitches the lap down to the sheeting, forming a large flat pocket, open at the top for the insertion of the blue-prints.

Both the transparent front and the coated fabric back are water-proof and grease-proof. Dirt or grease may easily be wiped or washed off, either without injury to the material. Both materials are flexible, and the holder may be rolled up, if desired, in the same way an unprotected blue-print is usually handled by a workman.

TO BRIGHTEN UP ORANGE SHELLAC

Most people are aware that oxalic acid will take out a rust mark on a white dress, but it is useful in the pattern shop for another purpose. Whenever your orange shellac loses its orange color and gets dull and dirty looking, just drop a few grains of oxalic acid into the jar and stir till it is dissolved. The effect produced is quite surprising. Remember, the stuff is poisonous.

Dunnville.—The car ferry Maitland No. 1 ran ashore in Patton's Bay, with a cargo of thirty cars of coal. She lost her bearings in a fog, and grounded about six miles west of Port Maitland, going hard and fast on the beach. Wrecking tugs were sent for immediately, and her early release is expected. She was not in any great danger, and damage, so far as could be seen, was slight.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

THE OLIVER NO. 1 UNIVERSAL PATTERNMAKER'S VISE

The Oliver Machinery Company, of Grand Rapids, Mich., have just placed on the market a new and improved patternmakers' and general woodworkers' vise, known as the Victor patent, which has many features worthy of notice. A few views of the vise and its capabilities are shown in the accompanying illustrations.

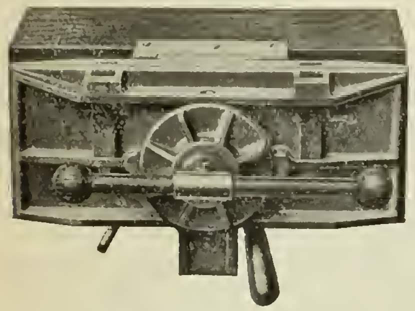


FIG. 1.

Fig. 1 illustrating the Oliver No. 1 universal vise in natural position, flush with the bench top. One is at once impressed by its sturdy and finished appearance—it is the last word in vise construction. Yet only fifteen parts are used and every part is interchangeable. Although the jaws appear lighter, yet, because of the deep web construction they are actually stronger, and under test have shown ability to withstand at least 300 pounds more pressure than jaws of other vises.

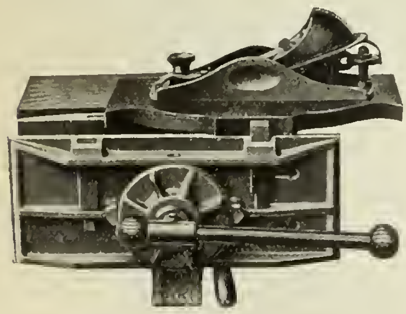


FIG. 2.

Fig. 2 shows that there is no limit to the work that can be done with this vise. It will securely hold all classes of work that any patternmaker or woodworker will need it for. This illustration shows the holding dogs for use in surface working on thin wood. Their use is also of great advantage in panel and framing work. Their utility can be further augmented by arranging additional dogs (hardwood) in the top of the work bench directly opposite those in the vise for holding forms or cases.

Fig. 3 shows the vise swung around and the pair of jaws provided for the holding of metal parts thrown into position to hold the metal parts to be worked upon. The sturdy construction of every part of the vise and its adaptability for every purpose is here plainly shown. The screws of the vise are double thread 4-pitch Acme, cold-rolled steel of ⅞-inch diameter. The weight of the vise is only 75 pounds.

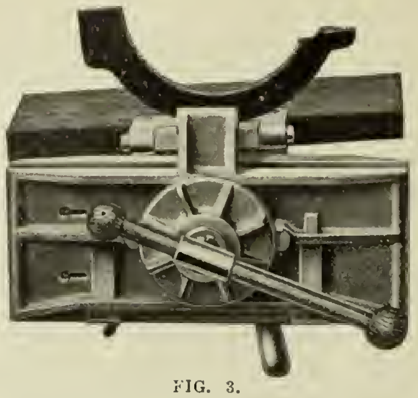


FIG. 3.

Fig. 4 shows the vise in one of the many convenient positions in which it can be set, to easily handle irregular-shaped work. Because the jaws turn on the beam when set to revolve they may be located and clamped at any desired angle (not at particular set angles as on the obsolete types). The hand-operated, adjustable collar makes the adjustment for odd shapes and wedges a simple and speedy matter.

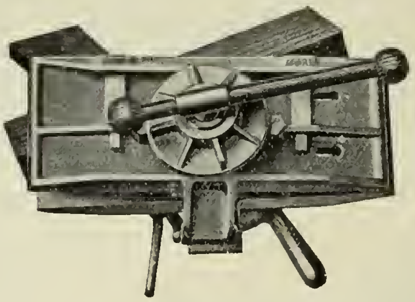


FIG. 4.

Fig. 5 shows the vise holding wedge-shaped work. The jaws are made to swing, being pivoted in the centre, so wedge-shaped work will fit either end of the jaws. The hand-operated adjustable collar makes the adjustment simple and easy. Note also the finished and substantial construction of the hub, which is part of the back jaw; the hand clamp lever used for revolving jaws and the beam, which in most every position protects the screw from foreign matter, being closed side up.

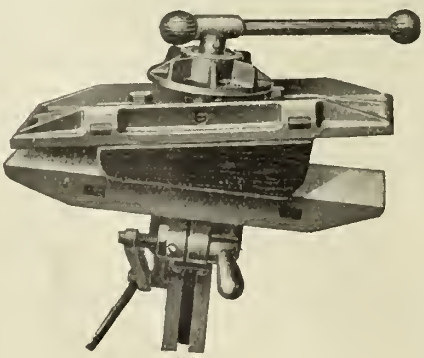


FIG. 5.

Fig. 6 shows the vise in upright position with tilt or angle jaw in place. Note the rack bar which is used for clamping jaws in any angular position. This bar is flat and holds very rigidly, whereas on other vises this is round and often allows the work to slip from its angular position. The jaws of the Oliver Universal No. 1 are smoothly finished; they are 7 inches by 18 inches in size, and have an opening of 15 inches. Its many special features make this an indispensable tool for the patternmaker's bench.

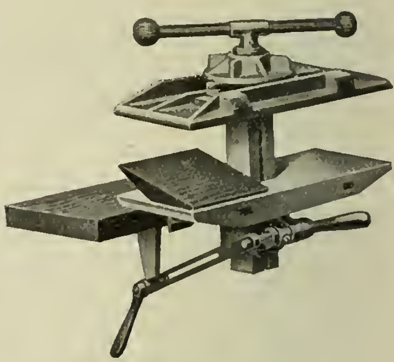


FIG. 6.

GRINNELL CO., INC., TAKES OVER BUSINESS OF GENERAL FIRE EXTINGUISHER CO.

On January first, all of the sales and contracting business which has formerly been carried on by the General Fire Extinguisher Company was taken over by Grinnell Co., Inc. This change is made because the old name so specifically described the Automatic Fire Protection Section of the company's business that it was prevented any natural assumption on the part of the public that the company was engaged in several closely related lines of business.

As a matter of fact the company's business is based fundamentally on industrial piping, and it is perhaps the largest concern in the United States doing exclusively that sort of work.

The related industries which the Grinnell Company takes over from the General Fire consists of: (1) Fire protection; (2) Power and process piping; (3) Steam, hot water and gas heating; (4) Drying; (5) Sales of pipe, fittings, valves and supplies.

On the Move! Once Common Among Moulders

Being the Continuation of an Interesting Story of a Moulder's Experiences Some Years Ago

By JOHN WOODSIDE

WITH April thaws came the news that the old shop was about to re-open, and I squared up accounts and had a few dollars left to carry me home and pay up union fees, which had run behind, for if I should have to travel, the "Journal" at least gave some guide to the safest road.

A couple of weeks passed before we got the long-expected square-up; then the shop opened in a half-hearted way, with jobs for the men with families, and we young, free-footed fellows scattered over the land. A large trunk, with some books and odds that I had accumulated, I addressed to a brother, married, and settled in Owen Sound, and with the moulder's light kit of tools and some clothing in a valise, I struck out to travel light. Choosing for my companion the dandy J. Mitchell, we struck for Kingston, intending to cross over and invade the States at Rochester. I bought a ticket, but Jack being minded to travel economically, entrusted his valise to me and rode the bumpers, but as he evaded the brakeman we landed together in Kingston; a short inspection sufficed to show no hope in this, our last stand, in our native land. Next day we found a boat leaving for the Rochester port, on which we embarked and bade a long adieu to Canada. My mate not being so intimate with the marine as with the railroad, perforce, bought a ticket, and we had a last unfriendly shakeup on Lake Ontario, which was not without its compensations, as it enabled the gallant John to aid a couple of damsels in distress from a slight attack of seasickness. As our luggage was light we were not detained by the Customs Officers, nor were we in those liberal days called upon to show up a "roll" before entering the delectable land. Rochester, however, showed little sympathy to us, except to direct us down the line to the little village of Marion, where they had heard that an old farmer-foundryman wanted a moulder for a while, to make up his season's stock of plows and scufflers; so together we visited the peaceful community, which was also in a dry county, but that did not hurt John and I. But here I put one over my traveling mate, for there was only work for one, and the moulder also had to do the melting, and John's education on this very important item had been neglected, while I had. in years gone by, mastered the art. So John stayed with me over Sunday and we quickly formed acquaintance in the village by promptly reporting ourselves at church, and on Monday Mitchell went on east, and I never met him again, although I sometimes tried to mix him with the labor leader, Mitchell, also a moulder.

The little shop, in fact the village also, was a quiet, restful place; if a fellow only could realize it, the little shop is the spot to settle in, if a young man could only content himself to rusticate, far from the everlasting wage fights of the big shops. But I had no chance to make a permanent home in Marion, for the job lasted less than a month. It had been quiet, with only a darky roust-a-bout for company; except for the occasional visits of the kindly old boss. He paid me off at the rate of $2.25 per day, being well satisfied with my work, and only sorry that he could not prolong the job; a village shop in Canada at this time would have paid me $1.50 per day; and I caught myself making a mental resolve never to go back to Canada under $2.00 per day, and it happened that I did not. The villagers were forming their celebration committees for the impending Big Fourth, the hundredth anniversary for Uncle Sam, and I fain would have lingered, but the season was advancing, and the busy East was before me, so I again struck out and dropped off at each likely town, but in vain, and at last came upon the Hudson River at Albany; it and its rival stove manufacturing city, Troy, were a revelation to me in shops, but they each had their hosts of moulders, and many not so busy, waiting for chances. I took a trip across the Vermont border to Hoosac Falls, where there were some large shops, but only succeeded in spending a few of my precious dollars.

Back in Albany, I remember glancing (in a thoughtful way) at a big placard: "Recruits wanted for the U. S. Army," and it occurred to me that I had never been averse to soldiering of the militia kind. But I had one other proposition to work out first, there was little hope of striking a job by going down the river, even New York was reported as about the worst of any. Philadelphia, the city of the Centennial Exposition, would be the likeliest place, and as I had not cash enough left for a railroad ticket, why not try a "hike?" I was a good walker, having got my feet pretty well hardened lately on the pavements of cities while in vain quest of that which man in his natural state does not always love, that is work. I had no luggage to bother me, and should I fall by the way I would be amongst kindly farmers, who, as a class, at home, were noted for their hospitality. So, choosing a good road leading eastward, I shouldered my valise and set out on the venture. The sun was hot and the road, not having the modern invention, the automobile, to call for well-groomed surfaces, was dusty, but I kept on steadily until toward evening, when I called into a farm yard to ask for a drink from the pump. I knew that many of my old acquaintances among the farmers would be likely to offer milk in place of water and even offer a bite of supper. The farmer gave me the water, grudgingly, I thought, then asked me where I was heading for, and when I mentioned Philadelphia, he remarked that it was a long way yet and I'd better keep a moving. This lack of hospitality had a dampening effect, so, also, had the rain, which now commenced to fall, and soon turned the dusty road to mud. An unquieting thought troubled me, perhaps those farmers would class me with the professional hoboes, whose predatory habits on retired hen roosts did not endear them to the agriculturalist. I again recalled the big placard in Albany streets, "Recruits wanted," and I weakened and turned again cityward. The rain kept up steadily and the night grew dark, but I tramped doggedly on until, as I began to see the city lights, a good samaritan in a buggy caught up to me and offered me a ride, and so ended my first attempt at the "road," which catches and holds so many loose wanderers, but for mine I would prefer the timber, and the Indian life. I found a cheap lodging, and next morning, having resolved to not consider the placard just at present, I called on the secretary of the local Union of Iron Moulders, and laid my case before him. Finding that I still had a dollar left, he advised me not to delay around Albany, but to take the boat for down the river, and as I would not have to show a ticket to get aboard, we would be some way down stream before the purser would interview me, and then I was safe for the next town.

I went aboard brave enough, but when the business-like purser demanded my ticket right amongst a crowd, I quailed before him and drew forth my last dollar, and obtained a ticket to Peekskill, where there was also a foundry or two. Upon landing here, dead broke, I removed a scarf pin, formed of a small gold nugget, a goodly portion of my father's savings from his Cariboo trip, and took it to a jeweler, who tested it, weighed it and gave me $3.00 for it. I also interviewed our mutual friend, the secretary, and made the raise of a dollar to carry me further down. For the rest of the way I now took a train, as it would carry me further into the city, in which I luckily had an uncle living, whose address I had treasured. Landed at the big station, I had no trouble, under the guidance of a policeman, in locating Water street, where my uncle kept a shop; in fact he had a new landmark this summer, as a pier of the great new Brooklyn bridge was nearly opposite his place.

To be continued

Research Work on Malleable Iron—*Continued*

Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

IN the December issue was shown some of the former misconceptions regarding malleable iron and some of the methods employed in research work regarding the same and the results of the methods thus employed, showing by actual test the improvement shown in the quality of the metal. The following article is a continuation of the research work and shows some valuable illustrations.—Editor.

FIG. 2—MICROGRAPH SHOWING FREE CARBON IN CAST IRON.

19. The members who submitted bars classified under Railway Work were twenty-two in number. The average ultimate strength and elongation of test bars submitted by the eleven members having the highest averages are found to be 53,559 lb. and 15.56 per cent. respectively. Carrying through the same operation with the twenty-six members who are not thus classified, it is found that the average ultimate strength and elongation of these thirteen are respectively 52,327 lb. and 12.42 per cent. Taking the average of these twenty-four members, we find that the ultimate strength is 52,943 lb. and the elongation is 13.99 or practically 14 per cent. Lest our intention be misunderstood, it should be explained that our effort is not directed toward securing an increased ultimate strength and elongation so much as uniformity of product. The aim is to secure a product that the engineer will readily acknowledge possesses excellent physical properties, which vary but little from heat to heat. Within what can be considered quite narrow limits, this is what these particular twenty-four members are doing, while most of the others are not far behind. It may also be of interest to state that from January 1, 1917, to March 31, 1919, the average ultimate strength of the test bars of the association as a whole has been over 51,000 lb. ultimate and the elongation 12.50 per cent.

Influence of War Conditions

20. In considering the last statement the following facts should be taken into account. War conditions during 1917 and 1918 made it quite impossible to secure appropriate pig iron and fuel. It is ony fair to state that most of the companies were greatly handicapped during this period. It was solely and only through an intimate knowledge of the metallurgy of the process derived from the research work that made such a showing possible. Aside from this the membership has been and is constantly growing and the total average is and for some time to come will be necessarily affected as a consequence, as it takes some few months to get a new member in line. It is not unfair to assume that a still better showing could have been made had the times been normal, and had the membership been confined to those only who were members when the research work was first started. At the beginning of our investigations an elongation of 10 per cent. was considered to be an indication of a superior product. As our knowledge of the metallurgy of the process increased, accompanied by better air-furnace practice and annealing-oven conditions, the elongation particularly began to climb. An elongation of 20 per cent. is not now looked upon as unusual; elongations of 25 per cent. occur with considerable frequency, while we have had numerous bars that have run as high as 30 per cent. and several of 31 per cent., which for an untreated cast-iron product we believe to be quite extraordinary.

Metallurgy of Cast Iron

21. The raw material from which malleable-iron castings are made is pig iron, but this must be of suitable composition for the process. The usual elements or "impurities" (as they are frequently called) in pig iron are carbon, phosphorus, sulphur, manganese and silicon. If any of these elements combine with the iron or combine with each other in definite proportion, compounds will be formed, and it must always be kept in mind that compounds have very different physical properties from those possessed by the elements that form them. For instance, pure iron is so soft that it is difficult to machine it in such a manner as to leave a nice clean surface, as the chips have a tendency to shear or tear off before the edge of the tool has cut through, while graphite, the form in which free carbon exists in pig iron, is certainly very soft; and still, when these two unite to form carbide of iron, in the proportion always of about 6.67 per cent. carbon to 93.33 per cent. iron, they yield the hardest substance that can be produced from iron or steel by any known method. Now it happens that there exists a preferential and reciprocal attraction between some of these elements. For instance, if a piece of pure silicon is dropped into a bath of pure iron, or even iron contaminated with phosphorus, sulphur and manganese, when solidification takes place the silicon will be found to exist in the iron not as such, but united to it to form a definite compound called silicide of iron, because any tendency it has to remain by itself is overcome by the iron, for which it has a greater attraction than for any of the other elements present. In the event that any element in pig iron remains uncombined, that is, fails to unite with the iron, or with any of the other elements present, then the element is said to exist "free."

22. Compounds of Iron.—In the absence of much silicon, carbon will always unite with the iron to form the compound called carbide of iron, a structural constituent known as cementite. We have already stated that silicon unites with iron to form the compound known as silicide of iron. Phosphorus in commercial pig iron suitable for use in the manufacture of malleable iron always combines with the iron to form the compound phosphites of iron. Sulphur and manganese have a reciprocal attraction for each other, greater than either has for the iron or the other elements, and in consequence we can consider that the conditions are always such commercially that the sulphur and manganese will unite together to form manganese sulphide. Any manganese in excess of this requirement will unite with the carbon to form what we will at present call manganese-iron carbide (manganiferous cementite). It can now be stated that of the five impurities or elements referred to, none, except the carbon, can occur in the iron in the free state, and the latter can never exist free, as graphite, in whole or in part, unless it happens that there is present in the iron an amount of silicide of iron sufficient to prevent the formation of iron carbide. As indicated, silicide of iron has a tendency to break up, that is, render unstable, the carbide of iron that forms during or shortly after solidification, causing it to dissociate into its

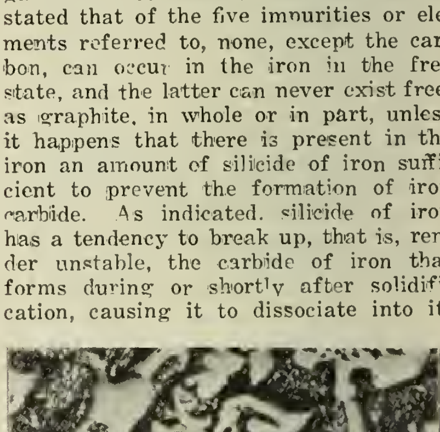


FIG. 3—MICROGRAPH SHOWING COMBINED CARBON IN CAST IRON.

two original soft constituents, iron and carbon, but as we will see later on, this action will not start unless a certain amount of silicide of iron be present.

23. Influence of Time Element.—It must be borne in mind that all reactions are governed more or less by a time factor. If the pig or the casting, although containing high silicon, be rapidly cooled the iron may become rigid so quickly that the carbon will be denied the time to separate out as graphite in spite of the presence of an amount of silicon that would have precipitated the carbon under conditions of normal cooling. Sulphur, on the contrary, acts to encourage the carbide of iron. Inasmuch as sulphur unites with manganese to form sulphide of manganese, a compound of

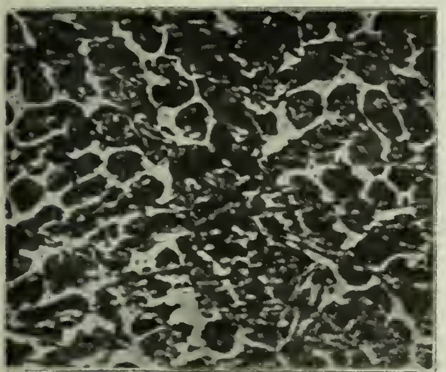


FIG. 4—MICROGRAPH OF HARD, WHITE CAST IRON.

the nature of slag and supposed to be inert, the writer fails to understand just how it functions to stabilize the carbide. He acknowledges that this appears to be the case even when there is present at times more manganese than sufficient to satisfy the sulphur. He acknowledges also his ignorance as to the cause, but believes that the sulphur does not unite with the manganese until after it first has exerted its influence in some manner unknown on the carbon.

24. Free and Combined Carbon.—When the carbon exists free, it occurs more or less uniformly distributed throughout the mass of metal, in plates of varying shape, size and thickness as shown in the micrograph of Fig. 2. When in this condition, the fracture of the pig iron usually will be coarsely crystalline and very black, the iron will be very soft and easy to machine, and it will lack high strength. If, on the other hand, the carbon is present entirely in the combined form, the fracture of the pig will be white and vitreous, it will be impossible to machine it due to its extreme hardness, and while it will have a much higher ultimate strength than when the carbon is in the free state, it will be brittle. The great difference in structure when the carbon is combined and when it is free can be seen by comparing the micrograph of Fig. 2 with that of Fig. 3. Between these two limits it is possible to have pig iron in which the carbon will exist in both the combined and graphitic form in any proportion of the total carbon content, while the appearance of the fracture, machinability and strength, obviously will depend upon what part of the total carbon content remains combined and what part remains graphitic. If, then, we see a sand-cast pig (one that has cooled normally) whose fracture is white, we know immediately much about its physical characteristics and a few things about its composition; that is, we know that it is extremely hard and brittle, that its silicon content must be low, and that all the carbon must be in the combined form. If, on the other hand, the fracture is very black and coarsely crystalline, we will know that the iron is very easy to machine, that is, will not have a very high ultimate strength, that the silicon is not very low but on the contrary is probably quite high, and that most if not the entire amount of carbon exists in the free state.

25. Effect of Silicon.—The foregoing practically signifies that whether the carbon will be in the combined or free state in a pig iron or casting depends primarily upon the percentage of silicon present, though the part played by the rate of cooling must also be considered, as we may have thick or thin castings or castings with thick and thin sections. Consequently, through the control of the silicon, the condition in which the carbon will remain in the iron can be determined. As the control of the silicon is easy, so is the control of the condition in which the carbon will exist in the casting.

26. Ignoring for the moment the influence of the rate of cooling, it has been stated that in order to obtain an iron that will be white in fracture, the silicon must be low enough to lack a tendency to break up the carbide of iron into its original two components. White iron is made up structurally of two elemental constituents, carbide of iron (cementite), and carbonless iron (ferrite), the former existing in part free, and the remainder forming a mechanical mixture in definite proportion with all of the carbonless iron, to make a constituent to which the name pearlite has been given. In Fig. 3 the white constituent is the cementite existing free, while the dark areas are the pearlite. Many years ago it was discovered that if particles of carbide of iron, in intimate contact with carbonless iron of the character referred to, were maintained at a temperature of bright redness for some 40 to 60 hours and then allowed to cool with extreme slowness, that this very hard constituent could be, through their treatment, broken up into the two very soft constituents through whose union it was formed.

Process of Making Malleable Castings

27. It can now be stated that the process for making black-heart malleable castings involves two steps. The first step consists in making a casting in which the totality of the carbon will exist as carbide of iron, when the iron will have a structure shown in Fig. 4, which structurally is like Fig. 3 but which contains less free cementite, because air-furnace white iron has an average carbon content of but 2.40 per cent. as against an average of 3.50 per cent. in white pig iron. In this step, then, is produced a casting white in fracture, hard and as brittle as glass. The second step consists in subjecting this white-iron casting to a heat treatment such as will serve to break up this hard carbide into its two original components, both of which are very soft, and hence from a white-iron casting we can obtain through heat treatment one that possesses the properties of strength, toughness and ductility. Fig. 5 shows the structure of a normal well-annealed piece of malleable iron. The white ground mass is the carbonless iron (ferrite), while the dark continent is the carbon that precipitated out during the anneal. If Fig. 5 be compared with Fig. 4 an idea will be gained of the profound change that has taken place in the structure during the annealing process.

28. As previously pointed out, the raw material for the manufacture of these castings is pig iron, though pig iron does not constitute the entire charge, as not only must the sprue from the previous heats be melted, but it is more than likely that when these two alone are used the carbon in the mixture will be too high to yield a white iron of suitable composition to produce the strongest product. Consequently, in order to lower the carbon to the necessary limit, steel or other very low-carbon scrap must be used to bring about that end. In by far the greater majority of cases this mixture is melted in a reverberatory furnace, commonly known as an air furnace, but the cupola, the open-hearth and the electric furnace can be and are used for that purpose. Inasmuch, as the iron for more than 95 per cent. of all of the malleable castings produced is melted in the air furnace, we will confine ourselves to that particular apparatus. A photograph of the furnace is shown in Fig. 6.

Description of the Air Furnace

29. The furnace consists essentially of a fire pot, hearth and stack. Some furnaces have a solid roof, the charge being "peeled in" through the charging door, but in the larger number of cases the roof is made up of bungs that can be removed during repairs and a sufficient number of them lifted off when necessary for the purpose of admitting the charge.

A continuation of this most interesting article, including a description of a typical air furnace, will appear in the next issue of this paper.

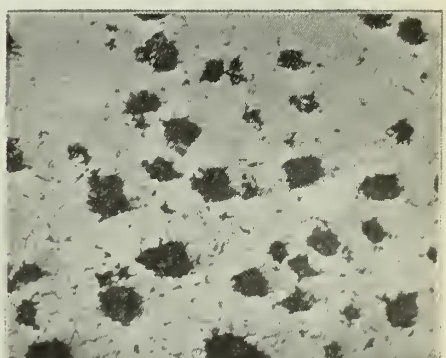


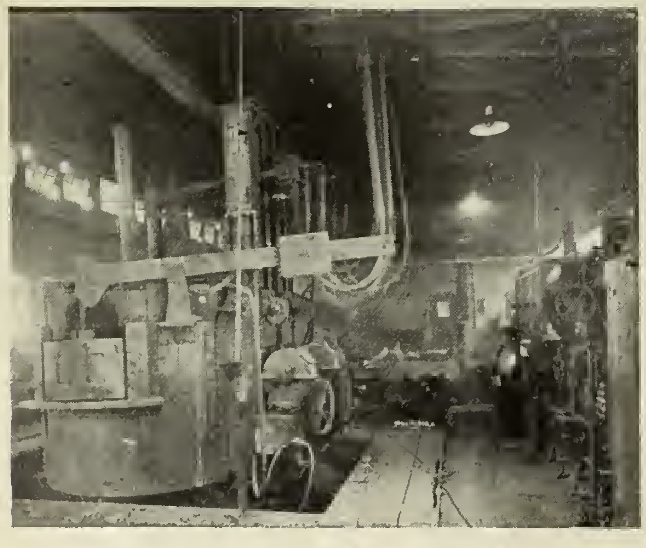
FIG. 5—MOCROGRAPH OF NORMAL, WELL-ANNEALED MALLEABLE IRON.

The Making of Nickel-Chromium Products

By W. F. Sutherland

NOT so very long ago the engineer's handbook contained a few well-known facts regarding the physical properties of the more common industrial metals. Reference information of this character was somewhat limited and the engineer was also handicapped by the paucity of the materials at his command. The handbook of to-day must contain a fund of data relative not only to iron, copper, brass and other well-known alloys, but must also embrace the subject of nonferrous alloys to a much greater extent than has been the practice heretofore.

Metals, which for many years had been of interest only to the scientist and to the laboratory investigator, are now used with signal success in the making of articles of high value in the industrial arts. Chromium is one such metal, and, alloyed with nickel, it forms the basis of many alloys used where high temperature conditions are encountered. Carbonizing boxes, annealing pots, lead pots and similar articles are subjected to the action of external heat, and it is desirable that the materials from which they are made should possess a number of characteristics, such as the power to resist the action of either oxidizing or reducing flames; resistance to the action of metals and salts and toughness under high temperature conditions, even as great as 2,500 degrees F. It is also desirable that the material should be soft enough for machining.



VOLTA FURNACE AND REGULATORS.

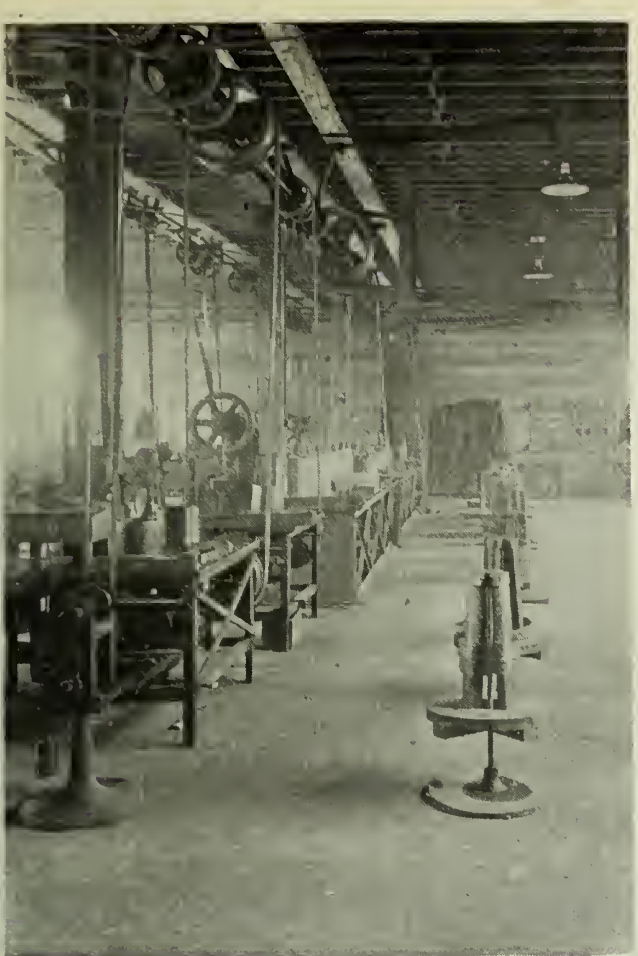
Hiram Walker and Sons Metal Products, Ltd., Walkerville, Ont., are the manufacturers of "Nichroloy," an alloy possessing the desirable qualities enumerated above. It is composed of low carbon steel, chromium, silicon, manganese, aluminum and nickel, together with two other metals, forming a very hard and clear surface when cast.

The physical qualities of the alloy closely resemble those of steel even when heated. The metal machines similar to a medium high carbon cast steel, yet, when machined, does not oxidize or rust, but maintains for a considerable time its grey steel appearance. Unlike steel, too, it does not become porous when heated, and when used for carbonizing boxes this property tends to the conservation of the carbonizing compound. The life of the boxes depends, of course, upon their size and thickness, as well as the temperature to which they are subjected. Life runs of about 3,500 hours are common.

The life of nickel content alloys when used for containers of molten metals or salts to some extent depends upon the percentage of nickel. In this alloy the nickel content is low and a scale is formed when heated in the air. By producing the scale artificially in the interior of the pots it is possible to prolong the life very materially.

Manufacture of Nichroloy Products

Naturally enough, when the product has to withstand high temperatures in the performance of its duties, its manufacture involves the use of higher temperatures to secure fusion and in the electric furnace is found the most suitable means of melting. In the present plant a one-ton electric furnace, made by the Volta Manufacturing Co., Welland, is installed. This furnace is of the three-phase type, using six-inch Acheson graphite electrodes and is fitted with a Thury regulator made by the same firm. The usual rheostats and hand control, together with ammeters for indicating the current input, are also installed. Low tension current for furnace operation is supplied by three single-phase Packard transformers, which step down the 13,200 volt, 25 cycle



GROUP OF DRAW BENCHES IN WIRE DRAWING DEPARTMENT.

supply to 100-95 or 90 volts, depending on the tap employed. The high tension is connected star, while the low tension is connected up in delta, the delta being placed at the transformers.

A switchboard forms part of the equipment, two Condit oil switches being mounted, together with a graphic wattmeter and an integrating wattmeter, both of Canadian Westinghouse make. The furnace lining is of magnesite brick for the hearth, with silica brick lining above and a silica brick roof.

In the making of nichroloy, the nickel is charged into the furnace in shot form and the chromium as ferrochrome. No slags are needed for refining as in steel making, the only additional agents needed being ferrosilicon and ferro-manganese. These ferro-alloys serve to eliminate any oxides formed in the metal.

Monel Metal

In the making of alloys which resist corrosion, there is a broad field for a metal which will withstand acids, high temperatures and the erosive action of hot gases and super-heated steam. Monel metal meets these severe requirements, and the Canadian distributors, Hiram Walker and Sons Metal Products, convert this metal into the form of the finished casting or wire for the Canadian market.

Monel metal is not a synthetic alloy, but is a natural combination of nickel and copper, which is refined without changing the relation of the important elements, i.e., nickel and copper. These two metals bear the same relation to each other when the alloy is refined and fabricated as in the ore taken from the mines. The alloy contains approximately 67 per cent. nickel, 28 per cent. copper and 5 per cent. other metals.

In making castings, the natural alloy, either in shot or ingot form, is charged into the furnace and melted down. Metallic magnesium is added for deoxidation near the end of the heat before the metal is poured.

Moulding Practice

Pouring temperatures encountered are much higher than those prevailing in the iron foundry and accordingly the foundry practice adopted is, to a large extent, that of the steel foundry. Exceptional care is taken to ensure good moulds since the metals cast are of comparatively high intrinsic worth and spoiled castings come high. Dry sand moulds are used, the binder being molasses. A silica wash is also employed when particularly smooth castings are desired. The baking of the moulds is very thoroughly done since moisture is detrimental to the proper casting of either nicholoy or money metal.

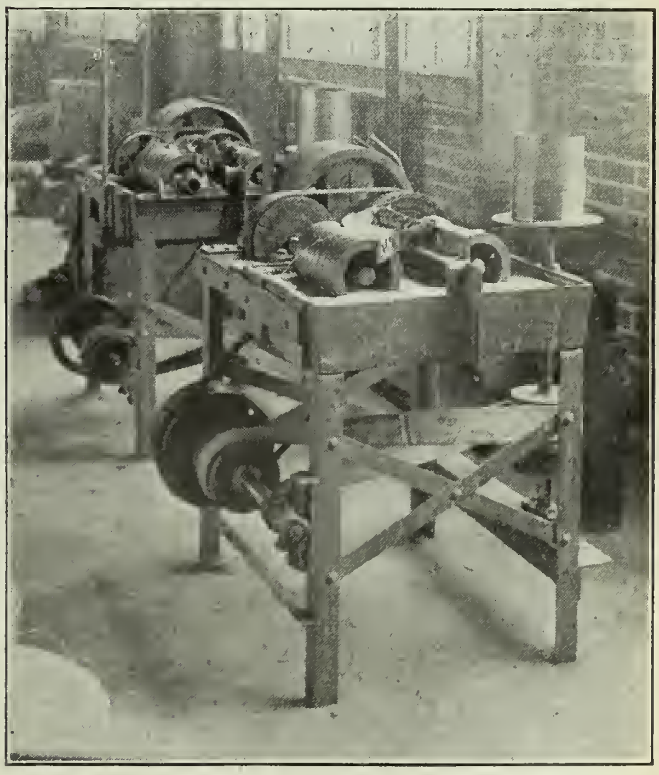
Wire Drawing

Nickel-chromium alloys possess valuable properties when used for resistance wire in electrical apparatus. Their specific resistance is high, varying with the different grades; their melting point is high and their immunity from oxidation makes them particularly adapted for use in heating appliances, both industrial and domestic.

This company manufactures "Chromel" resistor alloys in three different classes, each having its own electrical characteristics. Chromel "A" contains approximately 80 per cent. nickel and 20 per cent. chromium. It is especially useful in electrically-heated devices operating at temperatures above 1,600 degrees F. and up to 2,000 degrees F. Its resistance to oxidation and corrosion makes it very useful for electric stoves, furnaces, hot plates, etc., Compared with copper, its electrical resistance is 60 times as great at 75 deg. F. Chromel "B" has a lower chromium content since its composition is approximately 85 per cent. nickel and 15 per cent. chromium. It has a slightly lower electrical resistance, running about 51 times that of copper at 75 deg. F.

Chromel "C" is a nickel-chromium-iron alloy containing about 25 per cent. iron and 11 per cent. chromium. It finds considerable use in sadirons, toasters and other devices of a similar nature.

The Canadian demand for these various types of re-



FINISH DRAWING BY MEANS OF DIAMOND DIES.

sistance wire is met by the product of this factory and in addition to chromel wire, monel metal wire is also drawn. Aside from tungsten the chromel alloy "A" is the hardest wire drawn commercially, and since tungsten wire is drawn for lamp purposes only, the drawing of chromel alloy is no small achievement.

Various factors enter into the successful drawing of the metal. The drawing must proceed at a uniform rate, the wire must be supplied with the proper lubricant and the annealing and cleaning of the wire between operations must be carefully done.

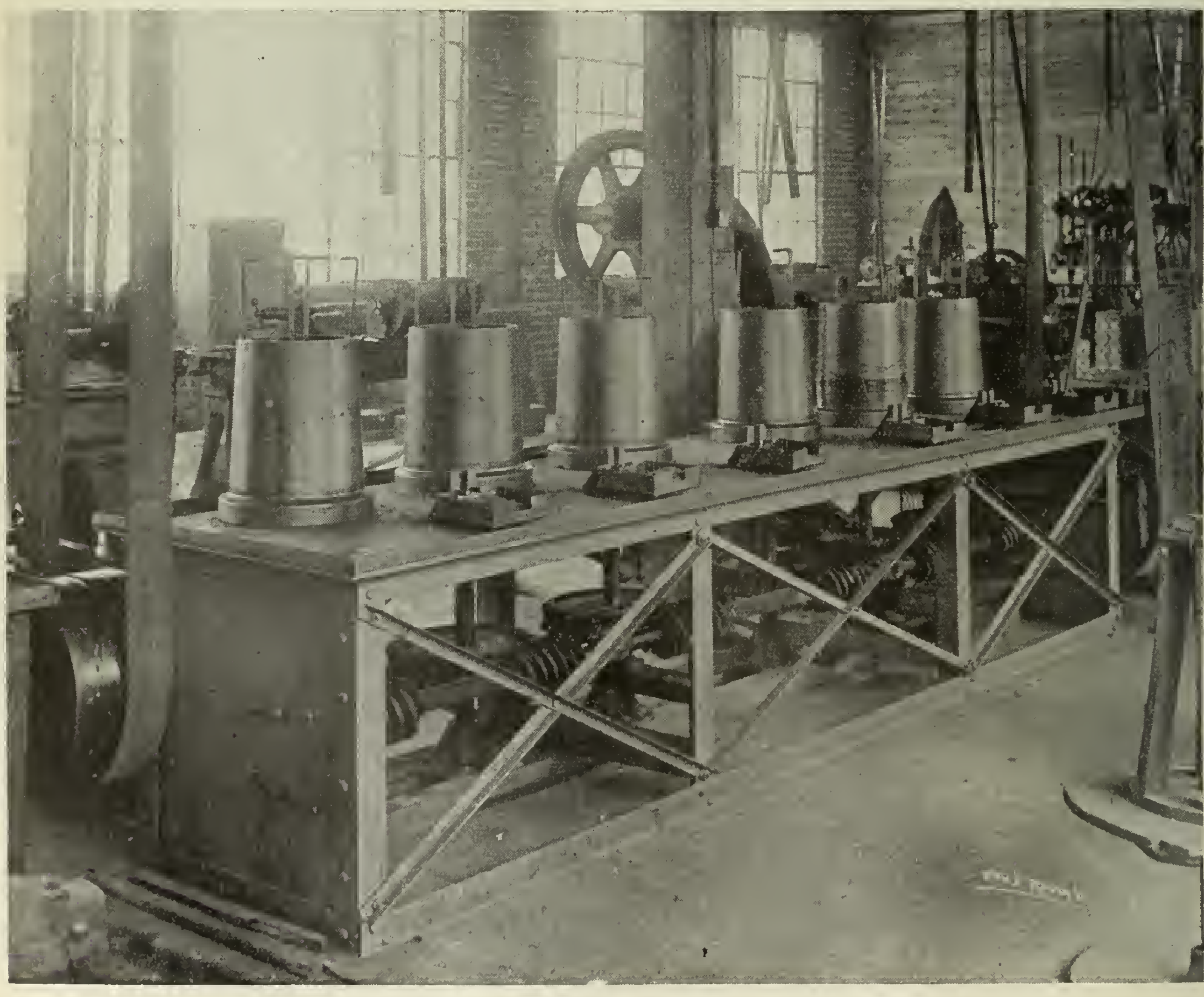
From the accompanying illustrations a good idea of the drawing operation may be gained. A number of draw benches are provided and are fitted with rotating heads upon which the wire is coiled and by means of which it is pulled through the dies. Two kinds of dies are used, chilled cast iron and the diamond. Since the latter is used on a somewhat special machine it will be considered later.

A word as to the mechanical details of the drawing benches: They consist of an angle-iron framework supporting a flat iron top. Through this top each vertical shaft projects and is provided with bearings and a worm gear meshing with a worm on a horizontal shaft running the length of the bench. This shaft is belted to the line shaft in the usual manner and is fitted with a friction clutch, by means of which it may be started or stopped.

Five stands or benches are used in drawing with cast iron dies. The first of these is a single drum machine with a 24 in. drum. The second stand is of similar construction to the first, mounting three drums of the same size. The third stand has six 14 in. drums arranged in two sets of three each. Two more stands of two drums each complete the equipment for using cast iron dies.

The drums on each stand can be used singly or in multiple, that is, the wire being drawn can be taken from the reel, passed through the die and wound upon the drum, or it can be reeled off, passed through the die, given a loop around the drum and through another die to the next drum in line, and so on until it reaches the last one, where it is coiled. By this means it is possible to effect several reductions in the one reeling with considerable economy.

The character of the metal being drawn determines the number of passes advisable; with monel, six are possible, but with chromel, three are about the limit, the greater hardness of the latter metal making the drawing operation more difficult and necessitating more frequent annealing. The wire, of course, elongates in being drawn through the dies, owing to the reduction in diameter, and at first sight it might be supposed that difficulty would be encountered from this source in multiple drawing, since the drums on each bench rotate at the same speed. This fact is of no importance, for the wire looped about the first and intermediate drums slips sufficiently to compensate for its growing length. The dies are of cast iron, chilled, and are cast in rectangular shape with rounded off cone-shaped depressions. The wire hole is drilled to the smallest size and carefully reamed to the correct taper. On being worn oversize the hole is then reamed to the next size larger, and as this is repeated until the opening is worn too large for the largest pass, a considerable life is thus obtained. The multiplicity of



DETAIL VIEW OF ONE OF THE LATEST TYPES OF DRAW BENCHES.

holes in each block also tends towards economical use of the die blocks.

The benches above described are made by the firm for its own use and are of interest in that the worm drive is contrary to usual practice. The extra expense is justified in the securing of more uniform tension in the wire. This is of considerable importance in the drawing of a difficult metal, such as chromel.

Diamond dies are used for the reduction of the wire to the finished sizes for the market. These dies are set in brass holders and the machine shown in one of our illustrations is of much smaller dimensions than those just described. While this is the case, these last machines, of which there are two, are capable of drawing monel wire through ten passes with the one reeling. Six passes are the limit on chromel wire.

Starting from the reel the wire passes through the first die and then over a drum beyond, from which it passes through the bath of lubricant and up over another drum on the original side of the die. From this it passes through the second die and repeats its course until all dies have been passed. From the late die it is wound on a receiving drum. Both horizontal cylinders and the receiving drum are power-driven. The elongation of the wire here as in former drawings is taken care of by slip. The dies are supported by an iron bar through slots in which the wire passes.

The lubricant here used is of a liquid type, a special soap being one of the ingredients. Wire is drawn from 5-16 in. rod down to standard gauges, as required by customers. The smallest size usually drawn is .009 in. in diameter; this corresponds to about No. 31 B. & S. gauge. The draft in each pass varies with the material and with the diameter of the wire; it varies from .025 in. down to about .0005 in. for the smaller sizes. The wire is annealed at various stages of the drawing. The annealing is done in a separate building with two oil-fired pot furnaces and fitted with quenching and pickling tanks. A special coating is also given the wire to assist in the lubricating of the dies used.

After a final annealing the wire is reeled on spools and is then ready for the market.

Baldwin's Ltd. to Add Open Hearth Equipment

A REPRESENTATIVE of CANADIAN FOUNDRYMAN has recently been given the opportunity of inspecting the construction work now under way at the plant of Messrs. Baldwin's Ltd., at Ashbridge's Bay, Toronto. This firm are using, as a nucleus for their Canadian plant, the site and building of the British Forgings, Ltd., purchased some few months ago from the Imperial Munitions Board, under which it was operated for the production of shell forgings during the war. And while the plant site serves admirably for the new development and while much of the equipment can be well utilized to advantage, much new equipment has to be built, and buildings erected for the making of the various steel products contemplated, viz., tin plate, black plate, terne plate, castings and forgings.

At the present time three new buildings, forming one unit of the plate mills, are in the course of erection. Each of these buildings will be 800 feet long and 80 feet wide. The first two will contain the furnaces and rolling mill equipment while the third will be used as a finishing plant containing the tinning and galvanizing equipment, together with that necessary for the making of terne plate. Pickling, annealing and cold rolling will also be done in this latter portion of the building.

Doing Rapid Work

At the present time about 500 men are employed around the plant, the major portion of them working on the foundation work now under way. This preliminary work is rapidly nearing completion and an enviable record for rapid construction has been made by the contractors, Roger Miller & Sons. The work was started in October and, when seen by the writer, the mill foundations were practically completed for the first unit and the footings for the building steel were all in place. The poor character of the ground, part of the filled in area at Ashbridge's Bay, has necessitated considerable piling and for the excavation for the mill foundations sheet piling has been necessary.

It is expected that the structural steel for the buildings will shortly be erected by the Canadian Allis-Chalmers Company who have the contract for its erection and fabrication.

In connection with the manufacture of the equipment which will be needed for the various activities of the firm, Mr. S. R. Cound, general manager, emphasized the fact that the major portion of it would be made in Canada and to their own plans and specifications. Only those portions of it which cannot be obtained with ease and promptness will be imported and of this the tinning and pickling equipment forms the major part.

Much of this equipment is being manufactured by Messrs. Baldwin's themselves, the various portions of the plant being admirably adapted to the purpose. The pattern machine shops and foundry are working on rolling mill equipment; screw pins and boxes for the roll housings, together with the housings themselves, are being machined at the present time, while patterns of all descriptions are ready, waiting their turn for casting as the work progresses. In fact there is no part of the plant which can be utilized standing idle. This all goes to show how quickly the management have turned everything available to the development of the new industry.

In connection with the making of sheet and tin plate, it is essential that the steel be of a certain quality. The securing of steel of the proper analysis and quality is one of the most difficult problems to be met with in the tin plate industry, and at the present time Messrs. Baldwin's Ltd., are working on the rolling mill and open hearth equipment necessary for the making of the bar stock for black plate and tin plate.

It is not anticipated that the present equipment of ten electric furnaces, each of six tons capacity and of the Heroult type, will be used for this purpose, owing to their higher cost of operation and open hearth furnaces will be laid down in consequence.

Seeing that the electric furnaces could not be used to advantage in the manufacture of plate, a new industry, for Toronto, has been created. It is purposed to utilize the electric furnaces in the making of steel castings to meet the requirements of the trade in Toronto and adjacent territory.

Foundry In Operation

The foundry during our visit was in full operation, about thirty to forty men were at work on the foundry floor. Steel castings for the rolling mill equipment were being made, one of them which had just been cast and which was being prepared for the machine shop, weighing six and one-half long tons. In the sand being prepared for the next cast was one of the heavy rolling mill standards which will weigh after machining in the neighborhood of 12 tons. In addition to meeting their own requirements, Messrs. Baldwin's are also handling custom work at the present time. Cast gears of accurate dimension and other intricate work has been cast. It is estimated that the foundry will be capable of turning out forty to sixty tons of steel castings per day when in full operation.

RECONSTRUCTION PERIOD

Our wine glasses make lovely vases
For a rose with a bit of green vine,
We've planted a palm in our punch-bowl
And a maidenhair fern in our stein.

Our buffet is filled with bright nosegays,
I wonder why father looks sad?
Our demijohn's gone to the milk-man,
No doubt Pollyanna is glad!

C. B. Orwig,
in Los Angeles "Times."

EXCUSES FOR STRIKES

While every sane citizen, whether employer or employee, deprecates the strike as a means of settling disputes, there are some things which put the working man in a position where he has little choice. While the American Foundrymen's Association and most of the individual founders try to be civil and fair with their employees, there are other organizations which are not so particular about being civil, even though they may think they are fair.

In different sections of the United States and Canada there are founders' associations of a local character, which are just as much of a union as the Moulders' Union is, only that they are composed of the employers, and some of their rules read as follows: "Employees will be paid the hourly rate, by premium system, piece-work, or contract as the employers may elect." "Every workman will be required to work peacefully and harmoniously with his fellow employees regardless of union affiliations." "The number of apprentices, helpers and handymen to be employed will be determined solely by the requirements of the employer." "It shall be the right of the foundryman to introduce moulding machines and appliances of any kind, and to have the same operated by whosoever he finds to his best advantage to employ thereon."

Now, while all of this is straight business it certainly savors of jug handle (all on one side) and puts the working man in the position of a tool, to take what he can get or do the other thing, as the rules specify in another place: "It is the privilege of the employee to leave our employ whenever he sees fit." This is quite a privilege to be sure, but it is not an ideal privilege.

If one concern works on this system it puts them in a position to undermine the founder who offers his men better conditions and compels him to pinch his men harder or else work under a handicap, or get off the market. The state of affairs is not in the best interest of the community at large. If peace and harmony are to exist and strikes are to be avoided, it is much more easily accomplished by both sides being considered than by the employer wanting everything. One of the greatest bones of contention between the employer and employee is what is termed "Arbitrary limitation of output," and this is certainly a complicated subject to deal with. If modern equipment is installed it is reasonable to expect to get the benefits of it, but as an example of how this works out I will cite a job which I once had pointed out to me, not in the foundry but in a forge shop. A job which paid 12 cents was reduced little by little until it got down to 2 cents. This took four years, but the operator kept getting more apt on his job, and the boss insisted on getting everything but just the bare living wage to the operator. After struggling for four years he threw it up and a new man had to be secured. This man lost a finger the first morning, and another one had to be secured (I mean another man, not another finger). The new men had to be paid by the day for a long while, and when finally a piece price was arranged it was away up, and it kept climbing until it is up to 12 cents again.

This was in one of our biggest Canadian industries and shows that so long as the man will accept smaller pay and work harder, that is what he will have to do, but when the company is driven to pay the price they will do so. It is regrettable but true, that force seems to be the only weapon which meets with generally-accepted favor.

REMOVING SMOKE FROM THE FOUNDRY DURING AND AFTER POURING OFF

A subscriber writes asking the question: "How can I remove the smoke from foundry during and after pouring off?" To which question we would say that we have been giving this subject considerable attention during the last year and have frequently published articles on the subject. There are different things to be considered in removing smoke from the foundry. It must be remembered that the smoke and gas and steam is all saturated through the atmosphere of the foundry, and in order to remove it the atmosphere with which it is combined must also be removed.

To successfully accomplish this, provision must be made to replace it with fresh air, and in doing this drafts must be avoided and the trouble with steam being created through the cold air coming from the outside coming in contact with the warm air on the inside must also be taken into consideration. But all of this is just the same, no matter what system is used to remove the smoke.

The standard system in vogue consists of a ventilator on the roof with doors opening on each side. If the building is situated in an open field and both sides of the ventilator are opened and there is any wind blowing, it will blow in one side and out of the other, and that is about all it will do. Of course, some smoke will find its way out according to how much leakage there is to the doors and windows down below. In case the foundry, which is a one-story structure, is situated alongside of a three or four-storey machine shop, this class of ventilator is of little use. In such a case tall galvanized iron ventilators which project to a height exceeding that of the highest building can be utilized to some advantage, but natural draught is certainly out of date and any satisfactory substitute has not been very generally adopted by foundrymen, with the result that foundries as a general thing are not ventilated.

Power-driven artificial draught devices will surely have to come into general use before long and with this in view we will publish a series of articles on this subject, beginning with our next issue.

Time was when we depended on Nature to propel our ships across the sea and to light our streets at night, but things have changed since then, and while the balmy sea-breezes and the beautiful moonlight are lovely things to contemplate, they were not steady enough in their habits and man's ingenuity had to be brought into action to furnish power which would be under man's control. So likewise will the problem of ventilating the foundry be solved.

INSTRUCTIONS SENT OUT IN BULLETIN FORM

The Foundry Equipment Manufacturers' Association, organized about a year ago to promote and further the interests of its members by impressing upon foundrymen generally the advantages to be derived from the use of efficient foundry equipment, proposes now to broaden the scope of its activities by conducting a campaign of education on the proper care, maintenance and operation of such equipment after it has been installed.

The members of this association, with their comprehensive knowledge and experience of conditions and problems in all classes of foundries, have been in a particularly favorable position to accumulate facts and data on the subject. They now propose to embody this information in a series of monthly bulletins, to be issued during the coming year.

These bulletins will be sent direct to the executives, superintendents and foremen of all the foundries in the United States and Canada.

That they may receive the attention of the men interested they will be mailed to their home addresses. An adjustable, stiff card-board cover will be sent with the first of the series so that the bulletins may be filed as they are received and thus be available for reference. The cover will be of convenient pocket size.

Only one individual phase of the problem connected with each piece of foundry equipment will be considered in each of these bulletins. It is stated that they will be written in a concise, practical manner and will contain a wealth of pertinent hints on the most efficient method of caring for and operating mechanical equipment to secure maximum production and service. The members of the association follow:

American Clay Machinery Co., Bucyrus, O.; American Foundry Equipment Co., 52 Vanderbilt Ave., New York City; American Molding Machine Co., Terre Haute, Ind.; Arcade Mfg. Co., Freeport, Ill.; Berkshire Mfg. Co., Whitney Power Block, Cleveland, O.; Beryk Co., 1265 W. Second St., Cleveland, O.; Blystone Mfg. Co., Cambridge Springs, Pa.; Buch Foundry Equipment Co., York, Pa.; Cleveland-Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.; Federal Foundry Supply Co., 2639 E. 79th St., Cleveland, O.; Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.; Grimes Molding Machine Co., 1218 Hastings St., Detroit, Mich.; Hanna Engineering Works, 1759 Elston Ave., Chicago, Ill.; H. M. Lane Co., Detroit, Mich.; McLain-Carter Furnace Co., Milwaukee, Wis.; National Engineering Co., 549 W. Washington St., Chicago, Ill.; S. Obermayer Co., 18th and Rockwell Sts., Chicago, Ill.; Pangborn

Corporation, Hagerstown, Md.; J. W. Paxson, Philadelphia, Pa.; Henry E. Pridmore Co., 19th and Rockwell Sts., Chicago, Ill.; P. H. & F. M. Roots Co., Connersville, Ind.; U. S. Molding Machine Co., 968 E. 69 Pl., Cleveland, O.; Wadsworth Core Machine & Equipment Co., Akron, O.; Whiting Foundry Equipment Co., Harvey, Ill.; E. J. Woodison Co., Detroit, Mich.; Young Bros. Co., Detroit, Mich.

RESEARCH LABORATORY OF THE JOSEPH DIXON CRUCIBLE CO.

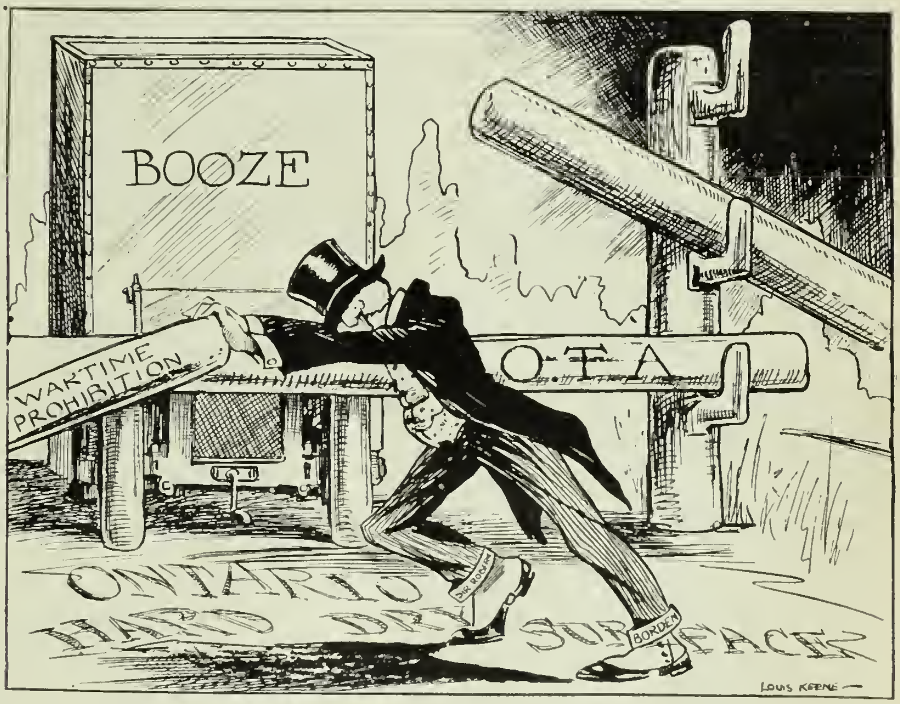
The superstitious folk of the middle ages experienced a wonderful feeling of romance from the magic of their alchemists and wizards—a feeling based on the mystery with which their activities were shrouded. Yet absurd as were their claims, the alchemists undoubtedly were the forerunners of the modern scientific chemists.

Nowadays, schools, books, and magazines have dispelled the old cloud of mystification from the work of scientists, and the results of research are felt alike by the farmer, the manufacturer, the housewife, and others. But who can step into a laboratory without feeling that the little blue flames, the little but loudly roaring furnaces, the crucibles and tiny cauldrons, the wicked-looking bottles, the strange and demonlike odors, are very suggestive of the days of witchcraft and conjuring?

There is such a place of interest and study to be found in the newly-established Research Laboratory of the Joseph Dixon Crucible Company. It is located close to the works, but far enough away to avoid the noise and dust, and be free from the vibrations of the factories which is so likely to disturb the accuracy of the delicate instruments.

The building is a large twenty-room house, the old-time manse of a Scotch Presbyterian church, wherein no cushions or heat or music were permitted, so they are reasonably sure that Old Nick was long ago exorcised, never to return.

In this very much larger and more complete laboratory they shall be far better able to analyze all their clays, graphites, and other materials that enter into the Dixon crucibles by the Dixon Company. They will also be able to make microphotographs of all materials that require microscopic study. In other words, they will expect to have what they have started out to have, a complete research laboratory, wherein their staff of chemists will be able to study and to produce results of great value to the Dixon Company and to its world-wide clientele.



IDLE PITY GIVING WAY TO PRACTICAL EFFORT ON BEHALF OF CANADA'S SIX THOUSAND BLIND

You have doubtless been interested in what you have read or heard regarding the progress of a national effort on behalf of the blind of Canada.

Do you realize just what this effort means?

Here are some of the things that are being done:

Industrial training and employment is being provided for the blind in centres established in Halifax, Toronto, Winnipeg and Vancouver.

Useful handicrafts, and the reading and writing of embossed characters, are taught in the homes of those blind people who, for various reasons, are unable to take training at one of the regular centres.

The product of the home-workers is bought and sold.

Personal contact is established with recently-blinded persons, and with cases which are sometimes so old that they become new in a very real sense. This work is done by an experienced field agent.

Books, magazines, and music in embossed types, are circulated free to the blind of Canada. The monthly average circulation of books, etc., is close to eight hundred. The Institute also arranges for the transcription of music for any of its members at cost price.

A residence and training centre, "Pearson Hall," has been provided, where blind soldiers may find congenial conditions while taking vocational instruction. In this connection, it may be interesting to know that the Institute has entered into an agreement with the Department of Soldiers' Civil Re-Establishment, under which the Institute has established an after-care department for Canadian soldiers blinded in the war.

There are other things, but they may all be summed up by saying that the Institute endeavors, in every practical way, to advance the interests of the blind, and to ameliorate the conditions under which they live.

Will you aid in supplying the most vital need of this work?

Then mail your cheque to the CANADIAN NATIONAL INSTITUTE FOR THE BLIND, 36 King Street East, Toronto, Ont.

SCRAP MARKET FOLLOWS FLUCTUATIONS OF IRON AND STEEL TRADE

The year 1919 began with the scrap market in a state of great uncertainty. Prices were low and dealers were treading cautiously, chiefly owing to their fear of the Government turning loose a flood of cheap material. Consumers also had this idea and held up their buying in hopes of getting their scrap cheap. However, when the Government scrap did appear on the market the effect was not nearly so serious as imagined. Heavy melting steel sold as low as $1[illegible] in New York but generally it remained around the $15 mark. Early in March improvement in the market became evident, foundries and steel mills coming in for material, one large company buying as much heavy melting as was available at $14.50. Scrap fluctuated during the ensuing months, but dealers, feeling confident of better values, bought scrap and piled it in their yards. A large sale of Government scrap stayed their hands for a while, but this material was soon absorbed and dealers started buying again. Their business acumen was justified when heavy melting went to $22 in August. The strike came along then and curtailed demand, and a shortage of cars made it difficult to move such material as could be sold. Heavy steel held up pretty well, not touching lower than $20, and with the end of the strike soon rose to $21. Cast scrap came into great demand with the shortage of pig iron, and the No. 1 grade sold at $30.50 del. Pittsburgh, $34.75 Chicago, and $31.15 Eastern Pennsylvania during December. Heavy melting steel touched $24.50 Pittsburgh in the last month of the year.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question.—Several months ago we equipped our large tank for a hot nickel solution. The solution used identically the same as we previously used cold with one exception, the density of the present solution is about double the former solution. With either of these solutions operated at normal temperature of air in the plating room we can produce a beautiful white background on our stove castings in one hour, in fact the dense solution will yield splendid white deposits of nickel in twenty minutes. Now, if we heat this concentrated solution to about 100 degrees Fahr. the deposit is dark, a dull gray, and the backgrounds are anything but pleasing to the eye. If the temperature exceeds 100 degrees the deposit is actually valueless as a finish for stove castings. This dense solution was diluted to the density usually employed with ordinary double sulphate baths and the results were equally as unsatisfactory, although of a slightly different character. We have experimented with the hot solution in an endeavor to improve results without adding chemicals to the solution. We have failed to get the white background. Will you kindly advise us of a method which will permit the use of a hot nickel solution in the production of silvery white backgrounds on gray iron stove castings?

Answer.—Hot nickel solutions have their disadvantages as well as their advantages, and the dull, dead appearance of the nickel deposits from hot solutions is a distinct disadvantage when these solutions are used for plating stove castings which have backgrounds. We have succeeded in producing very fine results by using five ounces of boric acid per gallon of solution and nickel chloride instead of the more commonly employed conducting salts, and using care in the maintenance of a solution temperature of 80 degrees. It has been observed by numerous platers that hot nickel solutions "throw" better at moderate temperatures than at extremely high temperatures. An ordinary nickel solution which yields bright deposits at 65 degrees Fahr., will usually yield very satisfactory white deposits when operated at about 80 degrees Fahr. If the temperature is increased to 90 degrees the deposits may become darker in tone, and at 100 degrees a blue shade spoils the appearance of the finished casting. Much depends upon the current density employed. We would suggest that you operate the nickel solution at about 80 degrees with a current density of approximately ten amperes per square foot. Boric acid not in excess of 5 ounces per gallon of solution will aid in getting the silvery whiteness you desire.

Question.—I am arranging a plating plant to process an output greatly in excess of any previous year's record. It occurred to me that possibly a combination copper solution would be a valuable solution to instal. Our products consist of sheet metal stampings soldered when assembled, the plating operation is performed on the assembled article. Would the solder cause us trouble either directly or indirectly? We cannot use an electric cleaner on some of our goods because the solder is attacked. Would the action be similar in the copper solution containing appreciable percentages of cleaning compounds?

Answer.—The copper-cleaning solution may be prepared so that soldered articles may be cleaned and coppered at one operation with perfect results if care is exercised in the introduction of the cleaning compound; an excess is to be avoided. The cyanide content will probably be required to be greater than when plain sheet iron or steel is processed. The only cases of failure in cleaning and coppering soldered articles in one operation which have come to our attention were caused by the careless use of solutions originally prepared for processing plain steel or iron; the caustic properties of the cleaning compounds were responsible for the trouble. When these solutions were reconstructed by the addition of copper salts and cyanide and operated at lowest possible temperature consistent with respect to cleaning, success followed. If the two or three bath method of cleaning is used the real damage may occur in one of the cleaning solutions previous to introduction into the copper solution. Personally we favor the employment of a good cleaning solution which acts quickly, say thirty seconds, then transfer directly to a well-balanced copper solution free from sodas or cleaning compounds, a simple copper carbonate or copper cyanide and sodium cyanide solution, operated at approximately 200 degrees Fahr. with 5 volts. Strike with highest possible current density, and if a heavy deposit is required for buffing reduce the current to about 10 amperes per square foot. A ten-minute deposit at this speed will suffice for all ordinary purposes. Solder, if present on the surface of iron or steel articles, will be attacked by almost any alkaline cleaning solution if the treatment is prolonged beyond reasonable limits. A mild cleaning compound may contain some caustics and ruin a soldered article if employed as an electric cleaner. Usually the period of cleaning is permitted to continue too long. One-half minute should be sufficient. If 5 volts will not do the job increase the voltage rather than increase the time of treatment. One operator we have met who is very successful in plating soldered articles uses a solution of: hydrochloric acid, 25 parts; sulphuric acid, 25 parts, and water, 50 parts, with lead strips as cathodes, and the soldered articles as anodes, 10 volts and 15 seconds' treatment gives the surface a clean condition, which is evidently the correct thing. The quickness with which this treatment is performed is probably responsible for much of the success attending the operation. Unless you are required to finish the soldered articles in copper we would advise the total elimination of copper-plating, as equally as perfect results may be obtained by nickel-plating direct on the steel, and less operations are required, and the chances of failure are decreased with each reduction in preparatory operations. Try this first.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1919-1920.

President—Mr. John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—Mr. T. G. O'Keefe, 147 Dupont St., Toronto.

Secretary-Treasurer—Mr. O. Holtham, 328 Carlton Street, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—Please inform me of a method which I can use to produce a steel grey color on brass. The deposit or coloring film must permit of relieving on portions of the articles. Nickel flash does not meet the requirements.

Answer.—Try an arsenic solution composed of 10 ounces of white arsenic, 4 ounces of white stick caustic potash in 1 gallon of soft water. Dissolve the potash in hot water, add the arsenic and boil the solution until the arsenic is completely dissolved. Pulverize the arsenic before adding to the solution. In case complete solution of arsenic is difficult a small quantity of the substance remaining undissolved will do no harm, but it must be remembered that the undissolved portion does not aid in the results required. Use solution cold with a current tension of from 2 to 3 volts. A ten or twenty minute deposit will be quite sufficient for your purpose; lacquer after relieving.

Question.—Admitting my inexperience but assuring you of my sincere desire to master the problems which beset me daily as I operate two nickel-plating tanks in a small shop, I wish to ask for your opinion on a matter respecting current strength in plating. We have been plating 400 sheet brass stampings strung on copper wire per lead, with 100 ampere of current; time of plating was one and one-quarter hours. Now we plate the same brass stamping on holders made from iron wire, and find that we can place 600 pieces in the tank per load. I have not been able to adjust the current so that a deposit of 1¼ hours would withstand the buffing. Can you suggest anything which might assist me to get a deposit equal to that obtained on copper wires and in the same time or less?

Answer.—If you have increased the number of pieces from 400 to 600 you must increase your current in proportion, or from 100 amperes to 150 amperes; in addition to this you will have to make allowance for the use of holders instead of copper wire. Iron wire has six times the resistance of copper wire of same size, therefore to offer the same conductivity a simple iron holder would need to be at least six times as large as the copper wire formerly used; by this we mean the cross-sectional area should be six times as great. If arms are soldered on and are of smaller cross-sectional area this fact must be considered. If you formerly plated 400 articles on 80 copper wires we may assume that you now plate 600 of the same articles on 40 iron holders, and would judge that the load would require approximately 200 amperes of current to produce a plate equivalent in protective value to that obtained when using copper wires and a lighter load.

Question.—In 1916 my present employers engaged in the manufacture of munitions, and a brass-plating solution which we had employed previously was placed in barrels and stored in a warehouse. I have just received an intimation that this solution would again be required for commercial plating. I anticipate trouble with it as I never was able to control results before it was stored. If you can suggest anything that might assist me in case of difficulty I shall appreciate the information.

Answer.—You are crossing the bridge before you reach it. Transfer the solution to the plating tank, and if possible to heat it, boil the solution for at least one hour, then electrolyze while cooling; use strongest current available, with small cathode and large anode surface. Note color of deposit, test with piece of polished steel, and if dirty gray dilute to about 50 per cent. its concentration, or to about 10 degrees Be.; add copper in generous quantities, electrolyze, and bring up to correct color by adding zinc carbonate dissolved in cyanide. If several colors appear on the plated surface add cyanide cautiously until clear yellow deposit is obtained and the anodes remain free from heavy dark coating. The solution removed when diluting the bath may be kept in a barrel and added to the plating solution when conditions require, or it may be added to an ordinary copper solution if care is taken not to add too much at a time. Small quantities of brass solution added to a copper bath often improve the copper deposits. We would prefer to use solution in this manner rather than keep it to add to brass solution as it is rarely necessary to add solution in this manner to a brass-plating solution unless the care of the latter has been neglected.

Question. — Several nickel anodes which we placed in use some four months ago are still quite hard and exhibit only slight evidence of having been suspended in a plating solution used daily for commercial plating. There appears to be a form of ragged coating on these anodes, underneath which the usual black pasty substance may be seen through numerous holes. The nickel solution in which these anodes are hanging has become seriously weak in metal and we do not wish to continue as heretofore if possible to avoid it. Can you inform us of some method which will enable us to employ the anode without further loss?

Answer.—The anodes which you have in the solution may be removed and the bark-like coating may be ground off or broken in many places so that the electrolytic action of the bath may affect the more easily soluble pertion beneath. Anodes which have not been in use are quite easily ground in this manner: The anode is very lightly applied to a fine emery wheel and merely the dull outer skin removed. If you prefer to treat the anodes in the following manner you will save the labor of grinding and reduce the time loss. Fill a clean stoneware crock or a hardwood keg with a 50 per cent. solution of sulphuric acid and water; add 4 ounces of common salt per gallon and connect the container with the electric current in same manner as for plating except that the positive or anode rod should be placed across centre of top so that the nickel anodes to be treated may be suspended therefrom and be entirely surrounded by cathodes of either lead, old nickeled holders, or brass. Use strongest current available for sufficient time to produce a black rather granular surface. Rinse in cold water after removal from the acid bath.

Question.—I have orders to fill which necessitate the installation of some form of tinning bath. Would you advise using a tinning solution with the electric current or the dipping process with molten tin? There is a plating plant in operation on same premises from which I could secure suitable current.

Answer.—If your contract calls for a coating of tin which must be durable, we unhesitatingly advise you to use the hot tinning process. It is more expensive than the electric method and has not the wide range of useful application which is possessed by the electric method but dip tinning is really much superior to electro-tinning in respect to protection for iron or steel. An electro-tin solution which has given splendid results for several years and thereofre is to be depended upon is composed of the following 8 oz. pyrophosphate of soda, 1 oz. tin chloride, 1 gal. water. These quantities may be increase slightly or decreased to ¼ above figures if the proportions do not vary appreciably. Both tin and soda will be required to be added occasionally to maintain proper working conditions. Slimy anodes denote excess current or deficiency of soda in the solution. It may be said that tin solutions are not wholly maintained by the disintegration of the tin anode and require special attention in current regulation and the solvent must be maintained quite constant if uniform results are expected. Use as large anode surface as possible. If a zinc coating would answer your purposes you will find the following a very satisfactory formula. Water, 1 gal.; zinc sulphate, 10 ozs.; aluminum sulphate, 7 oz.; ammonium chloride, 1 oz.; prepare in usual manner and add 8 ozs. of tin salt to each 25 gallons of the zinc solution. The deposit from this solution is very dense and unusually white, and could be successfully employed on goods which are not to be used for culinary purposes. It is easier to operate and keep in working condition than the tin solution.

Question.—Please give me the following information and oblige an appreciative subscriber. My copper solution plates very rough and the plate is hard to buff. Why does a nickel solution deposit dark, brittle coatings? My work consists of grey iron castings and occasionally some brass castings.

Answer. — Cyanide copper solutions may produce rough deposits sometimes streaked or discolored if too strong current is used when the metal strength of the solution is low, or free cyanide deficient, or impure copper salts are present. Acid copper solutions which have not enough free acid will give similar results. Alkaline nickel solutions usually yield dark deposits. Nickel solutions of normal acidity may yield dark plates if the conductivity of the solution is poor. Copper in any form introduced into the nickel solution will cause dark deposits. Nickel solutions excessively acid produce brittle deposits, the plate is hard and usually non-adherent on highly polished surfaces. Increase the metallic content of the solutions, neutralize, and add a good conducting salt. Use extra care in rinsing all castings previous to placing same in the nickel solution. Keep the solutions clean and maintain a large effective anode surface at all times. Use the solution as a friend. Do not neglect it.

CAPITAL AND LABOR

"The man who earns a dollar is a laborer, and the man who saves a dollar is a capitalist. It is as impossible to separate labor and capital as it is to separate oxygen and nitrogen in the air and continue to breathe."—Uncle Joe Cannon.

Scraps from the Foundry Scrap Pile

The Canadian Casting Co. is the name of a new company recently registered at Toronto.

Eclipse Machine Co., of Elmira, N. Y., are starting a business in Walkerville, Ont., to supply the Canadian trade with their line of brakes, clutches, etc.

Preston, Ont., Foundry Being Enlarged.—The Preston Woodworking Machinery Co. announce that they will construct a considerable extension to their plant as soon as weather permits in the spring.

Will Make Gasoline Engines.—Fisher-Wilkie, Ltd., of Sandwich, Ont., are making large additions to their plant and will enter into the manufacture of gasoline engines.

New Foundry for Amherstburg.—It is rumored that a new foundry is to be built in Amherstburg. A tract of four acres has been purchased by a syndicate, but so far nothing definite has been given out for publication.

The Ford Motor Company, automobile manufacturers, Detroit, Mich., while employing ten thousand hands in the foundry department of their big plant at Highland Park, are building a still larger foundry on the River Rouge, where their blast furnace is located.

By-law Carries in Dunnville.—By a vote of 368 to 63, on Jan. 5, the ratepayers of Dunnville, Ont., carried the by-law granting a fixed assessment of ten thousand dollars to the Canadian Engines, Limited, manufacturers of gasoline engines and other lines of machinery.

The McClary Manufacturing Co., London, Ont., are erecting an addition to their foundry at a cost of $110,000, to meet the increasing demand for their products. The structure will be two stories high and will contain, in addition to the foundry floors, a pattern department.

Change Name of Company. — The Cleveland Osborn Manufacturing Co., manufacturers of moulding machines, with head office at 5403 Hamilton Ave., Cleveland, Ohio, and branch offices at New York and Chicago, have changed their name to "The Osborn Manufacturing Company, Inc."

The Canadian Allis-Chalmers Company are erecting an electro-galvanizing department in connection with their Davenport plant, Toronto. The building is a separate unit of considerable dimensions, built at some distance from the main buildings of the establishment, and is equipped with everything the most modern.

New Fire-Brick Industry.—Gates Refractories, Limited, is the name of a new company recently organized at Montreal to manufacture fire-bricks. The buildings acquired are of two-storey brick construction with about 12,000 feet of floor space. One kiln of 50-ton capacity and three kilns of 60-ton capacity each are in operation.

Extending Plant at Guelph.—The Gilson Manufacturing Company, Limited, Guelph, Ont., manufacturers of gas, gasoline and oil engines and other lines of manufacture are making large extensions to their present plant. In addition to a two-storey addition, 140 x 80, to thir machine shop, they are adding a building, 70 x 90, to their foundry.

New Foundry For Guelph.—Guelph is to secure a large industrial concern, a branch of a Cleveland house. The firm is Henry Miller Foundry Company, Ltd., of Cleveland, and they will occupy the building lately occupied by the Sherer-Gillett Company on the Victoria Road. They will add to the building considerably. The firm manufacture heating apparatus.

By-law Carries at Mount Forest.—By a considerable majority, the ratepayers of Mount Forest carried the by-law which was submitted for approval on Jan. 5 to loan the sum of $15,000 to Ernst Brothers, foundrymen of that town, to enable them to enlarge their plant. Two large buildings will be erected and equipped with all modern appliances.

New Foundry for Brockville.—Mayor Lewis, of Brockville, Ont., announces that a new foundry is to be erected in Brockville in the early spring, headed by J. Gill Gardner, president of the Board of Trade. The industry will cover a very considerable space and afford employment for 125 hands at the beginning. Montreal capital is interested in the enterprise.

Perfect Machine Co. Enlargement.—The Perfect Machine Co., Ltd., Galt, Ont., have found it necessary to double the capacity of their moulding shop and are erecting a new addition which considerably more than doubles their moulding floor space. They have been doing, in addition to their own work, considerable jobbing work in gray iron and semi-steel castings and have been exceptionally successful.

Fairbanks, Morse & Co. announce that their present foundry at Beloit, Wis., will be replaced by a mammoth and thoroughly modern foundry, costing $1,500,000, and covering eleven acres of ground. The building, when completed, will be 900 feet long and 550 feet wide, and nothing which goes to make up an up-to-the minute foundry will be omitted. The capacity will be from 350 to 400 tons of grey iron per day.

The Norton Company of Canada, Limited, a subsidiary of the Norton Company, Worcester, Mass., is establishing a plant of the corner of Lottridge St. and Beach Rd., Hamilton, Ont., to manufacture grinding wheels for the Canadian and British trade. The Canadian company will be capitalized at half a million dollars, and will, at the beginning, manufacture vitrified and silicate wheels. These will be made of aluminum abrasive and crystolon abrasive, the former an aluminous abrasive made by the company from hauxite at their electric furnaces at Niagara Falls, N. Y., and Chippawa, Ont.; the latter an artificial abrasive chemically known as carbide of silicon, manufactured in electric furnaces at Chippawa, Ont.

Building Malleable Iron Foundry.—The Auto Specialties Manufacturing Company of Canada, located at Windsor, Ont., announce that they will at once begin the erection of malleable iron foundry in connection with their plant. The first unit of the foundry will cover approximately 45,000 square feet and will cost about $200,000. The buildings will be the last word in building construction, ample thought being given to light, ventilation, etc., and will be absolutely fireproof.

The company expects to have the plant ready for operation about April and will employ about 200 hands. Apart from their own requirements, they will be able to take on some custom work.

New Foundry for Brantford. — Construction work has been started on a new foundry building for the Dominion Steel Products Co., Limited, Brantford, Ont., 100 ft. x 160 ft. This foundry will be equipped with two cupolas, also with a 16-ton capacity air furnace.

The air furnace is being installed for the casting of heavy steel mill rolls, also the rolls for rubber-working machinery. The company has also purchased and will shortly install an electric furnace for the smelting of all types of nonferous alloys with a capacity of about 300 tons of castings per annum.

It is expected that the gray iron and steel foundry will be in operation in the early part of March. Its capacity will approximate 15,000 tons of castings per annum.

The Great Coke Plant at Anyox, B. C. —This plant, which was started during the war to supply their smelter with coke, is now completed and is considered to be the most efficient of its kind in the world. There are 30 ovens in all, stretching over 200 feet and standing 20 feet high. Gases driven off are conveyed to the by-product house, where many by-products are secured. The plant has a capacity of 500 tons of coke daily, while out of each ton of raw coal carbonized there results 65 per cent. of the total weight in coke, 11,500 cubic feet of gas, 10 gallons of coal-tar, 21 pounds of sulphate of ammonia, 3 gallons of light oil, 1.55 gallon of benzol, .4 gallon of pure toluol. 30 gallons of solvent naphthalene and 4 pounds crude naphthalene. From the tar there is made creosote, pitch and innumerable other useful by-products.

OBITUARY

John Stewart, who for forty years operated a foundry at Paris, Ont., is dead. Mr. Stewart was born and raised in Galt, and served his apprenticeship as a moulder in that city, after which he settled in Paris and entered into the foundry business on his own account.

Four years ago he took a stroke which incapacitated him from active business pursuits and necessitating his retirement. Accordingly, he removed to Brantford, where he remained until his death. He is survived by three daughters.

FIRES

Oil vats exploded at Moncton, N.B., on January 5, causing a fire which did damage to the extent of $65,000 to the plant of the Record Foundry Co. No one was injured.

The Katie Foundry, at Galt, Ont., was damaged by fire to the extent of several thousand dollars on January 2. The thermometer was hovering around the zero point and several of the firemen were frost-bitten.

The office and the main building of the Welland Iron and Brass Works, Welland, Ont., were destroyed by fire Saturday, January 3. Owing to the temperature which was near zero and a gale which was blowing, the firemen had a hard fight to keep the flames from spreading to Frank Round's planing mills and C. B. Wilson's utility electric stove factory.

CATALOGUES

The "Oliver" No. 1 Universal Woodworker's Vise is the main feature of an interesting pamphlet distributed by The Oliver Machinery Co., Grand Rapids, Mich. The vise is described in detail and embodies every feature of the standard vise and adds several points of superiority. It is easily, speedily and simply adjustable to any desired angle by the hand-operated collar, and clamped in any tilted position by the rack bar. All parts are interchangeable. It can be set at any point in a 90 degrees arc, and set at any point desired within the complete arc of another circle at right angles with the former. This can be done without loosening the work in the jaws. Wedge-shaped work will fit either end of the jaws as they are made to swing, being pivoted in the centre.

Chesapeake Iron Works, Baltimore, Md., manufacturers of electric travelling cranes, have sent us their latest bulletin illustrating and describing their cranes. The illustrations show all the details of the cranes, including cable drum, foot brake, electric brake, mechanical load brake, operator's cage covered in and uncovered, girders, blocks, etc., in addition to an interior view of the Chesapeake Iron Works machine shop, with innumerable cranes under construction and also an outside view of the plant. It also shows the cranes in operation in different classes of industrial plants, and is altogether a useful and interesting volume of information.

The Aeroil Burner Company, Inc., 400 Main Street, Union Hill, N.J., U.S.A., are distributing their newest catalogues of Averil thawing outfits and torches for removing ice and snow from frozen coal, sand and ore cars, hoppers, pockets, conveyors, loading chutes, dippers, tracks, and switches. The descriptive matter and illustrations are interesting and show how the burner may be used to undo the mischief caused through frost. It also gives other ways of utilizing it, such as straightening motor truck or auto frames, axles, chassis and goosenecks, loosening tight gear wheels, collars and pulleys, brazing, preheating for welding and many other heating purposes.

Lane Electric Cranes is the title of a new bulletin which has just been issued by N. B. Payne & Co., 25 Church St., New York City, sole agents for Lane electric cranes manufactured in Montpelier, Vt., by the Lane Mfg. Co. The bulletin fully illustrates and describes several styles of cranes in which steel girders or heavy timbers of long leaf yellow pine are used. A record of thirty years is claimed for this crane—minimum power and repair cost, great overload capacity, high return value on capital investment and the cranes can be operated by inexperienced labor. The bulletin contains a complete set of specifications and a very long list of satisfied users. A questionnaire is inserted in the bulletin for the use of the prospective purchaser, on which he can quickly write all information needed by the manufacturers. A free copy will be mailed upon request by N. B. Payne & Co., to any reader of this publication.

BOOK REVIEWS

"Foundry Cost Accounting," by Robert E. Belt, Certified Public Accountant; Cost Accountant of The American Malleable Casting Association, Cleveland, Ohio; is a book or 271 pages, bound in cloth, and the contents include the following: Importance of an Accurate Knowledge of Costs; Uniform Cost Finding Methods and the Effect on Competition; Examination of Plant Practices and Operating Conditions; Installing and Operating a Cost System; Accounting Practice and Records; Operating Departments and Department Records; Classification and Definition of Accounts; Monthly Statements; Product Costs; Depreciation; Estates and Quotations; Profits.

Each of the subjects is treated thoroughly and altogether every phase of accurate cost methods is covered.

The book contains some 100 forms and charts which cover the entire field of foundry cost keeping.

Nothing is dealt with in the way of general cost accounting, the subject matter being entirely specialized on foundry costs, not only the grey iron foundry but the steel, malleable and non-ferrous foundry as well.

It is a book which should be in the hands of every foundryman as well as every public accountant who has any foundrymen among his clents.

It is published by the Penton Publishing Company, Book Department, Cleveland, Ohio. Price $5, delivered.

Some interesting information concerning ancient metal works in India, is given by Mr. Panchanan Neogi, Professor of Chemistry, Government College, Rajshahi, in a booklet named "Copper in Ancient India." The second largest bell in the world is to be found, he says, at Minguin, in Upper Burma. It was cast in 1790, measures 16 ft. in diameter, and weighs 88 tons. Some very notable guns were also cast in India, the materials of which were chiefly wrought iron and brass or bronze. The iron guns were made by welding together rings placed side by side, and were often 30 feet long. Brass guns of great size were cast, a notable one being the great gun of Agra, an enormous howitzer, 1 4ft. long and 22½ in. bore, and weighing over 50 tons. A gun known as "Monarch of the Plain," the largest in the world of its time, was of bronze, of a length of 14 ft. 3 in., and had a diameter at its mouth of 4 ft. 10 in.

Company Loses Action.—The Russell Motor Car Company lost the decision in an action brought by them against various railway companies for loss of 3,838 castings, which had disappeared in transit. The action was dismissed on the grounds that the company did not count the contents of the freight car on the morning that they broke the seals.

At a recent meeting of the Montreal Board of Trade considerable opposition was advanced regarding the proposed advance in wharfage rates that the Harbor Commissioners intend putting into effect at the beginning of the year. It was decided that the council of the Board of Trade interview the Commission to see what can be done as to the withdrawal of the proposed advance, and if this cannot be done to suggest that the matter of the increase be deferred for a time so that the board may have time to bring the whole matter to the attention of the Government.

Moulders Are Out.—In accordance with the terms of their ultimatum to the management recently, the moulders and coremakers employed by the Dominion Iron and Steel Company, at Sydney, together with the apprentices in the company's foundry, quit work. Forty-one men are concerned. The men's demand is for a wage increase which the company has claimed cannot be made at this time of unsettled conditions in the steel trade. International headquarters of the moulders' union instructed the men to negotiate further, and this was followed by the men's notice to the company that unless the demands were met in forty-eight hours they would go out.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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CONTENTS

Happy New Year

ANOTHER year has rolled by and we are now travelling on into the year 1920. As this is our first appearance since the New Year we take this opportunity of greeting our readers with best wishes for a prosperous year and of assuring them that it will be our aim at all times to be of assistance to them whenever an opportunity arises. Our "Questions and Answers" columns will always be open for any questions relating to moulding, melting, core-making, brass work, pattern-making, plating and polishing; in fact, anything which touches the foundry business from any angle. We have assisted a lot of questioners during the last year and have had the satisfaction of receiving very complimentary letters in return. It is not only difficult questions which should be asked and for that reason we never hesitate to entertain subjects which might appear too simple to require any explanation.

The Strike Situation

THE strikes throughout Canada have mostly all been terminated to the satisfaction of both employer and employee, but, unfortunately, Toronto has been the goat for the rest of the country, both as regards the foundryman and the moulder. Other foundry centres throughout the country remained in abeyance, pending a settlement in Toronto, with the result that the men got their wages and the bosses filled their orders and made their profits, while both contending parties in Toronto were just making jokes of themselves. If one party made a move the other thought he had him beat, and so the situation remains. Most of the moulders have secured employment in other towns or at some other occupation, while the foundrymen are endeavoring to operate on the open-shop system. The best we can say is that it is unfortunate, and that if we could be the medium through which a settlement could be arrived at, we would welcome the opportunity.

This Year's "Foundryman"

AS we mentioned in our last issue, we are always glad to have suggestions from our subscribers, as it is the subscriber who is to be satisfied or dissatisfied, as the case may be, and it is our intention to have him satisfied if it lies within our power. From what we can glean from every class of reader, we have come to the conclusion that what takes the best in a publication of this kind is real, practical articles on how the work is done. This class of material might be considered as constituting a workingman's section, which it really is, but from letters which we have received from numerous business men, this is exactly what a trade paper is chiefly useful for. From this point of view we have decided to give the mechanical section a foremost place in the reading matter of the paper, and like the Questions and Answers, it is not necessary to adhere to the most difficult class of mechanical work. The making of ponderous castings is always fascinating, but it is not always the most useful knowledge to be gained. Some very simple points have been overlooked by good workmen, and a reminder on a simple subject will frequently be of valuable assistance.

Making Ponderous Castings

TO mould and pour a casting weighing one hundred tons is no more of a trick than to do one weighing one ton, although it is different in many ways, and would be a greater financial loss if it failed. But the actual risk of losing it is really less than making a light casting with difficult cores.

The heaviest casting which has been so far recorded is an anvil block which was made in Russia, for use in hammering the planished Russian iron for which Russia is famous. This block weighed 600 tons. To make a six-hundred-ton chuck it is necessary to figure up how much pressure there is going to be on the mould and then guard against it. Along with this it is necessary to bear in mind that the metal will remain in a molten state for a long while, and the material of which the mould is made must be of such a refractory nature as to resist the heat for a sufficiently long time.

The only thing remaining to be done is to have melting capacity and crane equipment. It would be quite possible to melt 600 tons and run it into this kind of work in an average jobbing foundry. If the cupola is a modern one with slag spout and capable of melting ten tons per hour it would only require to keep it in operation for 60 hours. The largest ladle in the shop could be utilized to pour the first iron in order to cover the face with metal which is not too hot. The remaining iron can be run direct from the spout to a pop gate, and as long as the cupola is kept free from slag the mould will continue to fill up, and by melting the iron white hot and having it fall into the centre of the chunk, it will force the duller metal to the sides and at the same time keep the necessary amount of iron in a molten state.

To make difficult work which requires to be poured in a few minutes it is necessary to have furnaces and cranes and ladles suitable for the work, but the actual skill required to do it is no greater than that on smaller work and for this reason we take just as much interest in the description of a small undertaking as we do in that of a larger one. The foundry presents one of the biggest propositions known, and no part of it is too small or insignificant to be considered.

Save Your Copies

SUBSCRIBERS are advised to keep every copy of CANADIAN FOUNDRYMAN and have them bound at the end of each year. Next December's issue will contain an index of the principal contents for the entire year. It is surprising how useful the bound volumes are as a book of reference.

High Cost of Leisure a Real Problem

T. R. MARSHALL, Vice-President of the United States, says that the high cost of living is not the only problem before the people. The high cost of leisure is, according to Mr. Marshall, as great a menace. He admits that he is among the laziest of mortals, but censors himself along with the rest, and says that citizens who have the good of the country at heart should consider the problem and they will agree that the only means of meeting the increasing difficulty is to produce more, to earn more, to economize more, and to save more. This is along the line of argument "that the modern man does not intend to work as long hours as he used to, and he does not intend to work as hard as he used to, but he intends to get more money." This, coupled with the fact that the farmer does not intend to sell his produce at any such prices as he used to, puts the whole thing in a somewhat complex state.

We have always contended that if the farmer was prosperous the whole country prospered with him. We still contend this, and have no desire to see the farmer sell at a sacrifice, but for those of us who have to purchase our supplies of food the high price makes a high rate of wages imperative. And for those of us who have spent our days at foundry work we do not see how we can speed up any more than we have always had to do, without shortening the number of our days on earth or else shortening the length of the day.

From this we are forced to conclude that if the working man is going to enjoy his life in the manner he aims at he must have shorter hours and more pay, and the only means of achieving this object is through the ingenuity of these very working men in devising means of producing the goods in larger quantities on automatic machines.

If hand-work is adhered to and the workman receives bigger rates of pay the product of his labor must sell at a higher price, thereby raising the price to the working man who purchases it, thus putting him in a position to require more money. And so the process continues like an endless belt running into perpetuity.

Some of the original so-called machines which were handed to the moulders were certainly insults, only adding to the output of the shop at the expense of the bone and sinew of the men who operated them. But this state of affairs has long since passed and some really helpful equipment is now taking the place of these man-killers and also of the old and laborious methods of moulding by hand.

We have no desire to back up the advocates of piling more onto the shoulders of the working man, in the disguise of a patriotic duty, but the facts are staring us in the face that if we are going to reduce the cost of living we must reduce the cost of production, and our theory is that machinery is the medium through which this can be accomplished.

But Times Have Changed

IN them there days what's went and gone and never to return; them days, my son, for which we sigh, for which we groan and yearn—we used to take a basket, then, around the Christmas time, and kick up quite a rumpus on two nickels and a dime.

We'd wander toward the market then, in homespun garb, my dear; with woollen socks upon our feet and wool tab on the ear.

We'd buy a turkey in them days—it did not strain our purse, nor yet did cause us to bust out in words that smelt of curse. We wandered through the grocery store, ah, yes, we did, by heck! Of currants and raisins and such truck, we bought 'em by the peck.

The gatherin' up of trinkets, too, it was a simple thing—we were not buyin' in them days as though for some fat king—in simple taste we sallied out and ere we went a block, we'd got for dad, in grey and red, a brand new Christmas sock.

But folks don't turn to them things now like what we used to do—the chance for gettin' past that way is mighty thin and few. For Christmas now we've got to go and dig down in our jeans, and peel from off our shrivelled wad the last few greasy beans.

We've got to give a motor bus, a gold watch or a farm—yes, scat you simple, woolly things what's weaved in braid and yarn.

Perhaps it's best that things should be just as they is to-day, as long as folks has got the cash to spill about that way—but I can't help just hankerin' back to them there days what's sped, when folks at Christmas time of year kept steady in the head. When we could saunter forth at ease around this buyin' time, and make a reg'lar rumpus on two nickels and a dime.—ARK.

Hanny in St. Joseph News Press

"HOW AM I GOING TO SHOOT THE ONE WITHOUT HURTING THE OTHER!"

Foundrymen's Association Sanitation Code

Being the Code Agreed Upon by the A.F.M. in 1917, Which if Coupled to the Laws on Our Statute Books, Should be Generally Satisfactory

Definition

A 1.—A foundry shall mean a building where iron, steel, copper, tin, zinc, lead, aluminum or composition containing any of the baser metals are melted and poured into moulds for the making of castings, and shall include all moulding, core-making, melting and cleaning rooms used in connection therewith.

Entrance

B1.—The term "entrance" shall mean passages for common use between the foundry and open air provided for employees during working hours.

B2.—Entrance to foundries located in cold climates shall be protected during the winter by a covered vestibule or its equivalent, which shall be so constructed as to eliminate harmful drafts, and of such dimensions as to answer ordinary purposes, such as the passage of wheelbarrows, trucks and industrial cars. This rule shall not apply to entrances used for railroad or industrial cars handled by locomotives or for travelling cranes, horse-drawn vehicles or automobiles; these entrances may remain open during the winter only for such time as is necessary for the ingress or egress of such cars, trucks and cranes, horse-drawn vehicles or automobiles.

Floors and Galleries

C1.—The floor beneath and immediately surrounding a cupola shall be kept free from collection of water.

C2.—The floor immediately adjoining industrial tracks over which workmen frequently pass shall be reasonably hard and flush with the top of the rails. Sufficient clearance for easy passage of truck wheels shall be provided between floor and rails.

C3.—All pits or openings located in foundry floors shall be guarded by suitable covers or railings or by watchmen.

C4.—Galleries where molten metal is poured into mould shall be provided with a solid partition not less than three (3) feet high, installed on the open side of such gallery.

Gangways

D1.—The term "gangway" shall mean a well-defined passage-way dividing the working floors of foundries.

D2.—The width of a gangway or aisle shall be understood to be the clear distance between moulds, posts, partitions or other obstructions on one side of the gangway or aisle and similar objects on the opposite side.

D3.—Gangways other than those for carrying molten metal shall be of sufficient width and properly illuminated to safely allow the passage of employees and materials. They shall be kept free from obstructions at all times.

D4.—Every gangway or aisle in which molten metal is being handled shall, during the progress of casting, be kept in good condition, clear of obstructions and free from undue dampness.

D5.—Gangways where molten metal is carried in crane, trolley or sulky ladles shall be sufficiently wide to allow employees safely to handle and empty ladles.

D6.—Gangways where molten metal is carried on truck ladles exclusively shall be not less than eighteen (18) inches wider than the extreme width of the truck ladle.

D7.—Gangways where molten metal is carried in crucibles by not more than two (2) men per crucible and poured into moulds placed on one or both sides of the gangway, shall be not less than three (3) feet wide.

D8.—Gangways where molten metal is carried in crucibles by more than two (2) men per crucible and poured into moulds placed on one or both sides of the gangway, shall be not less than four (4) feet wide.

D9.—Gangways where molten metal is carried in hand or bull ladles by not more than two (2) men per ladle and poured into moulds placed on both sides of the gangway, shall not be less than four (4) feet wide.

D10.—Gangways where molten metal is carried in hand or bull ladles by not more than two (2) men per ladle and poured into moulds placed on only one side of the gangway, shall not be less than three (3) feet wide.

D11.—Gangways where molten metal is carried in hand or bull ladles by more than two (2) men per ladle, shall be not less than five (5) feet wide.

Aisles

E1.—The term "aisle" shall mean a passageway between moulds leading from the gangway.

E2.—Aisles where molten metal is carried in hand or bull ladles or crucibles and poured into moulds on individual floors by not more than two (2) men per ladle or crucible, shall be not less than twelve (12) inches wide except where moulds alongside the aisle are more than twenty (20) inches high above the aisle level, in which case the aisle shall be not less than twenty-four (24) inches wide.

E3.—Aisles where molten metal is carried in hand or bull ladles or crucibles and poured into moulds on individual moulds by more than two (2) men per ladle or crucible, shall be not less than thirty-six (36) inches wide.

E4.—Aisles where molten metal is carried and poured into moulds on individual floors by cranes, trolley or sulky ladles shall be sufficiently wide to allow employees safely to handle and empty the ladles.

Foundry Equipment

F1.—All lip-pouring ladles of two thousand (2,000) pounds capacity or more shall be equipped with a worm gear or other self-locking tilting device.

F2.—All crane, truck and trolley pouring ladles shall be equipped with a dog to prevent premature overturning and shall be so constructed that when they are full of metal the centre of gravity shall be below the centre of the trunnion, unless each ladle is equipped with a gear mechanism and a latch, either of which will prevent premature overturning of the ladle.

F3.—All single shank hand ladles shall be provided with sheet metal shields.

F4.—When the combined weight of a crucible containing molten metal and the crucible tongs exceed one hundred (100) pounds, the crucible shall be removed from the furnace by not less than two men or by mechanical means, and when the combined weight exceeds three hundred (300) pounds, three (3) or more men or mechanical devices shall be employed.

F5.—Where the crown plate of an upright crucible furnace is elevated above the surrounding floor in excess of twelve (12) inches, the furnace shall be equipped with a platform having a standard rail; such platform shall be constructed of metal or other fireproof material, and shall extend along the front and sides of the furnace, flush with the crown plate, and shall be at least four (4) feet in width, and shall be clear of all obstructions during pouring time. If the platform is elevated above the floor in excess of twelve (12) inches the lowering from same of crucible containing molten metal shall be by mechanical means.

F6.—Equipment used for the movement of materials by overhead cranes, such as sand buckets, shall be of substantial construction. When buckets have movable bails, safety locks or catches shall be provided, and the use of such locks shall be enforced.

F7.—Substantial cast steel handles shall be provided on grab buckets to afford safe means of pulling or prying apart the jams in case the cylinders stock.

F8.—The practice of riding chain and crane loads shall be prohibited.

F9.—Swinging or dangling crane chains must clear all possible obstructions when the crane is in motion or they must be guided by chainmen walking beneath.

F10.—Sling beams shall be so constructed that the slings cannot jump off the beam and so that the slings can be readily moved to accommodate different size flasks.

F11.—Trunnions on flasks hereafter constructed shall be carefully designed

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$33 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00
Bessemer, Pittsburgh	35 00
Basic, Valley furnace	31 00
Toronto price	$37 00 to $40 00

FINISHED IRON AND STEEL

Iron bars, base	$4 75
Steel bars, base	4 75
Steel bars, 2 in. larger, base	6 00
Small shapes, base	4 25

METALS

		Gross
Aluminum	$33 00	$35 00
Antimony	10 00	10 50
Copper, electrolytic	24 50	26 00
Copper, casting	24 50	25 00
Lead	7 75	7 00
Silver, per oz.	....	0 98
Mercury		.....
Tin	....	68 00
Zinc	10 00	10 00

Prices per 100 lbs.

OLD MATERIAL

Dealers' Buying Prices

	Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	17 00
Copper, heavy	18 00	17 00
Copepr, wire	18 00	17 00
No. 1 mach. comp'n.	16 50	16 75
New brass cuttings	10 75	10 75
No. 1 brass turnings	9 00	9 00
Light brass	6 00	7 00
Medium brass	7 25	7 75
Heavy melting steel	13 50	13 60
Boiler plate	13 00	11 00
Axles, wrought iron	15 00	16 00
Rails	16 00	16 00
No. 1 machine cast iron	24 00	25 00
Malleable scrap	25 00	20 00
Pipes, wrought	10 00	9 00
Car wheels, iron	22 00	20 00
Steel axles	21 00	20 00
Mach. shop turnings	9 00	11 00
Cast borings	10 00	14 00
Stove plate	22 00	21 00
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$43 00
Open-hearth billets	43 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	55 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$13 00
5-16 in.	11 00
⅜ in.	10 00
7-16 in.	9 30
½ in.	10 15
9-16 in.	10 00
⅝ in.	11 75
⅞ in.	11 75
1 inch	10 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Putty, 100-lb. drum	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls.	1 50
Linseed oil, boiled, single bbls.	2 92
Linseed oil, raw, single bbls.	2 90
Plaster of Paris, per bbl.	4 50
Sandpaper, B. & A.. list plus	43
Emery cloth .... list plus	37
Borax, crystal	0 14
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$7 00	$6 75
Sheets, black, No. 10	6 50	6 50
Canada plates, dull, 52 sheets	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's est, No. 28	....	...
Premier, No. 28 U.S.	....	8 60
Premier, 10¾ oz.	....	9 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$16 75
3-16 in.	15 40
¼ in.	14 20
5-16 in.	11 50
⅜ in.	10 50
7-16 in.	9 30
½ in.	10 50
⅝ in.	10 00
¾ in.	9 70

Prices per 100 lbs.

IRON PIPE FITTINGS

Malleable fittings, class A, 20%, on list; class B and C, net list; cast iron fittings, 15% off list; malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: class B, black, 24½c lb.; class C, black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.o.b. Toronto.

ANODES.

Nickel	$0.58 to $0.65
Copper	0.38 to 0.45
Tin	.70 to .70
Zinc	0.18 to 0.18

Prices per lb.

NAILS AND SPIKES.

Wire nails	$4.70
Cut nails	4 75
Miscellaneous wire nails	60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.04
Acid, hydrofluoric	.30
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride, lump	.22
Ammonium, chlor., granular	.18
Ammonium, hydrosulphuret.	.50
Ammonium, sulphate	.30
Caustic soda	10
Copper, carbonate, anhy.	.41
Arsenic, white	.14
Copper, sulphate	.16
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.16
Nickel sulphate	.18½
Potassium carbonate	.60
Silver nitrate ..... (per oz.)	1 20
Sodium bisulphite	.18
Sodium carbonate crystals	.06
Sodium cyanide, 129-130%	.38
Sodium cyanide, 98-100%	.55
Sodium phosphate	.18
Sodium hyposulphite (per 100 lbs.	6.00
Tin chloride	1.75
Zinc chloride	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30%
Standard	30-10%
Cut leather lacing, No. 1	2.20
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$4 00
Polishing wheels, bullneck	2 25
Pumice, ground	0 06
Emery composition	0 08
Tripoli composition	0 09
Rouge, powder	0 45
Rouge, silver	0 50
Crocus composition	0 12

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	42 50	43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6x4 base	45 00	44 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd.	0 34
Brass sheets, 24 gauge and heavier, base	0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.10
Packing square braided	.38
Packing, No. 1 Italian	.44
Packing, No. 2 Italian	.36
Pure Manila rope	.37
British Manila rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.74

OILS AND COMPOUNDS.

Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 60
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	10¼

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	27½
Delta Files	20
Nicholson	32½
P.H. and Imperial	
Globe	50
Vulcan	50
Disston	40

for the loads they are to handle and constructed with a factor of safety of at least ten (10) including bolts where they are used. The diameter of the button shall be equal to the diameter of the groove plus one and one-half times the diameter of the sling used to handle flask. Inside corners shall be well filleted, and, in order to prevent the sling slipping or riding the button the radius of the corner between groove and button shall be approximately equal to the radius of the sling used, the remainder of the inside edge of the button to be straight.

F12.—All slings used to suspend flasks from jib crane beams shall either be designed so that there is safe clearance for a hand grip or handles shall be provided to hold sling.

F13.—All ladles, ladle shanks, crucibles, crucible shanks, crucible tongs, yokes, skimmers, slag hoes, crane chains, cables, ropes and slings used in handling or pouring of molten metal shall be inspected daily in regard to their safe condition by the men preparing and using such appliances. A monthly inspection in regard to the safe condition of all crane chains, cables, ropes and slings used for suspending molten metal in mid-air shall be made by a man designated by the employer for the purpose. Written report of such monthly inspections shall be kept.

Finishing and Cleaning

G1.—All castings shall, where practicable, be cleaned or chipped in rooms separated from rooms used for other purposes; but where castings are cleaned or chipped in moulding or casting rooms, there shall be provided suitable screens, partitions or other effective means to protect employees against flying chips and excessive dust.

G2.—When finishing rails or benches are used, these must be sufficiently far apart to allow the operatives to pass between them without being endangered by falling castings.

G3.—All cleaning and finishing floors shall be cleaned and levelled as often as necessary to ensure safe working conditions.

G4.—Where dry tumbling mills are used within a foundry, exhaust apparatus shall be installed and operated that will effectively draw off the dust created by the operation of such mills, or the mills shall be enclosed in reasonably dust-tight compartments while in operation.

G5.—Where dry grinding, buffing or polishing machines are used an exhaust apparatus or its equivalent that will effectively remove the dust created by the operation of such machines shall be installed and operated. This rule shall not apply to floor or bench stands used especially for tool grinding or portable grinders.

G6. — Where swing frame buffing, grinding or polishing machines are used, screens shall be provided when necessary to protect adjacent workmen.

G7.—Sand-blasting by hand-operated apparatus shall be carried on in suitable sand-blast rooms or outside the foundry, and in both cases effective means shall be provided to protect passers-by from sand blast. Dust shall not be exhausted into the open air but into a collector.

G8.—All tools shall be kept properly dressed and free from mushroom heads.

G9.—All electric arc welding shall be properly enclosed to prevent egress of light rays when carried on during working hours. Such enclosure shall be properly ventilated.

G10.—The use of high explosives or of a drop for breaking scrap shall not be permitted unless done under reasonably safe conditions.

Protection Devices

H1.—When the dust arising from cleaning operations may be injurious to the health of cleaners, they shall wear suitable respirators, which shall be provided by the employers; when engaged in sand-blasting by hand apparatus they shall, in addition, wear suitable helmets or hoods which shall be provided by the employer. When the eyes of the employees are liable to injury by dust, flying chips, or molten metal, employees shall wear suitable safety goggles which shall be provided by the employer. When engaged in welding or burning operations by means of oxy-acetylene or other gas torch, employees shall wear suitable safety goggles, which shall be provided by the employer; when engaged in similar operations by means of an electric arc, employees shall use suitable shields or wear suitable helmets, which shall be provided by the employer. In both of the operations employees shall wear slow combustion aprons or overalls, which shall be provided by the employer. When handling molten metal, employees shall wear suitable Congress-type shoes, which shall be provided by themselves; they shall also wear suitable leggings when these are provided by the employer.

Lighting

I1.—The light in every foundry shall be sufficient to provide safe entrance and exit of employees, and to carry on work safely during working hours.

Heating

J1.—The temperature in every foundry shall be sufficient to provide safe entrance and exit of employees and to carry on work safely during working hours.

Ventilation

K1.—Every foundry shall be so ventilated during working hours that smoke, gases, fumes, or dust injurious to the health of employees shall, as far as practicable, be rendered harmless by means of natural circulation of air or by ventilating hoods, fans, or other effective devices.

K2.—Where the operation of drying ladles causes fumes or gases injurious to the health of the employees within the foundry, ventilating hoods shall be provided to remove such fumes or gases.

K3.—All ovens from which fumes or gases injurious to the health of the employees escape shall be provided with hoods of sufficient capacity to remove such fumes and gases.

To be continued

BETTER DELIVERY THE WISH OF 1920

Otherwise Outlook is Bright for the Industrial Outlook in This Year's Trade

TORONTO.—The start of another year's trading is well under way, with prospects all that could be desired. It may be well to modify that phrase "all that could be desired" by a little explanation. If one were to go to the steel trade or to the machine-tool trade and ask what would help them more than anything in the present year, or especially in the immediate future, the chances are that the verdict could be summed up in a couple of words, viz.: "Better deliveries."

There is such an expansion of business on all hands that the makers of tools cannot get out the orders. As a matter of fact production per man in the shops of the tool builders is not as high as it was before the war.

Buying is General

One of the largest dealers in steel in this district showed CANADIAN FOUNDRYMAN a list of business that was carried over from 1919 to 1920 on his books. It was not chance trade, or orders that might be withdrawn, but all placed on the understanding that a contract is a contract. The tonnage was large and the industries represented were representative of almost every line in the country. They took in shipyards, automobile shops, agricultural implement works, boiler makers, and a number of other lines. Besides this there was a large booking of structurals, all of which means good business in this country during the year that has just been entered upon.

Indications that are coming up now bear out the prediction that has been made in these pages recently, viz., that prices of certain lines of steel would move upward. This week some of the Canadian mills moved bars up. The Toronto price from the mills has been raised from 3.30 to 3.50, which means that the warehouses will in all likelihood be quoting bars, iron or steel at 4.75, a figure which CANADIAN FOUNDRYMAN is quoting this week for the first time as the average price to the buyer who gets his materials from the warehouse. The former price of 4.25 has stood for a long time, but had to give way in view of the recent action of the mills.

"We are doing the best we can for our old customers," is the way one importer sized up the situation. "Judge Gary says that the mills of the corporation are running about 80 per cent. That is very good," he concluded, "but it must be remembered that against this 80 per cent. production there is a demand that looks like 150 per cent. of normal."

Good Business Reported

In last week's CANADIAN FOUNDRYMAN reference was made to the fact that one buyer who had a large order to place for cutters and drills was looking for a special price. From what CANADIAN FOUNDRYMAN can learn he was successful in his quest for part of the business, getting some sag in the price. Most of the representatives of Canadian concerns are standing pat on their prices for small tools.

THE PIG IRON TRADE SHOWED GREAT STRENGTH AT THE END OF THE YEAR

The state of the pig iron trade during a great part of 1919 was marked by extreme dullness. This continued until the great strike was ushered in, and the end of the strike was marked by a great revival of business, bringing much enhanced prices.

The lassitude of the market extended over the first nine months of the year, no doubt caused a great deal by the exercise of Government control over prices. Again, consumers seemed able to get whatever iron they required despite the fact that production was low compared to previous years. During the month of June, when consumers usually engage their iron for last half requirements, there was some activity shown in foundry iron, but not much in steel-making grades. Into this peaceful atmosphere came the disturbing element of the strike. This hit the producing furnaces much more severely than it did the steel-making and finishing mills, and production dropped rapidly. The estimated loss in production for the months of September and October amounted to something over 1,000,000 tons. At the same time foundries which were comparatively little affected by the strike were crowded with orders. Having been buying only for immediate requirements, their stocks were very low, and they were forced into the open market, which they found highly competitive. Practically all classes of foundries, stove and radiator makers, automobile casting makers, and machine tool builders were clamoring for material, and there was little to be had. This condition probably alarmed consumers, for the buying movement, once started, continued until the producers were practically booked up for the first half of 1920

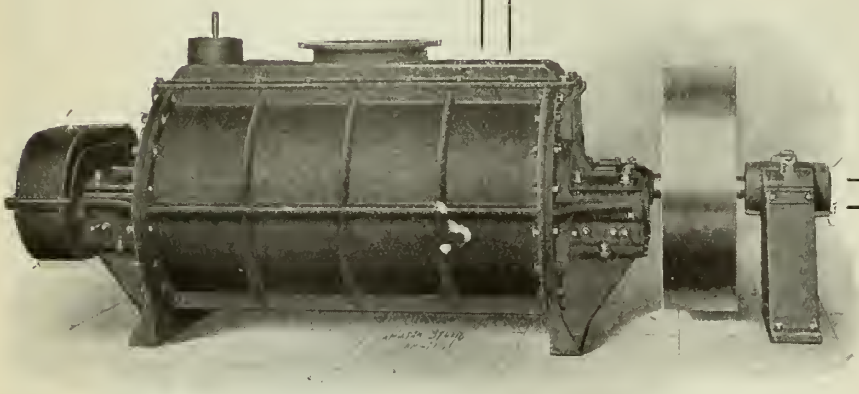
The production for this year would seem to be largely a question of labor. There is ample furnace capacity for the

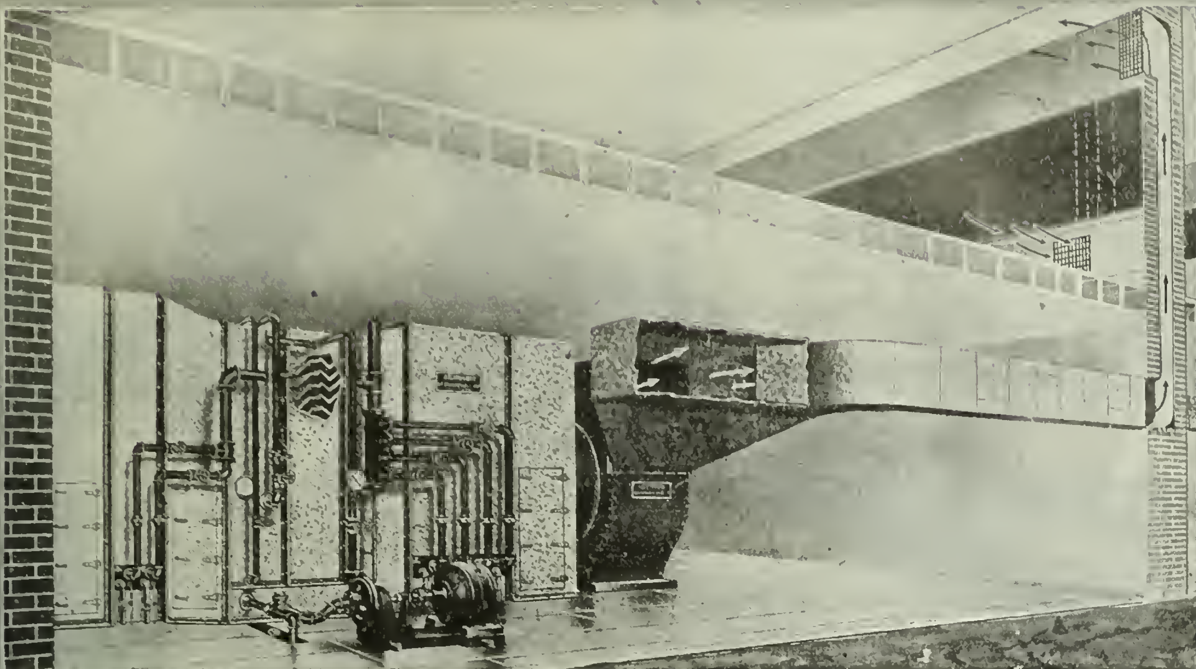
country's needs, but there is no question of the shortage of labor. A large number of the foreign workmen are availing themselves of the opportunity to visit Europe, this diminishing still further a supply that was none too adequate originally.

The year opened with the price of pig iron under control of a Government board, and a drastic cut was made from the first of the year. This amounted to \$3 per ton, and on March 1 a further reduction of \$4.25 per ton was made, making a cut of \$7.25 from the last quarter of 1918. The prices were: \$26.75 for 1.75 to 2.25 silicon; \$25.75 for basic, and \$27.95 for Bessemer. The Control Board went out of existence during the second quarter, and the market, left to itself, settled into the state already described. When the buying rush started following the strike, Bessemer and basic were bought heavily as well as foundry, being used as a substitute for the latter when that grade became scarce.

Prices as now established show great increases over the low level mark of 1918. No. 2 silicon is quoted \$38 Buffalo furnace, and \$36 Valley furnace. This is compared with \$26.75 furnace in March, 1919. Standard Bessemer is at \$35 furnace, as against the low mark of \$27.95 furnace. Malleable is at \$26.25 Valley furnace, a gain of \$9 over the low level of last year.

The City of Outremont will adopt a new type of snow plough for cleaning the streets during the winter. The device is simply a gas-driven rotary snow fan, similar to those used on the railroads, mounted on sleigh runners and drawn by two or more horses. W. H. Stadig is the inventor and the machines are being built by the Canadian Fairbanks-Morse Co.





Typical Sturtevant Heating, Ventilating, and Air Conditioning Installation.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

AIR COMPRESSORS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

AIR JOLTS
Davenport Mach. & Fdry. Co., Davenport, Iowa.

ALBANY SAND
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

ANALYSIS
Hersey Co., Ltd., Milton, Montreal, Que.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

ARRESTERS, DUST
Pangborn Corporation, Hagerstown, Md.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, SANDBLAST
A. C. Leslie & Co., Ltd., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

BINDERS, SAND
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

BOILER GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.
Roots Co., P. H. & F. M., Connersville, Ind.

BLAST GATES
Roots Co., P. H. & F. M., Connersville, Ind.

BLAST GAUGES—CUPOLA
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
Clark, Chas. J., Chicago.

BLAST METERS
Clark, Chas. J., Chicago.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRICKS, RUBBING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRONZE CASTINGS
American Manganese Bronze Co., Philadelphia.

BRONZE FORGINGS
American Manganese Bronze Co., Philadelphia.

BRONZE INGOTS
American Manganese Bronze Co., Philadelphia.

BRONZE MANGANESE
American Manganese Bronze Co., Philadelphia.

BRUSHES, FOUNDRY AND CORE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CABINETS, SANDBLAST
Frederic B. Stevens, Detroit, Michigan.

CARBON BLACKING
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Woodison Co., E. J., Toronto.

CARS, CORE OVEN AND FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont
W. W. Wells, Toronto.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Chaplet & Mfg. Co., Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Lindsay Chaplet & Mfg. Co., Philadelphia.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

CLAMPS, FLASK
Diamond Clamp & Flask Co., Richmond, Ind.
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CONVERTER BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOXES (STEEL AND WOOD)
Diamond Clamp & Flask Co., Richmond, Ind.
Woodison Co., E. J., Toronto.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE JOLTS
Davenport Mach. & Fdry. Co., Davenport, Iowa.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Holland Core Oil Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.

COMBINATION JOLT ROLLOVER AND PATTERN DRAWING MACHINES
Davenport Mach. & Fdry. Co., Davenport, Iowa.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

FACINGS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Diamond Clamp & Flask Co., Richmond, Ind.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY EQUIPMENT
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton,
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY SUPPLIES
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Hyde & Sons, Montreal, Que.
Woodison Co., E. J., Toronto.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Black Donald Graphite Co., Calabogie, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, CHAIN AND PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOLT ROCKOVERS
American Molding Mach. Co., Terre-Haute, Ind.

JOLT MACHINES AND SQUEEZERS
American Molding Mach. Co., Terre-Haute, Ind.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT STRIPPERS
American Molding Mach. Co., Terre-Haute, Ind.
Davenport Mach. & Fdry. Co., Davenport, Iowa.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

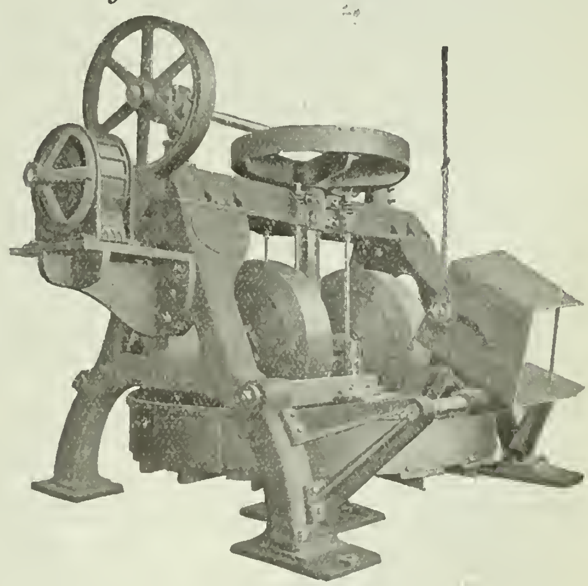
LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.



MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
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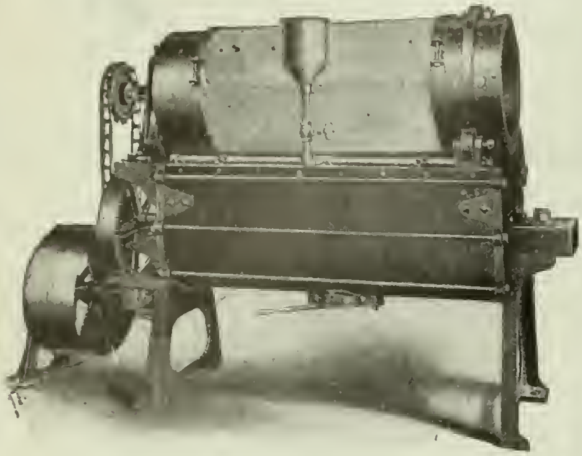
CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XI. PUBLICATION OFFICE, TORONTO, FEBRUARY, 1920 No. 2.

The Standard
Core and Facing Sand Mixing Machine



No. O-A Standard Improved Sand Mixer

Cuts over and mixes 4 cu. ft. of sand 120 times a minute—equivalent to the labor of 50 men.

Screens, tempers and mixes sand in one continuous operation and with but one handling.

When the batch is prepared it may be emptied into a wheelbarrow or car by opening the discharge gate underneath the mixer.

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No. 4 Standard Improved Sand Mixer

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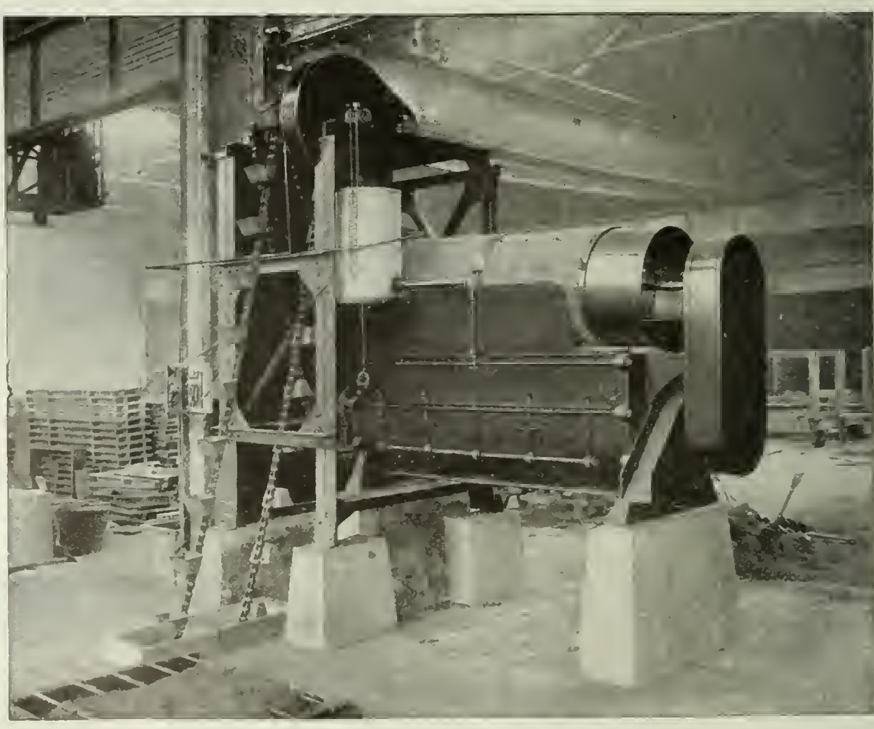

THE STANDARD SAND & MACHINE CO.
CLEVELAND, OHIO, U.S.A.

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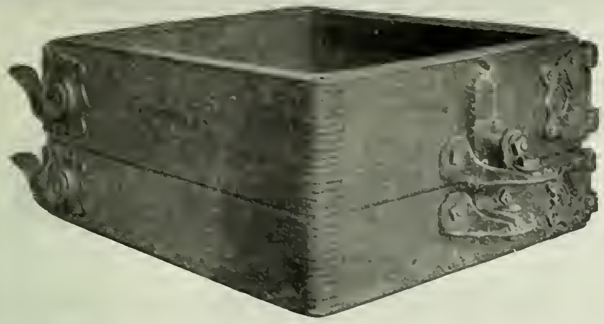

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Diamond Steel Jacket

DIAMOND

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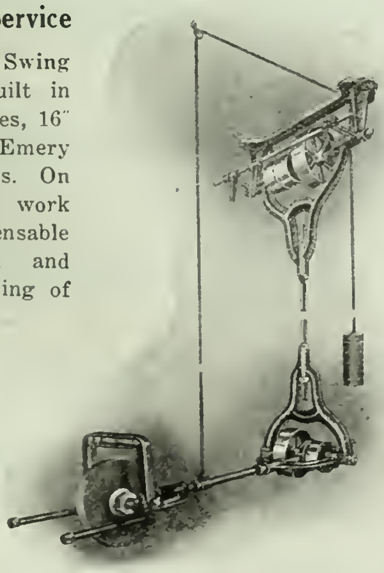
For Foundry Service

Our "All-Steel" Swing Grinders are built in two standard sizes, 16" and 20", for Emery Wheel or Brushes. On heavy foundry work they are indispensable for the rapid and economical cleaning of castings.



Our catalogue will give you full detail on our wide range of Grinders. Mailed on request.

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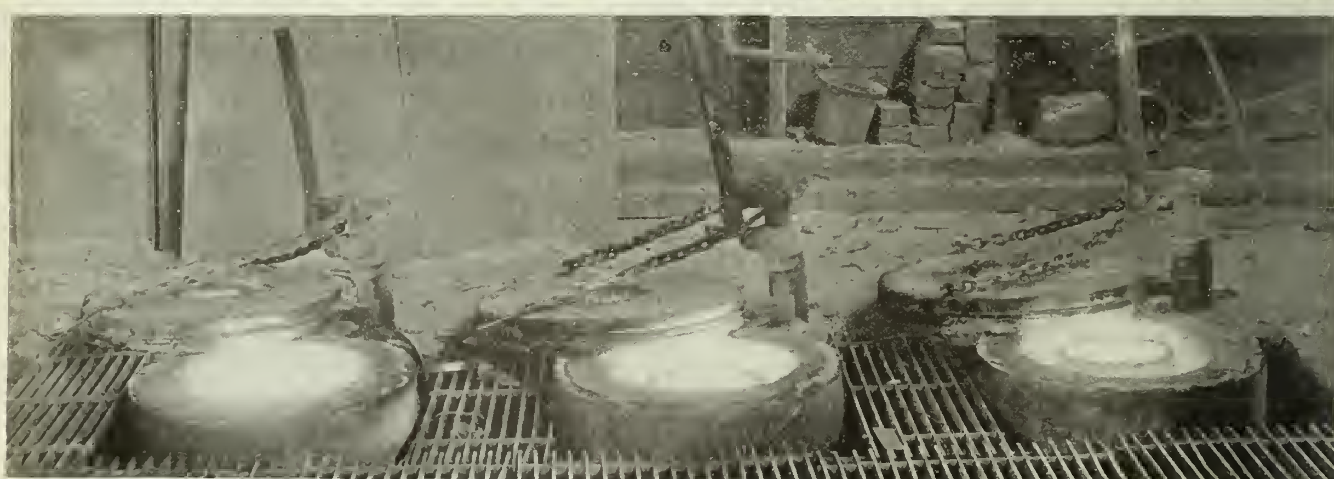

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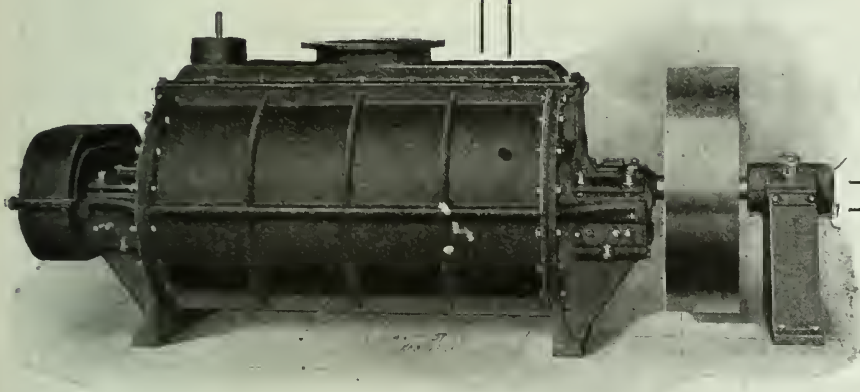
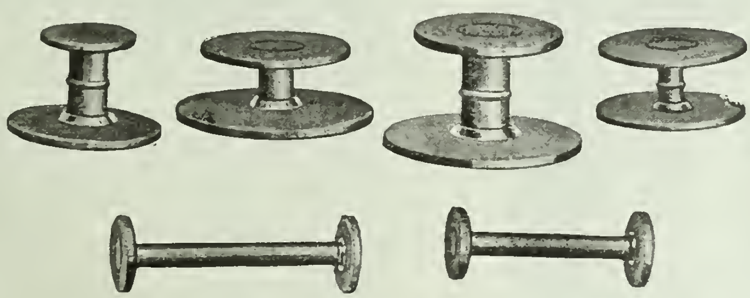
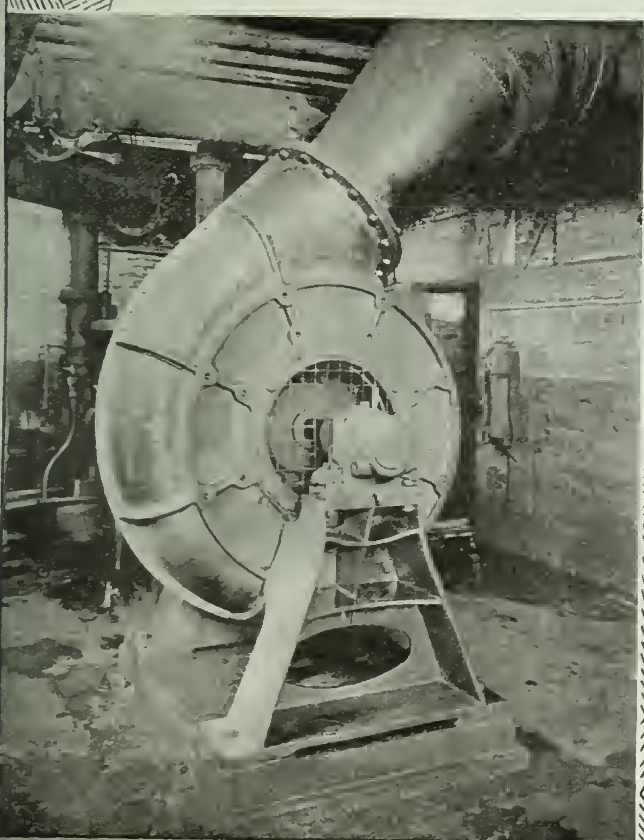






CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

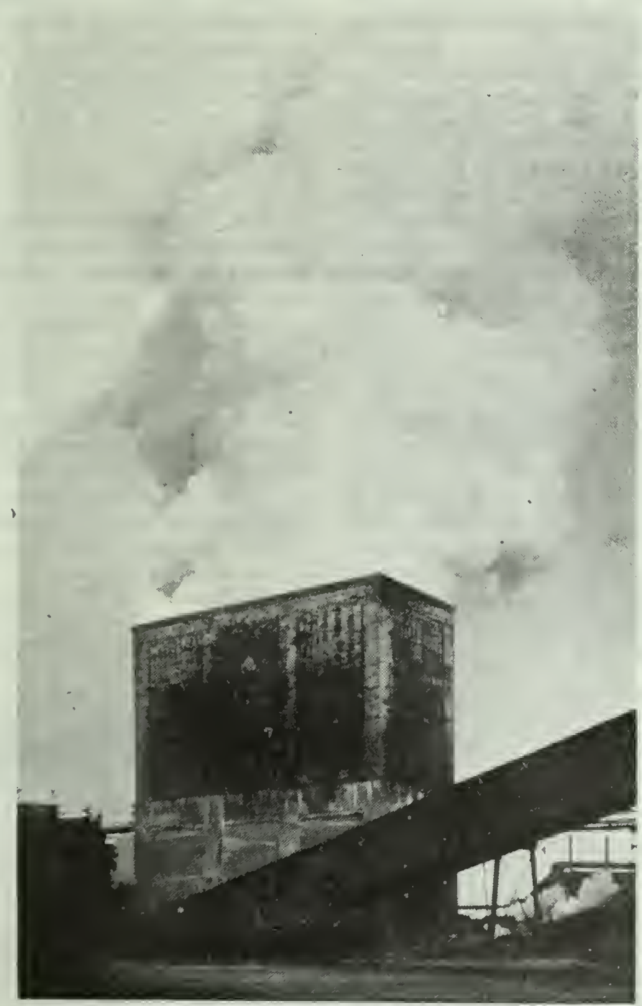
Established 1909 Published Monthly

Making *Coke* for the *Foundry Cupola*

An Article Which Describes the Making of Solway Coke in the By-Product Coke Oven

By W. F. Sutherland

The Ovens Are Installed at the Hamilton Plant of The Steel Company of Canada



On a quiet day when the clouds hang low the quenching station is well worth observing. The steam given off in quenching rises to mingle with the clouds above.

PRIMITIVE man probably first made iron in an ordinary fire, then improved upon his method by bettering the draft. Later on, the use of the bellows was adopted. The intentional making of cast iron and its conversion into wrought iron and steel followed at a later date and in the fifteenth century ornamental iron castings were made.

Charcoal was the fuel used and the appetite of even the crude furnaces then employed was such as to bring about the first agitation for fuel conservation. Queen Elizabeth forbade the cutting of wood in certain parts of the country and later, furnaces were prohibited in some counties.

This increasing scarcity of wood was probably the reason for the attempts which were made to replace charcoal by mineral fuel. In 1611 Simon Sturtevant patented the use of coal for iron smelting, but it was not until 1735 that Abraham Darby showed how to make cast iron with coke in the high furnace, which by this time had become a veritable blast furnace, although primitive. From this time on charcoal as a metallurgical fuel fell into disuse and is to-day only used where exceptionally pure iron is required.

The art of making coke, up to comparatively recent years, made little advance and the bee-hive oven in general use to-day resembles the original type very closely. Having the advantage of cheapness in construction and giving good coke, it suffers from the disadvantage of wasting all the gas and other valuable by-products obtained from the original coal. It is in its essentials, nothing but a brick-lined chamber in which the gas is driven off from the coal in the coking operation.

The modern by-product oven, a comparatively recent development, on the other hand conserves the gas, tar and nitrogen content of the coal and where combined with blast furnace and steel plant renders a cheap gaseous fuel available for open hearths and other equipment. It also enables the metallurgist to control the quality and physical properties of the coke to a nicety.

The Steel Company of Canada have been operating their new coke ovens at the Hamilton plant for about a year and the following article is descriptive of the plant itself and of its operating characteristics.

Coke used for blast furnace work should be hard,

GENERAL VIEW OF THE HAMILTON WORKS, THE STEEL COMPANY OF CANADA, THROUGH THE DIFFERENT DEPARTMENTS OF WHICH THE BY-PRODUCT COKE IS USED.

strong, porous and regular in composition. It is very light as compared with the coal from which it is made and it is estimated that 50 per cent. of its volume is air space. The amount of sulphur is of importance, for if much is present it enters the iron or necessitates higher temperatures in the blast furnace for its elimination in the slag. Generally speaking, coke with less than one per cent. sulphur is satisfactory.

Since the physical properties and chemical composition of the coke are of such moment, the grade of coal used is of importance. In the present case two kinds are employed, one running about 34 per cent. volatile and the other about 17 per cent. Both run about 8 to 9 per cent. ash content and contain .8 per cent. or less of sulphur.

The coal is unloaded into a receiving pit capable of handling two cars and from this is lifted by an apron conveyor onto a 30-in. belt conveyor. This conveyor, driven by a 50 h.p. motor, carries the coal to the top of the coal-handling plant where it is delivered into the crusher. The crushing is done by a Bradford breaker and on being crushed the coal is screened, the slate, etc., being separated and delivered to a reject bin.

From the crusher the coal is delivered into either one of two mixing bins depending on its volatile content and from these it is drawn out onto the mixing table one floor below. This table consists of two short apron conveyors in line, with their upper surfaces travelling towards each other. The depth of coal on each conveyor is regulated by means of independently adjustable gates. By means of the gates any desired percentage of high and low volatile coals is obtained; at the present time the mixture runs about 85 per cent. high and 15 per cent. low volatile.

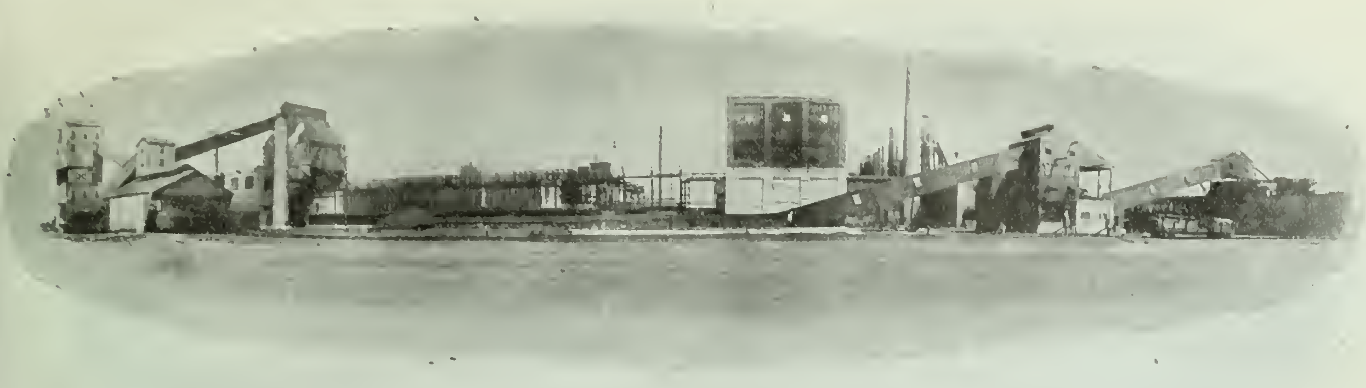
From the mixing table the coal now composed of the two grades goes to a hammer mill below, where it is pulverized fine enough for eighty per cent. to pass a ⅛-in. mesh screen. From the pulverizer the coal is conveyed by belt conveyors to a transfer tower and then at right angles by another conveyor to a coal storage bunker holding 1,400 tons. The hammer mill was supplied by the Williams Patent Pulverizer & Crusher Co., and is driven by a 300 h.p. three-phase Canadian Westinghouse induction motor of the wound rotor type. The mixing table is driven by a 10 h.p. squirrel cage induction motor, also of Canadian Westinghouse make. The coal-handling plant, together with the conveying system, was installed complete by Heyl & Patterson, Pittsburgh, Pa.

Coke Ovens

The Wilputte by-product coke ovens are arranged in two batteries placed end to end. Each battery consists of 40 separate ovens. Between each oven 28 flues are built into the side walls by means of which the ovens are heated by conduction through the brickwork. Below the ovens and flues proper, regenerative chambers are built in. These are filled with checkerwork and function similarily to those used with the open hearth. A cross-flue connects the tops of the vertical flues with whichever portion of the regenerator is on heat. The air necessary for the combustion of the gas employed passes through that side of the regenerator which is on blast and passes upwards into the twenty-eight vertical flues. At the bottom of these it meets the incoming gas and combustion takes place.

A balanced draft system is employed, that is forced draft delivers the air to the regenerators and induced draft removes the products of combustion. The fans for the air supply are of Canadian Sirocco type and are steam-driven. Three are provided, two in constant use and one

THE DISCHARGE SIDE OF THE COKE OVENS, SHOWING QUENCHING CAR.



A VIEW OF THE COKE OVENS, SHOWING THE COAL BREAKERS TO THE LEFT AND THE LOADING ELEVATORS TO THE RIGHT, OVER WHICH THE COKE IS PASSED IN BEING LOADED FOR SHIPMENT.

spare. The volume of air supplied is controlled from the chart room immediately above.

The induced draft apparatus is housed in a separate building and here three Canadian Sirocco fans are also provided, one of them spare as before. The products of combustion escape through two radial brick chimneys six feet by 75 ft. in height. These chimneys were installed by the M. W. Kellog Co., New York. The exhaust fans are steam-driven and the engines have 8 in. cylinders by 8 in. stroke.

Ordinarily it has been customary on installations of this type to dispense with induced draft fans and to use 200 ft. chimneys for the securing of the necessary draft. It was thought, however, that better regulation and control could be secured with the equipment installed, and operation has confirmed this opinion.

The gas necessary for the maintaining of the proper temperature in the ovens is supplied by two sixteen-inch mains which are carried along the outside walls a few feet above ground level. From these gas mains risers are led off and into the flues. Each riser is equipped with a valve actuated by a rod running the full length of each battery and operated by a motor-driven controlling mechanism.

The air supply is also controlled by reversing valves, motor-operated, and at each half-hour period the flow of air through the regenerators is reversed.

Chart Room

Between the two batteries and over the fan room, a chart room is located. All recording instruments and controls are brought together in this room which provides a central point from which all operations can be directed.

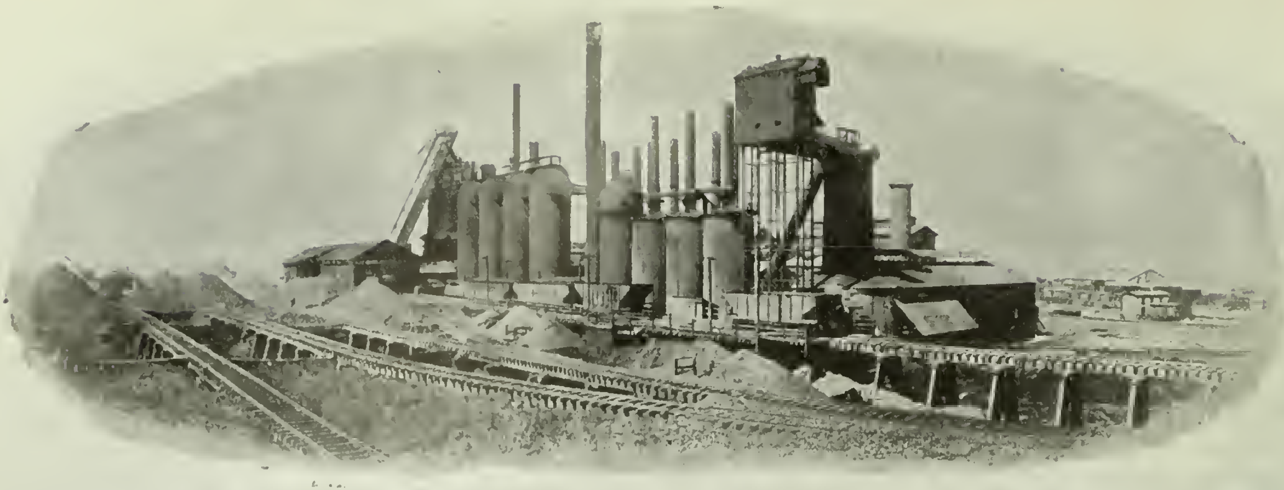
The gas consumed in the heating of the ovens is here measured by two Venturi meters and the pressure on the gas main, the forced draft and induced draft pressures are measured by three Bacharach pressure recording gauges for each battery.

Charging

The ovens are charged from above through four openings to each oven. A charging lorry with four bins travels the full length of the two batteries and receives its supply from the 1,400-ton bunker which is located overhead. Each hopper of the charging lorry holds sufficient coal for the charging of its portion of each oven. Between the ovens and immediately over each of the twenty-eight flues in the side-walls inspection holes are provided by means of which the condition of the brickwork and the combustion going on below can be observed.

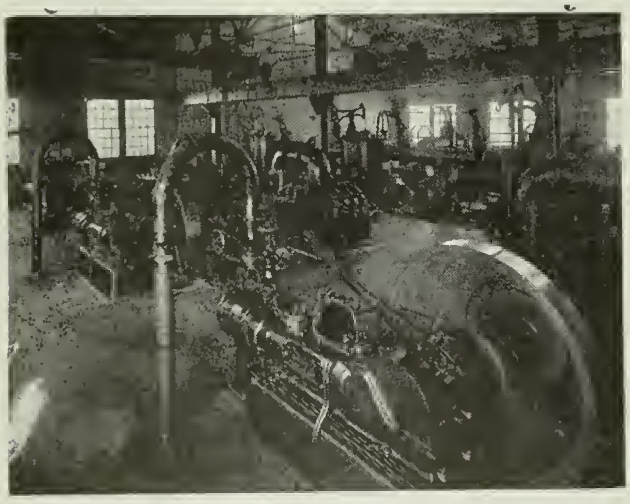
When the charge in each oven is converted into coke it is removed by a pusher, almost human in its functions. The pusher travels the full length of the two batteries and is provided with three rams, one of which lifts the oven door off and draws it back out of the way, rocking it about a horizontal axis first to break the clay luting provided for gas tightness. The second ram, when this is accomplished, is advanced and pushes the coke through the door at the other end of the oven. The third ram is used after the doors have been placed back in position

THE COKE PUSHER WHICH REMOVES THE OVEN DOORS, PUSHES THE COKE OUT ON THE OTHER SIDE INTO THE QUENCHING CAR AND THEN LEVELS DOWN THE FRESH CHARGE.



THE BLAST FURNACES AND ORE PILES. THE MAJOR PORTION OF THE BY-PRODUCT COKE, PRODUCED IN THE COKE OVENS, IS USED IN THESE BLAST FURNACES.

and when the fresh charge is placed. It is advanced and withdrawn several times through a small opening in the door and serves to level off the top of the charge.



THE EXHAUSTERS SHOWN HERE BRING THE GAS OVER FROM THE OVENS INTO THE BY-PRODUCT PLANT.

The main pusher ram is driven by rack and pinion through two intermediate gear trains from a 75 h.p. motor of railway type. A magnetic brake is provided. The levelling ram is driven by a similar motor through a drum and cables. The door extractor is advanced from the cab and its further operation controlled by the door man on the platform. The coke pusher was supplied by Wellman-Seaver-Morgan, Cleveland.

The doors on the discharge side of the ovens are removed by a travelling extractor which is also provided with a coke chute to guide the red hot coke over the platform and into the quenching car below. The quenching car on receiving its load travels to a quenching station, shown in our first illustration, where the coke is wet down and later discharged onto an incline from which it makes its way by conveyor to the coke-handling plant.

The temperature at which the ovens are run has an important effect on the life of the brickwork; at this plant the side-wall temperature carried is 2,200° Fah. Silica brick are used of Harbison-Walker manufacture.

By-Product Plant

In the making of coke a number of valuable by-products are given off, gas which has a high calorific value, coal tar which finds use in the chemical industries and as a fuel, and ammonia compounds. All of these have considerable commercial value and when used in the steel mill or sold, materially lower the cost of the coke. A by-product plant is installed which purifies the gas and recovers the tar, ammonia content, and naphthalene carried over from the ovens.

Each oven is provided with an ascension pipe through which all volatile matters driven off during coking pass. Each pipe is equipped with a cap opening to atmosphere and a mushroom valve, and terminates in a common header. When charging, the gas driven off is allowed to escape until the operation is complete when the mushroom valve is opened and the gases allowed to pass into the header. The header running the full length of the two batteries has tar constantly circulating through it to catch any particles of free carbon carried over.

From the header the gases pass over the pusher runway to the by-products plant and enter the condensers or primary coolers. These primary coolers, shown in one of our illustrations, are three in number, one of them spare. Each of them contain about 900 tubes through which water is constantly circulated on the counter-flow principle. The gases passing over the tubes have their temperature materially lowered and here most of the tar is thrown down, together with ammonia liquor and some naphthalene.

From the primary coolers the gas passes through the gas exhauster plant which provides the suction necessary

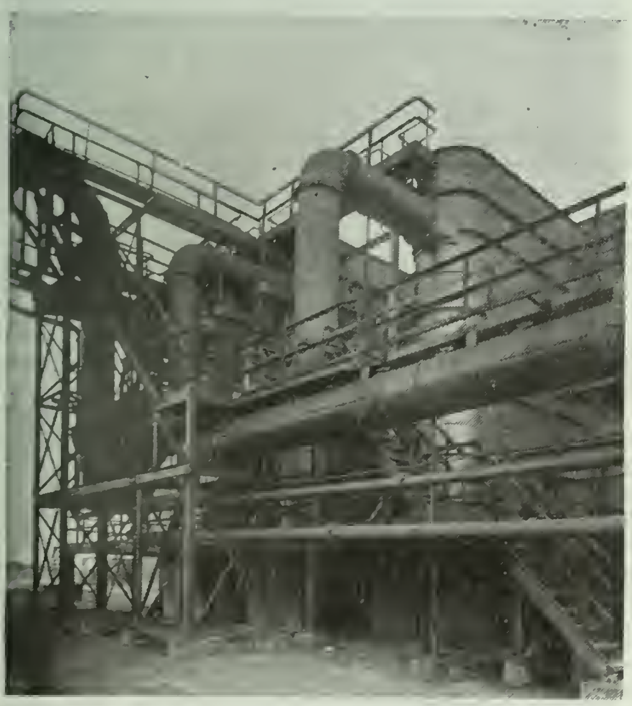
ONE OF THE GAS MAINS ON THE COKE OVENS SHOWING THE RISERS AND VALVE CONTROL.

THE OPEN HEARTH STEEL FURNACES, WHICH ARE HEATED BY THE GAS AND TAR PRODUCED BY THESE MODERN OVENS. GAS AND TAR ARE TWO OF THE VALUABLE BY-PRODUCTS.

to draw it over from the ovens. Three units are again provided here, two of them constantly in use and the third one as a spare. The blowers are built by the Connersville Blower Co., Connersville, Ind., and have a displacement of 51.7 cu. ft. per revolution. They are steam-driven, and Fleming engines are employed, made by the Harrisburg Foundry and Machine Works, Harrisburg, Pa. These units are controlled by electrical pressure regulators made by the Rateau Battu Smoot Co., New York. The speed is automatically varied according to amount of gas coming from the ovens and by this means a constant suction is maintained.

From the exhaustor the gas passes to the tar extractors which eliminate any tar fog which may remain. These extractors are three in number, one of them spare, and consist of vertical tanks which contain sheet steel bells perforated with 1-16 in. holes. The holes in successive cones are staggered and any particles of suspended tar are thus eliminated.

The gas is now free from tar but still contains considerable ammonia vapor. This is eliminated by the saturators through which the gas next passes. Three in number as before, these consist of large cast iron tanks



THE PRIMARY COOLERS IN WHICH THE GAS IS COOLED AND IS FREED OF THE GREATER PART OF THE TAR AND AMMONIA LIQUOR.

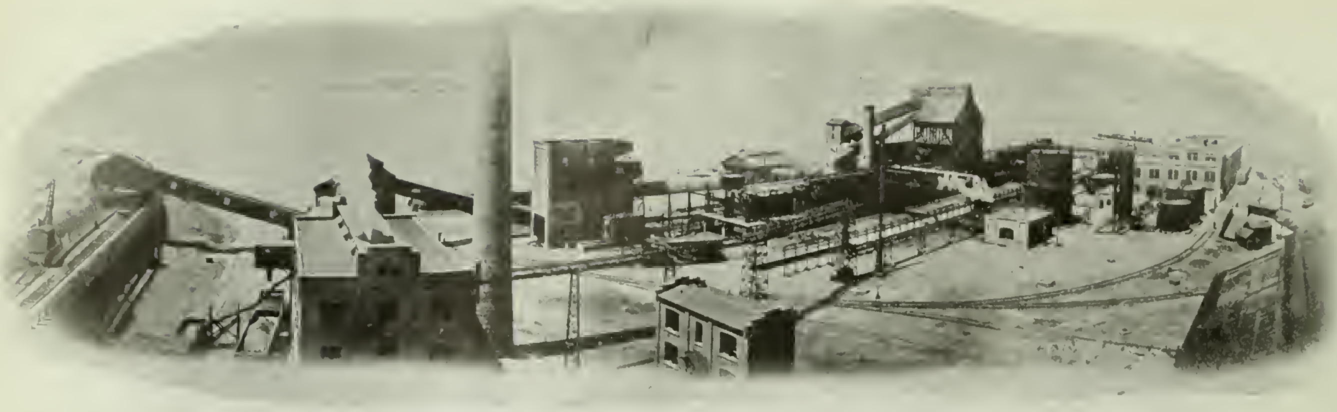
lead-lined in which a 6 to 8 per cent. solution of sulphuric acid is maintained. The gas passing through this acid liquor gives up its ammonia content which unites with the sulphuric acid to form ammonium sulphate. As this

COKE AFTER BEING QUENCHED.

salt accumulates the solution becomes saturated and crystals of ammonium sulphate are thrown down. To effect their removal the principle of the air lift pump is adopted. A jet of air is blown into the bottom of a vertical discharge pipe and carries with it the crystals of sulphate together with some of the acid liquor. Flowing out of the saturator at the top, the mixture passes into lead lined settling trays where the ammonium sulphate falls to the bottom. It is then thrown into steam-driven, centrifugal separators where any remaining acid liquor is thrown off. The liquor is here recovered, and that from the ammonium sulphate is taken to the salt room where it is bagged and shipped to outside consumers.

Quite a romance might well be written about the by-product end of the coke industry. The coal tar is the starting point from which countless coal tar dyes and chemicals are made, and the nitrogen content of the coal is of great value to agriculture and other industries. Nitrogen compounds are essential to vegetable growth, and when these have been exhausted in the soil through intensive cultivation, artificial fertilizers are necessary.

Sulphuric acid has to be added to replace that used in the formation of the ammonium sulphate and it is found that about one pound of acid is required for each pound of sulphate made.



A GENERAL VIEW OF THE BY-PRODUCT COKE OVENS.

Ammonium sulphate or sulphate of ammonia is one of the most valuable of nitrogenous fertilizers owing to its chemical and other characteristics, and that made at this plant goes to practically every corner of the world. Japan is one of the largest consumers; Java, the Barbadoes and other countries use vast quantities of this fertilizer and it finds considerable use in the cotton-growing countries of the tropics.

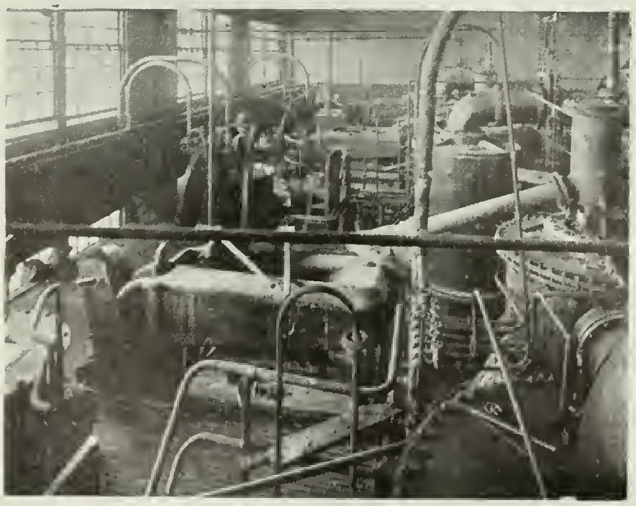
The product exported and otherwise sold by the Steel Company of Canada is aptly named "Gromore," owing to its important usefulness as a fertilizer, and has a whitish or grayish color. Its importance as a plant food is due to the fact that it contains 25 per cent. ammonia and more than 20.5 per cent. nitrogen. This makes it the richest of nitrogenous materials.

Ammonium sulphate can be used alone as a fertilizer, but more often reaches the farmer in the form of mixed fertilizers. It can be used with acid phosphate, potash salts, cotton seed meal, tankage and fish scraps. It is not subject to chemical action when thus incorporated into a mixed fertilizer and its freedom from free acid and moisture is also of advantage.

Disposal of Gas

The gas, now free of tar and ammonia, finally passes through a washing tower where it meets a spray of water and is made ready for use. The water passing through this tower removes the naphthalene present in the gas and this is caught in settling basins for disposal.

From the washer the gas goes to the gas holder and from this it is distributed to the open-hearths, the boiler room and to the coke ovens. That portion which goes to the open-hearth furnaces passes through an exhauster which raises its pressure to 5½ lb. The "Root" exhauster is driven by an R. 20x20 in. Ridgeway engine and has a capacity of 8,000,000 cu. ft. per 24 hours.



THE SATURATORS IN WHICH THE AMMONIA IN THE GAS IS CONVERTED INTO AMMONIUM SULPHATE.

Tar Storage and Ammonia Still

The tar and ammonia liquor begin to separate out at the header on the coke ovens and each header, and connecting pipe contribute some to the total yield. By far the largest portion is recovered in the primary coolers and the remaining small fraction of the yield is obtained by the tar extractors. All the tar and ammonia liquor collected from the above sources is pumped into a separating tank. The tar, having a specific gravity of 1.2, settles to the bottom of the tank and is pumped into a tar storage tank. The ammonia liquor flows off and into an ammonia tank. About 25 per cent. of the total ammonia yield is obtained from the liquor, and since this quantity is well worth recovering the liquor is treated.

SALT ROOM IN WHICH THE AMMONIA SULPHATE IS STORED.

The weak liquor is pumped from the tank into an ammonia still where it is subjected to heat from low pressure steam. The heat serves to drive off the free ammonia and the addition of lime frees the fixed ammonia.

The mixture of steam and ammonia vapor passes into a dephlegmator or condenser which cools the mixture down below 212°, to 190° to be exact. At this temperature the steam is condensed while the ammonia remains as a gas and passes on into the main gas line before it enters the saturators. Here it is converted into ammonium sulphate together with the 75 per cent. which comes over direct in the main gas line.

The operation of the by-product plant necessitates the handling of various kinds of liquids and a pump room is provided for the various pumps. Tar pumps of both centrifugal and duplex plunger type are provided for flushing the tar through the mains and headers. The centrifugal pump is of the Goulds single-stage type and has a capacity of 660 U.S. gallons against a 90 ft. head. It is driven

THE COAL STOCK PILES, SHOWING THE ENORMOUS TONNAGE OF COAL ALWAYS ON HAND TO SUPPLY THE COKE OVEN REQUIREMENTS.

by a Canadian Westinghouse 30 h.p. induction motor.

Two air compressors are also installed, made by the Chicago Pneumatic Tool Co.

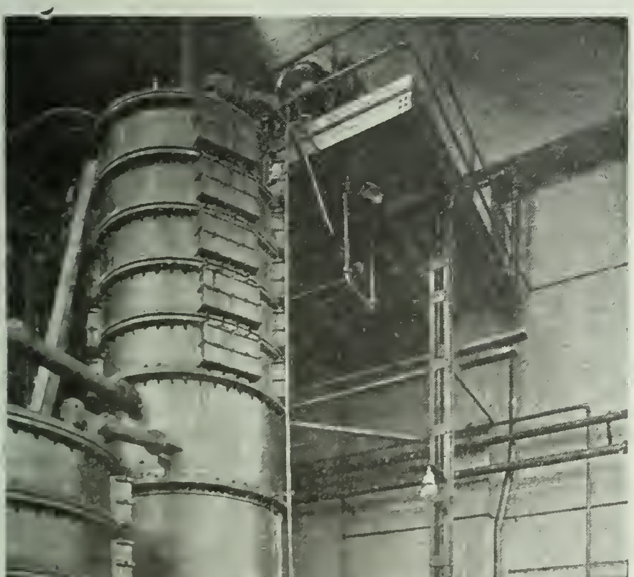
Operating Characteristics

Approximately 13 tons of coal are charged into each oven at a time. The coking time is 17½ hours and 108 ovens are charged per day, producing 900 tons of coke. Of this quantity the greater portion is required for the Steel Company's own blast furnaces, the remainder being disposed of to outside firms.

Each ton of coal as fired produces 11,000 cu. ft. of gas, 11 U.S. gallons of tar and 27 lb. ammonium sulphate. Forty per cent. of the gas is used in heating the ovens and the remainder is available for other plant purposes. The tar, together with most of the gas, is used in firing the open-hearth furnaces of which there are eleven. From each ton of coal three-quarters of a ton of coke are obtained.

Steam Generation

A considerable quantity of steam is used for the ammonia still and for the various engine-driven fans and exhausters. For the generation of this steam a boiler plant of 750 boiler horsepower has been erected.



THE AMMONIA STILL IN WHICH THE AMMONIA LIQUOR GIVES UP ITS AMMONIA CONTENT.

Three Erie City double-drum water tube boilers are installed of 250 h.p. each. A steam pressure of 150 lb. is carried and the steam is superheated 100°.

In the making of coke considerable coke breeze or dust is made and this is used as a boiler fuel. The coke-handling plant screens all the coke and the fines are taken by belt conveyor to the boiler house. Here they undergo a further screening, chestnut size and over being eliminated, the remainder dropping into the bunkers in front of the boilers.

Coxe travelling grate stokers made by the Combustion Engineering Corporation, New York, are fitted to the boilers and are specially designed for the burning of the coke dust. This fuel is difficult to burn and in order to keep the ignition arches at the proper temperature it is necessary to burn gas as a supplementary fuel. Four two-inch gas pipes are led into the combustion chamber of the boiler setting above the grate and the gas passing through them is burned by excess air through the grates, no other air supply being needed. About 250,000 cu. ft of gas is burned per 24 hours in addition to the coke screenings.

The boilers are fitted with Diamond soot blowers made by the Diamond Specialty Co., Detroit and Windsor. All valves used in the boiler house are of Crane manufacture. Forced draft is supplied by a Canadian Sirocco fan provided with two engines, one of them spare. Pin and belt type clutches are provided for changing over from one engine to another.

The feedwater is heated in a Cochrane feedwater heater to 210° Fahr. Exhaust steam from the engines at 15 lb. back pressure is used for this purpose.

The feed pumps are in duplicate, two Canadian Fairbanks-Morse 10x6¼ duplex plunger pumps being installed.

The boiler house is some distance from the by-product plant and two six-inch steam lines are provided. These, for part of the distance, are carried overhead on structural frame work.

Construction

The coke ovens and other equipment including the by-product plant and boiler house were designed and installed by the Wilputte Coke Oven Corporation, 469 Fifth Ave., New York City, who also acted as their own general contractors. The silica brick necessary for ovens, etc., was supplied by the Harbison-Walker Co., Joliet, Ind., while the firebrick was furnished by The Evans and Howard Firebrick Co., St. Louis, Mo. All tanks and tankwork were supplied by the Jas. G. Hagey Co., Joliet, Ind. The coal and coke handling plant was furnished by Heyl & Patterson, Pittsburgh, while the Hamilton Bridge Co. furnished the structural steel. The two radial brick chimneys for the coke ovens and a similar but larger chimney for the boiler house were supplied and erected by the M. W. Kellog Co., New York City.

Troubles in Electric Furnace Operation

Mechanical and Electrical Features of Furnace Design Which Are Liable to Give Trouble if Not Guarded Against. Most of These Are Simple in Themselves, But Cause Much Inconvenience

By W. F. SUTHERLAND

NOT so very long ago an engineer who ought to have known better asked an electrical furnace operator in a Canadian plant just what burned inside and how the heat was generated. While his knowledge embraced a wide range of subjects, it did not extend to the subject of electro-metallurgy. His position in many respects corresponds to that of many plant engineers who have the purchase of equipment of this character in their hands.

In its essentials a comparatively simple mechanism, the proper design of both mechanical and electrical parts has a lot to do with successful operation.

The engineer, purchasing a furnace of any type, should carefully examine its design and the following sources of trouble may serve to indicate some of the weak spots.

The design of the doors is an important item. They should be so constructed as to present considerable resistance to the warping action of the hot interior of the furnace and the guides should be designed with this in view. Reasonable tightness is desirable and the more nearly gas tight the door is, the larger will be the life which may reasonably be expected.

The subject of counterweighting is one which should be carefully studied. Doors which require three or four men on the end of the counterweight lever to open them are worse than useless and money will have to be spent in the remodelling of the equipment.

Electric furnaces are built without exception with removable roofs or tops and the provision for changing roofs should receive attention. Not only should the roof be easily removable but the design should be such that the refractory brick can be laid up easily. It should also be borne in mind that the fewer the openings and the smaller their size —the longer the life which may be expected.

Electrode Gears

Electrode breakage is a very material item of expense in the operation of some furnaces and attention might well be paid to the design of the electrode gear for its minimization. In some designs a jib holding the electrode clamp projects from a structural steel mast and is arranged for vertical travel in this mast. The usual means of effecting this travel is to have wheels fastened to the jib and bearing on the inside of the flanges of the steel members of which the mast is made. It is obvious that the diameter of these wheels must be less than the width between flanges, but if there is much more than ¼ in. clearance trouble may be expected.

With the electrode hanging free in the furnace and not in contact with the charge the bottom guide wheels on the jib bear on the flange of the I-beam or channel furthest from the electrodes and the top ones bear on the near flange.

Should the electrode travel downwards until it is in contact with the charge, the position of these guide wheels is reversed owing to the release of the weight and the pressure upwards. This results in the turning of the electrode through a small vertical angle, depending on the wheel clearance and if the latter is of sufficient magnitude the electrode will likely bind on the charge and roof-ring of the furnace or may pinch in the electrode hole with resulting breakage. In one case, it was no uncommon occurrence to break several electrodes during the course of the day's run from this cause alone.

The jib is usually raised and lowered by means of a wire cable running over sheaves to an electrically operated winch. The method of attaching this cable is of some importance, for if it is simply passed through a punched hole in a plate cutting may be expected. Thimbles should always be used for the fastening of cables in this manner.

Mention has been made of the clearance of the jib guide wheels in the mast. Of almost equal importance is the clearance in a direction at right angles to the former. If this is not made of small amount, the electrode and its supporting mechanism will wobble sideways with harmful results.

The tilting gear is of much importance and it is essential that the motor be of a rugged type and its location well protected from splashings of hot metal and flying slag, to say nothing of the miscellaneous foundry dirt which is sure to find its way into the pit. The tilting motor control should be of an extremely rugged type and totally enclosed. All connections should be made in conduit.

A worm gear drive is usually incorporated into the tilting mechanism and it is of importance to notice that the worm gear should be of bronze. Cast iron is not a suitable material and is liable to cut. For the sector gears cast iron is suitable if the proportions are correct and allowance made for the heavy work which has to be performed. In some types of furnaces the sector gears take more than half the total weight of the furnace, and the importance of proper design can hardly be overestimated. Any failure of the tilting mechanism when pouring involves much inconvenience and at times considerable loss.

Direct current is usually used for operating the electrode and tilting motors when it is available and in this case dynamic breaking is usually resorted to. When alternating current is the only kind available, recourse must be had to solenoid-operated brakes for checking electrode travel and tilting. In this case, it is important to properly proportion the solenoid for proper current carrying capacity coils for heat dissipation. Burned-out coils are a source of annoyance and expense which can easily be obviated by proper design.

With automatic regulation it is important to see that a no-voltage attachment is provided. Without it, if the power supply is cut off through line failure the transformer switch opening, the regulator immediately starts the electrode travelling downwards with disastrous results to the electrode or its gear. With the no-voltage feature the regulator immediately ceases to function and the electrodes remain stationary unless hand control is used or until the power comes on again. It is important also to notice whether this no-voltage feature functions properly. If it does not, it is worse than useless since it only gives one a sense of security which is utterly false.

Ammeters are usually provided and in most cases they are installed in the regulator circuit. Care should be taken to see that they are of the proper scale to correspond to the current transformers. Thus, if the current transformers have a ratio of 4,000/5 amps., the ammeters should show a full scale deflection of 4,000 amperes when traversed by a current of 5 amps.

The ammeters should also be correctly installed in the secondary circuit of the transformers. This circuit is essentially of the series type, although modified by a parallel connection to the regulator rheostat. The ammeters should be installed in such a manner that all of the current generated by the secondary e.m.f. of the transformer passes through them and so that none of it is shunted by the rheostat above mentioned.

Low Tension Leads

Soldered connections should never be used on the low tension leads since any local heating is sure to melt the solder. Lugs should be cast on the leads or clamp connectors, if used, should be designed for ample current carrying capacity.

It is preferable to have an inverse time limit relay installed in connection with the transformer oil switch. This feature minimizes outage time particularly in the breaking down period.

Is it Possible to Have Overproduction?

The Following Article by Mr. Basset, of Miller, Franklin, Basset & Company, Discusses the Problem of Overproduction and Through the Lowering of Costs Points a Way to the Elimination of This Source of Hard Times

WE have had a dozen or so nostrums recommended to cure high prices — our latest epidemic. Right now the favorite prescription is "increased production." Certainly in nearly every paper and magazine we find this cure recommended—usually by men connected with the management of industries.

The arguments in favor of increased production to reduce prices, are sound. If a man will make two articles where he now makes one, the cost will be halved. At the same time increased produtiontion will, it is argued, let supply overtake demand and by reviving competition which has been sluggish recently, do away with the too wide margins of profit of which some manufacturers have been suspected.

Perhaps it will be possible to convince workmen that they can better themselves by increasing their output. It is worth trying to educate them up to the broad economic viewpoint certainly. But it will not be easy to get them to reverse their habits of thinking, for restriction of output has been the gospel of organized and unorganized labor for a long time.

Certainly, simple reasoning from cause to effect shows that with a given amount of work to be done, the slower a man works the longer he will be employed. And, unfortunately, the workman's experience shows that reasoning to be correct. He can't forget the times when he has been laid off because, he was told, there was no work for him to do. He has little faith that the whole unfair proceeding will not be repeated.

Perhaps we can educate the workman out of this frame of mind and stimulate him, with arguments and with wage incentives, to increase his individual production. Then, shortly, if things go as they have in the past, and if new markets for the additional goods are not found we will have a glut of manufactured goods—overproduction.

What will the managers of industry do then? Lay off men as in the past, with the excuse that business is poor, meaning that they have not been astute enough to sell what the factory has made?

If they do we will have more labor unrest.

It's up to the employers to find markets for all they produce, so that we will have no over-production. General statements are seldom accurate, but I believe it's safe to say that most concerns have come nowhere near selling to all possible buyers of their products.

I am not going to advocate extensive nor intensive selling effort—nor advertising alone—although all of these methods of increasing distribution have a place. I suggest selling on price.

That will be possible, because manufacturing costs can be made much less than they have ever been, even though wages remain high. In the first place remember we are asking workmen to stop soldiering on our promise that they will not work themselves out of jobs. That will reduce costs.

Then, the labor shortage and the high price of materials has forced those in charge of our factories to become better managers. Some of them have learned a lot about managing a business profitably that they did not know a few years ago.

They have learned that by studying operations, production can be increased with decreased fatigue to the men. They have learned that there is no limit to what a man has a right to earn if his production increases. They have learned that if payment is scientifically based upon output the man who is most valuable to his employer is the man who earns most in a day. That, in a word, there is no limit to the wage a man may be worth. They have learned how to increase the output of men and of machines. They have learned how to prevent wastes of material. They have learned the need of planning production so that avoidable delays will not occur, and so that the maximum production can be had with the least capital. They have learned that no business can be run to the best advantage until it knows accurately its costs. They have learned, in short, that good management comprises a thousand things besides buying cheap and selling dear.

If manufacturers will benefit by these lessons, their costs can be reduced tremendously—I know of several who have cut their costs in half.

Now what will the management do with this increased margin? Will they bank on the public's having become accustomed to high prices and attempt to pocket the extra profit? If they do they cannot expect to reach a much wider market and they will soon be turning out more than they can sell at high prices.

Let me call attention to two well-known products which exemplify both phases of this marketing problem. One is a talking machine ranging in price from $15 or so up. The one most commonly sold is priced at $200. A lot of people would like a machine but can't afford $200 and yet won't buy a cheaper one because of pride—because their friends would know it was cheaper.

Now I don't know what that $200 talking machine costs to make, but I'm reasonably sure that if made in large quantities it could be sold for $50 at a profit. At that price I'll venture to say sales could be increased several times over, with the resultant tremendous increase of record sales.

On the other hand, take Ford. He could readily get two or three hundred dollars more for his car and still undersell his nearest competitors. But he could not sell cars at that price to as many people as he can reach now, simply because people who can buy his cheap car would not be able to buy the more expensive one.

Ford's quantity production is an old story, I know, and many people say, "That's all right for Ford, but my business is different." Perhaps it is, but the fact remain that financially all of us have limits and that every time a manufacturer can reduce his selling price he reaches new buyers. That enables him to increase his output and further reduce his price and increase his market. "Ford has the 'benign circle' as opposed to the 'vicious circle' of rising costs and prices."

But if he tries to take the increased margin himself and does not reduce the selling price to the limit—regardless of what his less able competitors do—there is over-production. That brings lay-offs of men, suspicions of profiteering and more labor unrest.

It might be worth the while of an astute trustworthy employer to advertise that he proposes when possible, to reduce his selling price for this purpose, and that he considers it a part of his duty to provide permanent work for his men through his own ability to dispose of their output. It can be done and the employer who cannot do it is not an entirely capable manager.

AND HE WAS A MOLDER

Down in Ottawa, right in the burg where the laws are made and where the legitimate Canadian coin is minted and where various legalized bank-note publishing companies flourish, a culprit has been apprehended by the Dominion police on a charge of making and circulating counterfeit 25c coins.

A large amount of bogus silver currency had been in circulation for some time previous and the police were put on the scent of various clues with the result that their labors culminated in the arrest of a molder—yes, he was a molder, and should have had lots of good coin in his overalls pocket without going into this line. But he may not be guilty.

HOW TO LIVE

Worry less and work more,
Ride less and walk more,
Frown less and laugh more,
Eat less and chew more,
Preach less and practice more.

Research Work on Malleable Iron—*Continued*

Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

THE air furnace, as was explained in the January article, consists essentially of a fire pot, hearth and stack. Some furnaces have a solid roof, the charges bein "peeled in" through the charging door, but in most cases the roof is made up of hinges that can be removed during repairs, and a sufficient number of them lifted off when necessary for the purpose of admitting the charge. An illustration of a typical air furnace is shown in Fig. 6.

While a few furnaces operate with natural draft, most of them use a forced draft of from 3 to 4 ounce pressure. Although oil is advantageously used for fuel in a few instances where its cost is not prohibitive, bituminous coal having a volatile combustible or from 25 to 35 per cent. is the heating agent used by the majority. In order to burn the volatile products of the coal, as well as the CO generated from it, when, as should be the case, a deep bed of coal is used, secondary air is admitted through a series of tuyers or a continuous tuyere, which is located far enough in front of the grate bridge wall and so inclined that the air will enter and be deflected about 15 in. from the base of the bridge. In this manenr a maximum temperature of about 2,800 to 2,950 deg. Fahr. can be eventually obtained. Considerable time and thought have been expended in an endeavor to see if it would not be possible to regulate the amount of secondary air to just insure perfect combustion by the use of a CO_2 recorder. After considerable experimentation it was found that the plan was defeated by the inability of the recorder to act with sufficient promptness. The furnaces vary in capacity from about 7 tons for the small furnaces to 35 tons for the larger ones. The best are very inefficient, and in practice the fuel ratio is about three of iron to one of coal. The average practice does not exceed 2.5 to 1. In numerous cases waste-heat boilers are used, and while this conserves heat, it obviously does not add to the furnace efficiency. The average furnace has a capacity of about 15 tons.

The Character of the Air-Furnace Charge

30. It has been explained that the object of the first step in the process is to obtain white-iron castings, or those in which the totalty of the carbon is in the combined form, and we have seen that this object can be attained through a control of the silicon; that if the silicon is high, the carbon will be precipitated in the iron as graphite, which will yield a gray-iron fracture, while if it is low, the carbon will combine with the iron and the fracture of the casting will be white. As pig iron in which all the carbon is combined can be easily made and purchased, it would appear logical to assume that inasmuch as the sprue which, of necessity forms part of the charge must be white, why not use this character of pig, when all that will have to be done will be to melt the charge, superheat it to a temperature that will successfully run the castings and let it go at that. Actualy this is what is done when the inferior cupola product is made. To understand why it is impractical to do this in the air furnace, it is necessary to have a previous knowledge of what takes place in this apparatus during the melting of the charge.

Oxidation in the Furnace

31. The electric furnace is the only apparatus in which a high temperature can be attained with a reducing atmosphere. A high temperature in any other melting furnace consequently implies an oxidizing atmosphere. This in turn means that, during the melting and superheating of the metal in the air furnace, those elements in the iron that will oxidize and remain oxidized will be eliminated to an extent that will depend upon the time the charge is exposed to the oxidizing influence of the furnace atmosphere. Practicaly, all of the constituents are oxidized in part, but only four remain in that condition. These

FIG. 1. TYPE OF AIR FURNACE

four are the iron, silicon, manganese and carbon. Oxidation actually starts as soon as the charge on the furnace hearth begins to get fairly well heated up. The bulk of the oxidation takes place, however, just as the iron begins to melt for at this stage the molten iron as it runs off the melting sides of the pig is freely exposed to the oxidizing furnace gases, and presents a large surface in proportion to its weight, with the resultant elimination of some silicon, manganese, iron and carbon. The iron is oxidized to ferrous oxide, the manganese to manganous oxide, the silicon to silica, and the carbon to CO which escapes as a gas. As the silica has acidic properties, while iron and manganese oxides are basic in their action, they will unite together to form a slag consisting of a double silicate of iron and manganese, although the composition of the slag as tapped is much more complex, being modified by the sand on the pig and sprue and the unpreventable erosion of the hearth side wall and bottom. During an average normal heat there will be a loss in silicon of 0.35 per cent. actual, a loss in carbon of about 0.35 per cent. actual, and an average loss of about three-fifths of the manganese.

Reasons for Not Using White Pig-Iron Charge

32. The reason why it is impractical to use white pig iron can now be made clear. In the making of coke pig iron in the blast furnace, the amount of silicon and sulphur that will be in the product is largely a function of the furnace temperature. When this is low, there will be produced a pig in which the silicon will be low and the sulphur high. With a hot furnace the conditions are reversed and there will be obtained a pig high in silicon and low in sulphur. As a rule, a low-silicon coke pig means one that is prohibitively high in sulphur, but even if this were not the case, pig of this character could not be successfully used in the air furnace to make white-iron castings for the manufacture of malleable iron, because such castings must have a silicon content between certain limits. If the silicon is too low, then on annealing we will fail to obtain a casting whose fracture will be normal. If, then, we used a pig as low in silicon as obtains in the case of white pig iron, and with this were forced to use 35 to 40 per cent. of sprue that must of necessity be still lower in silicon than the charge from which it was made, then we would obtain metal too low in this element to yield good castings. The situation, however, is worse than this, because to lower the carbon to the necessary limit steel scrap must be used, which contains practically no silicon, while by the time the molten metal is hot enough to be tapped from the furnace 0.35 per cent. of the silicon in the charge has been eliminated. Fortunately there is no necessity of using white iron, because it is a perfectly simple operation to convert pig iron that is gray in fracture, and in which the carbon exists mostly free, into castings in which all of the carbon is combined.

Control of Silicon Content

33. In Fig. 7 can be seen the fractures of six air-furnace test sprues. No. 1 of gray fracture was cast very shortly after the charge was completely melted, while No. 6, white in fracture, was cast when the metal was just hot enough to run the castings. No. 2 was cast about twenty-five minutes after No. 1, and the others at succeeding equal intervals. In comparing the fractures in the order in which the sprues were cast, it can easily

be seen that as the silicon and carbon content in the bath were being gradually lowered, the graphitic carbon lessened by degrees, until finally the silicon became so low that it no longer possessed the power during solidification to drive the carbon out of combination with the iron. It is simply a matter of holding the molten iron in the air furnace a sufficiently long time to eliminate the silicon down to a point where the amount that remains in the bath will be sufficient to precipitate any carbon when solidification takes place. Irrespective of how much silicon within reason were in the charge, it would be possible to finally eliminate enough to accomplish this object, but as this would involve a great waste of fuel, it would not be commercially practical to do it. The logical thing to do, and the thing that is done, is to charge a mixture with a silicon content just high enough to admit of the carbon combining, coincident with the arrival of the bath to pouring temperature. While too high a silicon content will result in a waste of fuel and valuable time, too low a silicon will not only defeat the obtaining of superior product but the castings ordinarily will be unsound.

Phosphorus Content

34. The usual practice is to have the phosphorus content under 0.20 per cent., but if all the other elements are correctly proportioned and the white-iron castings correctly annealed, a much higher phosphorus content can be used and a very good product obtained. The writer is convinced that in the absence of combined carbon, considerable liberty can be taken with this element in sections that do not exceed ¾ in. It may also be stated that there seems to be no advantage to the quality of the product to run the phosphorus as low as 0.10 per cent., while there is a disadvantage in so doing that results from a lessening fluidity of the iron. Inasmuch as a pig of 0.20 per cent. phosphorus can be purchased as cheaply as one containing 0.30 per cent., there is no commercial advantage gained in using the latter.

Sulphur and Manganese Content

35. In considering the proper sulphur content, we must at the same time take into account the manganese, since due in a measure to their reciprocal attraction these elements unite to form manganese sulphide, as already explained. Provided the sulphur is properly balanced by the manganese, one need not fear injury from this element up to, say, 0.10 per cent., but approaching this point and beyond it to 0.12 per cent. as the highest limit, great care must be taken not only to see that it is properly balanced by the manganese, but that the annealing temperature be kept low. Just how low can be better understood when the raitonale of the annealing process is briefly entered into. As far as the writer has been able to ascertain, there is absolutely no advantage to be gained, and, as a matter of fact, considerable disadvantage in striving for a low sulphur content in the castings. It is getting increasingly difficult to purchase malleable pig iron that will average much below 0.65 per cent. in manganese, and it is not easy to obtain it this low When this percentage in the mixture or charge is exceeded, it is quite difficult, if not impossible to obtain best results, unless some sulphur be present to control subsequently its action through the formation of sulphide. Under present average conditions the writer would prefer to see 0.05 sulphur in the product than one-half that amount.

36. The manganese content in the product should not be lower than 0.18 per cent, nor higher than 0.36 per cent., the former when the sulphur is at its low, and the latter when it is at its high, limit. This does not mean that a good product cannot be made with a slightly lower manganese provided the silicon is not abnormally low, or with one slightly higher, but as a departure is made from the figures given, greater care must be exercised all along the line. An excess manganese makes the material very sensitive to heat, and when the manganese in the hard-iron casting is high, the annealing temperature must be kept at the lowest point at which the carbon can be precipitated.

Carbon Content

37. Concerning the desirable carbon content for the hard-iron castings, the writer believes that the higher the carbon the more easily can the carbon be precipitated in the anneal, but the weaker the product. It is impossible to obtain such a product as is now being turned out if the carbon be high. In looking over the literature of even recent date one can find statements to the effect that a superior product can be made with a carbon content of over 4 per cent., which is further evidence in regard to what has been considered a superior product by some authorities. The literature of the subject is fraught with just such statements but invariably unaccompanied by data to back them up. To cover the ground briefly, it can be said that the lower the carbon, up to a point at which the carbon can be successfully precipitated, the more ductile and trustworthy will be the castings. If, however, the carbon is run too low, trouble will be experienced from lack to fluidity and in complicated castings contraction cracks will be in evidence, while if the carbon is run still lower, a steely fracture will exist in the castings. A carbon content of 2.35 per cent. in the hard iron will yield sufficient fluidity for most work and after such removal of the carbon as will take place during the anneal a tough, strong product will result. A few figures in this connection will prove illuminating.

Total carbon, per cent.	Elongation, per cent.	Total carbon per cent.	Elongation, per cent.
1.72	21.00	1.50	20.50
0.72	20.31	1.43	21.09
1.18	22.00	1.52	22.66
1.54	23.00	1.46	21.88
1.46	21.00	1.39	21.09
1.36	20.00	1.35	21.50
1.85	22.00	1.81	25.78
2.03	20.31	1.50	20.31
0.82	25.00	1.51	21.00
1.31	25.50	1.64	20.50
1.72	21.00	1.78	20.50
1.83	22.00	1.76	20.00
1.97	20.50	1.19	21.00
1.77	20.00	1.49	23.50
1.41	20.00	1.62	22.50
1.55	20.00	1.70	21.00
1.61	20.00	1.42	20.50
1.75	25.00	1.52	22.50

38. Table 3 contains the carbon analysis of many bars, in all of which the elongation was over 20 per cent. and the ultimate strength over 52,000 lb.

SHORTAGE OF COKE

A leading Nova Scotia manufacturing company reports that they are having great difficulty in procuring raw material, especially boiler plates and American coke for melting. Canadian coke producers and Canadian dealers in American coke should look into this.

Various Methods of Making Column Patterns

The Author in the "Foundry Trade Journal" Gives a Description of Various Methods of Making Column Castings. Much Diversity is Necessitated Through the Many Forms Possible

By JOSEPH HORNER

COLUMN patterns are characterized by much diversity of forms, which considerably affect the details of the pattern work and moulding. The basis, or the shaft, of all columns, except those of very small diameters, is the same, and is made as a lagged-up pattern, i.e., one built with long, narrow strips attached to cross-bars. This is the only way in which a pattern, say beyond 3 in. or 4 in. in diameter can be constructed to permanently retain its shape under the conditions of incessant moulding in damp sand.

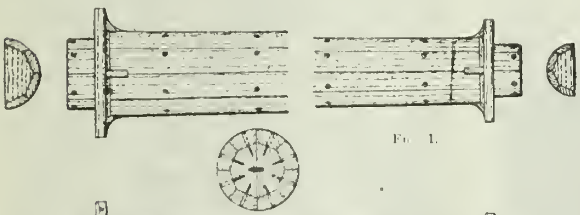


Fig. 1.

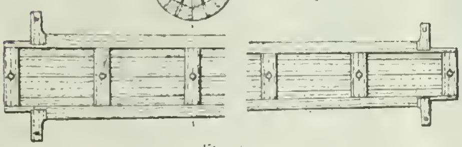


Fig. 2

Figs. 1 and 2 represent the typical plain column pattern in its external appearance, and open in the joint face, respectively. From these figures, with the end views of the core prints, and the section through the shaft, it will be seen that lagging-strips, which extend the entire length, are screwed (and glued) on cross-bars, having flat faces planed to receive the lags. The cross-bars are jointed and dowelled along the centre. The flanges are let into shallow grooves, both to prevent them from getting shifted out of position and to permit of turning the radius on them. Brackets are shown fitted to support the flanges. Eight lagging strips make up the circle, but this number is regulated by the diameter. A 6-in. or an 8-in. column need not have more than six strips, but a 12-in. column might have ten or twelve, and larger sizes more in proportion. The width of the strips must not be excessive for two reasons: one being that wide stuff will shrink and open along the joints; the other, that the thickness at the joint edges will be lessened with increase of width. The section shows suitable proportions.

The distances between the cross-bars must be such as to afford due support the lags. If they are much farther apart than the proportions indicated in Fig. 2, the strips will be liable to bend under the ramming, and the joints may start, resulting in lapping. The rigidity of the pattern also depends much on the holding of the longitudinal glued joints. The cross-bars are shown with flats to receive the lags, which makes the strips thinner along the jointing edges than elsewhere. To avoid this, circular cross-bars have been used, which entails planing the lagging strips concave to fit them. This is quite unnecessary, entailing much extra labor, with no corresponding advantage.

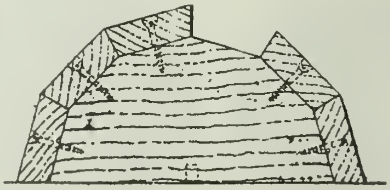


FIG. 3.

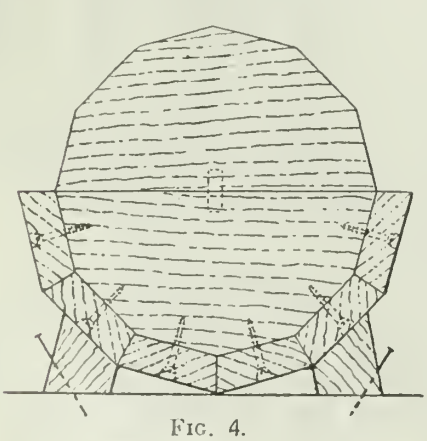


FIG. 4.

In the column shown, the thickness of metal is moderate, and there is no moulding, or bell-mouthing. Here, therefore, the lags are continued to the ends of the core prints, which entails a considerable reduction in the thickness over the prints, as seen in Fig. 2. But sufficient wood is still left. If the reduction were greater, the end cross-bars would be continued from the terminations of the prints for a little way past the flanges. Or the prints might be prepared separately and screwed on the flanges.

The sequences of operations in building-up a lagged pattern is shown by Figs. 3 and 4. After the cross-bars have been dowelled, and their facets marked off and planed with the slight bevel required, if the column is a tapered one; or square, or is parallel, the halves in which the dowell holes occur are laid

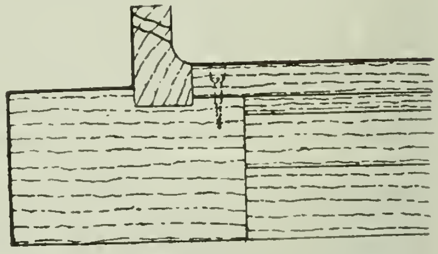


FIG. 5.

upon a bench, or on a joint board, set by a centre line, and loosely tacked down in their correct relative positions. A straight-edge is, as a precautionary measure, tried along all the faces, in order to be sure that the lags will make close contact all down the faces. If incorrect, the high parts must be eased. Then the first lags are glued and screwed next the joint face, the edges being planed alike with a bevel, set to the exact angle, and quite straight longitudinally, as tested with a straight-edge. Afterwards, the lagging is continued on each side, as shown in Fig. 3, leaving only the final lag to be inserted. Since the joints are long, and so much depends on them, care must be taken both in getting continuous contact and in glueing. The exposed joint-face last made is chalked, and the mating face being planed straight and to the correct bevel, is rubbed against it until the chalk shows transference along the whole length. The glue is applied rapidly to avoid chilling,

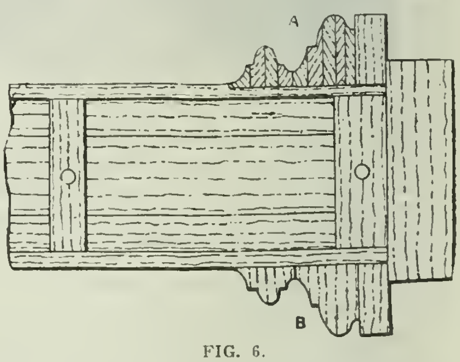


FIG. 6.

and the excess is rubbed out by a to-and-fro longitudinal movement continued for a few seconds by a man at each end. Glue is also applied to the facets of the cross-bars. Iron dogs are then driven in at intervals to retain the joint in contact while the screws are inserted through the lags into the cross-bars. The heads of the screws are sunk into centre-bit holes, as indicated, to prevent their coming into contact with the turning tools. The holes above the heads are filled with wooden plugs. When the last lag is being fitted (Fig. 3), the two joint edges require attention. The half-pattern is then turned over, as shown in Fig. 4. It is supported on blocking pieces, while the other halves of the cross-bars are dowelled into position, and the remaining portion of the pattern is lagged in the same detail as that of the first half. Centre plates are then screwed to the ends, and the pattern is put into the lathe and turned.

We may now note some of the typical variations that are made in column patterns.

The first example is that the fitting of a block for a print, as indicated in Fig. 5, instead of extending the lagging to include the print, as in Figs. 1 and 2. In Fig. 5, this is only a matter of individual choice, because the difference in the diameters of the print and of the body is not very great. There is, however, enough difference to make the lagging thinner than is desirable over the print section, and a block like that shown is preferable. But it must be fitted with the grain running longitudinally, as indicated by the timber shading, and not transversely. In the construction shown in Fig. 5, any shrinkage that might occur would be uniform, and the circular shape would be preserved; but if a chunky block were fitted with the grain running transversely, shrinkage would produce an elliptical section. The flange is shown in the figure as sunk into an annular recess turned in the print block.

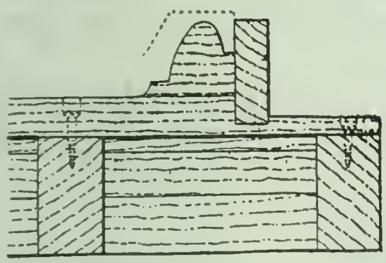


FIG. 7.

A moulding is shown in Fig. 6 fitted to the pattern, with a choice of two methods of construction. At A it is glued up with courses of segments, say, six to the circle in pan. At B it is cut from the solid in two thicknesses. The method at A secures permanence of form that at B does not, since the wood will shrink and become elliptical, and will also be liable to fracture across the short grain in the vicinity of the pattern joint. The segmental structure, therefore, at A is to be preferred for standard patterns, but that at B might be adopted for a pattern from which a few moulds only have to be taken.

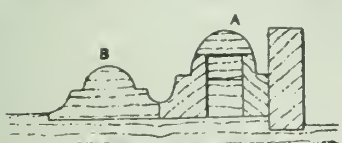


FIG. 8.

These mouldings may be turned when attached to the main body, or separate therefrom. In either case, the holes to fit over the pattern body must be bored on a face-plate in the lathe, and the mouldings may just as well be turned and finished at the same chucking. A is shown as being let into a shallow recess turned on the pattern body, in order to afford a little timber to support the radius where the moulding merges into the shaft. B, not being let in, has a feather edge, with short grain near the jointing faces.

The flange, round or square, is prepared separately, and bored to fit over body. It need not be let into a recess, as in Fig. 5, because it is supported by its contact with the moulding. Here, too, owing to the bell-mouthing of the core to follow the enlargement of the moulding, the print must be prepared separately, and attached with an abutting joint to the end of the column.

Fig. 7 shows a simple moulding fitted in solid wood, with the grain running longitudinally. This is glued on the shaft in the form of short lags, being an extension of the main lagging strips, and glued on them on flats, or hollowed to fit the curve of the shaft when turned. Should shrinkage take place, it would be equal all round; but the joints may open slightly on the outer diameter. If they do, thin strips can be glued in later, and no further shrinkage will be likely to occur. The flange and the print are made and fitted similarly to Fig. 2.

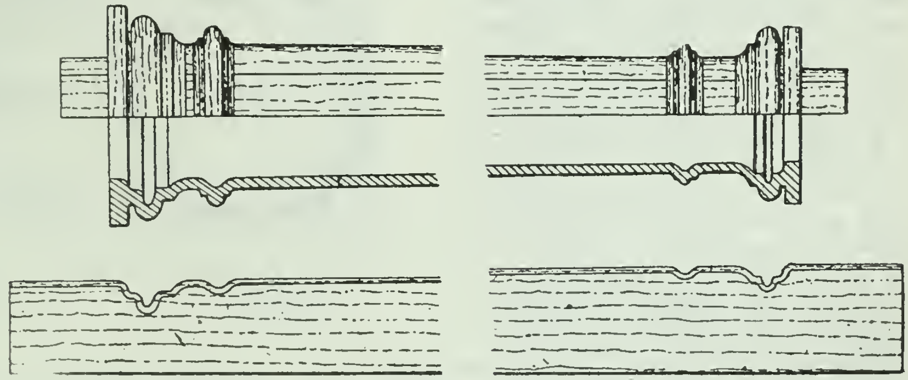


FIG. 10.

In Fig. 8 yet another method of making a moulding is shown. The portion at A, standing out to a considerable distance, is built up with segmental pieces in the manner indicated by the timber shading. Two sets of segements have the grain disposed circularly, with a space between, and this is bridged and covered with segments that have the grain running longitudinally. The moulding at B, being shallower, is made by an extension of the lagging, similar to Fig. 7. Both mouldings are prepared as separate sections, turned, and bored to fit a shallow recess turned on the shaft. The flange and print are made as in Fig. 7.

Frequently, instead of a moulding, a large square base terminates the shaft of a column. To attach this as a separate fitting to the end of a round shaft does not make quite so good a job as to fit it in the manner shown in Fig. 9. here the shaft is continued the whole length, and being recessed, as shown, it is removed from the lathe and the square base is fitted to it by boxing-up. The print also being correspondingly large, is boxed-up, and screwed to the flange. The timber shading illustrates the disposition of the grain in the various portions.

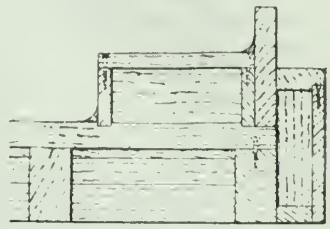


FIG. 9.

When a column has a plain shaft like Figs. 1 and 2, a special core board is not necessary. The prints give the moulder the diameters at the ends, and the edge of a straight board is used for sweeping. When mouldings are included, the thickness of metal is maintained equally by making the core follow the contour of the mouldings, as in Fig. 10. Here the relation of the edge of the board to the core is shown. It is always desirable to preserve very approximately equal thicknesses of metal throughout, since if chunks are permitted to be left in any localities, the cooling will be delayed there, and drawing and weakening of the casting will result.

In Fig. 10 the radius of the sweeping board is set by measurement from the core bar. Inaccuracies of from ½ in. to ¼ in. by diameter may easily creep in, with varying metal thicknesses in the castings.

(To be continued)

The Independent Pneumatic Tool Co., Chicago, have issued a leaflet on the Thor universal assembling and repair vise for pneumatic drills. This vise is of material assistance in the repair shop and saves, so it is estimated, 50 per cent. of the time of the repairman.

The Making of a Rumbler Casting in One Piece

Many Problems, Which at First Glance Look Very Difficult, Lend Themselves to Easy Solution if Only a Little Thought is Taken and Ingenuity Exercised

By C. R. SAND

THE article in the last issue of CANADIAN FOUNDRYMAN, describing the molding of a machine frame with a bottom to it forming a basin in which the oil would be held was a very good example of how green sand cores can be used to good advantage, and it brought to my mind a job which might appear too simple to be worthy of consideration, yet simple and all as it is, it baffled a lot of good molders and was actually refused by several foundrymen.

It was a six-cornered rumbler, or tumbling barrel or whatever we may wish to call it and was for polishing purposes in some kind of a factory, but it was just the same as the old stave rumblers used in the foundry, with the exception that it had to be dust-proof instead of having cracks all around it, and for this reason it was cast all in one piece, with the exception of one panel or stave which was fitted in neatly afterwards. The ends, of course, were cast on, and onto these were the trunnions which were hollow so as to connect them to a suction fan. These trunnions had permanent core prints on the outside and loose ones inside. The side and end views are shown in Figs. 1 and 2. The pattern was parted at A A, Fig. 2, and was hollow and of the proper thickness, so that it could be used as a core box or molded in green sand, but to add to its perplexity from the molder's standpoint it had a flat core print an inch thick placed over the opening, and an inch bigger all around than the opening, and a core-box of the same dimensions, but half an inch thicker, and so arranged as to leave a panel on the face of the core, the exact size of the opening in the pattern. It will be understood from this that if the opening in the pattern was, say 6 inches wide and 24 inches long, and the casting was 1 inch thick. The core print which was dowelled on over the opening would be 8 inches wide and 26 inches long and 1 inch thick, and the core would be 8 x 2 and 1½ inches thick at the edge and for 1 inch inward, leaving a 1 inch thickness of core 6 x 24 or exactly the size of the green sand core in the opening. The core would appear as in Fig. 3 and when in place would appear as in Fig. 4.

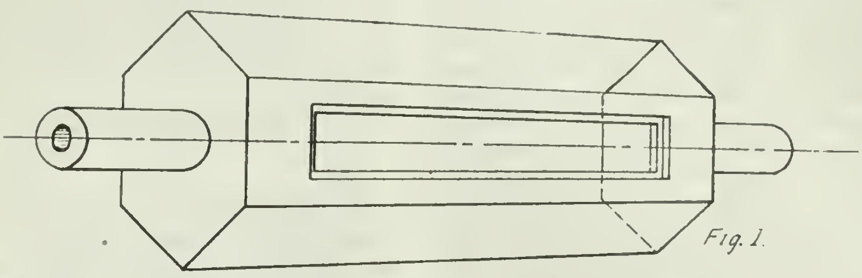


Fig. 1.

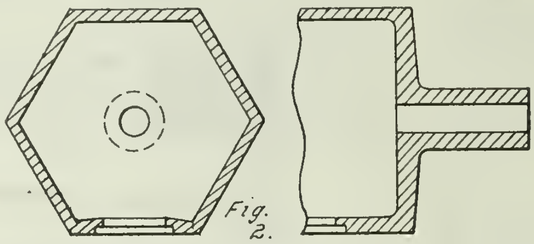


Fig. 2.

Fig. 3.

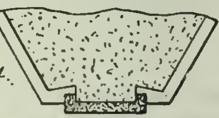
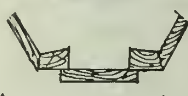


Fig. 4.



Arrangement of Core Print

Making the Mold

The mold is made to pour with the open side down. The cope is rammed up first and rolled over. A flat slab core of about the same dimensions as one of the flat surfaces is now put down in the bottom and about four inches of sand is pressed against the entire inside of the pattern and well needle vented. The remainder of the space and an equal amount of space above the parting is now filled with coke and the other half of the pattern put in place, the balance of the space tucked and rammed in with sand, and a flat parting struck off at the opening. Several holes are now shoved down to the coke with a sprue punch and the core print put on, when it will appear as in Fig. 5. The drag which is barred the same as a cope is now rammed up, vented and the board bedded on temporarily and lifted away. The drag is now lifted off and half pattern may be brought up with it or it may be allowed to remain down, but I consider it best to bring it up as any little patching which might be required, is better to fall to the lot of the inside rather than on the outside. After removing the pattern and nailing all corners and doing what repairing is required, the flat core with the panel on the face is placed on to the green sand forming the opening, the panel allowing the edges to go down half an inch into the casting, thus forming the place to fit the lid into when the casting is being fitted up. This could have been accomplished with the core 1½ inches thick right through and fastened up into the print, but the green sand in the opening would have required to be strickled out for half an inch in order to let it down, and it would not have any advantages, and would be more likely to be finny. This core must have vent holes in it to correspond with the ones which reach down into the coke. The drag must also have similar vent holes through it to the board, and the board may either have holes through it or a channel may be cut in the sand loading to the ends of the flask where notches may be cut to let the gas out. When all is ready, the drag is closed into place and the board put on and clamped and the mold rolled over and the cope lifted off and the other half of the pattern taken out. The molder will, of course, understand that everything must be proof against iron entering the vent holes. To be on the safe side, some flour or thin paste could be put between the core and the green sand. The core could be filed so as to fit loosely in the print, floured and the mold tried on and off, and when the proper thickness of filling is ascertained, dough or heavy paste is used, and the mold is closed again and proceeded with as already described. When the pattern is drawn, and the loose core prints taken from the inside, the trunnion cores are set and the vents protected. Chaplets are now shoved up through the cope and the mold grated and closed up. These chaplets will be clamped down against the flat oilsand core which was put into the pattern before ramming the inside.

I have only been describing the molding of the pattern as I found it. The flat core print which was dowelled over the opening could have been dispensed with and the pattern could have been made to fit the lid, but it would have been a less secure bearing to hold up the inside and it would not make as neat a fitting job for the lid. To go to the other extreme, the entire inside could have been made in dry core sand, or the bottom half could have been dry and the top green, but I think the way which I have described is the best and is a good illustration of a simple job with a few perplexing features. It is always best to have a good solid bottom to rest a green sand core onto, and in ramming a green sand core such as the one described, it should be well supported with irons to keep it from sagging or crushing. Several clamps could be rammed into the narrow part in such a way as to rest upon the dry core, and these clamps could in turn rest against a long one running lengthwise. The coke, which we described as being half in each part, does not require to be in the bottom half if it is going to interfere with the proper rodding of the mold. The under part of the core does not make much trouble, providing the top part is well vented into the coke, but the bottom part being the last rammed could not well be vented until the pattern was drawn when it could be needle-wired into the coke, even though the coke was in the top half. If what coke there is, is reasonably close to the top and is connected to all parts by means of fine vent hoies and also connected to good big openings leading to the outside, there is very little risk of having any trouble.

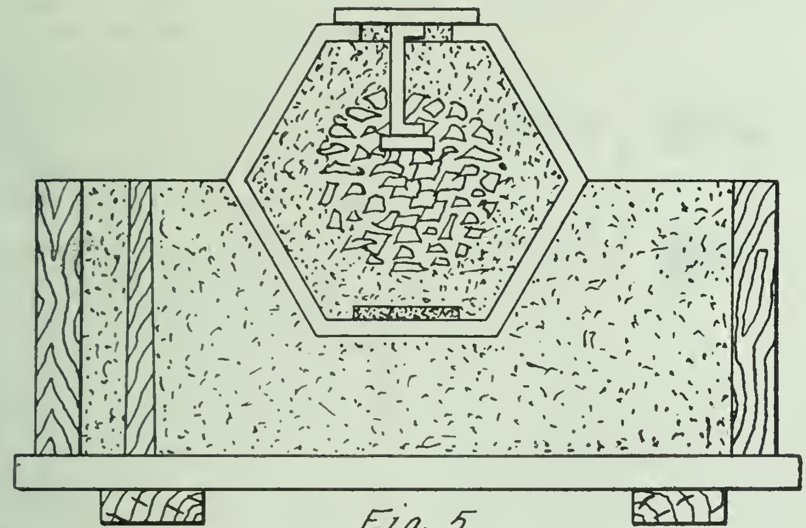


Fig. 5.

ELECTRIC FURNACES

The very considerable developments which have taken place in this country during the war in electric steel melting and refining, and which formed the basis of an instructive discussion at a joint meeting of the Iron and Steel Institute and the Institution of Electrical Engineers last week, raises an interesting controversy regarding the future of this branch of our steel industry. The demand for these furnaces arose mainly because of the shortage of steel, and a considerable number was installed for the purpose of melting and refining the large quantities of steel scrap and turnings available in the country. The furnaces were put to work where this scrap material was accumulating in sufficient quantities, and manufaturers preferred to install their own furnaces to convert their scrap steel direct into castings, ingots, shells and steels for special purposes, rather than dispose of it to the metal merchants. The proposition was considered to be commercially sound in the special circumstances, in spite of the high price of the electrical energy consumed in the process. It had the further national advantage of relieving the already congested railways, since it was no longer necessary to transfer the scrap material from the works where it was produced to some other steel works, possibly in another part of the country, in order that it could be utilized. The conditions are now, however, already considerably modified, and economy in cost of production must be judged by the standards set in those countries where the natural resources have been developed to provide cheap electrical power. The result is that owing to the relative high price of electrical energy in this country, some authorities consider that the future activity of the electric furnace will be very limited indeed. Taking the power consumption of the steel furnace at 650 units per ton, and the price per unit for this country at ¾d., the cost of power per ton of steel produced totals over £2, whereas in other countries more favorably placed the price would be a matter of a few shillings. It should, however, be possible for our electric supply authorities to grant special terms to users of the electric furnace, on the condition that the furnaces were operated to improve the load factor of the station. These furnaces must be a source of considerable revenue for the supply authority, and now that the disadvantage due to the peaky nature of the load has been largely overcome by means of automatic control of the electrodes, it is to be hoped that the supply authority will be able to make concessions to the furnace user in preference to losing so valuable a load. There are also possibilities of cheaper power with the advent of the super-power station. Although there is considerable scope for improvement in the construction and working of the electric furnace, further developments will benefit all users of the furnace by reducing the proportionate cost of power to total cost per ton of steel. It is curious, by the way, that practical requirements should have ousted the induction furnace from the market. This furnace, first suggested by Mr. de Ferranti as long ago as 1897, embodies the most direct method of heating the charge, and eliminates the troublesome electrodes of the arc furnace, and yet it has been practically displaced by the arc furnace, despite the defects and drawbacks of that type, which were alluded to in the discussion to which we have referred. We have here another example of a common experience that the best scientific solution of a problem is not always the best industrial solution.

PURIFYING ALUMINUM

Some experiments on the purification of aluminum in the Reichsanstalt are described in the "Chemical Trades Journal." F. Mylius found that he could remove the silicon by fusing the metal with sodium nitrate, but not the iron. On the other hand, he made the observation that the iron could be extracted with the air of diluted hydrochloric acid, and that the silicia would be washed out that the same time. His aluminium contained from 0.4 per cent. to 2 per cent. of impurities, mainly iron and silicon, in addition to traces of carbon, sulphur, phosphorus, and nitrogen. When he experimented with a very slowly cooled sheet aluminium, which was porous, he reduced 1 per cent. to 0.1 per cent. of iron with a yield of 60 per cent. of metal. Aluminium surfaces which had taken up iron during the manufacture were successfully purified of iron by treatment with the same acid. An aluminium free of iron can thus be prepared with hydrochloric acid, when part of teh metal may be sacrificed. Mylius also states that aluminium will crystallise as pure chloride from the solutions in hydrochloric acid.

SLAG WOOL AND STEEL RUST

Some tests have been carried out by Dr. J. E. Stead to determine if slag wool had the effect of inducing rust on steel. A polished knitting needle was inserted in the centre of a cylinder of compressed slag wool about ¾ in. thick. The samples were immersed and saturated in water and then allowed to dry in a warm place. After drying they were again immersed in water and again allowed to dry, this operation being continually repeated during ten weeks. The needles were drawn periodically for examination to see if they had rusted. No rusting was observed at the end of ten weeks.

Moulding a Large Column in Loam

The Author Discusses in "Foundry Trade Journal" the Moulding of a Large Column in Loam and Without Patterns. Some Interesting Details Are Given

THE following article describes the tackle and method of moulding large columns in loam. Fig. 1 is a sketch of a furnace-column, weighing 7 tons 5 cwts., the casting of which recently came under the writer's supervision. Many foundrymen contend that loam-moulding is the costliest method of producing castings if more than one is required; but the casting under consideration was made much more quickly struck up in loam than by dry-sand moulding from a full pattern. A costly pattern was also saved. It will be obvious from the dimensions of Fig. 1 that for a casting of the size indicated the tackle would be of an unwieldy length and difficult to store. A casing, or box-part, is required as shown in Fig. 2, which is divided in the centre at A, two pieces forming the bottom half and two the top half of the box. The dividing of the box is also provided with a view to the utility of the tackle for shorter columns, hydraulic cylinders and rams, etc. Fig. 2 shows the bottom half, with the two portions bolted together and the strickle set for moulding. The casing conforms to the shape of the column, with pockets B at each end to receive the flanges. Provision is made on each section of the casing at A, for bolting together, the dimensions being such as to allow 4 in. of brickwork, with 1 in. of setting-loam and 1 in. of loam on the face of the bricks; this allows sufficient room for setting the brackets, which are larger than the general body of the casting. Holes are cored out along the casing to help the drying and act as vents. In making the top part of the casing, additional holes are provided to allow runner and riser gates, and chaplets, and for bolting grids which are fastened to the top to hold in the brick-work when the latter is turned over. Openings are provided at each end, top and bottom, to allow the core and barrel to protrude through the box, as shown at A. Fig. 3. In the top part a bar should be fitted in the pockets B at each end of Fig. 3, to form about 4 in. of space between the end of the box and bar. This space is left open when building the top half of the box to provide an effective way of sealing the ends of the mould when closing. Holes are provided along the flanges C, Fig. 2, to bolt the top and bottom parts together. The joints of the casing must be machined, the correctness of the mould depends upon this, as well as the spindle bearers, Fig. 4, which are bolted on each end D, Fig. 2. Also, two or more bearers similar to that shown at E, in Fig. 2, are made, according to the strength of spindle, to support the latter along its length, to ensure a true sweep in the mould.

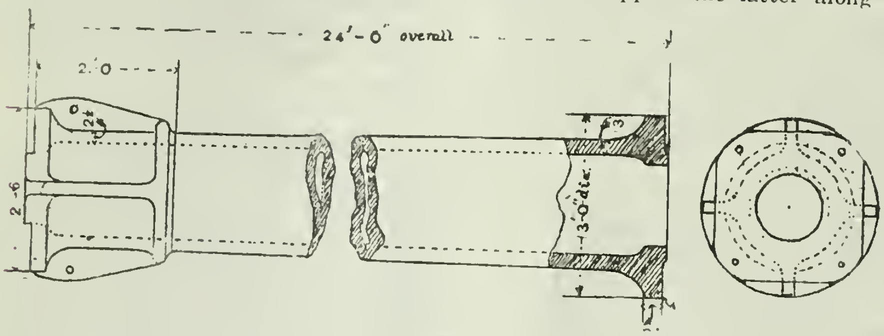


FIG. 1.

Collars are put on the spindle, on the outside and inside of the bearers at each end, to prevent end-play. The two boxes forming the bottom casings are placed on the floor, levelled and straightened by stretching tightly a piece of string the full length of the two parts, and bolted together. The patternmaker should overlook and help in setting the strickle on the spindle. The sweep board requires cutting in three or more places to allow of the free movement of the "sweep" past the bearers which take the weight of the spindle towards the middle. After setting the casing ready for moulding, the rectangular flange at the end and the brackets are set, after which straightforward bricking is proceeded with. At a distance of 8 ft. and 11 ft. respectively from each end, iron bars are set in the brickwork down on to the iron casing to act as bearers for the cast-iron studs, Fig. 6, which are divided into two pieces at about the same place as the box, their purpose being to bear the weight of the core and barrel. With a view to the repeated use of the brickwork, as first set, the bricks are laid soundly in new loam. It is not necessary to fill-in cinders or dry sand between the brick-work, as is done with more open moulds. The brickwork and loam is not deep, and with the vent-holes along the casing and a good open loam, no risk is taken of a scabbed mould.

In the middle, where the box is divided, the bricks are set to form a vertical joint, loam being rubbed on and a parting sand-face provided. About 1 in. of loam is well rubbed on to the brickwork over the whole length of the mould, and the mould swept to shape. The joints are strickled with a straight-edge board across the machined flanges of the casing. When the roughed-up mould has partially set, fine loam is spread over the surface, using the bevelled edge of the strickle. The mould is then allowed to set. The top half of the casing is levelled and bolted together in the same manner as the bottom. Grids are bolted firmly along the whole length of the joint either side of the mould, the depth of the grids from the joint face being arranged to take one row of bricks be-

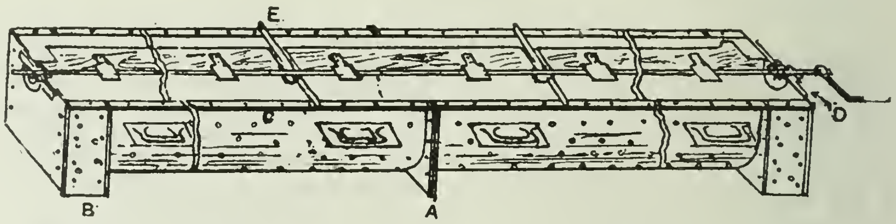


FIG. 2.

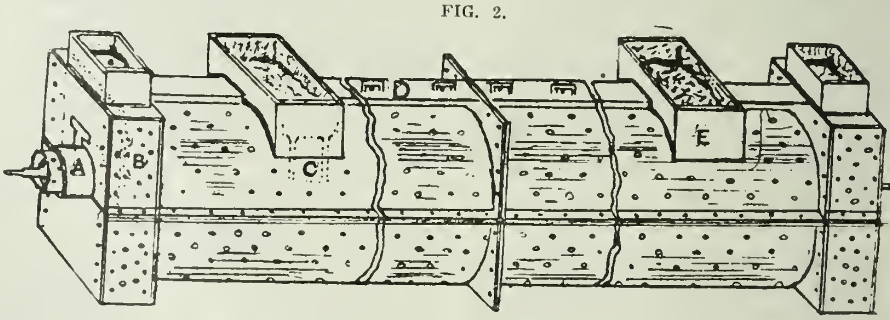


FIG. 3.

tween two rows of stout prods, which are cast on the grids. The remainder of the brickwork is thus held in by the first row of bricks and grids. Before bricking the mould runner-gates C, Fig. 3, are set at each end of the column, about 4 ft. from the flanges, and riser gates on each flange. The top half is then struck up similar to the bottom half of the casing and left to set.

When the complete mould has stiffened, it is unbolted and dressed before being stoved and dried. The core is made in two lengths, about 13 ft. 6 in., on strong cast-iron bars. At the centre, where the cores butt together, A, Fig. 7, the ends of the core-bar must be cast solid or plugged, and tapped to receive the trunnion for turning the core when strickling. When coring, the trunnions

FIG. 4.

FIG. 5.

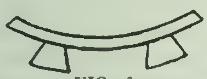


FIG. 6.

can be taken out and tapped, and the holes sealed with sand; the metal is thus prevented from penetrating the barrel of the core through the joint where the cores meet. Iron bearers are set in the core B, Fig. 7, down on to the iron barrel, corresponding with the iron bearers set in the bottom half of the mould, and the chaplets which are inserted through the top part of the mould to hold down the core when filling the mould with metal. If this provision were not made, the studs and chaplets would bury themselves in the core, or in the mould, as loam will not withstand the heavy core and the "lift" given to the core by the pressure of metal when fluid. If 8 per cent. of coal dust is added to the loam when milling, it will help in the extraction of the core-barrels after casting. When the core and mould are dry, the

FIG. 7.

two pieces forming the bottom half of the mould are again set on the floor, the top parts of the mould tried on, and set by the spindle-bearers, Fig. 4, which are still attached to the ends of the box, top and bottom. Guides are then bolted on to previously prepared places along the flanges, the top portions of the box again removed, and the spindle-bearers unbolted and taken off the ends. The cast-iron studs are next placed on the iron bearers in the bottom half of mould and cores set. Chaplets are wedged to the sides of cores and the iron casing to prevent any movement sideways. The mould should be tried with clays to test for ascertaining the thickness of metal in such columns being to

in such columns being to drill holes at given points. Strong chaplets are inserted through the top parts and the mould closed down, the joints sealed with black loam, and the four parts bolted together. The ends are sealed by ramming sand in the 4 in. of space formed by the ends of the box and bars as previously described.

Readers' Queries

BRONZE TO STAND FROM 40,000 TO 50,000 POUNDS PER SQUARE INCH

A subscriber recently wrote, asking for a bronze which would stand a pressure of from 40,000 to 50,000 pounds to the square inch. This we take to mean hydraulic pressure without leaking. We always contend that the melting and the different operations in connection with preparing the mold have a lot to do with the casting leaking, but for tensile strength the composition must be carefully figured. 90 per cent. copper and 10 per cent. tin (commonly known as "gun metal") was for ages considered the strongest known alloy, but the difficulty in keeping it free from oxide was so great that 2 per cent zinc was found to make a better casting for hydraulic pressure, but for tensile strength it was not improved. Phosphor bronze, while primarily intended as a bearing metal, has been shown to have the highest tensile strength of any of the alloys. Phosphorus is added to bronze as a dioxidizer, hence but a small percentage is required. Zinc should never be present in phosphor bronze, as it causes liquidation of the tin and consequently "tin spots." Phosphor bronze is usually made of copper, tin and phosphor tin. The phosphor tin usually contains 5 per cent. phosphorus. About two pounds of phosphor-tin per 100 lbs. of alloy are usually enough. This is really only one-tenth of one per cent. phosphorus, but it serves the purpose for which it is intended and demonstrates that if the old-fashioned gun-metal is properly dioxidized there is nothing beats it for strength. To get the best results it should be poured into ingots and remelted, when it will produce sound castings which will stand a tensile pull of 5,000 pounds to the square inch. Phosphor bronze for bearing can have up to one per cent. phosphorus and for heavy duty can be slightly higher in tin.

MUNTZ METAL, DELTA METAL, AND STERRO METAL

Editor, CANADIAN FOUNDRYMAN: In your issue of December, you say that manganese bronze is practically the same as muntz metal with the addition of one-third of one per cent. of manganese, and you also give some formulae, which leads me to ask what is the difference between these metals and Toben bronze or for that matter between them and Delta metal or sterro metal? Do you know anything about these metals which I have named?

Answer.—There is really little or no difference between any of them. They are in reality yellow brass with a high percentage of zinc and can not properly be termed bronze, and it is also improper to call them by the name of metal because when two or more metals are mixed together they become an alloy. But these are just trade names which have been adopted by different institutions. Delta metal was patented in 1882 by Alexander Dick, but it is just the same as sterro-metal which had been brought into prominence some years before by an Austrian named Rosthern. It is composed of about 60 parts copper, 37 parts zinc, 2 parts iron, 1 part tin. Different manufacturers made up mixtures of their own and still clung to the name of Delta metal but introducing manganese, lead, nickel and even phosphorus.

Toben bronze usually consists of 60 per cent. copper and 38 per cent. zinc and the remaining 2 per cent. made up of tin, lead and iron in varying proportions according to the purpose for which it is to be used. If for casting only, the bulk of this 2 per cent. would be tin, but if for forging, the tin will be reduced to below 1 per cent. and the iron and lead increased in proportion.

National Safety News is a neat bulletin issued weekly by the National Safety Council, of 168 North Michigan Avenue, Chicago, and is full of valuable information as well as valuable hints on how to prevent accidents. It is a paper which every person who can read should have in his library, if for no other purpose than to keep his mind on the things which he has already learned.

NEW USES FOR OLD THINGS

Slicing Cucumbers on the Fan

We don't guarantee success and would like to know what luck others have before we try it on ours.—"The Exciter," house organ of the Central Marine Power Company.

Practical Hints for the Brass Founder

AIR PRESSURE FOR METAL CASTING

What follows is a small portion, in an abridged form, of an important paper by W. Rosenhain, F.R.S., and D. Hanson in the Transactions of the Institute of Metals.

During the last four years the Metallurgy Department of the National Physical Laboratory has been called upon to prepare a series of alloys of copper for certain special and most exacting requirements. Various alloys in a wide range of proportions were attempted to be produced and the most difficult and responsible operation was quite naturally the melting and the casting of the samples. Even when the greatest care was taken, and every precaution was taken to prevent the entrance of dross, it was found difficult to obtain ingots with satisfactory surfaces. The obvious remedy seemed to be to cast the metal by tapping it from a point well below the surface, and the most satisfactory method appeared to be the forcing of the liquid metal, by means of externally applied air pressure, through a feeder tube communicating with the bottom of the mold and dipping into the molten metal nearly to the bottom of the crucible.

In order to carry out this, it is necessary to use a previously heated feeder tube, through which the metal can be forced without splashing and with exposure to the atmosphere, the dross, charcoal, etc., being left behind in the crucible. The amount of metal in the crucible must be so adjusted that the mould is filled before the bottom of the feeder tube is exposed, and the air pressure on the metal must be maintained until the ingot has become solid.

The apparatus used is illustrated diagrammatically in the accompanying engraving. A is a cylindrical cast iron vessel closed at the bottom, while the upper end is open and has an external flange. The crucible C stands on a fireclay support P. The top of the cast iron vessel A is closed by means of a lid B, which is provided with an annular recess R, fitted with an asbestos washer for the purpose of making an air-tight joint with the top of the vessel A, to which it can be tightly clamped by means of a number of screw clamps—not shown in the diagram. The centre of the lid is provided with a hole 3 in. in diameter, in which fits a circular flange piece of steel E, which is screwed to the iron tube D, ¾ in. in internal diameter. This is the feeder tube, and its length is so arranged that it reaches nearly to the bottom of the crucible C. The steel piece E is separated from the lid by another asbestos washer, the object being to form an air-tight joint and also to reduce the loss of heat from the tube D to the cold lid of the vessel. The feeder tube and its holder are held in position by the clamping bar G, which consists of a flat strip of steel slotted in the centre to take the top of the tube, and near the ends to enter corresponding slots in studs H H. The clamping is performed by slipping the centre slot over the projection of the tube, and springing the plate until it is possible to engage the end slots in studs H H. The "spring" of this strip, together with the weight of the mould, are sufficient to hold the tube in place against the internal pressure in the vessel A. A two-part mould L, fitted with a hole in the bottom, fits over the projecting part of the tube D. The pressure vessel A

SKETCH OF APPARATUS.

is connected with a compressed air main through the inlet M, the supply being regulated by means of a delicate needle valve; an exhaust valve N is also fitted. A pressure gauge S is provided.

The requisite amount of metal is melted in the manner described above, except that it has been found convenient to add the aluminum while the crucible is still in the furnace; this is done because it was found necessary for this method of casting to work at somewhat higher temperatures. When the last addition has been made the crucible is moved to one side of the furnace, and the feeder tube with its steel flange screwed in position is inserted into the furnace and left there until it has reached a bright red heat. The pot is then removed from the furnace, rapidly skimmed free from most of the charcoal, and a little cryolite is thrown on to the surface. The crucible is then placed in the pressure vessel, the surface of the metal being again skimmed to leave the centre portion as clean as possible for the entrance of the feeder tube. The lid is then placed in position and clamped on. While this is being done the runner tube is taken from the furnace, placed in position, and clamped. Then the previously prepared mould is carefully lowered into place. During these operations the exit valve N is left open in order to allow of the escape of the expanding air caused by the heating of the air in the vessel by the hot crucible, feeder tube, etc. As soon as the operations are completed this valve is first closed and then air is slowly admitted to the vessel from the compressed air main. The metal rises in the feeder tube and flows into the mould, the pressure of the air being regulated in such a manner that the mould is filled gently and without splashing. When the metal approaches the top of the mould the rate of flow is gradually reduced, and is almost arrested, the last stages being carried out very slowly. At this stage a crust is formed on the top of the ingot. As soon as this is sufficiently thick, the pressure is gradually raised in the vessel to 30 lb. per square inch, and is maintained at that value until the ingot is solid. The pressure is then released, the clamping bar removed, and the ingot mould with the feeder tube attached is removed from the vessel. The liquid residue in the crucible can then be cast into small ingot moulds. The mould is then opened and the runner removed from the ingot by cutting off with a saw.

Among the innumerable strike threats, says the "Manchester Guardian," one notices nothing so Gilbertian as a demand for less pay. Such a demand, however, has more than once caused industrial conflict. In 1884 the Oadby sockmakers offered to take 7½ per cent. less wages in order to attract work from Leicester, whereupon the Leicester operatives offered to take 5 per cent. less if the masters promised not to send work to Oadby, and on the offer being declined wetn on strike to enforce it. Years ago, too, the miners of Northumberland and Durham requested that they should not be compelled to earn more than three shillings a day, and, the masters not agreeing, they instituted a strike which lasted twenty weeks. The idea behind the seemingly senseless demand was to make the work go round.

The Canadian Plant of Crane Limited

A Description of a New Montreal Plant Which Contains Features of Interest to the Brass Foundryman. A Modern and Well-Equipped Brass Foundry is One of the Principal Features of Plant Design

THE illustration shown on this page is that of the Montreal plant of Crane, Ltd., manufacturers of iron and brass valves of every description and size.

To a foundryman perhaps it will be first appear uninteresting, but it is in reality most interesting.

At first glance it would appear to be a big factory building, including offices and storage departments, with most likely a foundry somewhere behind it in the back part of the yard, where foundries are usually located. But not so. The foundry occupies the most prominent position, not only in the illustration, but in the building itself. Centrally located in the picture will be seen a peaked roof section covered and surrounded with smokestacks. Well, right there is the foundry, in the top storey of this big building.

Of course the foundry end of any plant is not usually on a large scale as compared with the other departments, but it is without doubt the most important department, and while a large portion of this plant is for the other departments, it is only in connection with the foundry that I will endeavor to interest the reader.

The company manufactures valves such as are carried in stock on the shelf of a store as well as valves such as are seen being drawn on trucks and drays to some engineering construction or waterworks extension, and incidentally all intermediate sizes. Some of these valves are made of brass and some of iron, while others are made of both brass and iron combined. The bulk of the plant, as has been explained, is utilized in fitting up these valves, but still in a plant of this size the foundry will be large in proportion.

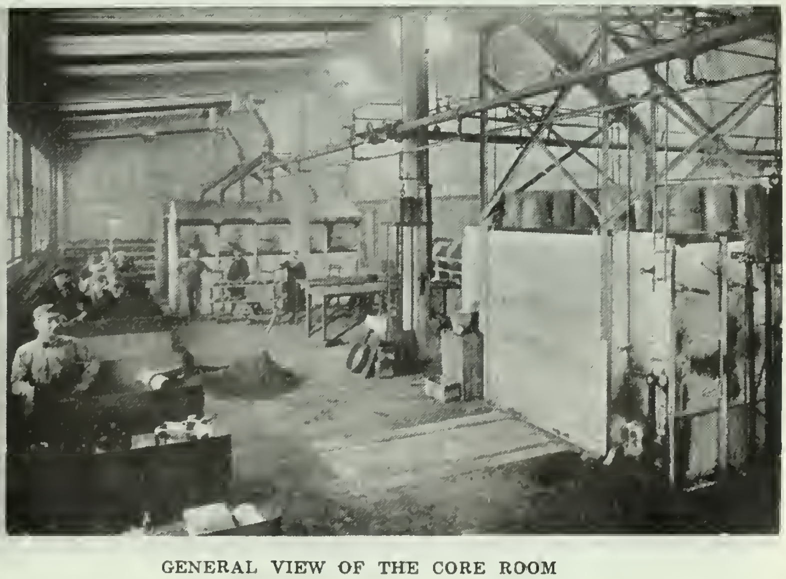
The main building is three storeys high, which, with the basement, makes it in reality four storeys, and is built of reinforced concrete. The floors are of creosoted wooden blocks throughout, and this style of floor makes an ideal foundry floor. Having the foundry in the top storey has no disadvantages, but on the contrary has everything in its favor as it provides exceptionally good light and ventilation.

In the two succeeding views will be seen a view in the foundry and one in the core room, which appear just as though on the ground floor. The grey iron foundry and the brass foundry are both on the same floor but on opposite sides of the floor, while the core room, which is also on the same floor, is located midway between them so as to conveniently serve both departments.

The Core Room

Arranged along the wall are the work benches made of sheet steel, and each one fitted with a stool that can be swung beneath the adjoining bench when desired. The specially-designed oil-fired furnaces, two small and one large, are located in the centre of the room. The

A VIEW IN THE BRASS FOUNDRY.

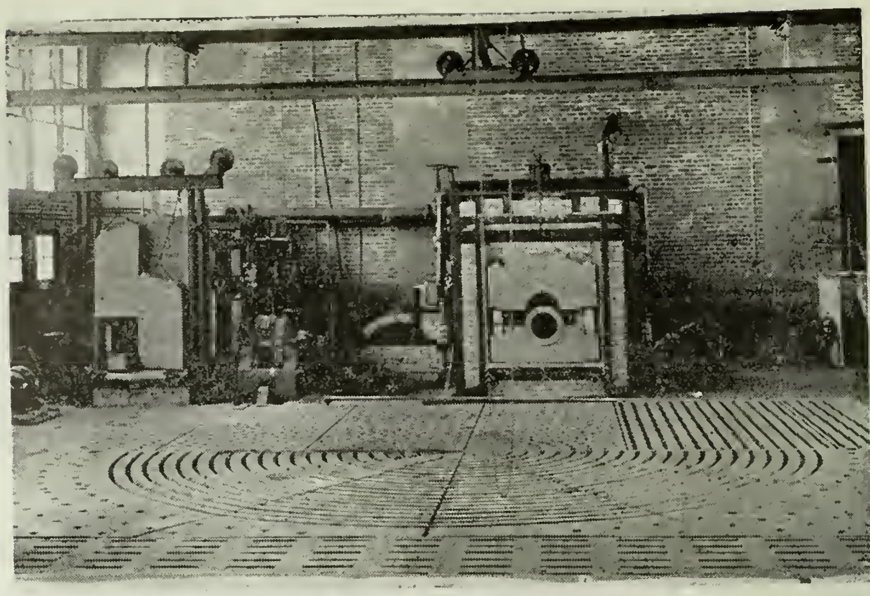


GENERAL VIEW OF THE CORE ROOM

door on the larger oven is of the balanced type, and hand-iron safety guides are provided on either side to protect the workmen from the moving weights and which prevent any one from going directly beneath them when they are in a raised position. The ovens are provided with small sectional side doors for observing the progress of the drying process. The transfer trucks which carry the cores from the benches to the ovens, and from the ovens to the stock shelves, are of the all-metal type, the platforms being supported on compression springs. This arrangement serves as a cushion and reduces the possibility of destroying the cores by the jarring of the truck.

The Brass Foundry

In the brass foundry the pit furnace and crucible is still adhered to as being most suitable for this class of brass founding, and sixteen of these furnaces are arranged in a row along one side of the room. The crucibles of melted metal are lifted out of the furnaces by means of pneumatic cranes, commonly known as air hoists. Two travelling cranes—one in each bay—connect up to these air hoists and deliver the metal to any part of the moulding floor, or more properly speaking, to any part of the pouring floor, as the moulds are not poured where they are moulded but are taken from the snap bench or moulding machine, as the case may be, and placed on trucks and delivered to the desired location and placed in rows as shown in the illustration, making them convenient for pouring.



PIPE-BENDING FLOOR PLATES AND HEATING FURNACES

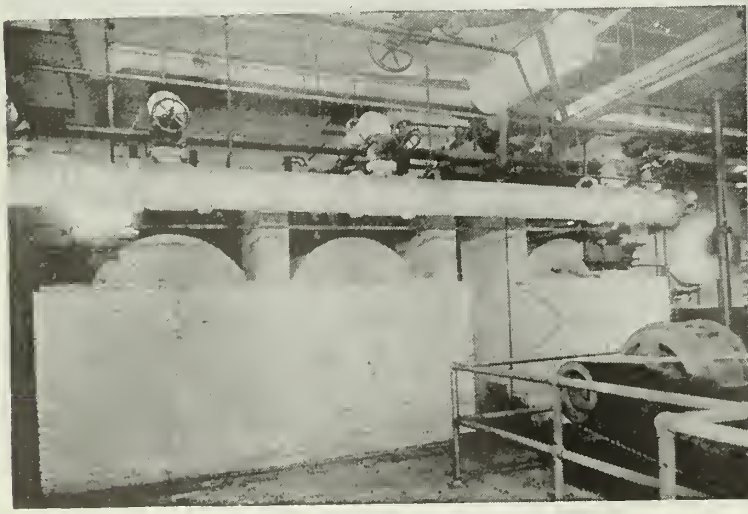
BIG EXTENSION WILL BE MADE TO PLANT OF ALGOMA STEEL

IT is announced that arrangemments have now been completed for the immediate commencement of construction of a new structural steel mill by the Algoma Steel Corporation at Sault Ste. Marie, Ont., at a cost of $6,000,000 to $7,000,000. The product of this new mill is expected to replace the greater part of the present imports of this material. About 90 per cent. of the consumption in Canada of structural steel is now imported, and it is the hope of the Algoma Steel Corporation to supply that, or the greater part of it, from the Sault mills. Work will begin at once, and the construction is expected to take 12 or 15 months. The Corporation already has four blast furnaces, which will furnish much of the steel necessary for the new mill. It is expected that 500 men will be required for the construction work this winter, to be increased to 1,000 in the summer, and when the mill is completed it will require 600 operatives. The immediate financing of the venture is made easy by the possession of ready cash and other liquid funds of the corporation. The last annual report shows current assets of $13,834,842, while the current liabilities were only $2,449,790.

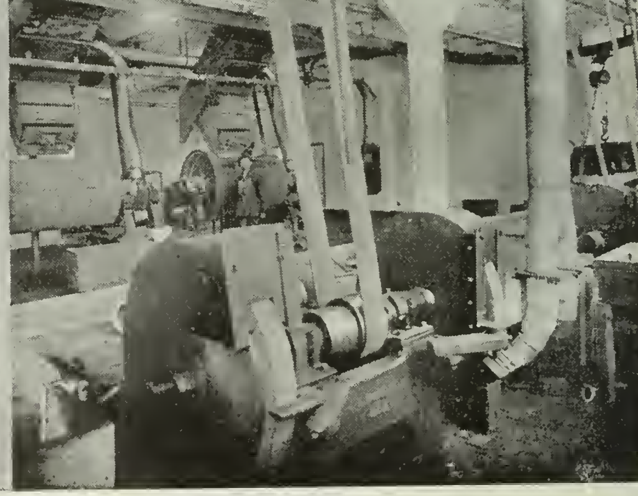
The corporation's plans for this mill have been under consideration for some time, but it was doubtless felt that the present enormous demand for steel, together with other favorable conditions, made it desirable to commence operations. In the last report of the Board the plan was thus described:

"During the past twelve months the services of capable constructing engineers were secured to prepare engineering plans for a new universal mill, consisting of a 40-inch blooming mill, 36-inch rougher and three-stand 28-inch combination structural and rail-finishing mills, all motor driven. This mill, in addition to rolling beams and channels up to 24 inches, will be able to roll a substantial steel rail tonnage to meet the increasing demand for heavier and longer rails.

"Your directors are well satisfied that not only is there prospective business to warrant the proposed new construction, but that the new mills of the kind contemplated are vital to the continued success of the Steel Company. It may be mentioned that at the present time Canada imports all structural steel and and shapes in excess of 35 lbs. per yard."



GENERAL VIEW OF BOILER ROOM



A SECTION OF THE MILL ROOM

Technical Education for Foundry Apprentices

The Foundry Apprentice is Apt to be Sadly Neglected When Technical Education is Talked Of, But the Foundry Requires as Much, if Not More, of Engineering Practice and Skill Than the Machine Shop

By F. H. BELL

THERE is no question to my mind which requires more serious attention at the present time than that of the foundry apprentice. There was a time, not far remote, when boys were booked in advance and waited their turn to be apprenticed to learn the trade of moulding, but that time has passed, and not without good reason, and at the present time there is practically no one seeking admission to the foundry with this object in view. Of course the last few years have been exceptional years and boys were not anxious to learn any trade, but under normal conditions there should be as many boys as ever, and there should be as many applicants for the foundry positions as for any of the others, but there will not be. Now what is the reason that boys do not want to learn moulding? It is simply lack of encouragement. Moulders are looked upon as being in a sort of lower strata of humanity than what other workmen are, and the employer does not hesitate to let them know that he looks upon them in that light. Perhaps the employer does not think he is doing that, but it is precisely what he is doing. It was my privilege during the last few months to visit several railway shops, and during these visits I have been shown what the management really felt the most pride in, of anything in connection with the whole institution, and this was nothing more nor less than a perfectly-equipped school room with desks and an instructor, and the apprentices had certain hours each week when they would be in attendance in this room and undergo a course of instruction in engineering and mechanical draughting at the company's expense. I asked if all the apprentices in the different departments took the same course, and was told that it was only for the machinists and patternmakers. So I asked what was being done to improve the quality of the moulders which were being prepared for the future and was informed that they did not bother with them at all. I also learned that as soon as they get through with the ones they had under way they would not take on any more, but would "break in" laborers and make moulders out of them.

Now no practical man who had ever worked at moulding would think of such an idea. Moulders cannot be "broken in" like colts. Moulders, to be profitable investments for the employers, must serve time under competent instructors, and should start young while the brain is in a condition to absorb the information and before the anxieties and worries of life absorb their entire thoughts. The trouble comes from not separating the executive of the machine shop from that of the foundry. To get the best out of a foundry it should be under the control of a man who gives foundry work his entire attention and who is not hampered by some one over him who has allowed his brain to absorb such ideas as "breaking in" moulders.

It is not my purpose in this article to belittle the qualifications of a machinist but rather to bring out some of the features in connection with the trade of moulding. There is perhaps no class of workmen which causes the employer as much vexation as the moulders, and yet when we look upon both sides of the question there is perhaps no class which has more justification for their actions than the moulders. I know of nothing which will cut deeper into the vitals of a human machine than to be held in contempt, and therein lies the great secret of unrest among moulders.

Now what I contend is that to be a good moulder requires equally as much brain development as to be a good machinist. Of course it is a different kind of work, calling for a different kind of thought, but nevertheless equally as serious thought. Moulders are seldom called upon to be quite as accurate in their measurements as what machinists have to be, for the reason that where great accuracy is required the moulder is simply expected to leave metal for the machinist to show his skill upon, and of course if he gets near the mark he is all right, whereas the machinist must use his micrometer and get down to a one-ten-thousandth part of an inch (when he is telling it). In my own experience I have visited some machine shops where a pretty high class of work was being done, but I always noticed that the highest grade of mechanics, and the ones whom I was informed were the highest paid, were the ones who used the hand tools and fitted the parts to each other, not to micrometers but to the places where they were intended to fit, which fact prompted me to think that much of the ten-thousandth talk was visionary. Still we have to admit that the machinist requires to be accurate in his work to a much greater extent than the moulder does. But that is only one point; in other respects he has every advantage over the moulder. For instance, his work is right before his eyes and he has no excuse for doing it wrong, whereas the moulder is working in the dark in almost every move he makes, and unless he has been pretty careful to have things about right he has no way of knowing what has been going on inside of his mould after closing it. But if he is a capable moulder he will be in a position to know pretty well what to expect.

Now as I have said, I do not want to belittle the machinist trade but only wish to put foundry work in its proper light, and I think I can back up my arguments very forcibly by pointing to the hundreds of jobbing foundries on the American continent which are run as separate units and connected in no way with any manufacturing concern, but are profitably selling castings by the pound to manufacturers who have foundries of their own but cannot make them pay. This is because the jobbing foundry is run by a foundryman, whereas the manufacturer's foundry is under the control of a superintendent who looks upon it as a necessary evil and considers that it can be filled up with men of the laboring class who have been "broken in" to be moulders. Now what I propose, and what I am confident will ultimately come to pass, is for the manufacturer to look the matter squarely in the face and see the absurdity of trying to run a machine shop and a foundry under one head. The man was never born who could be a successful machinist and a successful moulder, and unless a man has been a successful machinist he would not count for much as a general superintendent, and as such he is only a stumbling block in the foundry, and he knows it, but he has to make a bluff at it or his services are not required. There is as much difference between a foundry and a machine shop as there is between a farm and a flour mill, and while it takes both the farmer and the miller to produce flour, no man would think of being both, and no machinist can superintend the operations of a foundry any better than a miller can superintend a farm or a bread baker can superintend a mill. What we want and what I will always urge, is that we put the foundry in a class by itself and under the supervision of men trained for that purpose and for no other purpose, and that technical classes be established for the benefit of the boys who are to train for these positions. The conditions in the foundry should be on a par with the conditions in other departments, and the man in charge should be under obligations only to the manager. With a foundry run on these principles it should be no trouble to get good apprentices, as they would have something to look forward to. Under present conditions, with the manufacturer's constitution saturated with the belief that there is nothing to know in a foundry but what can be done by laborers who have been "broken in" from the ranks of the moulders, it does not look very encouraging, but if the few boys who are now serving at the trade will put up with the slurs which are hurled at them these days they will be doing a wise act, because moulders will be moulders in dead earnest before many years now, but to be a good moulder with the chances which a boy has these days will require a lot of study, as I doubt if there is a technical class in Canada where anything is taught on foundry practice. I had occasion a short time ago to visit a large technical school in one of our Canadian cities, and was shown through all of the departments, which included a well-equipped machine shop and tool room, wood-working of all kinds, and even to a full-fledged blacksmith shop, but not a sign of a foundry. I naturally felt stung, so I enquired if foundry work was not taught, and was informed that it would be taught theoretically, so I asked who was going to teach it, and was informed that Mr. So and So. the instructor in the machine shop, would devote certain hours to this subject. Now wouldn't he hand out some valuable information ? I suppose he would only require to devote a very few hours to the subject in order to "break in" the students in this class, so that they would know the little there was to know about a foundry, such as melting twelve to fifteen tons of iron with a ton of coke, etc.

What is wanted in Canada is a technical school in every industrial centre, where common-sense foundry practice can be taught to the apprentices who are serving in the shop, and also to moulders who realize that they are lacking in some details of the trade. Technical schools will never teach the boy his trade, but the foundry business has become so specialized that it is hard to find a place where moulding in all its branches can be learned, and for boys who are learning in these specialty shops the technical class would be a big benefit along with the practical knowledge which they get in the foundry.

ESTIMATING THE WEIGHT OF A CASTING

There are two ways of estimating the weight of a casting. One is to weigh the pattern and the other is to measure it. If the pattern is made of dry pine and the casting is to be of iron, the casting will weigh approximately sixteen times as much as the pattern. If the pattern is of such a design that it can be measured with any degree of accuracy, the weight of the casting can be arrived at by multiplying the number of cubic inches in the pattern by .26, or near enough by dividing it by 4, as a cubic inch of cast iron weighs approximately a quarter of a pound, or 26 one-hundredths of a pound.

It has always been said that there are exceptions to every rule, and accordingly there is an exception to this one about weighing the pattern, and I will relate an amusing circumstance in which I was one of the leading figures. I was employed as a moulder in a jobbing foundry with a stove plate man as foreman. He was a good fellow but he did not know much about job work. However a job came in one day which consisted of a square block 30 inches in diameter and 7 inches thick. It was for a table on some kind of a press, and the fellow was in a hurry, and obviously it was not going to be a difficult mould to make, so I undertook to get it out the same day. At casting time I was a little bit behind, and the boss came around and said: "How much iron is that going to take?" and I said: "I haven't time to figure it up, just throw it on the scales and we will get near enough." He weighed it, and it weighed 75 pounds, so I told him that it would take twelve hundredweight to pour it, and he said: "No it won't take twelve hundred nor even ten hundred," and he proceeded to argue that the pattern must be half nails, and he decided that nine hundred pounds would be an abundance, he could tell that from the looks of it.

The pattern was made up of four thicknesses of 2-inch plank, but the planks had been dressed on both sides, reducing them down to about a quarter scant, and he justified his argument by concluding that it would take a lot of nails to fasten these planks together and the nails would make the pattern heavier than if it had been a block of dry pine.

If by any means we should lose the casting we would have to bury it as we only had a small cupola, and we had no means of smashing such a piece; yet, knowing all this, the foolish fellow would take the chance, and he refused to give me any more than nine hundred pounds of iron to pour that chunk. When I had poured in the nine hundredweight I had it about half full, but having a good big feeding head we got the entire bunch of moulders carrying iron in hand ladles and pouring it down the risor until we had it full. When we came to look at it over next day it was all right excepting that the corners were dupped off a little bit, but the customer accepted it. When we weighed it we found that it weighed sixteen hundred pounds. I would like to have had one on the foreman, but I had no chance as I was four hundred short in my own estimate and he was seven hundred short in his guess, and since the casting was saved we all laughed it off and let it drop at that.

To make a long story short, or a short story long, which ever it might be, the pattern consisted of a frame made from two thicknesses of strips with a plank top and bottom, leaving it all hollow on the inside. If I had taken the time to measure the pattern I would have seen that it would have figured up to 6,300 cubic inches, which, multiplied by .26, would weigh 1,638 pounds, yet the foreman could tell from the look of it that it would only weigh 900 pounds.

The pattern being hollow, we did not get the weight of the wood which should have filled the centre, and consequently we did not get the weight of the iron which would occupy that space either.

Toronto. O. B. SERVER.

The United States Silica Company, Chicago, have issued a bulletin descriptive of their Flint Silica core sand and in particular pointing out the advantages of using a dry sand and applying the oil before mixing in the water.

THE 1920 CONVENTION OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION

The board of directors of the American Foundrymen's Association, at their annual meeting held in Cleveland on Tuesday, January 13, voted unanimously in favor of holding the 1920 Convention and Exhibit of the Association in Columbus the week of October 4.

This unanimous decision was reached as a result of a careful survey of the accommodations and advantages offered by the various cities which had extended invitations.

The Exhibition buildings on the Ohio State Exposition Grounds afford the most extensive and best accommodations that have ever been provided for the exhibits. In addition, adjoining buildings provide all necessary accommodations for lecture halls and meeting rooms, making possible holding all the activities of the Association in one place.

Bearing in mind difficulties experienced in the past in securing satisfactory hotel accommodations, the board gave careful consideration to what Columbus could provide and would guarantee, and as a result were satisfied that the Columbus hotels could and would meet all requirements. The week of October 4th was decided upon as a date when ideal weather conditions would most likely prevail.

Columbus is located practically in the center of the iron and steel industry of the country. A radius of 200 miles takes in all of the state of Ohio, the western part of Pennsylvania, including Pittsburgh and Allegheny, the northern half of West Virginia, the eastern half of Indiana including Indianapolis, and the southern part of Michigan including Detroit and the surrounding territory. A radius of 500 miles, a night's ride, takes in twenty-two states, including every city in which the conventions have been held for the past twenty-five years, with the exception of Boston.

SUPPLYING THE FIRE

The Man of Law—"But, my dear madam, there is no insurance money for you to draw. Your late husband never insured his life; he only had a policy against fire."

The Wonderful Widow — "Precisely. That is the very reason I had him cremated!"—London Passing Show.

Staff Photographer—"I've caught a snapshot of the fleeing criminal!"

City Editor—"Fine! Now take a time exposure of the police chasing him."

The fellow, who isn't fired with enthusiasm, is apt to be fired for some reason.

Excess is an arch enemy of success.

If top-notch effort yields you no happiness, there's something wrong with either yourself or your efforts. Sit down and do some analyzing.

After all, you've got to give full fair value or you won't last.

Various Causes of Grinding Wheel Breakage

There Are Nine Important Reasons Why Grinding Wheels Break, According to the Author of This Article, Which Appeared in "Machine Tool Review." A Perusal Will Prove Worth While

By HAROLD E. JENKS

THE subject of grinding wheel breakage is one which directly concerns every wheel consumer as well as the manufacturer of the product.

Breakage of the wheel affects the consumer as well as the manufacturer of the product.

Breakage of the wheel affects the consumer, since it means danger to the operator and possibly to others in the shop. It also involves considerable expense due to the loss of the wheel itself and loss of time in procuring and mounting another one.

It affects the wheel manufacturer, since it is obviously for his interest to have as few breakages as possible charged up against his wheels, and since, if the cause of breakage is clearly due to manufacturing defects, he will be expected to replace the broken wheel at his own expense.

It is important, then, that wheel breakages should be reduced to a minimum. To do this, its underlying causes should be clearly understood, and it is with the purpose of making these causes clear that this article has been written.

Breakage of a grinding wheel while in operation may be due to any one of the following causes, or to a combination of two or more of them:

1. Centrifugal force due to rotation of the wheel.
2. Direct pressure exerted by the work on the wheel.
3. Heating of the wheel or spindle.
4. Grinding on the side of the wheel (side pressure).
5. Improper mounting.
6. Impact on the side of face of the wheel.
7. Cracks or flaws in the wheel structure.
8. Lack of balance.
9. Initial stresses.

It is unavoidable that these causes should overlap to some extent; for instance, heating of the wheel is a result of direct pressure by the work. It is thought, however, that the list has been condensed as much as possible to still retain the desirable property of clearness.

By "stress," as used here, is meant force acting betwen the particles of wheel material per unit of area let us say in pounds per square inch. Wheel material is much weaker under tensile stress than under compressive stress—that is, a much smaller force will break it if tending to pull its particles apart than if tending to push them together. For this reason, stresses are herein specified as tensile or compressive, it being understood that compressive stresses are not important as sources of breakage. Mathematical proof of statements made regarding the amount and position of stresses in wheels is beyond the scope of this article, and is therefore omitted.

Much importance should be attached to the fact that although not one of the existing stresses in a wheel may be excessive, the combination or resultant of two or more of them may be sufficient to cause breakage.

Centrifugal Force Due to Rotation of the Wheel

In any body which rotates about an axis, stresses are induced at every point due to centrifugal force, which is the force tending to make the body fly apart. In a grinding wheel these stresses are of two kinds: a radial stress acting in the direction of the radius of the wheel; and a tangential stress acting in a direction perpendicular to the radius. Both these stresses are tensile. The tangential stress is much the larger of the two, and reaches its greatest value at the inside of the wheel—that is, around the circumference of the hole.

The radial stress has its maximum at a point from one-third to three-fourths the distance from the face of the wheel to the hole. The amounts of both stresses vary as the square of the wheel speed, which means that if the speed is doubled the stresses are quadrupled. For a given peripheral speed and diameter of wheel, the maximum tangential stress increases slightly as the diameter of the hole is made larger, and in cylinder wheels becomes about 20 per cwt. greater than in disc wheels with ordinary sized holes.

Since a grinding wheel in operation is always revolving, stresses due to centrifugal force always exist; and although it is probable that comparatively few wheels in operation break from these stresses alone, others may easily combine with them and produce breakage.

Reliable grinding wheel manufacturers test all wheels before they leave the factory by running them at such speeds that the minimum safety factor is 2½ and the maximum in some cases as high as 5. As a result of this precaution, practically all breakages that occur from centrifugal force alone can be traced to such causes as shifting thoughtlessly from large to small pulleys, placing large wheels on spindles running at speeds intended for small ones, or substituting for a wheel running at the correct speed one of different grain and grade and lower recommended wheel speed. In other words, these breakages are nearly all due to carelessnes or ignorance on the part of the operator.

Direct Pressure Exerted by the Work on the Wheel

By "direct pressure" is meant pressure on the face of a wheel directed toward its centre. Stresses produced by this pressure are of two kinds—radial and tangential, or frictional.

The radial stress is the same as would be produced by direct pressure, if the wheel were not revolving, and is compressive. It is usually small in amount and is unimportant as a cause of breakage.

Contact between the particles of the revolving wheel and the work produces a frictional force whose amount is proportional to the direct pressure and which is in the direction of a tangent to the wheel face. This force causes bending stresses along a diametral section of the wheel which are tensile on one side of the centre and compressive on the other. These stresses reach their largest value at the face of the wheel, and are usually small and unimportant.

Heating of the Wheel or Spindle

Considerable heat is developed at the point of contact of wheel and work, and in cases where grinding is done dry the wheel may become very hot. The stresses produced by unequal expansion of different parts of the wheel may in this case reach a large value, and many breakages are probably due to this cause. These stresses are similar to those resulting from centrifugal force, and are (as in that case) of two kinds—radial and tangential. THEY MAY VARY GREATLY IN AMOUNT ACCORDING TO VARIATIONS IN TEMPERATURE OF THE WHEEL, AND AN EXACT DETERMINATION OF THEIR AMOUNT IS DIFFICULT, IF NOT IMPOSSIBLE. The greatest tensile stress occurs around the circumference of the hole and hence combines with the greatest stress due to centrifugal force.

Heating of the spindle may be produced by tight bearings on the machine; and if the wheel bushing fits the spindle tightly, expansion of the latter will cause tensile stresses of considerable magnitude in the wheel, which, adding to the maximum stress due to centrifugal force, may cause breakage.

Grinding on the Side of the Wheel (Side Pressure)

Many breakages are directly caused by side pressure, which occurs to a limited extent when work is being traversed across the face of the wheel, but principally when grinding is done on its side. Also, particularly in snagging operations, large side pressure may be produced by grinding on or "working" the corners of the wheel face. The effect of side pressure is to produce a bending stress whose maximum reaches all points of the wheel as it revolves, and which is tensile on the side of the wheel which sustains the pressure and compressive on the other.

Properly designed flanges used on wheels of sufficient thickness are the best protection against breakage due to side pressure. They not only greatly reduce the maximum stress due to this pressure, but prevent its attaining its maximum at the circumference of the hole, where it would otherwise combine with the maximum due to centrifugal force.

Improper Mounting

This subject is of such importance to all grinding wheel users that it is thought advisable to first give the following brief statement of the essentials of correct mounting:

Care should be taken that the sides of the wheel and the sides of the flanges in contact with the wheel are plane surfaces, in order that an even bearing may be secured.

The hole should be of a diameter approximately .005 in. larger than the spindle or arbor on which the wheel is to be mounted, and must be at right angles to the sides of the wheel, concentric with the circumference. No portion of the bushing should project beyond the sides of the wheel.

The spindle should be perfectly straight and threaded in a direction such that any tendency for the wheel and nut to turn will tighten the nut.

Flanges are used primarily to transmit power from the shaft to the wheel, and for this reason the inside flange must be keyed to the shaft. Both flanges must have plane faces at right angles to the shaft, and should be properly relieved —that is, they should be countersunk so as to bear on the wheel only on the part of the side of the flange nearest the rim.

Blotters or some other form of compressible washers should be used between flange and wheel to insure an even bearing. Their diameter should be at least as large as that of the flanges.

The nut should be tightened only enough to properly hold the wheel. Further tightening is unnecessary and undesirable.

Stresses in the wheel due to improper mounting are particularly important because they all combine directly with the maximum due to centrifugal force.

Forcing a wheel on a spindle for which its hole is too small is extremely likely to result in breakage, as large tensile stresses are induced around the circumference of the hole. If the hole is too small, it should be carefully enlarged by scraping until a perfect fit is obtained.

Side pressure producing large tensile stresses may result from any defect in mounting which tends to produce uneven bearing between flanges and wheel, such as bent or broken flanges; projecting bushings; high spots on bearing surfaces of flanges or wheel; flanges not properly relieved; failure to use proper compressible washers; flanges of diffferent diameters, or excessive tightening of the spindle nut.

Impact on the Side or Face of the Wheel

Probably most breakages due to impact are the result of carelessness or ignorance on the part of the operator. It should be borne in mind that stresses in a wheel produced by a suddenly applied force are very much larger than those produced by the same force if applied gradually.

The impact of the particles of the wheel on the work in any form of grinding produces certain stresses in the wheel, but these are carried more by the particles in direct contact with the work than by the wheel as a whole, and are not important as a cause of breakage. Cases have been known, however, where ignorant operators, in order to increase the speed of cutting, have hacked the face of the wheel in such manner as to cause breakage due to this form of impact.

Breakages are sometimes caused by bringing heavy pieces of work into too sudden contact with either the face or side of the wheel. Carelessness in snagging castings suspended from chain hoists, for example, might easily produce breakage of this kind.

In work requiring a table traverse, the headstock or footstock may be run into the wheel, which will cause wheel breakages unless something else gives way first. This is not true impact, but approaches it on account of the suddenness of application of the force, and results in larger stresses due to side pressure.

Catching of the work between the wheel and the rest in free hand operations is very likely to cause wheel breakage. Such an accident may be due to improper adjustment of the rest or to lack of attention or ignorance on the part of the operator, and may have very serious consequences. This is a case of true impact, the speed of application of the force being practically the speed of the periphery of the wheel.

Cracks or Flaws in the Wheel Structure

Wheel breakage sometimes occurs because of cracks or flaws which are in the wheel before it is put in operation. Such defects may be entirely under the surface of the wheel and therefore not visible. Flaws are manufacturing defects, while cracks may be due to faulty manufacture or to various other causes, such as carelessness in transportation, handling, unpacking, or storage.

Due to the fact that the Norton Company uses such extreme care in testing wheels for flaws and cracks, it is practically impossible for a wheel with such defects to pass inspection and be shipped outside the factory.

The "ring" of a wheel, or sound produced by its vibration when tapped lightly with some solid object, is used as one indication of interior cracks or flaws. A wheel with a clear "ring" is fairly certain to be free from such defects, although it has been shown that a poor "ring" does not necessarily mean a defective wheel. Norton Company, however, in order to be on the safe side, rejects all wheels which do not ring clear.

After the test by "ringing" the wheel, all wheels of over 5-in. in diameter are given a speed test at about double the recommended operating speed, as stated previously. This is a very severe test and is practically certain to eliminate defective wheels.

Rigid inspection follows this speed test and the wheels are very carefully packed for shipping in strong boxes made especially for the purpose.

Breakages due to cracks are therefore beyond the control of the Norton Company, since these cracks must occur subsequent to the time the wheels are shipped.

Lack of Balance

A wheel that is out of balance has developed in it stresses of rather complex character. In cases where the lack of balance is very great, breakage may result, either from these stresses or from impact, as will appear below. Lack of balance may be due to several causes, the description of which follows:

Variations in density in a wheel may cause imperfect balance. However, this can hardly prove serious in the case of wheels furnished by any reliable grinding wheel manufacturer, as the homogeneity of structure of such wheels precludes the possibility of a dangerous amount of lack of balance.

If a wheel goes out of true for any reason, it will also go out of balance, since its centre of rotation will no longer be at its centre of gravity. Wheels may go out of true from such causes as a bent spindle, loose bearings, loose frame, improper use, or from the hacking of the wheel face previously mentioned. If a wheel is seriously out of true, it will deliver a series of blows to work thrust against it, thus producing large impact stresses. The stresses due to the centrifugal force of the out of balance portions of the wheel may also become large in this case, and will combine with the maximum due to centrifugal force.

A wheel should not be allowed to stand partially submerged in water or other liquid, for when it is started in motion the wet portion is much heavier than any other and hence the wheel is greatly out of balance. Several cases of breakage from this cause are known.

During the process of manufacture of any solid body, initial stresses are sometimes set up in the material of which the body is composed. Unless great care is used in its manufacture, a grinding wheel may have such stresses existing in it. These may be regarded as incipient flaws or cracks, and may combine with other stresses to increase the maximum stress in the wheel. No method has yet been devised for determining the existence of initial stresses in wheels.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

NEW BALL-BEARING ELECTRIC SAND RIDDLE

The Preston Woodworking Machinery Co., of Preston, Ont., have recently put on the market an electric sand sifter which is meeting with phenomenal success.

The illustration shown gives its general exterior appearance. The electric motor is enclosed in the casing and the electric current is supplied by means of wire, which is connected to any lamp fixture by simply removing the lamp bulb and attaching the wire shown on the machine. The motion of the riddle when in operation is both reciprocating and gyratory, giving it, as near as possible, the human shake of the practical moulder. The one wheel shown will be seen to be on trunnions, which fit into the slot, shaped similar to the letter J. When this wheel is placed as shown it holds up the weight of a portion of the machine, and, by grasping the two remaining legs the machine may be moved about with the ease of a barrow. When placed in the desired position the weight is taken off the wheel for an instant by simply raising up on the machine so that the trunnions may be shoved out of their bearing and allowed to go up into the upper part of the slot. The machine will then rest on three solid bearings.

BALL-BEARING SAND RIDDLE

This machine not only riddles the sand for the moulders when moulding but is a great saving when preparing the sand after a heat. Scraps of core as well as of iron are removed with ease, and the gaggers, while being separated from the sand, are at the same time smashing up the lumps of dry sand, making it much easier to be tempered and cut over.

For mixing core sand or facing sand it is ideal. It can also be used to advantage in preparing the cupola, and if required, can be taken outside the building entirely. The machine is fitted with ball bearings throughout.

A NEW SAND BLAST HELMET

A new sanitary blast helmet has recently been put on the market by J. A. Spangler, of Benton Harbor, Michigan. The main features of this new helmet are that it is made of aluminum, is of light weight, weighing only 22 pounds, and it is durable. It is strictly sanitary, constructed throughout of non-rusting material, which permits it to be scalded with hot water or steam after the day's work is finished, which makes it clean and pure for the next day's work.

It is so constructed that it is comfortable to wear.

The vision opening is so constructed as to allow the operator a clear view of his work at all times.

While a sand blast helmet is, as its name would imply, essentially an adjunct to the sand blasting machine, it has other fields of usefulness, equally as important.

For instance, in the matter of picking out the cupola it fills a long felt want. If there is any one job more than another in the average foundry which is exceptionally disagreeable to the workmen, it is this very job. It is not always advisable to wet down the inside of the cupola to an extent sufficient to settle all the dust as the mud thus formed is a nuisance and the humidity of the atmosphere after wetting the hot bricks is almost unbearable to the workman. By putting on the helmet, the hose attached to it supplies fresh air and the workman can go anywhere, no matter how bad the dust is. Shaking out hot molds and digging out dusty pits are all included in the jobs which require protection for the workman.

SANITARY SAND-BLAST HELMET

TO FIND THE MELTING POINT OF ALLOYS

The melting point of alloys which melt at a low temperature may be found by tying a small wire to a piece of the alloy and suspending it in a pot of water which is gradually heated. A thermometer is kept in the water, and as the temperature raises the thermometer is watched until the alloy melts. This temperature is noted as the melting point of the alloy.

As 212 degrees Fahr. is the limit to which water can be heated, paraffine wax is substituted for alloys which require a temperature above 212 degrees.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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CONTENTS

The Business Outlook

FOUNDRY business throughout Canada never was better and prospects for the future never were brighter than they are today. Take a trip through any of the industrial centres and the story is always the same,—Lots of work but good men scarce, and coke and iron hard to get with prices soaring out of reach." It is remarkable how the demand regulates the price. It would not appear to cost any more to produce pig iron on Tuesday than on Monday but strangely enough the price raised about three dollars per ton during that short spell. However, the prices are away up, but prices do not appear to count for so very much now.

In Galt for instance all the foundries are rushed. One establishment has an order for a rubber tire plant equipment requiring seven hundred tons of metal. Another establishment has an order for the equipping of a match factory in Quebec Province, and will be rushed until about July on this work. Another is making ponderous ammonia compressors, enormous Corliss engines, etc.

All through the city can be seen machinery of every description and of immense proportions being turned out. All over the country the same thing prevails. When we take into consideration the fact that one company alone is spending a million dollars on a plant to manufacture automobile tires at Kitchener, and that a Montreal concern is doing a similar act and that one in Toronto is being enlarged to about double its capacity, all for the manufacture of one article—the automobile tire—it shows the confidence which investors have in the future of Canada. Other lines, of course, are booming in proportion. Perhaps it is not generally realized what the tire business means to the foundry over and above the original fitting out with machinery. Every tire is made in a cast iron mold with a cast iron core, and these molds and cores have to be made of specially prepared iron and fitted up with the greatest of care and at best they are very short lived, so it will be seen that there is something for the foundry in this one item alone.

All told the spring of 1920 is opening up under the most favorable auspices for Canadians of all walks in life, not omitting those of the foundry, and it is to be hoped that the foundrymen will see their way to offer their men something encouraging and that the men will be sane enough to accept it and put an end to this nonsensical strike situation which has been pestering the country during the last year.

One encouraging feature of the Spring opening is that if last year's strike can be patched up before the end of April, May day should be ushered in with tranquillity and peace should reign supreme throughout the year. A few lessons to be learned from the strike might save a lot of trouble in the future. For instance, an old saying is that "More flies can be caught with a pint of molasses than with a barrel of vinegar," meaning that a little bit of sweet talk will accomplish much more than volumes of the other kind, and it is true.

A prominent foundryman told us a few days ago that he had tried to have a settlement with the molders but that every time they had a conference it ended with a row. Of course, he did not say who started the row, but presumably it was the other fellow. They must have been using the vinegar instead of the molasses. "Peace on earth, good will toward all men" and "Do unto others as we would that others do unto us" are two noble mottoes and if acted upon will yield results. Let us have no industrial strife this year but let us take advantage of the wave of prosperity which is coming our way and make business hum this coming year.

Is a Strike Justifiable?

IT is not our purpose to uphold the strike as a means of bettering the working man's condition as we know as well as the workman does, and his employer also, that a strike is a most undesirable last resort, when all other means fail, and that it should be discouraged by every possible means. Neither is it our intention to belittle the medical man, but as a medical man has spoken in a belittling manner regarding the working man and has spoken of the strikers as being foes to every form of Government the question might be asked, "What would the medical men do if their demands were refused?"

The doctors, not so long ago, charged one dollar per visit, but there are few of the one dollar variety to-day Now supposing when the doctors raised their rates, what would they do if the public refused to pay them? They would simply laugh at the public and if a patient found it necessary to call a doctor, he would find it equally as necessary to submit on the question of price. The doctor sets the price and the public pays it, and the law sees that they do. In the case of the working men they set their price and name their conditions and submit them to the employer, who does not accept them, with the result "a strike." The working man does not have the law to back up his demands, so he backs them up himself. The law might easily be arranged so that it would bear upon all classes alike. If it is felt that in the interests of the public the doctors should be protected, the law should be so arranged as to have their prices set for them. As it is their fees are out of proportion to the income of the average man who has to pay them. The same thing is the case with all professions. They set the price and the public pays it. The working man is about the only man who is held up to ridicule if he opens his mouth about such matters. The working man is apparently supposed to have the price set for him on the only thing which he has to sell and also on everything which he has to buy.

Now as regards the strike question, we have to admit that it has its justification side, but on general principles it is hard to recommend it as of practical value excepting in extreme cases. Arbitration would seem to have all the points of quality which can be found in the strike, and it does not leave either party under the stigma of defeat. Of course if the employer says there is nothing to arbitrate, then we know there is something which he is trying to conceal, and more drastic measures are in order in his case, and if the workmen put up the argument that arbitration boards always opposed the working class then we know that they have something up their sleeves, which will not stand fire when put to the test. What we will always advocate through the columns of this "our only great Canadian Foundry Magazine" is that the employer and the employee must be on the same side, and then the ideal "one big union" will have been accomplished.

The Unskilled Laborer

Dr. H. A. Garfield, ex-Fuel Controller of the United States, in addressing an audience at the Young Men's Canadian Club, in Montreal a few nights ago, said: "There is a deadly foe to every form of Government," and in the course of his remarks dilated himself on the wits of organized labor and of the working class in general and capped his argument by expressing himself thus: "I hold this to be the time that the unskilled laborer has no moral right to demand wages to do more than support him and himself alone in good health and working conditions."

Had he said "himself and his family" it would not have had quite such an unsavory touch to it, but to specify "himself alone" would indicate that the laborer is to have no wife and no family.

This coupled with the generally accepted argument that automatic machinery would ultimately do away with skilled workmen, would place all workmen in the ranks of the unskilled and consequently of the unmarried, and families would only be for the elite, and when the unskilled operators of the automatic machines have finally passed in their cheques and journeyed on to their reward, leaving no families to fill their positions, the elite families will, of course, find it first an enjoyable pastime to take an "automatic" and crawl down into a mine or a sewer or wherever any laboring is to be done, and start the "Automatic" doing it. But why continue?—This condition will never endure. It is men of the type of Dr. Garfield who invite violence. If an attempt is made to force the working man into the position advocated by Dr. Garfield, the working man is perfectly justified in demonstrating his powers, but fortunately there are few sane employers of labor who are of this ilk. The shrewd business man boasts of his willingness to pay good wages and do everything in his power to improve the conditions of the working man if the working man will co-operate with him, and this is the condition which everyone should strive to bring about. Machinery will certainly lighten the burden of the working man and shorten his hours of labor as it has already done to a very great extent. Life is not what it was last century, when everything was done by hand and long laborious days of toil were necessary to sustain life. Machinery will, of course, reduce the necessity of the skilled workman in some channels but it must not drive him out of existence. There is plenty for everyone to have his share of happiness, and while we do not consider that the laborer is entitled to the reward which is due to the man who exerts himself and endeavors to be of more value to the community, we certainly consider it insane to speak of paying him off with a wage which will simply support "himself alone" and keep him in such a physical condition as will enable him to do a good day's work for some more fortunate one to reap the benefits from, and still more insane to expect him to accept it.

It is regrettable that any boy should be allowed to grow up in the 20th century with no other ability than that of a laborer, but there are other ways of viewing it. Supposing the working class all became professional men, who would do the work?

The profession to which Dr. Garfield belongs certainly takes good care of itself. The medical fraternity is without a doubt the strongest organization in the world, with the law of the land at its back, and they use it to the limit for their own advantage, and yet one of their number would propose throttling the working class, and speak of them as deadly foes to every form of Government because they make demands which they consider that they are entitled to.

The Old-fashioned Home

THERE is one place I like to go, of that there place I'll write—it's got your fancy dangled homes knocked higher'n a kite. To enter there's a tonic sure for every aching bone, that place is sure a wholesome one—a real old-fashioned home.

You seem to feel the home-like stuff before you're quite inside, there's not a touch of snobbery, of jealousy or pride.

They haven't got those spindley chairs you fear to sit upon, nor the paper tinted to a shade betwixt the night and dawn. And cushions ain't piled up in hills, just to be squinted at; what's more, there is no Turkish rug nor Oriental mat.

But everything seems just to say, it talks as plain as mud, "Just come and rest your carcass here, you great big weary dub. It doesn't make no odds to me how hard or fast you sit, or whether you wear silk-lined gloves or just a home-made knit."

Perhaps the carpet's just as plain, 'twas rag made hit and miss, but it beams and shines and seems to say, this is a place of bliss. Folks like to joke about the words in mottoes on the wall, and 'bout the peacock feathers stuck resplendent in the hall. And if a spot appears upon the carpet by a chance, the folks don't throw a fit right off, or pass into a trance. It aint a very serious crime, it really aint, by heck—to spot a place upon the wall where flies have left a speck.

But sweet content is campin' there—it comes in like a flood, and you couldn't chase it out again with a broomstick nor a club. Let's toast the good old-fashioned home, with its dear old-fashioned airs, unspoiled by touch of higher art, nor cursed with three-legg'd chairs.—ARK.

CARELESSNESS

From "National Safety News"

Born several thousands of years ago.
I am always on the job.
You see the results of my work everywhere.
My work is to "get" you—kill you or maim you.
You all know me; I am everywhere, in every shop,
On every job, in the parks, and in the home.
I am Carelessness.

If a little knowledge is dangerous, where is the man who has so much as to be out of danger? Use our Library and Information Bureau as a "Safety" measure.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question.—I use a muriatic acid solution as a pickle for steel. Generally, we experience no difficulty from rusting during subsequent handling prior to plating. If, for any reason, the operator is prevented from maintaining a regular and continuous passage of the work through the dips and baths, the pieces which accumulate from the pickle become very rusty and require a great amount of labor and time to restore to a condition suitable for plating. We have tried to avoid the trouble by using common soda ash solution at various strengths, but the results were not satisfactory. May we obtain your help?

Answer.—After the pickled steel is removed from the pickling solution, rinse thoroughly in cold running water, then immerse the steel in a solution of lime water made by adding 8 oz. of lime to each gallon of water used. Slack the lime before adding to the water. Allow the steel to remain in the lime water a few seconds, if the solution or the steel is kept in motion during the treatment it will assist in obtaining best results. Remove from lime water, rewash in cold water and place in a boiling solution of soap and water. The soap solution will form an invisible coating over the steel which will prevent rusting for several days. The durability of the soap film depends upon the amount of soap used per gallon of water and also upon the nature of the soap. Whale oil soap is often used. Oakite No. 2, together with a good soluble oil, is also employed. Keep the soap solution near boiling point when in use and and allow the steel to dry off by evaporation only.

Question.—How can we produce the "Old Brass" finish on electrical fixture chains which have been brass-plated, without application of brush as is usual in the production of "Old Brass" finish?

Answer.—Tumble the chains in maple sawdust moistened with a little coal oil. Use medium grade of pulverized pumice with the sawdust to effect the correct deadening of lustre. Only a little pumice will be needed. Water may be used instead of the coal oil if the use of latter causes extra labor in subsequent preparation for lacquering.

Question.—I wish to obtain some information about the production of a pea-green finish direct on brass. The final finish must be lustrous to a certain extent. A dead finish will not meet our requirements. The greens which I have obtained thus far are not such as can be produced commercially with profit. The article to be finished is a brass casting in tablet form and has a very simple design on face side.

Answer. — Polish the surface of the casting, then treat with pumice and water to produce a dull surface. Use a tampico brush as medium for application of the pumice, or a stubby circular brass wire scratch brush will suffice. Now wash the casting and immerse same in a solution composed of copper nitrate, 4 oz.; chloride of lime, 4 oz.; ammonium chloride, 4 oz.; water, 1 gallon.

A momentary immersion is sufficient, remove and allow casting to dry in the air. A green color will form, now stipple the surface just a little with a bristle brush which may be merely dampened with clean water. This treatment produces the variegated tones which are essential to correct appearance of finished article. When well dried, lacquer in ordinary manner and then apply a thin coating of wax by using a soft buff or fine circular bristle brush. In this manner a semi-lustrous finish is obtained which is very attractive.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1919-1920.

President—Mr. John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—Mr. T. G. O'Keefe, 147 Dupont St., Toronto.

Secretary-Treasurer—Mr. O. Holtham, 328 Carlton Street, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—Please furnish me with a formula for a nickel solution which may be used in mechanical plating apparatus employed in plating direct on small steel articles. I want a durable deposit of moderate lustre, and white in color.

Answer.—Use a voltage of at least 5 volts. See that all connections are clean and contacts perfect. Use a cylinder with suitable perforations, at correct speed for the work to be treated. Keep anode surface large and do not allow slime to accumulate in bottom to a depth sufficient to cover lower ends of anodes. This is a careless practice and not only reduces the volume of the solution but creates a dirty condition which results in poor results generally. The solution we suggest is: Double nickel salts, 10 oz.; single nickel salts, 4 oz.; Epsom salts, 4 oz.; water, 1 gallon. Dissolve the nickel salts in boiling water and add the Epsom salts. We would advise giving each batch of work longer treatment than is usually suggested by manufacturers of mechanical plating apparatus. You will have to determine the exact time by experiment. Some forms will permit of longer treatment than others. Proper loading is also an important factor in avoiding difficulties which arise from tumbling action of the articles being treated.

Question.—Our nickel plating plant has been unusually busy during the past four months and we note that the nickel solutions which are made from the double nickel salts give us much more trouble than one which we made from the single salts of nickel. The greatest trouble is peeling. We have built the solution up repeatedly, but it soon becomes troublesome. We will admit we are crowding all the work possible through the solutions and must continue to do so for an indefinite period in future. Should we use larger proportions of conducting salts or make addition of metal salts more frequently? This latter method appears to us as being a very expensive method.

Answer.—You have correctly judged the cause of the short life of your double salt nickel solution. There is a limit to the powers of any solution, and during the same period in which the double nickel salt solution was originated and successfully used, there was no reason to desire more rapid plating. Recent years have introduced causes which have created an almost feverish condition in the plating world, and overcrowding has been the direct result. Then came the effect known as commercial nickel deposits. This term signifying thin films hastily deposited on poorly-prepared surfaces. If you must continue to overwork your nickel solutions, we would advise frequent and regular attention with respect to maintenance of correct metal content. The additions of metallic salt should consist of the single salts instead of the double salts. Neutralization to be effected by use of moist nickel carbonate. A density of seven degrees or eight degrees Beaume will prove satisfactory if the temperature of the solution does not get lower than 65 degrees Fahr. 70 degrees to 80 degrees is a very safe range to work with. Some platers are using nickel chloride with splendid results, but for your purposes we believe you will succeed without the extra expense which this chemical entails. Keep your anode surface large and in good condition.

Question.—May I ask you to kindly publish a formula for a copper solution which would be suitable for plating steel sheets and steel tubes of various sizes but of uniform shapes? A solution which will produce moderately heavy coatings quickly is desired.

Answer. — A warm cyanide copper solution will meet your requirements nicely. Use a sheet steel tank equipped with iron steam coil and keep the solution at a temperature of about 150 degrees Fahr. Use a voltage of 5 to 6 volts and a current density sufficient to produce a velvety matt copper surface upon the work in 10 to 15 minutes. Place steam coils at side of tank instead of on bottom and do not allow ful pressure of steam to enter coils while the solution is in use, thus avoiding violent circulation of solution and attendant troublesome effects when solution becomes slightly charged with insoluble matter from various sources. The solution is made by dissolving 10 oz. of sodium cyanide per each gallon of water required and then adding 4½ oz. of plastic copper carbonate per gallon of solution. Dissolve the carbonate in a portion of the solution contained in a stoneware crock before adding to the plating tank. Electrolyze for a few hours by using a very small cathode and large volume of current. Test for deposit by using a piece of sheet steel. If color is pinkish and the deposit smooth and uniform, clean and adherent, proceed to use for regular purpose. Watch anodes, if they become black after short period of operation add more cyanide; if deposit becomes streaked or has brown patches, add more copper carbonate dissolved in cyanide. Occasional additions of cyanide will be necessary. Carbonate will not be required after solution is once working properly if cyanide content is maintained at proper point and the maximum current density employed.

READERS' QUERIES AND COMMENTS

Editor, CANADIAN FOUNDRYMAN:

On the cover of your January issue was an advertisement which was really as good as an editorial article. And while it was primarily an advertisement for a brand of sand, it contained three points of interest, which are of inestimable value to core makers, and to a considerable extent to other members of the foundry fraternity.

One feature is that pure silica is the best material to make a core from, which point I am prepared to back up from my own experience. Another exceptionally valuable point which I never conceived of, and which is simple to see through, is that to mix silica sand with a certain percentage of oil, and the balance with water, the sand should be dry and should be thoroughly mixed with the oil first, after which the water is to be introduced. If the sand is wet the oil does not get a chance to take hold of it and a great deal more oil is required.

The other point is the man who discovered this read his trade paper and got himself posted on what was already known and then he proceeded to work from this knowledge. I can agree with the idea of reading the trade papers, particularly when you get so much valuable information for so little money, and in my own case I have received actual value from reading that advertisement. I believe that as much is gained by reading the advertisements as from any other part of a magazine.

The Editor: Can you give me information regarding a coated string which may be used for venting crooked cores, and can you recommend the idea, and will you explain how to make it?

Answer.—This material is for sale by most foundry supply houses and can be bought for less than you could make it for, unless you went to a lot of expense It consists of a fine string covered with wax. It can be placed in the core while the core is being made and can be made to fit around any shape. It is left in the core, and when the core is being baked the heat melts the wax, which is absorbed by the core sand, leaving a full-sized vent hole with a fine cord in it, which soon burns out, leaving a clear passage. This material is advertised in CANADIAN FOUNDRYMAN under the heading of "Vent Wax," and I certainly can recommend it.

FOUNDRYMEN'S ASSOCIATION SANITATION CODE—*Continued*

(The Code agreed to by the A.F.M. in 1917)

K4.—No locomotive, while discharging smoke, shall remain inside a foundry during working hours except during such periods as may be necessary for its entrance and exit, but this regulation shall not apply to locomotive cranes or steam charging machines.

K5.—No foundry in which zinc-bearing metals are melted or poured shall hereafter be installed in a room less than fourteen (14) feet in height from the lowest point of the ceiling to the floor, except that where the roof is of peak, saw-tooth, monitor or arch construction the minimum height of the side walls may be twelve (12) feet. If such foundry is installed in the front part of the building the ceiling shall be in every part not less than six (6) feet, six (6) inches above the curb level of the street in front of the building, and if such foundry is installed entirely in the rear part of a building or extends from the front of a building to its rear, the ceiling shall not be less than three (3) feet above the curb level of the street in front of the building and the foundry shall open on a yard or court which shall be not less than six (6) inches below the level of the floor.

K6.—If, after this safety code is approved, the operation of any foundry in which zinc-bearing metals are melted or poured shall be discontinued for not less than fifteen (15) consecutive days, it can thereafter be reopened for the same purpose only by complying with the provisions of Section K5.

L1.—No female shall be employed in a foundry unless upon examination by a competent nurse or physician it has been determined that she is of normal health, size and weight.

L2.—No female employed in a foundry shall lift any object exceeding thirty-five (35) pounds in weight unless she uses mechanical means by which her physical effort is limited to thirty-five (35) pounds.

General Regulations

M1.—Regulations affecting industrial establishments generally in respect to the safeguarding of transmission machinery, miscellaneous machinery, elevators, stairways, platforms, or relating to sanitary conveniences and first-aid equipment, not included in this code, shall apply with equal force to foundries.

N1.—This code may be modified or suspended in whole or in part by the proper state authority in respect to existing foundries if good and sufficient reason therefore is submitted.

Recommendations

O1.—Accident prevention will be encouraged by the formation of safety committees among the men. All foremen should take a personal interest in accident prevention and are expected to set an example of carefulness.

O2.—Strict enforcement of workshop regulations is one of the best methods of accident prevention.

O3.—It has been proved that 75 per cent. of all accidents can be eliminated by educational methods; therefore, the use of bulletin boards, motion pictures, safety meetings, and suggestion boxes should be encouraged.

O4.—First-aid kits should contain: One 2-ounce bottle castor oil for eye irritations. Two 3-ounce tubes of burn ointment (3 per cent. bicarbonate of soda in petrolatum). One 2-ounce bottle 3 per cent. alcoholic iodine as an antiseptic for injuries that bleed. One 2-ounce bottle of white wine vinegar for nose bleed and as a neutralizing agent for alkaline burns. One 2-ounce bottle 4 per cent. aqueous boric acid, an antiseptic eye wash. One 2-ounce bottle aromatic spirit of ammonia for headache, nausea, dizziness, heat prostration, and where spirituous liquors would otherwise be used. One 2-ounce bottle Jamaica ginger, 73 per cent. of alcohool, 25 per cent. ginger, for cramps, bowel pains, chills, etc. One piece of flannel 24 by 36 inches, for use as a soft bandage. One and one-half ounces of absorbent cotton in roll. One 3-inch x 10-yards gauze bandage. One 2-inch x 10-yards gauze bandage. Two 1-inch x 10-yards gauze bandage. One spool, 1-inch x 5 yards, adhesive plaster. Six sealed packages 6 x 36 inches, sterile gauze. One tourniquet. One pair scissors. One pair tweezers. One triangular sling. One wire-gauze splint for fractures. Twelve assorted safety pins. One teaspoon. One metal cup. One medicine glass. Two medicine droppers (one for boric acid and one for castor oil). Three paper drinking cups. Supply of first aid record cards for notifying doctor or other responsible party of any wounds dressed by first-aiders, to assure follow-up attention.

O5.—A room should be provided and kept in sanitary condition for employees' use to eat their meals.

Scraps from the Foundry Scrap Pile

J. S. Tail, of J. S. Tail & Co., Limited, Vancouver, B. C., has purchased all the stock of the Vancouver Pipe and Foundry Company of that city.

The Three Rivers Steel Foundry, Ltd., are making considerable extensions, and installing new machinery at their plant at Three Rivers, Quebec.

The United Iron Works and Machine Co., Haileybury, Ont., are investigating different sites, and when one is secured, will erect a foundry at a cost of $75,000.

Wm. Kennedy & Sons, Ltd., Owen Sound, are making large extensions to their plant and will engage more extensively into the manufacture of marine machinery.

The Gates Refractories, of Montreal, have opened a Toronto office in the St. James Chambers, at the corner of Adelaide and Church streets, in charge of J. F. Alexander.

The Galt Foundry Co., Galt, Ont., are building a large addition to their plant, and will manufacture sprinkler stokers, etc. They intend, before long, to make further extensions to their buildings.

The Erie Stove and Manufacturing Company of Canada, Limited, has been incorporated to manufacture heating apparatus, etc., at Montreal, Quebec. The leading figures in the enterprise are Frank B. Common, Francis Bush, Herbert and W. Jackson, and the capitalization is $200,000.

The R. McDougall Co., Galt, Ont., are making a number of extensive additions to the plant. Two large three-storey storehouses and a large new elevator shaft are the principal additions to the buildings. In the foundry they are preparing to move the cupolas to a more suitable position and erect large all-metal charging floors.

The Preston Wood-Working Machinery Co., Preston, Ont., manufacturers of patternmakers' and other woodworking machinery, electric foundry riddles, snider mills, etc., are preparing plans for a hundred-foot square extension to their plant which will be proceeded with as soon as the frost is out of the ground in the spring.

This company have only recently entered the field of foundry equipment but are meeting with satisfactory responses from the trade. They are also doing a fairly large export trade in their woodworking machinery, mainly to Great Britain.

The Canadian General Electric Co. of Peterboro, Ont., contemplate spending between $600,000 and $1,000,000 on new buildings and new equipment. This will include a moulding shop. Work is to commence on the new building in June, and, when completed, will add between a million and a million and a half to the Peterboro' company's payroll.

The Massey-Harris Co. has acquired property, including 100 acres of land, at Weston, Ont., and will erect more buildings and embark into the manufacture of gasoline tractors and other farm implements in that town.

Will Build Foundry.—A building permit has been applied for by the Dominion Steel Products Company, Brantford, for the erection of a new foundry at a cost of $55,000. The building will be 160 feet by 100 feet.

Hamilton.—W. B. Champ, president of the Hamilton Bridge Works Company, says that owing to the exchange situation they may find it necessary to close the plant, since the price of material that must be bought in the United States is almost prohibitive with the exchange added. Other local firms are also hit hard.

Galt Plant Grows.—For the third time in four years Galt Brass Company has found it necessary to enlarge its plants to handle increased business. Plans have just been prepared for a new foundry building 138 by 58 feet and an extension to vitriol plant 90 by 40 feet. Both buildings will be of concrete, steel and brick construction, and work will be started as soon as weather permits.

Malleable Iron Plant Burned.—The main building of the malleable iron foundry at Merrickville, Ont., owned by T. G. Kyle, was destroyed by fire on January 27, with a loss approximating $20,000. It was partly covered by insurance and will be immediately rebuilt and put in operation. An interesting story could be told of the early history of Merrickville if some interested Merrickville citizen would take the trouble to advertise his town, as it was here that the first malleable iron foundry in Canada was built, and it was for a number of years the only one in Canada. In addition to the Kyle Malleable Iron Works, this town supports another good sized iron works, the Percival Plow and Stove Co.

Damage to the extent of $65,000 was caused to the plant of W. J. G. Grey, corner of Esplanade and Church Street, Toronto, by fire of unknown origin between 6 and 7 p.m. January 26. The company manufactures flour mill machinery as well as bakery and other machinery and were very busy at the time of the fire. A large new addition to the plant was being erected, the joists of which were in place, but the floors were not laid, and Fire Chief William J. Russell, head of Toronto's fire-fighting forces, nearly lost his life by falling between the joists. Several other firemen were more or less severely injured, but none seriously. The plant will be rebuilt at once, but in the meantime 150 hands will be temporarily unemployed.

The Chicago Flexible Shaft Company opened a New York office, February 1st, for the distribution of their furnaces, forges and heat-treating equipment. This office will be located at 350 Broadway and will be in charge of J. W. Lazear, formerly with the Brown Instrument Co. of Chicago.

The Mead Morrison Mfg. Co., East Boston, manufacturers of hoisting and conveying machinery, have purchased the plant of M. Beatty & Son, at Welland, Canada. The Canadian plant occupies about nine acres of land and heretofore has been engaged in the manufacture of hoisting and dredging machinery. It will be operated by the Boston company as a Canadian branch and such alterations and additions will be made as are required to adapt it to the new work.

Messrs. Hall and Pickles, 64 Port St., Manchester, England, have issued a booklet descriptive of their well-known "Hydra" brand of high speed tool steels. An account is given of the different brands of tool steels made by this firm and the work to which each is adapted, together with instructions for heat treatment. The major portion of the booklet is given over to data relative to high speed steel and tables listing sizes and shapes carried in stock. A valuable feature is seen in the excellent tempering chart and chart of heat colors, which have evidently been prepared with considerable care.

The Taylor Instrument Companies, Rochester, N.Y., have issued the 1919 edition of their General Industries Catalogue of Tycos instruments. This catalogue lists the temperature instruments manufactured for the requirements of manufacturing and industrial operations. Thermometers of all types, hydrometers, viscometers, pyrometers, both indicating and recording, temperature control apparatus are listed, and a valuable feature of the catalogue which will commend itself to the engineer is thirty-two pages of ready reference tables applicable to industrial uses.

Foundry to Rebuild.—Fire which broke out in the main building of the Kyle Malleable Works, Merrickville, gutted the interior of that part of the foundry completely. Total destruction of the entire plant was prevented by the well-directed efforts of the volunteer fire brigade and for some time it was questionable whether they would succeed in saving the remainder of the building. Mr. Kyle states that he will have the works in operation again in three weeks. He does not intend to rebuild the building to its original height—three stories—but will construct a more modern plant, housed in a one-story structure. The loss was heavy but is fairly well covered by insurance.

Some Interesting Remarks on the Use of Oil

Extracts From a Paper Read Before the Institute of Petroleum Technologists

By SIR PHILIP DUMAS, C.B.

IN JULY, 1912, I was sent for one morning by Lord Fisher, and told that he had selected me to serve as the principal secretary of the Royal Commission on Oil Fuel and Engines. I knew nothing of the subject whatever, but Lord Fisher was enthusiastic, and as he has always proved right in the long run, I accepted. That afternoon I got hold of Sir Boverton Redwood's book and others, and passed some of the most fascinating hours of my life in the realization of the importance of the subject, and that I had happily come in touch with probably the greatest existent factor for sound economic advance and efficiency in many of the engineering problems of the future, and that here was a real help towards Buckle's third great cause for the decline of the warlike spirit in producing better means of locomotion.

On the other hand, I also realized, and almost as quickly, that never had a splendid natural source of power been so inefficiently sought for and controlled, that although to be found everywhere, the supply was comparatively limited in volume, was being wasted, and that as things were, even then it could not last, and I may go as far as to say that during the progress of the Royal Commission, by much evidence from the greatest authorities on the subject, these opinions of mine were constantly fortified.

It seems to me that anyone with a grain of imagination can foresee motor launches, motor lighters and motor lorries at work in tens of thousands before long, and at the same time liquid fuel will be required for shipping, oil engines and the huge number of motor cars and aeroplanes which but a few years will see in the possession of everyone.

Meanwhile and for the near future the value of oil for the advance of civilization and the increase of production is such that the most minute and systematic search should be made for it everywhere. Are we making such a really systematic study of the sources of crude oil in the world, or indeed training and employing a sufficiency of geological experts to carry out the work? I fear the answer can be but no, and yet there are thousands of able and adventurous young men in England with brains to be trained and used, and you should do it.

Also can anyone doubt that there are vast fields of oil yet to be located? Why, twice in my life, once in the Indian Ocean and again on the West Coast of Africa, I have steamed through oil, and the atmosphere reeked of it. It is up to the great and wealthy companies—thank God for competitive monopolies and capitalists—to search for and locate the sources.

And we know of and suspect vast deposits of shales—hundreds of thousands, probably millions of square miles of such deposits of great depth: indeed an enormous and overwhelming source of power to be tapped and used, and used economically. Are the great oil companies preparing for the inevitable future exhaustion of their fields by purchasing these, and carrying out systematic research in good time into the most economic method of extraction of the oil and its use? Of course I know that a great deal has been done in this direction, and even now companies are exploiting the shale fields of Great Britain in many localities, but one wants it on a larger scale, and above all, to increase our production at home. The Dorset shale we know produces good and useful oil, which, with some of the sulphur extracted, can be mixed with purer types and so used to advantage.

Shortly, very shortly, the owners of all ships and engines will realize its efficiency and present cheapness, the cry will arise for it everywhere, and there is only one-twentieth of our requirements. So again I say, put your army of experts—a very small army at present, I am afraid—on to systematic research as regards shale, and it will prove well worth your while. Indeed any system of production of oil will unhappily be eventually well paid for by the war. This war has been largely waged on oil. The next one will be nearly wholly so. and Bismarck's dictum of "Blood and iron" brought up-to-date would read "Blood and oil." Therefore yet once again I say. Find and conserve your oil, and in so doing it may well prove that you will preserve your country—this England, which, with a heart of oak and set in a silver sea, quite naturally requires something of the creosote type to keep it sound.

Here indeed is the type of engine of the future, and is it really true that we cannot get the internal-combustion engine on a large scale? Literally I do not believe it, and I beg you not to listen to the despairing tones of our experts who say it is impossible. Remember that the very fact of being an expert means that he has gained in experience and lost in imagination, that few are young men, and to those the future belongs, and further, let your memories revert to that very instructive sermon preached from the stage a few years ago and called "Milestones." I beg you to preach its advent everywhere, and do not mind if people deem you foolish. Of course, it has got to come, and it will come, and with its arrival will cease the abominable scandal of wasting precious oil by burning it under boilers.

Preach its advent sufficiently, and with it the inventor will arise: one comparable with Watts, and a greater than Sir Charles Parsons, and incidentally he will command what I saw called the other day, a Rockefeller fortune. Largely owing to the lack of a suitable internal-combustion engine for merchant shipping I compute that roughly a hundred million sterling per year is wasted, and something like a half of all the oil produced in the world is clean thrown away. Of course it would be easy to produce figures in support of what I say, but no one listens to or understands them, and indeed it is wise, considering how easy it is to manipulate them.

But indeed, and indeed it is true that the advent of the internal-combustion engine will save vast sums, and when one thinks over the vast waste of value, power and efficiency in burning oil to raise steam, it should reduce all the happy owners of oil to tears; that is unless they are ignorant of the fact that their fortunes are being thrown away. To you who do understand I would say that in the intervals of weeping you should constantly ponder over the realization that with its arrival on a really large scale, the life of your oil fields, and incidentally your fortunes, may well extend to the neighborhood of another hundred years.

With that pondering will come the determination to forward the development of the internal-combustion engine, but for heaven's sake get on with your pondering and let the solution of that, as with all other great advances, come from Great Britain.

Up to date I am given to understand that the big experiments are still in the hands of the Germans and other foreigners. The Germans! Good God!! I know Germany and the Germans through and through, and man for man, you are better than they are in geology, chemistry, and engineering in just as great a degree as you proved to be in fighting. Realize that fact, and endow and employ young Englishmen—or as it is a case of an engine perhaps I had better say a Scotsman—to devise and develop this great want of the world.

Recollect that there is no time to lose. Already the Germans, Dutch and Danes have had a measure of success, and meanwhile there is no actually all-British internal-combustion engine on the market at all. And yet you have in England to-day—I hope in this room—probably the greatest living expert on the subject, whose brains and experience are worth millions to any one or group of you who is wise enough to catch him at once. When you leave here to-day I beg of you to try and find out what have been the profits of that admirable firm called Burmeister and Wain in the past few years, and form a similar British firm and make your own millions. If I had any capital—but for thirty-seven years I was an underpaid naval officer, so, of course, I have none—I would make them myself. Believe me they are just waiting for the first of you who is wise enough to pick them up.

There is No Universal Panacea for Unrest

Personal Observations of W. R. Basset, President of Miller, Franklin, Basset & Company, of 347 Madison Avenue, New York City

QUACKS want us to believe that there is a magic formula which can be invoked to cure all of the labor diseases in whatever plant or part of the country they may be found. Some have secret processes guaranteed to bathe the face of the erstwhile discontented workman with peaceful, beatific smiles of content.

One demonstrates how pretty five-room cottages with a trellis and a garden hose undoubtedly made self-satisfied, hard-working pillars of society out of I. W. W.'s in a certain town. Another proves that in an Ohio factory the men settled down to a life work of making the boss happy as soon as they were given a voice in the management of the business. And so it goes through the whole list of the cures, whether they be profit-sharing, old age pensions, collective insurance, lunch rooms or baths.

The deuce of it is that every one of these cures have been effective in many plants in bettering the temper of the men. But in many other plants, the same methods have failed miserably.

The trouble is age-old. It is another manifestation of the belief in panaceas, the philosopher's stone, and the fountain of youth. They can't be found.

A pleasant home makes life worth living for self-respecting men, and so conduces to his being better content with his job. But there are a lot of manufacturing concerns which cannot finance such a development. Then there are a lot of foreign-born workmen who will in a week turn a model home into a pigpen. I know, for I've seen it.

Giving the men more or less of a voice in the management of a business has worked fine in plants where the men really wanted to be happy at their work; where they still retained a wish to be craftsmen. But in a plant where radical teachings have sunk into the men; where the direct-actionist idea of seizing all capital has a hold—the plan is too mild to suit the men. Strongly unionized plants under the dictation of powerful labor leaders are not as a rule to be successfully organized under Industrial Democracy.

Piece rate wage-payment plans are usually successful with a thrifty set of men. But in one plant I recently studied a wage incentive failed to spur workers to an easily obtained maximum earning. This plant was in a small town where the living costs were low. Had it been in a large city where it cost more to live, the workers would undoubtedly have needed more money and might have increased production to get it. As it was, we had to invoke the fear of the fellow-workman's disapproval by means of the group economy bonus.

And so it goes. We have a thousand or so industrial districts in the United States, each with its own living conditions. The workers differ in their ideas, outlook on life, education and nationalities. In some districts the men are largely thrifty; in some not. Some are largely home-owners—capitalists in a small way; some are irresponsible floaters. In some towns there is a preponderance of American born workers with their respect for American ideals of government; elsewhere they are mostly foreigners, here only to get the money and go back.

Here we find most of the men have at least a common school education and read good papers; there they do not speak nor read English but get their information from imported radicals and "reds."

With such wide variations in the type of labor from town to town and between different industries, it should be apparent that the employer's problem is almost an individual one. That makes it out of the question to buy a ready-made "system" which can be put into operation in any plant.

I know of factory owners, in every branch of manufacturing, who have no labor problems. They have without exception studied their workers and devised some method of handling them which fit the peculiar conditions. None of them attempted to buy a patent medicine cure.

Although I'm a disbeliever in "sure cures" there is one thing which I believe would lay a foundation for quieter labor conditions in all industries. That is education in the fundamentals of business economics. It is ignorance of this that makes so many formerly contented men prey to the inflammatory false reasoning of agitators.

The source of wages, for instance, is a mystery to most workmen. They are accustomed to cartoons of a fat capitalist with bulging money bags—from which, presumably, he doles out as little as possible in the way of wages. We know that wages are not paid out of capital but from production—but most workmen don't. If they did, it would be easy to convince them that they can reduce the high cost of living by turning out more work in a day.

Few workmen realize that relatively little capital is in the form of money. They don't stop to think that anyone who saves and buys a house or a piano is a capitalist, and that if capital were confiscated, he would suffer with the other, richer capitalists.

He demands interest from the bank on the savings he puts by for old age—but he forgets that the capitalist who builds the plant he works in is also entitled to interest.

We don't teach these fundamentals of economics in our public schools, and you may be surprised therefore to find that even some of your well-up executives are not well enough informed on these basic principles to offer a better argument to Bolshevik teachings than "Oh bunk!"

The radicals know of this ignorance and work upon it. We should combat their false teachings with true ones.

I have perhaps digressed from my main subject—but I did want to show that there is a need for basic education throughout the whole labor structure.

With this fundamentally sound foundation each employer can then go about getting the co-operation of his men in his own way with a much better chance for success.

He can do this in any way he pleases; but if he is wise, he will be careful about experimenting. If he has time, let him search out another concern in his own line, with surrounding conditions and labor supply the same. If this concern has a plan that has worked well, let him adopt it.

Or he may take advantage of the advice of experts, industrial engineers who have installed methods of every sort in all kinds of plants. The wise employer, however, will not, in blind hope, grab any system which has made good elsewhere, perhaps under entirely different conditions.

Just as employers have different interests and ambitions, so workers differ. Some method can be found which will stimulate them to greater production and to a degree keep them contented with their jobs. But exactly the right method must be chosen.

The production of nitric acid in the United States in 1914, according to the Census of Manufactures, was 78,589 tons of nitric acid of average strength and 112,124 tons of mixed acid. According to other data given in the census, these figures represent about 89,000 tons of 100 per cent. nitric acid. All of this acid was produced from nitrate of soda, consuming about 160,000 tons of nitrate. The pre-war importations of nitrate of soda amounted to about 560,000 tons per annum; hence the normal consumption for purposes other than the manufacture of nitric acid was about 400,000 tons. The present rate of importation is about 1,600,000 tons of nitrate per annum. Since very little is going into storage, and the total consumption for purposes other than nitric acid, manufacture has increased but slightly, if at all, it may be estimated that at least 1,000,000 tons of nitrate per annum are being converted into nitric acid at the present time. This is equivalent to 650,000 tons of 100 per cent. nitric acid, of which nearly five-sixths is being used for the manufacture of military explosives.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$33 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00
Bessemer, Pittsburgh	35 00
Basic, Valley furnace	31 00
Toronto price—	
Silicon ....$2.25 to 2.75	47.30
No. 2 foundry. 1.75 to 2.25	49.95

FINISHED IRON AND STEEL

Iron bars, base	$4 75
Steel bars, base	4 75
Steel bars, 2 in. larger, base	6 00
Small shapes, base	4 25

METALS

	Montreal	Toronto Gross
Aluminum	$33 00	$35 00
Antimony	14 00	10 50
Copper, electrolytic	24 50	26 00
Copper, casting	24 50	25 00
Lead	7 75	7 00
Mercury		.....
Tin	....	58 00
Zinc	10 00	10 00

Prices per 100 lbs.

OLD MATERIAL

Dealers' Buying Prices

	Montreal	Toronto
Copper, light	$14 00	$13 75
Copper, crucible	17 00	17 00
Copper, heavy	17 00	17 00
Copper, wire	17 00	17 00
No. 1 mach. comp'n.	15 75	16 00
New brass cuttings	11 00	10 75
No. 1 brass turnings	9 00	9 00
Light brass	6 00	7 00
Medium brass	7 25	7 75
Heavy melting steel	15 00	16 00
Boiler plate	13 00	11 00
Axles, wrought iron	25 00	20 00
Rails	16 00	16 00
No. 1 machine cast iron	24 00	25 00
Malleable scrap	25 00	20 00
Pipes, wrought	10 00	9 00
Car wheels, iron	22 00	20 00
Steel axles	21 00	20 00
Mach. shop turnings	9 00	11 00
Cast borings	10 00	11 00
Stove plate	22 00	21 00
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$43 00
Open-hearth billets	43 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	55 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$13 00
5-16 in.	11 00
⅜ in.	10 00
7-16 in.	9 30
½ in.	10 15
9-16 in.	10 00
⅝ in.	11 75
⅞ in.	11 75
1 inch	10 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Putty, 100-lb. drum	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls.	1 50
Linseed oil, boiled, single bbls.	2 92
Linseed oil, raw, single bbls.	2 90
Plaster of Paris, per bbl.	4 50
Sandpaper, B. & A. ..list plus	43
Emery cloth ....list plus	37½
Borax, crystal	0 14
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$7 00	$6 75
Sheets, black, No. 10	6 50	6 50
Canada plates, dull, 52 sheets	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's est, No. 28	....	....
Premier, No. 28 U.S.	....	8 60
Premier, 10¾ oz.	....	9 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$16 75
3-16 in.	15 40
¼ in.	14 20
5-16 in.	11 50
⅜ in.	10 50
7-16 in.	9 30
½ in.	10 50
⅝ in.	10 00
¾ in.	9 70

Prices per 100 lbs.

IRON PIPE FITTINGS

Malleable fittings, class A, 20%, on list; class B and C, net list; cast iron fittings, 15% off list; malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: class B, black, 24½c lb.; class C, black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.o.b. Toronto.

ANODES.

Nickel	$0.58 to $0.65
Copper	0.38 to 0.45
Tin	.70 to .70
Zinc	0.18 to 0.18

Prices per lb.

NAILS AND SPIKES.

Wire nails	$4.70
Cut nails	4 75
Miscellaneous wire nails	60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.04
Acid, hydrofluoric	.30
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride, lump	.22
Ammonium, chlor., granular	.18
Ammonium, hydrosulphuret	.50
Ammonium, sulphate	.30
Caustic soda	1[illegible]
Copper, carbonate, anhy.	.41
Arsenic, white	.14
Copper, sulphate	.16
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.16
Nickel sulphate	.18½
Potassium carbonate	.60
Silver nitrate .....(per oz.)	1 20
Sodium bisulphite	.18
Sodium carbonate crystals	.06
Sodium cyanide, 129-130%	.38
Sodium cyanide, 98-100%	.55
Sodium phosphate	.18
Sodium hyposulphite (per 100 lbs.	6.00
Tin chloride	1.75
Zinc chloride	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30%
Standard	30-10%
Cut leather lacing, No. 1	2.20
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$4 00
Polishing wheels, bullneck	2 25
Pumice, ground	0 06
Emery composition	0 08
Tripoli composition	0 09
Rouge, powder	0 45
Rouge, silver	0 50
Crocus composition	0 12

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	42 50	43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6x4 base	45 00	44 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd.	0 34
Brass sheets, 24 gauge and heavier, base	0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 4[illegible]

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.10
Packing square braided	.38
Packing, No. 1 Italian	.44
Packing, No. 2 Italian	.36
Pure Manila rope	.37
British Manila rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.74

OILS AND COMPOUNDS.

Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 60
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	10¼

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	27½
Delta Files	20
Nicholson	32½
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	40

EXCHANGE HURTS BUSINESS HERE

TORONTO. — Between the exchange situation and the difficulty in securing material, there is a feeling of uncertainty in the market this week that is not desirable.

The talk has been for some weeks that the exchange difficulty would right itself in short order—that it was only a temporary displacement, etc.; but the trade is getting weary waiting for that time to come. As a matter of fact, it is not any use disguising the fact that there is no small amount of nasty feeling cropping up over the way in which some of the U.S. firms are insisting on the last pound of flesh in the matter of exchange. Every place the representative of CANADIAN FOUNDRYMAN called this week the question of exchange was discussed before anything else, and many of the dealers were outspoken in regard to the situation.

There is a nice list out by the Canadian National Railways this week for the Toronto shops. This list is for carbon drills, and calls for 164 dozen of various sizes.

A Lean Market Here

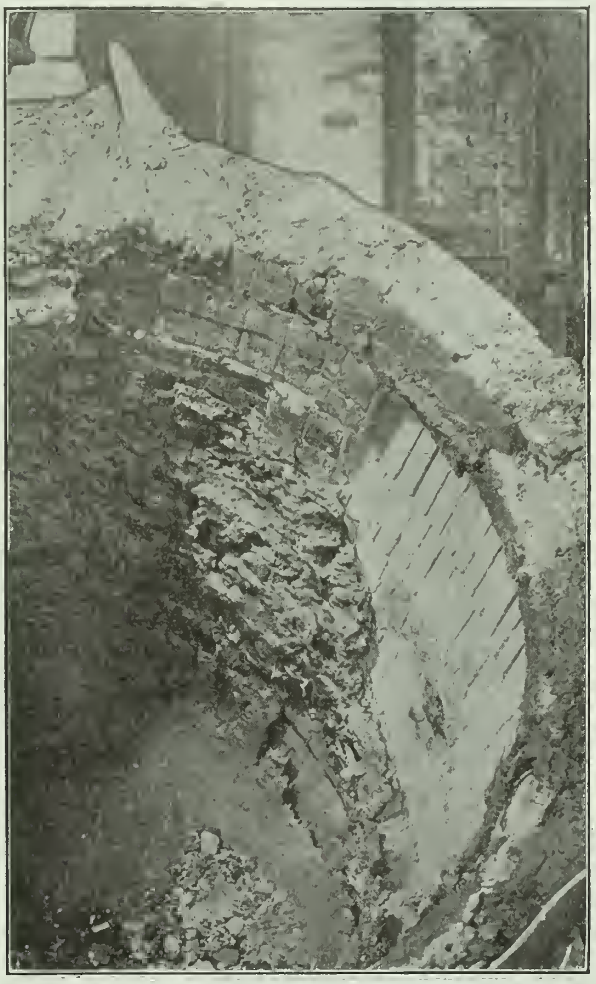
"Absolutely no improvement." That is the way the steel trade can be sized

HYTEMPITE CEMENT

The Ideal Material for Lining Ladles Cupolas, Brass Furnaces, etc.

This Forty-Ton Ladle

looks small from this distance, so we will take a "close up" and have a good look at the lining. See how the inner course brick is eaten away, especially where there's only 1/4 in. thickness of brick left at some points. This is the condition of the brick after three heats when the ladle lining was laid up with fire clay. In some cases but one heat was secured.



Burnt out lining showing condition of bricks after 3 heats.

HYTEMPITE

solved this trouble. By laying up the brick with Hytempite the number of heats obtained from the brick was more than double, because

"It Sticks to the Bricks"

and does not eat away like common fire clay

Relining a 40-ton ladle in steel foundry using Hytempite for laying up and surfacing.

Time to reline—so we'll chip away the slag and burnt-out brick, laying up a new lining with

HYTEMPITE

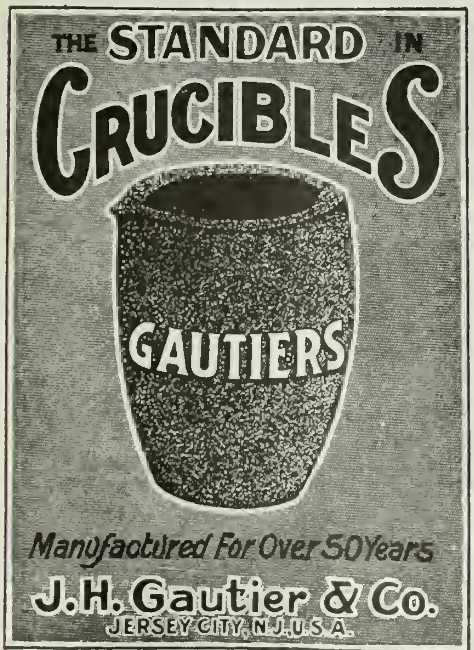
knowing we will double the life of the brick—and we will get a finished lining that looks like this—

HYTEMPITE is a highly refractory cement for laying up furnace and boiler walls and for lining and patching Ladles, Cupolas, Pit Furnaces, making Rammed-in Linings, Special Tile, etc. It bonds at normal temperature, withstands high temperatures, and has great binding strength.

Manufactured by The Quigley Specialties Co., Inc., New York, and sold by

THE DOMINION FOUNDRY SUPPLY COMPANY, LIMITED

MONTREAL WINNIPEG TORONTO



up this week; and it is the truth. At the offices of the U.S. Steel Products, the information is given out that they are booking very little, as deliveries are too uncertain. That must not be taken like many of the mills, there is always the chance of a very needy customer getting through.

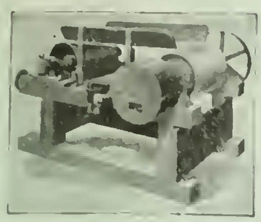
Jobbers admit that the most serious shortage in bars is in the three inch and heavier. Mills are sold out for some time to come on all sorts of bars. In fact, about nine months would be a fairly correct estimate of the time for which their mills are full. One thing that helps out is that there is a fairly warehouses, from which a fairly quick delivery can still be made.

The Scrap Metal Market

Prices that are quoted for scrap metal can hardly be accepted as the real strength or weakness of the market, as the case may be. The word "peculiar" describes the scrap metal situation about as well as anything at the moment. No one seems to want to state just exactly what is going to happen. The exchange rate has the market on red and yellows, all tied up. For instance, were an Old Country firm to buy copper in the United States now, instead of paying 19½ cents (the market price) the firm would have to pay 25.76. This means that they are not going to buy. In fact, there are large shipments going from England to the States, to take advantage of the exchange situation.

No. I machinery scrap is quoted at $25; but it is well known that the metal would bring more than that. The reason that the figure is left there is that we could not find a dealer who wanted to name a definite figure as the market price. The feeling is: "Bring us the material—a good tonnage of No. 1 machinery scrap—and we will pay the price for it." There is practically none coming in now, and the dealers that have it—and there are some—are holding for about $40. Of course, that price is f. o. b. consumer's mill at Ontario points.

MAGNETIC MANUFACTURING CO.
MILWAUKEE, WIS., U. S. A.



Buried Treasure --- and the foundry refuse heap

This magnetic separator, equipped with the powerful "high duty" magnetic pulley will reclaim every scrap of iron and steel from your foundry refuse. The saving of nails and core rods, and even particles that are too small to be detected, will in a short time pay for the installation.

Your refuse heap may be costing you thousands of dollars a year. Let us show you how to save this money.

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DOMINION FOUNDRY SUPPLY CO.

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LIMITED

Grinding Wheels
for All Purposes

HAMILTON -- CANADA

CRANE FITTINGS

CRANE
LIMITED

HEAD OFFICE & WORKS
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BRANCHES: Toronto, Winnipeg, Vancouver.
SALES OFFICES: Halifax, Quebec, Ottawa, Calgary.

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Economical and Efficient
for all kinds of
Foundry Sand Mixtures

Automatic Discharge. Saves Labor and Materials. Produces a thorough mixture, gives large capacity with small cost of maintenance and operation. Its success demonstrated in a great many of the best known plants in the country.

Write for list of users, details and price to

NATIONAL ENGINEERING CO.

Machinery Hall Bldg.
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WHITEHEAD'S KAOLIN

For lining and patching the Cupola, Furnace, Ladles, etc., will save fire brick and the time of your men.

E. B. FLEURY
Agent
1609 Queen St. W.
Toronto, Ont.

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If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

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Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

AIR JOLTS
Davenport Mach. & Fdry. Co., Davenport, Iowa.

ALBANY SAND
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

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Pangborn Corporation, Hagerstown, Md.

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Holland Core Oil Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

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Woodison, E. J., Co., Toronto, Ont.
Clark, Chas. J., Chicago.

BLAST METERS
Clark, Chas. J., Chicago.

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General Combustion Co., Montreal.

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Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
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Roots Co., P. H. & F. M., Connersville, Ind.

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CORE OVENS—SEE OVENS

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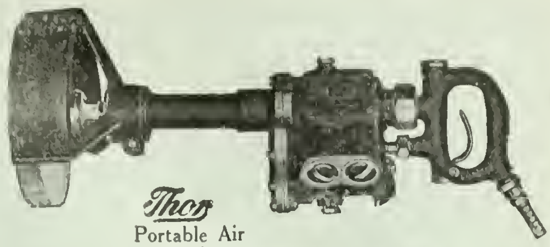

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DUST HANDLING EQUIPMENT
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DUST EXHAUSTER, ANISTER SYSTEM
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Woodison, E. J., Co., Toronto, Ont.
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Whitehead Bros. Co., Buffalo, N.Y.
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Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

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Obermayer & Co., S., Chicago, Ill.
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W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Crane Ltd., Montreal.

Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FITTINGS, CAST IRON
Crane Ltd., Montreal.

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Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY EQUIPMENT
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Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
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Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton,
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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National Engineering Co., Chicago, Ill.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
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Roots Co., P. H. & F. M., Connersville, Ind.

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Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.

Pettinos, George F., Philadelphia, Pa.
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Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

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Independent Pneumatic Tool Co., Chicago, Ill.

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GRIT, STEEL
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Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

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Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
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Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
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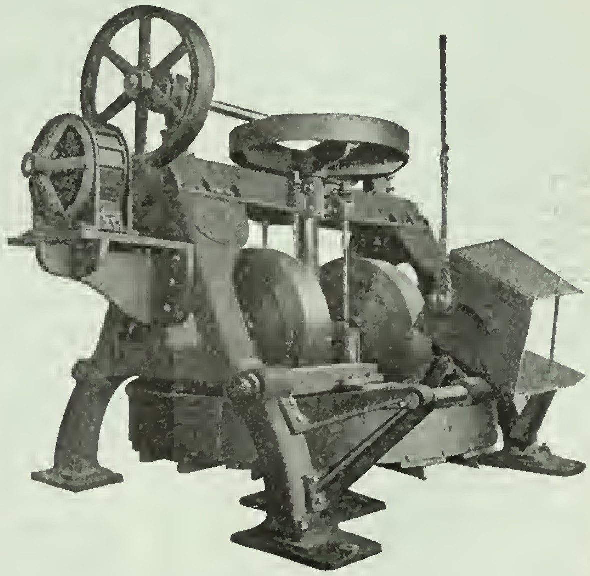

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Whitehead Bros. Co., New York, N.Y.
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XI. PUBLICATION OFFICE, TORONTO, MARCH, 1920 No. 3.

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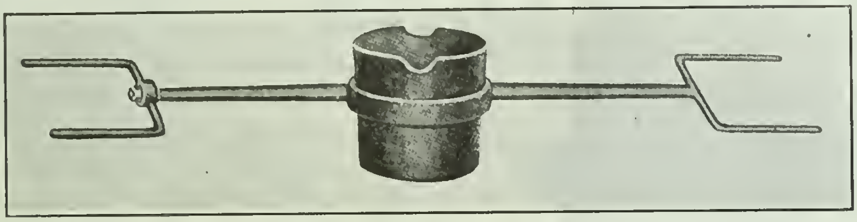

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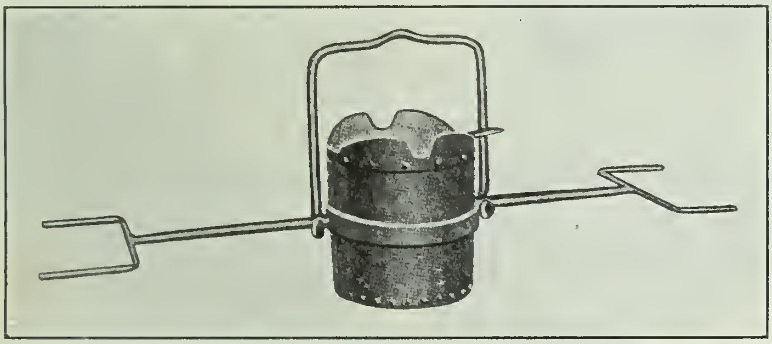

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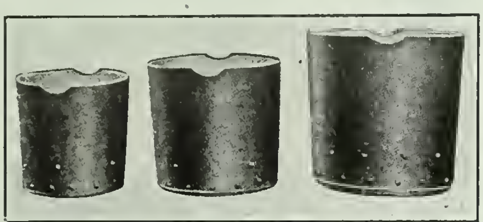

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ANADIAN FOUNDRYMAN, March, 1920. Vol. XI, No. 3. Published monthly, at 143-153 University Ave., Toronto, Can. Subscription price in Canada, .00; in the United States, $1.50. Entered as second-class matter July 1st, 1912, at the Post Office at Buffalo, under Act of March 3rd, 1879, and at the ost Office Department, Ottawa, Canada.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Keeping the Foundry in Continuous Operation

Showing Different Interpretations of the Term in Different Plants With Some Observations on Cupola Practice

By JOHN H. EASTHAM

THE term "continuous," when applied to foundry operation, may be interpreted several ways, some plants under this heading running twenty-four hours per day, six days a week, and are thus properly entitled to the name, others, and in greater number, melting metal during most or all of their eight or nine-hour working day, while some shops, for definite reasons specially suiting their own special business and shop accommodation, take off three or four heats of short duration daily.

We may safely assume, however, that the ultimate object is in all cases the same, namely, the production of a maximum tonnage from a certain area, in many cases a very limited floor space turning out a surprising weight of castings per diem per capita. Leaving out for the present the mammoth plants maintained by such prominent companies as the Westinghouse and International Harvester, which, with their splendid floor and machine equipment and batteries of cupolas, may be considered the last word in foundry engineering, a brief description of a few shops run on a continuous or semi-continuous system, which have come under the writer's observation, may be of interest to readers of CANADIAN FOUNDRYMAN, besides showing that, in the average every day plant, much may be accomplished on these lines, without any exorbitant initial outlay.

Fig. 1 shows a "T" shaped foundry operated by a southern Michigan company of automobile casting jobbers, ten or twelve important car companies who do not manufacture their own castings, and one or two whose foundry capacity is below their needs, being supplied with cylinders and all other accessories in the way of castings of a ferrous nature, the shop shown in the sketch being dedicated to the output of crank-cases, pistons, cylinder heads, fly wheels, manifolds, and the smaller castings made on benches, a separate department being maintained for the manufacture of cylinders.

Approximately forty thousand square feet of floor space are available, a good deal of this area being, of course, occupied by such fixtures as the two cupolas, one lined to fifty inches diameter, and one to thirty inches, a dry sand mould oven, facing sand mill, narrow gauge track gangways, and supervisor's office, the coremaking, as will be seen, being handled in an annex parallel with the long bay of the shop.

The average daily melt under normal trade conditions is seventy-five tons, resulting in an output of approximately fifty tons of castings, two-thirds the total melt ranking as saleable castings, being a good showing for the class of work under discussion, the bulk of the work being made on hand rammed stripping plate machines of the drop pattern type.

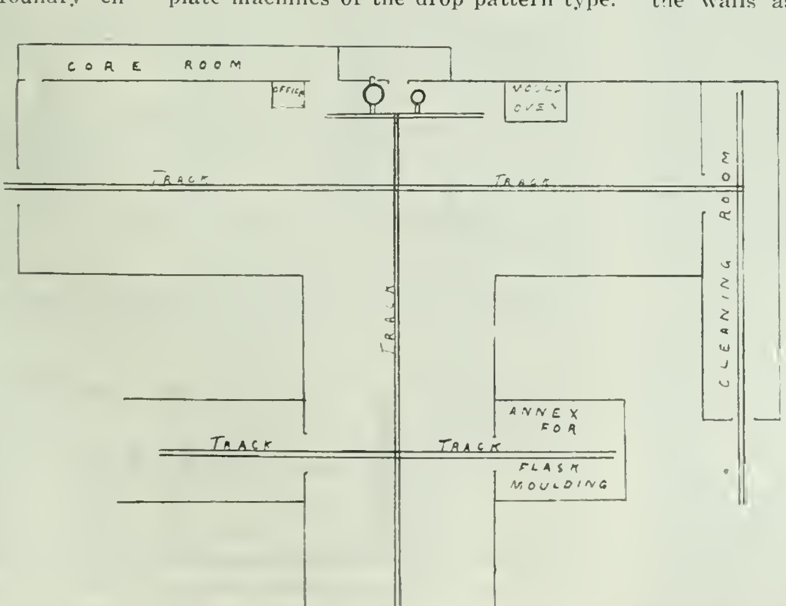


FIG. 1. A NAMERICAN FOUNDRY DOING AUTOMOBILE CASTINGS

As a satisfactory piecework system is practised, there is the usual tendency on the part of some of the moulders to start about an hour earlier than usual in the morning, all sand being cut over by a night gang using a straddle heap sand-mixing machine, the consequence being that usually, around four tons of work is ready to cast at seven o'clock, the usual starting hour, about one-third of the total melt being on the floor by nine o'clock. The cupola gang starts work at five o'clock, the fifty-inch cupola being lit up around seven thirty, and the blast put on around eight forty-five, the first ton ladle being wheeled away usually at nine a.m., followed regularly at intervals of eight minutes by others during the next ten hours.

As is evident from the shop layout, the moulding floors are arranged at right angles to the track, the moulds being placed first to the track or centre gangway, and worked back to the wall, most of the machines being portable, and consequently moved back towards the walls as the work progresses, the casting gang being thus enabled to operate on any particular floor at any time as conditions warrant.

To avoid confusion, and facilitate the handling of the metal, this company maintains a standard daily analysis, subject to slight changes at the discretion of a qualified chemist, approximately ten per cent. of steel scrap being used in all charges, ten to fourteen pounds of limestone per ton of iron being used as a flux, the slag being taken away in two wheeled iron trucks as fast as melted.

Charges of three thousand pounds each have been found most convenient in this plant, a ratio of one pound of coke to nine of iron on the full day's melt, with a blast pressure of about twelve ounces, being consistently maintained. Dry sand moulded test-bars, a foot in length by one inch square, are cast at intervals of about one hour, allowed to cool before removal from the moulds and analyzed the following day, the changes in the various elements due to coke and pig

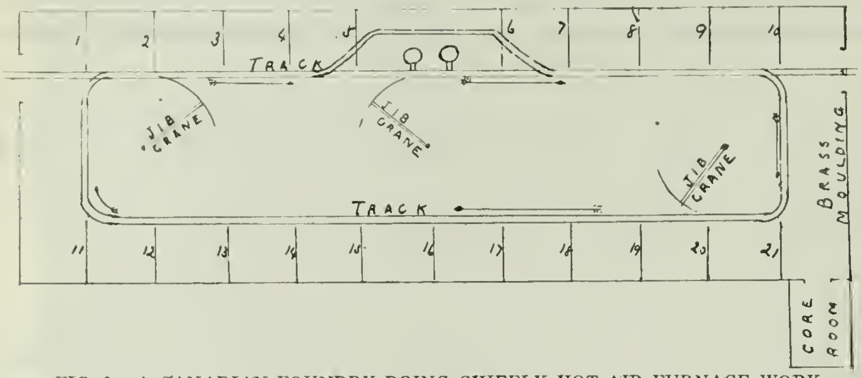


FIG. 2. A CANADIAN FOUNDRY DOING CHIEFLY HOT AIR FURNACE WORK

conditions being thus quickly noted and corrected. Orders for castings of special analysis to meet customer's requirements are considered and accepted, the thirty-inch cupola being pressed into service for these contracts when of sufficient volume to warrant its use. About one hour after the first ladle of metal is tapped, the shakeout-gang begins work, following up the pouring gang all day, their duties being to shake out the moulds, stack the boxes in piles as required, and take all the castings to the chipping room, and gates and runners to the cupola scaffold, taking possession of the industrial track for the two latter purposes as soon as the cupola bottom is dropped every evening. Simultaneously with these operations, the sand-mixing machine above-mentioned gets to work, thus completing the circle, hose pipes, each with a spray nozzle, being placed at convenient points along the foundry walls, the need for water-carrying being thus avoided, while a consistent temper is given to the sand piles, the danger of undue dampness or dryness being overcome by particular attention to these details on the part of the night foreman. The little dry sand work handled in this department is loaded and unloaded on to the mould oven cars by means of a two-ton hand-operated hoist, chain driven from the floor, any unusually large casting or repair job being also made under its span.

Fig. 2 shows details of a Canadian plant engaged in the manufacture of jobbing castings in general, and hot air furnace work in particular, and is a fine example of an up-to-date foundry laid out specially for the quantity production of light and medium heavy castings in iron, brass and aluminum, with a floor space of approximately twenty-five thousand square feet, the coremaking, as shown in the sketch, being carried on in an annex at right angles to the main building. Two cupolas, both lined to forty-five inches diameter, furnish a melt of seven tons per hour each, but, as one furnace has so far easily supplied sufficient metal for the daily output in iron castings, the company very wisely keep their melting equipment in excellent order by using different furnaces on alternate days, repairs to the melting zones being effected on each cupola's "off" or "cold" day, Sunday and holiday rush repairs being thus avoided.

Three jig cranes, each of three tons capacity, their radii covering the industrial track dividing the side floors from the centre floors, take care of the larger work, the single "I" beam runner hoists installed over each side floor serving admirably the class of castings turned out on those sides of the gangway.

With the exception of the bench castings, and a few special castings made on the floor by the matchplate system, the loose pattern system prevails, most of the output being on a day work basis, an average daily melt of about twenty tons taking about three hours to dispose of. Truck ladles of twelve hundred pounds capacity are taken to the gangway end of the moulding floors as fast as the metal is melted, a left to right movement in the direction of the arrow marks assuring continuity of action, the full ladles leaving one way, and the empties coming in from the opposite direction.

Apart from the fact that the castings are removed from the foundry each morning after starting time, owing to the industrial tracks being at liberty all morning, the procedure is much the same as in the case of the shop above-mentioned, the floor sand being mixed at night, a clear start being assured the moulders every morning, and practically all their working time devoted to production.

Fig. 3 shows a shop of fifteen thousand square feet with a daily capacity of thirty tons of tractor castings, in the form of gears and their attendant small castings, the familiar spike or "mud-hook" whose purpose is to prevent slipping adding considerably to the tonnage melted daily, these latter castings being molded on benches from wooden match-plates.

In addition to this work, repetition jobbing work is made on a small jolt machine, installed under the crane operating directly in front of the layer cupola spout.

The tractor gears are made on stripping plate machines of hand-rammed type, in circular boxes, which are stacked three deep to economize space, as is customary in foundries handling work of this description. Two cupolas, one lined to twenty-five inches, and one to fifty inches, are shown in the sketch, the larger unit being fitted with a "T" head, or rocking spout similar to the one recently described in CANADIAN FOUNDRYMAN, six bogie ladles of one ton capacity each being lined and dried for every heat, two of the six acting as reserves, as, owing to the rapid transit facilities provided in the way of floor tracks and cranes, four ladles easily handle the eight-and-one-half tons per hour melted in the larger cupola, the smaller one being retained for slack times and special analysis.

As no machining beyond drilling a few

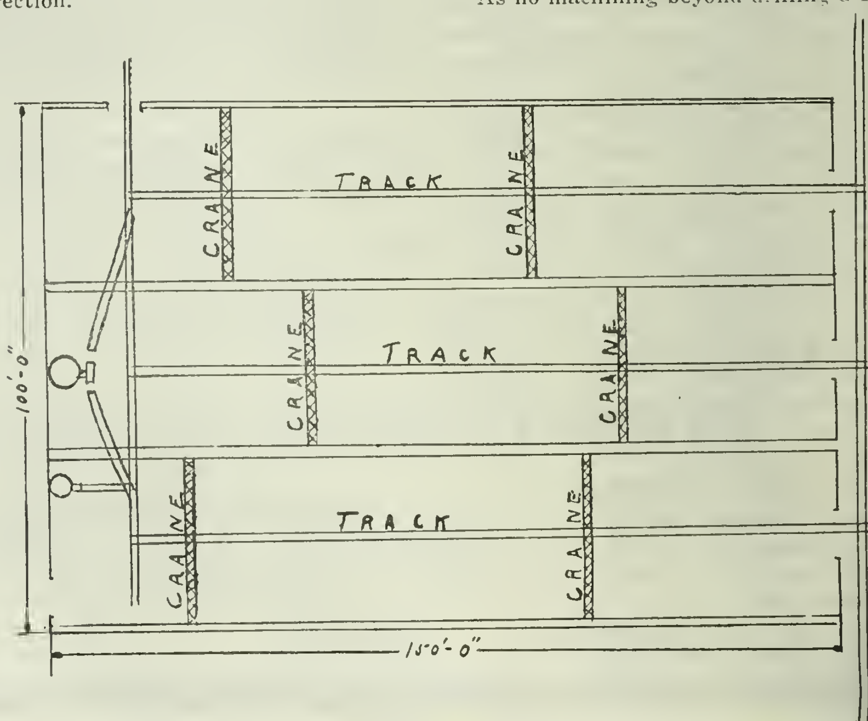


FIG. 3. AMERICAN FOUNDRY DOING TRACTOR WORK, INCLUDING GEARING

holes is necessary on the class of work under discussion, hardness and long wear being most desirable, the cupola charges are mainly composed of agricultural and plow scrap, a small percentage of Number I pig being added when necessary to keep up the silicon content.

Alternate layers of two thousand pounds of iron to two hundred pounds of coke, above the first bed, ensure a steady continuous tap of moderately hot iron, about five hours usually taking off the heat, shaking out, casting removal, and sand-mixing operations being conducted at night on a tonnage basis. Incidentally, as the metal is drained from the cupola as melted, the depth between the lower edge of the tuyeres and the sand bottom is kept down to six inches, a space large enough to hold between eleven and twelve hundred pounds of metal, or about four minutes actual melting, being thus allowed to cover the occasional need to stop the flow in case of accident to cranes or ladles.

Several hundred pounds of bed coke are in this way saved daily, let us say, three hundred pounds, though that is much below the mark.

Spread over the three hundred working days constituting the average business year, we have there a saving of forty-five tons of coke. Think of it, my brethren, at current prices, and try to find a satisfying reason for your tuyeres being paced twelve or eighteen inches too high.

Frequent short taps, or one continuous flow, into a receiving ladle balanced on trestle, will ensure a homogeneous mixture if the charging is properly attended to, in the cases above quoted, the bogie ladles delivering the metal to the moulders at the end of the floors act as mixing ladles, making a tilting ladle under the spout unnecessary, though in many foundries making car wheels on a continuous basis a five or six-ton ladle is kept under the spout constantly, the supply of metal to the floors being thus easily controlled without stopping the flow from the cupola.

Fig. 4 is the ground plan of a foundry operated by an important English railway company, principally, as will be seen from the sketch, engaged in the production of locomotive parts, weigh bridges and depot light columns being also turned out on the heavy green sand floors.

Here, in a total space of twenty-four thousand three hundred square feet, a daily output of forty-five to fifty tons of castings is secured on a premium bonus basis, two cupolas being installed, and operated alternately, as in the case above-mentioned. In this instance, however, three distinct grades of iron are melted daily in a single cupola, their technical names in the shop being "hard" iron, "soft" iron, and "cylinder" iron, the first being intended for the brake shoe and grate bar floors, the second for the general work requiring machinery, and the third for its own particular purposes, viz., cylinders, piston rings, liners, etc., the irons of particular analysis being charged at specified hours, and delivery to the various classes of work by bogie ladle or crane governed accordingly.

The usual removal of castings and sand-mixing is accomplished at night, the regular working day beginning at six o'clock each morning, the blast put on at eight a.m., about five-and-one-half tons per hour being taken every hour from a forty-inch cupola during the following ten hours, with one hour's shutdown for lunch. A review of the foregoing examples of foundries, each company ignorant of the other's existence or methods, shows a marked similarity in ways of working amongst all four, their classes of work are as wide as the poles apart, but their fundamental principles the same, that is to say, in three cases, as the following analysis will show. Number one, with forty thousand square feet of moulding space, using a piecework system and machine production, turns out two-and-one half pounds per square foot of room; number two, with thirty thousand feet, loose patterns and day work methods, turns out a little less than one pound per square foot; number three, with fifteen thousand feet, gets a production of four pounds per foot by piecework and machines, (conservation of space by stacking up the moulds helping this company considerably); while number four, with twenty-four thousand three hundred feet, turns out a fraction below four pounds per foot on a bonus system, partly by loose pattern and partly by machine. But in certain essential features note the similarity. "Chacun son metier" ("Each one his trade"), moulders to mould, laborers of various grades handle their respective share of the business, stated operations at stated times, in a word, SYSTEM. Also a firm belief in, and constant use of, the industrial track, as against the wheelbarrow, and last, but certainly not least, the use of machines and matchplates on repetition work wherever possible.

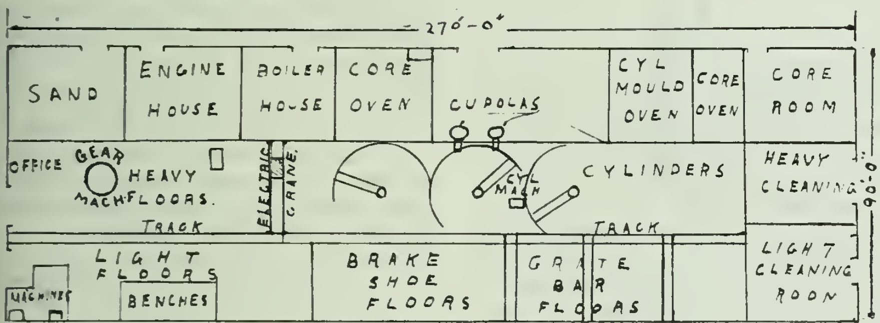


FIG. 4. ENGLISH FOUNDRY DOING RAILWAY CASTINGS

SOME THINGS WORTH THINKING OF WHEN STARTING A FOUNDRY

In going into the foundry business, it is well to study up the various difficulties to be confronted in operating it. One of the foremost thoughts must of necessity be that of "what class of molders is to be employed."

Now it is only reasonable to suppose that if wages are the same, the best men that can be secured would be the most likely ones to employ, but in order to get this class of men, what are the considerations to be looked into? I would say, conditions.

Let us put ourselves in the position of the men to be employed, and see which kind of a shop we would strive to get into if there were several to choose from. I have seen shops which were ideal from every standpoint, and I have seen others which were the very reverse. Some foundrymen employ a man whose duty it is to keep everything in its place and keep the shop clean and tidy, while others seem to aim at keeping the shop in as dirty a condition as possible, and have everything out of place. On the other hand, there are molders who prefer to work in a dirty shop where everything is in the wrong place and where system is unknown, for the reason that no one knows whether they are killing time or not, and if things go wrong there are innumerable reasons which a good reasoner can advance for allowing them to be wrong.

But the way to get value out of the men employed is to have the shop in ship-shape all the time so that the molders can go right ahead with their work and where every move shows results, or something accomplished. This kind of a shop will draw the class of molders who enjoy seeing results and who will not require to be urged in order to get up a day's work.

From this, it will be seen that, according to my way of figuring, the best class of men are attracted to the systematically managed foundry, and even some chronic lazy kritters can't help but make a good showing when the shop is in a condition such as will make it an easy matter to go ahead.

He who would keep young and look young must have the child heart. He must keep himself fresh, vigorous, buoyant physically. And this can be done only by taking plenty of recreation, plenty of exercise in the open air, lots of time to play.

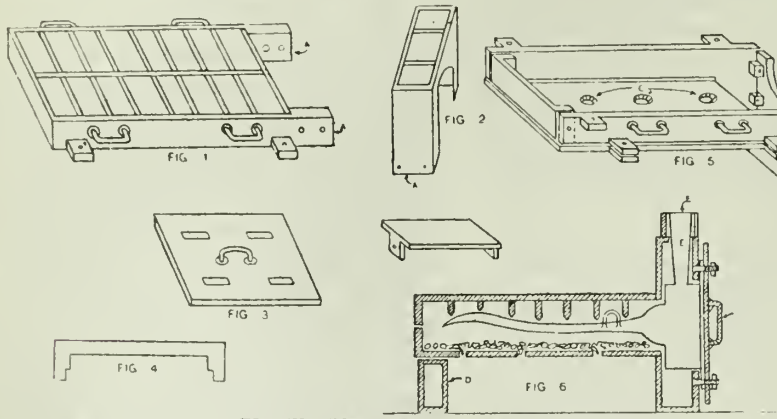
Many men do not understand why they cannot grip their thoughts with more tenacity, why they cannot think more intensely, but the real reason is their minds are clogged with brain ash, with fatigue. They need mental relaxation.—"The New Success."

The Moulding of Propeller Blades in Loam

Showing How Sectional Propellers Are Built and How They Can be Repaired With Ease in Case of Accident at Sea

By A. B. SMITH, in *Foundry Trade Journal*

THERE are many ways of molding propellers, and the method adopted will depend on how many are to be made and what facilities are at hand. The sections wheel has advantages, but it also has disadvantages, and these must be taken into consideration. The hub of a sectional wheel is so cumbrous that it occupies space which would, on a solid wheel, be occupied with part of the blade, thus consuming power while not doing service. From this point of view, it is quite common to see wheels as great as 17 feet in diameter cast in one piece.



FLASKS FOR MOLDING PROPELLER BLADE

Where the blade is likely to strike obstructions, the advantages gained by the use of loose blades more than overcomes this in the saving of time consumed in replacing a blade instead of installing a new wheel. The method herewith described one in which the loose blade system is adopted.—Ed.

The following describes a new method in the production of propellers, the blades being made singly and afterwards built up in bosses or hubs as three-bladed or four-bladed propellers. The method is very cheap, quick and efficient. In the event of a blade being broken at sea or otherwise a single blade can be replaced instead of waiting for a new propeller.

Boxes of special design are made to fit the job completely, and built up in sections. Fig. 1 is the top box, provision being made at A to accommodate the "pocket" piece, Fig. 2.

Two bolts are cast in for bolting up the "baffle" plate, Fig. 3. The reason for using this plate is that sometimes a facing piece is cast in the boss or flange of the blade, and it also ensures a perfect joint and facilitates the finishing of the mould, which is cast open-sand. The baffle is a cast-iron plate with four slots cast for the bolts at Fig. 6. The handle is for lifting purposes only. Fig. 4 is the strickle used for striking up a loam face.

Bottom Box

Fig. 5 shows the method of making and assembling this box. The whole being made in open-sand and in sections, the sides and ends are bolted down on the bottom plate, leaving three holes C cast in to allow of the free exit of air from the coke bed. Fig. 6 shows the method of assembly and the position of the casting in the mould. If cast on the floor, a piece of packing D is used to keep the mould level.

Moulding.—When the bottom box has been levelled, a layer of coke or clinker is put in about 3 in. deep and followed on with new sand or good sand to nearly level with the box edge. This is thoroughly rammed and vented in to the coke bed. The sand is then roughly struck off to something like the shape of the pattern, when a layer of about 2 in. of loam is put on, a dusting of parting sand, and the pattern is brought into position and knocked down to a sound bedding. The joint is next made, the loam soon stiffening on the sand bed. A good joint of parting sand is most essential, sea sand being most favored for a joint of this description. The top box having been put on, a layer of loam is put all round the pattern, and a quantity of "gaggers" put in.

The ramming up can next be proceeded with. A large runner is placed upon the topmost points of the boss or flange at E, Fig. 6. When the ramming is completed, it is advisable to leave it for a few hours to allow the loam to stiffen, or to put the mould complete in the store for a night. When the top can be removed and the pattern withdrawn the mould can be finished off and water washed, after which it is again stoved and thoroughly dried. It can then be blacked and closed, the baffle plate being put in position on a wet loam joint to prevent bursting, and bolted well up by the means provided.

The job is cast flat, running it straight down and well feeding through the runner. In this way the result should be all that is desired.

Moulding the Hubs

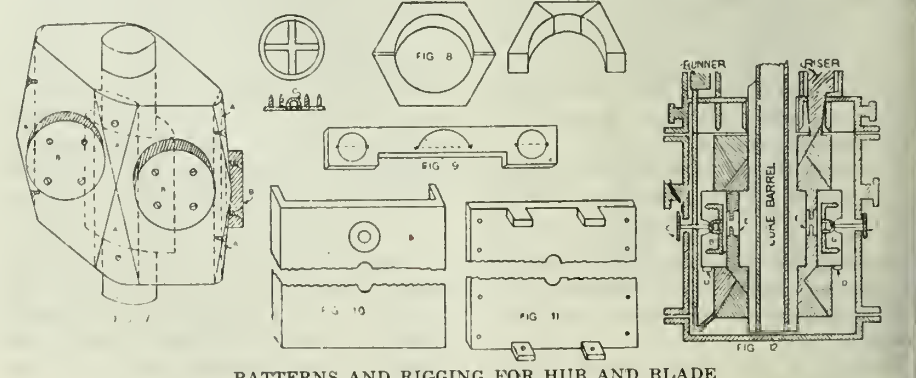
The hubs are of special design to accommodate the blades above described. The pattern is of a square design with the corners taken off (A, Fig. 7). This offers less resistance under water. The core prints on each side are for the reception of the flanges on the blades as at B, Fig. 7 and Fig. 12. All the corners and prints are made loose to facilitate the moulding, and can be drawn in when the main pattern is withdrawn.

Fig. 8 shows the core box, and a core grid. A staple being cast in the centre of the grid for fastening back the core in the mould, as at C, Fig. 12. Fig. 9 is the core board for the centre core, and is chambered to facilitate subsequent machinery. The core is just a plain loam core.

Boxes.—An ordinary square top and bottom part can be used, and if a middle box is not obtainable, a plate box can then be made to suit as in Figs. 10 and 11, a hole being required in the centre of each plate for the purpose of fastening tack the cores as at C, Fig. 12.

Moulding.—As this is a straightforward job, it needs no comment. It is advisable to use two joints, then enabling the mould to be finished off clean. It can be bedded on a flat bottom and

Continued on page 67



PATTERNS AND RIGGING FOR HUB AND BLADE

Vacuum as a Means of Lifting Patterns

The Counterweight Does the Actual Lifting, But the Vacuum Does the Gripping—Saves Much Time and is a Great Saving on the Patterns

WHILE electricity has been recognized as a sort of a universal panacea for all the shortcomings of the foundry, with pneumatics (commonly known as compressed air) holding a good second, it remains for vacuum, the very reverse of compressed air, and one of the oldest of the sciences to perform operations which would be difficult to perform by either of the former forces, and with a degree of ease and rapidity truly marvellous.

In Fig. 1 will be seen a sketch of one style of machine for drawing patterns by means of vacuum with the assistance of gravity.

A frame hinged to a post carries a metal tube with a rubber cup-shaped suction disk at its lower end. The tube is supported by means of a cable passing over a pulley on the upper end of the frame and another pulley at the rear of the post and attached to a counterweight as shown in the sketch. A rubber tube connects a vacuum pump with the upper end of the tube which carries the suction disc.

A vacuum pump is a simple contrivance and may be a unit by itself for the exclusive rise of this machine or it may be a more extensive one connecting up with different machines. The machine, shown in the cut, is a self-contained one, carrying a vacuum pump at top.

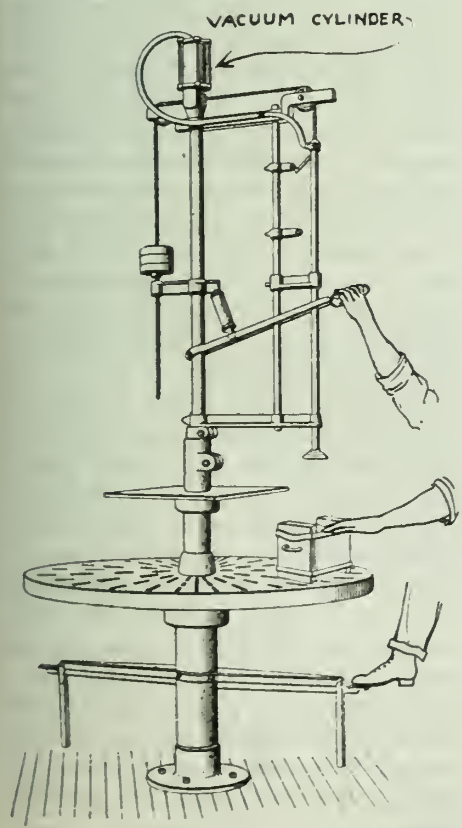


FIG. 1. PATTERN-DRAWING MACHINE

To operate this machine, the lever attached to the upright tube is pulled downward until the cup rests against the pattern board. By pressing down on the foot lever a vacuum is formed in the cup. In fact the cup will probably be drawn down flat, as shown in Fig. 2.

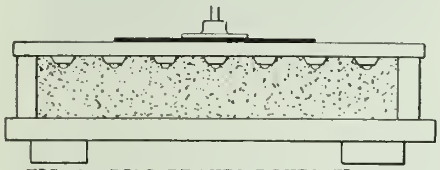


FIG. 2. DISC DRAWN DOWN FLAT BY VACUUM

By releasing the tube carrying the disk the counter-weight at the back of the column will raise the pattern board, as shown in Fig. 3, at whatever rate of speed is desired by the operator. This will draw the pattern absolutely true, no matter how complicated it may be.

After swinging the frame carrying the tube and disc as well as the pattern to one side, the operator releases the pattern by simply raising his foot, when the pattern will automatically chop off.

The machine, shown in Fig. 1, is a standard machine which can be set up anywhere in the foundry and makes a neat, convenient and profitable machine where much small work or even fairly large work is done, but it is not necessary to have it exactly like this. The vacuum pump, shown in Fig. 4, is a very simple device and can be attached to any post along the wall or elsewhere and the mold can be rammed up on a snap-bench squeezer or jolter.

Where rapid work is aimed at and where both top and bottom parts of the pattern are of complicated design, calling for careful drawing this machine, Fig. 1, is particularly advantageous. Instead of mounting the pattern on both sides of the match plate, two match plates are used, each carrying half of the pattern and each rammed up and finished as a drag and put together afterwards. By this means two men can work on opposite sides of the machine, oen making drags and the other making copes, while a third man puts them together and carries them away. By treating each half of the mold as a drag, and drawing the pattern upwards it is quite possible to make molds from patterns which would bother an expert molder to make by hand.

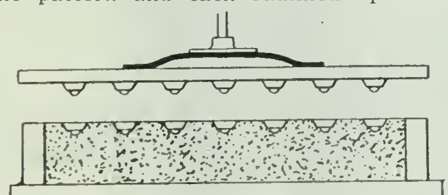


FIG. 3. PATTERN BEING HELD BY VACUUM

The subject of vacuum is well worth thinking over, as so many people labor under an illusion that it is a complicated line of machinery which will be required and also that it is a scientific process, calling for great skill on the part of the engineer in charge. Such is not the case, however. When, for instance, a bicycle pump is connected to a hollow chamber and the plunger is forced downwards, compressed air is formed. Now if the valve arrangement on the plunger is reversed and the plunger forced in the opposite direction vacuum is formed, and if the hollow chamber happens to be the space between the rubber disc and a flat board, the vacuum will grip so tight that the board can be lifted, even though carrying a heavy load.

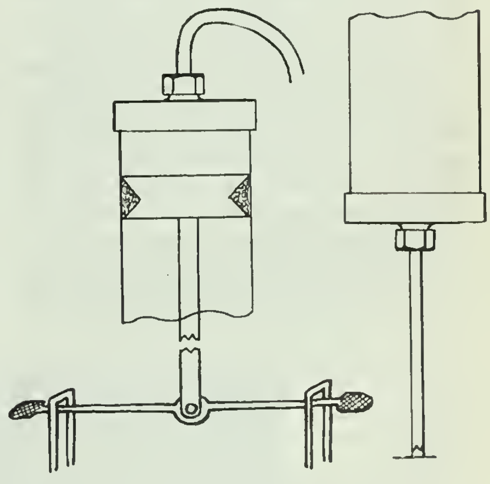


FIG. 4. A SIMPLE VACUUM PUMP

The illustrations shown are those of match plates but vacuum works equally as successful on any pattern provided that it has a flat surface broad enough to get hold of.

MOULDING OF PROPELLER BLADES

Continued from page 66

rammed straight up, care being taken to put bearing plates under the core prints B, D, Fig. 12. The centre core print should be carried right through the top box; the casting is run from the bottom, as shown, and when the centre core is placed in position a stud is firmly fixed between the cores as at E. A glance at Fig. 12 shows the general arrangement of the core and runner and casting.

A Few Hints About Modern Cupolas and Tuyeres

Showing, Theoretically, How the Blast Enters the Cupola, Together With the General Construction of Cupola and Tuyeres

By F. H. BELL

SO MANY inquiries have been received lately regarding construction and management of cupolas, that I have decided to show what might be considered as a modern standard cupola, differing in general construction very little from most modern cupolas. This particular type is what is known as the "Newton" cupola, but as I have already said, is to all intents and purposes the same as all modern cupolas, with the exception of the tuyere design, which I will also show. I will not say that this tuyere is any better or any worse than the others. It lets the wind into the fire and that is what it is for. The reader may judge for himself and govern himself accordingly.

In Fig. 1 will be seen the lower section of the furnace, the upper part being simply straight up to the top, with no variations excepting the charging door. As will be seen, the legs are fastened together at the bottom to prevent any possibility of spreading. These binding rods will be concealed in the brick or concrete floor which will be built under the cupola. As will also be seen the legs are spread so as to allow the bottom doors to swing without striking the legs. The doors will be seen to have vent holes for carrying off the gas from the sand bottom. B is the bottom plate of furnace, onto which the doors are hinged, R is the spout. C shows where the breast is, and T locates the tap hole. G is the wind pipe, directly opposite the tap hole. H is the wind jacket which encircles the cupola and connects the wind pipe, G, with the tuyeres H and J. At W, will be seen the slag spout. This is simply a trough similar to R, but only of sufficient length to reach beyond the bottom plate B, and slanting downward as shown. It is connected to a tap hole opposite to the tap hole T, but high enough above this to allow the basin of the cupola to hold a considerable quantity of melted iron, being just below the level of the bottom of the lower tuyeres sufficient to prevent the slag from entering the tuyeres. This slag hole should not be located under a tuyere, as the cold air will chill the slag. It should be midway between any two of the tuyeres and slightly below them. It does not, however, do any harm to have it under the wind pipe, because the windpipe does not come in line with any of the tuyeres. L shows the fire-brick lining, and E shows an angle iron hoop riveted to the inside of the shell to prevent the bricks from slipping down when relining the melting zone. H is the upper tuyere system. The advantage claimed for this row of tuyeres is that gases may be distilled from the fuel and escape without coming in contact with air blown through the lower tuyeres. They must however, pass through air blown through the upper tuyeres, and thus become completely consumed. The double row of tuyeres could, therefore, appear to render possible economical operation and rapid melting, inasmuch as no fuel would be wasted. Some cupola experts are, however, not in favor of the upper row of tuyeres, claiming as their argument that the cupola lining is damaged to a much greater extent and that the saving in fuel and the additional speed in melting is not sufficient to warrant their use unless running a very large cupola to the extreme limit of its capacity. Circumstances would undoubtedly be the governing factor, and, here too, the reader will be the judge of circumstances. As I have already stated, the general construction of the cupola is similar to any modern cupola, so also is the upper tuyere system, but it is of the bottom or main tuyere system that I wish to speak.

The Main Tuyeres

At Fig. 1 will be seen the bottom tuyeres shown also connected to the wind jacket and, as will be seen, they consist of a three-way opening with flat, level bottom, while the top slopes down toward the inside, giving it the appearance of a nozzle for forcing the blast. To a certain extent, this is what it is, but the view from this sketch does not convey the proper idea as well as it should.

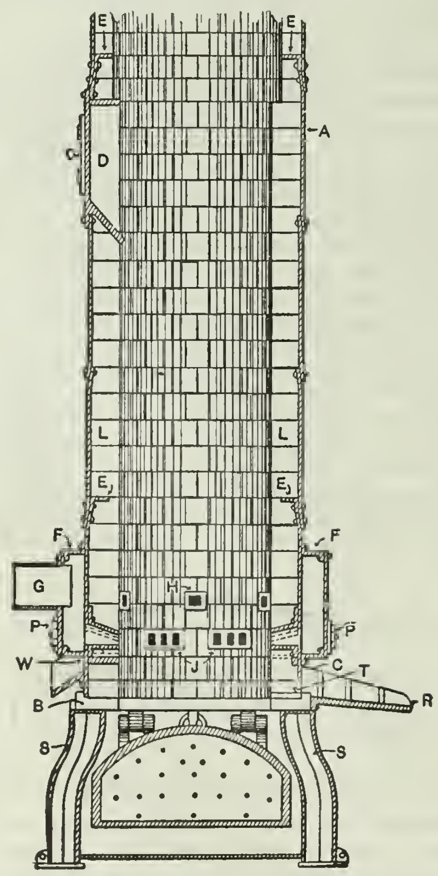


FIG. 1. CROSS SECTIONAL ELEVATION OF NEWTON CUPOLA

In Fig. 2 will be seen a sectional plan of the entire system, which does not tell the whole story either, but taken in conjunction with Fig. 1, it will be seen that if the two inner partitions had been omitted we would have a rectangular tuyere with the same area at each end, although different dimensions. For instance, the outside might be 6 inches square, and the inside 3 by 12, which would make 36-inch area at either end. The blast on entering, would be forced to follow the course indicated by the curved arrows, which is to say, it would spread all over the entire area of the cupola, with the exception of possibly the centre which might not be reached. Whereas, if the tuyere were of the same height from the front to back, the spreading sideways would not have the same spreading effect, as there would be nothing to force it to spread, and the tendency would be to go straight in. So far I have only dealt with it as a single opening, and have shown how it distributes the air throughout the fire with the possible exception of the centre.

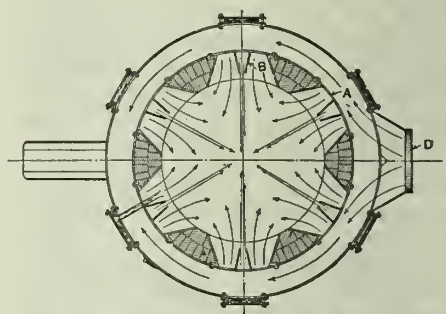


FIG. 2. CROSS SECTION PLAN OF TUYERES

The two partitions shown in Figs. 1 and 2, as will be seen, converge towards the inside making the centre opening a perfect nozzle and forcing the air from this small section to the centre. The air will, in the mind of the inventor, follow the course of the different arrows when entering the fire through the different sections of the tuyere, and while we can not say positively what takes place inside of the cupola, the theory looks quite acceptable, but as I have tried to explain, each individual reader will have to be his own judge.

TROUBLE WITH THE CUPOLA LINING

A subscriber has written the following letter regarding trouble which he is having with his cupola lining, and we cannot help but think that he must be having other troubles than this, particularly slow melting.

Question.—I am a subscriber to your paper and I get lots of valuable information out of it. So I would like to ask your advice about our cupola. We have considerable trouble with the lining burning out at the melting point. Our cupola is thirty inches in diameter when lined and has two tuyeres but no wind chest. We have to reline it after about ten heats. Would you advise putting in three or four tuyeres and smaller pipe? I do not think we have too much wind—the pipe is about 4 inches at tuyeres and 6 inches main pipe from fan.

Answer.—You do not say what size your two tuyeres are, but if your wind pipe is 4 inches at the tuyere we will presume that to be the size of the tuyere. Your cupola has probably been in use for many years as this is the type of wind arrangement in vogue before cupola practice became a real scientific study. Experience has proved that the tuyere area should be from 15 to 25 per cent. of the area of the cupola, with 20 per cent. as a good average, but never less than 15. Your 30-inch cupola would have an area of approximately 700 sq. inches and 15 per cent. of this would be approximately 100 sq. inches. If two tuyeres are adhered to they should be at least 7 inches square or oblong with 50 square inches of area each. With coke at its present price and time as valuable as it is at the present time it is not profitable to use a cupola like this, when the expense involved in making the alterations would be trivial. If an air belt is put around this cupola and six tuyeres 3 inches high and 8 inches wide put in, and the pipe leading from the fan to the air-belt is enlarged to about 12 inches in diameter, the heats can be run off in half the time, with the same fuel and with less power and the cutting effect on the fire bricks will be reduced to a minimum. In fact, everything which assists in rapid melting tends to improve the quality of the work. The faster the iron is melted and taken from the cupola, the less impurities it is permitted to absorb from the fuel. The system of forcing the blast through a nozzle not only cuts away the lining but it has an injurious effect on the metal. Nothing is to be gained by forcing the air into the fire. When the air in the centre of the cupola burns out, other air will automatically take its place, provided there is sufficient air entering the cupola.

PORTABLE OIL BURNER FOR LIGHTING CUPOLA

The illustration, Fig. 1, shows the new Hauck Portable Oil Burner for lighting coal and coke in kilns and furnaces without the use of kindling. This is just one of the many types of burner outfit manufactured by the Hauck Co. for use in practically every way where heat is of value. Coal oil is the fuel used, and by putting it under pressure the oil is vaporized, and in this condition burns with a powerful blue flame. By placing the burner on the spout of the cupola, the blaze is forced under and through the fuel, lighting it as easily as though kindling wood had been used.

FIG. 1. LIGHTING FIRE WITHOUT KINDLING

The portable or independent, self-contained type have a hand-pump attachment, but where the plant is equipped with compressed air apparatus, it is conveniently connected.

These burners may be used for various purposes around a foundry, such as drying molds, drying repairs to large cores which have been taken from the oven.

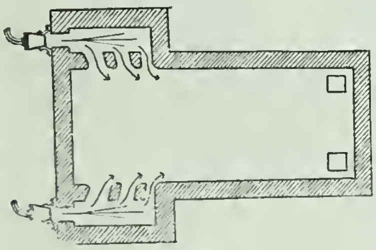


FIG. 2—FIRING CORE-OVEN WITH HAUCK BURNER.

Many large malleable iron foundries have found them particularly advantageous in lighting their furnaces. Hauck burners can also be used for fixing boilers, melting brass without any other fuel than coal oil, and for foundry ovens. In the illustration, Fig. 2, will be seen a plan for attaching to annealing or core oven or similar furnaces, two Hauck Burners for indirect heating. Note the special combustion chamber.

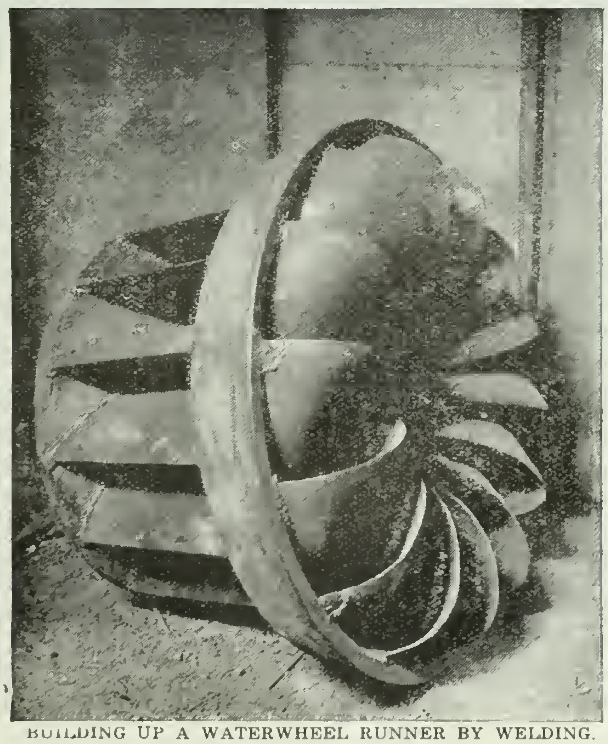
Additional sketches for attaching Hauck Burners to annealing furnaces, forges, melting furnaces, boilers, kettles for heating liquids, etc., will be supplied by the Canadian Hauck Co., Port Hope, Ont.

WELDING REPAIRS TO WATER WHEEL

Our readers will remember an article in CANADIAN FOUNDRYMAN a few months ago, in which it was shown that a water-wheel may be made in one piece from ordinary cast iron in a green sand mold. There are, however, certain styles of wheel which are preferably made with cast ends and steel vanes. These vanes are put in the mold and have their ends projecting into the part which will be poured wth melted iron. These ends will be what is termed burned in, but sometimes they do not burn in, and are simply loose with the iron ends holding them from falling away. While in this condition they will continue to get looser and will ultimately make trouble. The method shown, whereby they may be securely fastened by means of electric welding should be a boon to foundrymen in this line, as well as to users of water wheels. The illustration will also serve to show molders who never moulded a water wheel what it is like and it will give them something to ponder over and study how they would proceed to make it.

An electric welding repair job that is of considerable interest to the power

Continued on page 85


BUILDING UP A WATERWHEEL RUNNER BY WELDING.

The Booth Rotating Brass Furnace

A Type of Electric Brass Furnace in Which the Shell is Rotated. This Results in Less Zinc Loss Through Vaporization and a Longer Furnace Life.

By Carl H. Booth
Pres. Booth Hall Co., Chicago

ABOUT five years ago we were associated in the design of several electric furnaces for the production of special chemical compounds. These furnaces were cylindrical in shape and arranged to rotate about a central axis through which the electrodes projected. At the time it was suggested that this type of furnace could be adapted to the melting of non-ferrous metals, but there was no opportunity to carry on such work. An illustration of one of these furnaces is shown in Figure 1.

In these earlier furnaces a door was provided in the cylindrical surface of the shell and lining, for charging and pouring, but we experienced considerable difficulty in maintaining the lining around this combination spout and door. Further, in pouring the furnace it was troublesome and inconvenient to be obliged to place the ladle between the supports beneath the furnace. Consequently, in designing the present Booth Furnace, these difficulties have been overcome by placing the door in one end of the furnace, as shown in Figures 2, 3 and 4, and having a tapping hole in the other end, as shown in Figures 2 and 3. In this way the cylindrical surface of the lining and shell is unbroken by any opening. This permits the continuous rotation of the furnace, and consequently the absorption of heat by the charge from all parts of the lining, which means no local overheating and uniform wear.

Capacities

As a general rule, the quantity of non-ferrous metal melted at one time, or at one heat, is less than the quantities involved in the melting of steel and iron, and, therefore, smaller sizes of furnaces are desirable.

To meet the requirements of the small foundry, as well as the large foundry, and the smelters and refiners, Booth Furnaces are built in the following sizes:

Rater Holding Capacity	Maximum Holding Capacity
250 lbs.	350 lbs.
500 "	750 "
1,000 "	1,500 "
2,000 "	2,500 "
3,000 "	4,000 "

There are many small plants where heats of 50 to 350 lbs. are required, and the smallest size furnace shown above answers the purpose with great economy, whereas larger furnaces to operate efficiently must produce more metal than is needed. Further, there is also a great

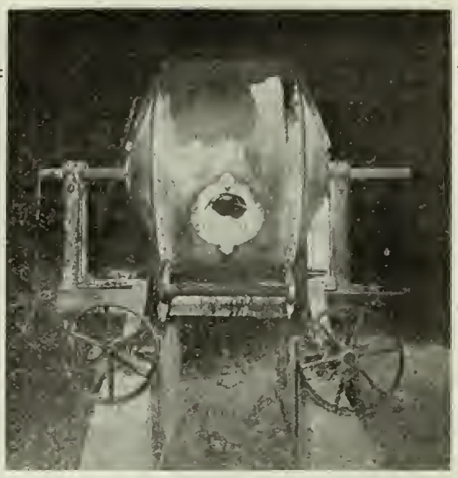


FIG. 1—ORIGINAL ROTATING FURNACE.

disadvantage in trying to pour a ton of brass into small castings and keep the metal hot. We know of a large company having a one-ton electric furnace where it is taking them 50 minutes to pour a heat into castings, and they are finding great difficulty in doing so. Further, the great variety of mixtures made by many small foundries requires a small, efficient unit, from which "short" heats can be taken, producing great flexibility of operation. On the other hand, smelters and refiners frequently require furnaces of relatively large holding capacity, which will turn out a considerable amount of metal per day.

Any one of the above furnaces will melt and bring to pouring temperature a charge of its rated holding capacity in an hour's time, when the furnace is hot.

Mechanical Details

The illustrations and drawings give a very good idea of the general design of the Booth Electric Furnace.

Figure 2 is a cross-section or diagram, illustrating clearly the principle of construction. As will be noted the furnace rotates on rollers, and is carried by two cylindrical tracks. The rollers are driven at the proper speed by a motor, so as to rotate the shell at a speed of two revolutions per minute. No gearing is required encircling the furnace. The current is carried to the electrodes by means of short pieces of flexible cable, which connect to the above-mentioned track, and the current is supplied to the track by means of shoes which press against them and form a sliding contact. The electrodes are regulated by means of screws shown, and on small furnaces are entirely hand-operated, but on the larger furnaces automatic electrode control is used, thus doing away with the necessity of close watching on the part of the operator.

In the small furnaces, the door is in one end only, but in the larger furnaces both ends are provided with a door.

Figure 3 is a photograph of a rear view of a 250-lb. Booth Electric Brass Furnace, in the foundry of Leitelt Brothers, Chicago. This shows the charging door open ready for charging. The latch which holds the door shut when the furnace is charged will be noted and also the electrode projecting through the door. A door of similar type with electrode projecting through it has been in use for a considerable period in the construction of the Booth-Hall steel melting furnace, built by our company. The contact shoes are shown in this view pressing against the track.

Figure 4 shows the same end of the furnace after it is charged and the furnace is ready to run. The flexible cables from the track to the electrode holder are shown, as are also the water-cooling connections for cooling the electrodes. It is not necessary to open the door until after the heat is poured. The door is then opened for charging.

Figure 5 shows a front view of the 250-lb. Booth Electric Brass Furnace, and illustrates well the cylindrical drum type shell and the track driven by the rollers. This also shows the bronze

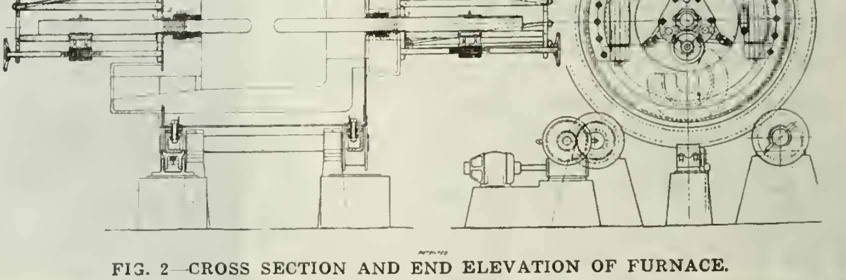


FIG. 2—CROSS SECTION AND END ELEVATION OF FURNACE.

shoes which carry the current to the track and the flexible cable connected with the electrode holder and the water connections. The pouring tap is shown directly beneath the electrode holder frame.

Figure 6 shows a side view of the furnace. The cable supplying the power to the furnace is shown on both sides, coming from conduits in the floor to the bronze shoes. These are the only connections necessary to carry the electricity to and from the furnace. The contractors are shown on the switchboard, together with push-button control for starting and stopping the furnace.

In pouring the ease with which the men handle the ladle up to the furnace, and the operator controls the furnace at the switchboard by means of push-button control, add greatly to economy in operation and to the comfort of the crew.

Lining

Probably the most important of all factors in reliable and efficient furnace operation is the lining. Especially is this true with the melting of non-ferrous metals, where a lining with many joints will have a decided tendency to absorb metal. In order to overcome this difficulty the lining provided with the Booth Furnace is made with as few joints as possible.

In lining the furnace the electrode supporting mechanism at either end of the shell is removed by simply unbolting same from the end plates. These are made as a unit and in taking them off they do not get out of adjustment or out of line, and therefore do not require any adjusting when put back in place. The shell is then lifted off the rollers by suitable hoist or crane, just as if it were a barrel and is turned on end so that the end plate of the furnace shown in Figure 3 can be unbolted and removed from the shell.

Figure 3 shows to some extent how this lining is made. The door is made of one solid piece of brick with a hole in the centre through which the electrode projects. The cylindrical part of the furnace is made of two cylindrical tiles, which fit together with a tongue and groove joint in the centre, this joint being filled with heat-resisting cement. The ends of the furnace are each lined up with four special bricks, joined together with cement and cemented to the tile. In this way we really have a large crucible electrically heated, but with walls of considerable thickness, and a minimum number of joints. Further, this lining does not require a brick mason to install it, but can be put in with common labor. This special brick lining is backed up with a layer of heat-insulating material, so that when the furnace is at working temperature, the temperature on the outside of the shell is so that the hand can be placed upon it. Compare this with the large amount of heat in the neighborhood of a crucible or other fuel fired furnace, and it will show you how much easier it is to get men to work around a furnace of this character.

The time required for relining this furnace is 8 to 12 hours.

Charging

In starting the furnace the tap hole is plugged with moulding sand, the charge placed in the furnace, the door closed and the power thrown on. The electrodes are then brought together by means of the moving mechanism shown in the photograph and the amount of current flowing regulated by moving the electrodes closer together or further apart, as indicated by the meter on the switchboard.

Methods

If turnings, floor sweepings or grindings are used the rotation of the furnace is started at once and continues until the metal is ready to pour. We have never broken an electrode in operating in this manner. If ingots or heavy scrap is used, the furnace remains stationary until the ingot is partly melted, and then rotation is started and continued until the metal is ready to pour. We have experienced no difficulty in regard to breaking electrodes when this method is followed.

As the furnace is sealed up quite tightly from the time the power is on until ready to pour, we have obtained very good results as to metal temperature by keeping the power practically constant for a definite length of time. After the operator has poured a few heats, it is possible for him to determine the right temperature practically every time without opening the door and inspecting the metal in the furnace.

Pouring

In pouring the furnace, the pipe stands which carry the water connection simply lift out of the way without it being necessary to unbolt anything, and the men can go right up to the furnace with the ladle.

When the furnace is ready to tap the operator stops the rotation until the tap hole is above the level of the holder, and thus above the surface of the metal. The tap hole is then opened by means of a sharp-pointed steel rod. As the tap hole is simply plugged with moulding sand there is no sledging or pounding required, as we have found it can be very readily picked out if a small pointed rod is used. We have never had any trouble with the tap hole. After the tap hole is opened, the furnace is rotated down until the opening is below the surface of the metal, and the metal poured out into the ladle as illustrated. If it is desired to only remove a portion of the metal, the furnace is again rotated back and the tap hole brought above the level of the metal in the furnace.

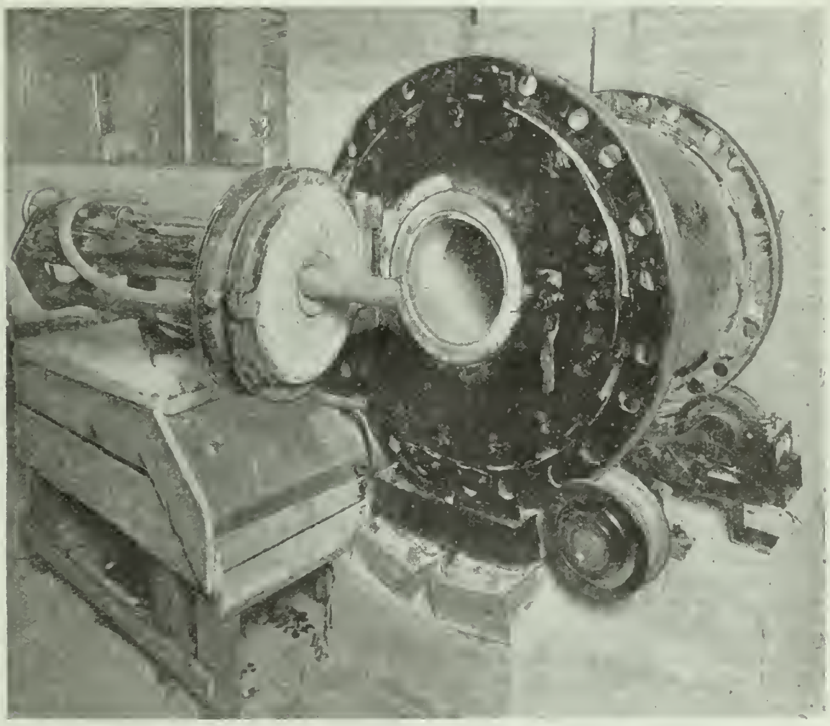


FIG. 3—SHOWING METHOD OF CHARGING FURNACE.

On account of the fact that there are no swinging cables connected with the electrode holders, it has been suggested that the furnace itself could be picked up from its rollers by means of a crane and the metal poured into ingots or castings. We have not attempted to do this as yet, but it seems to be entirely feasible.

Operating Records

With the small furnace which is in the plant of the Leitelt Bros., Chicago, we have poured about 130 heats, using a great variety of mixtures and pouring a considerable number of different grades of metal. We have used:

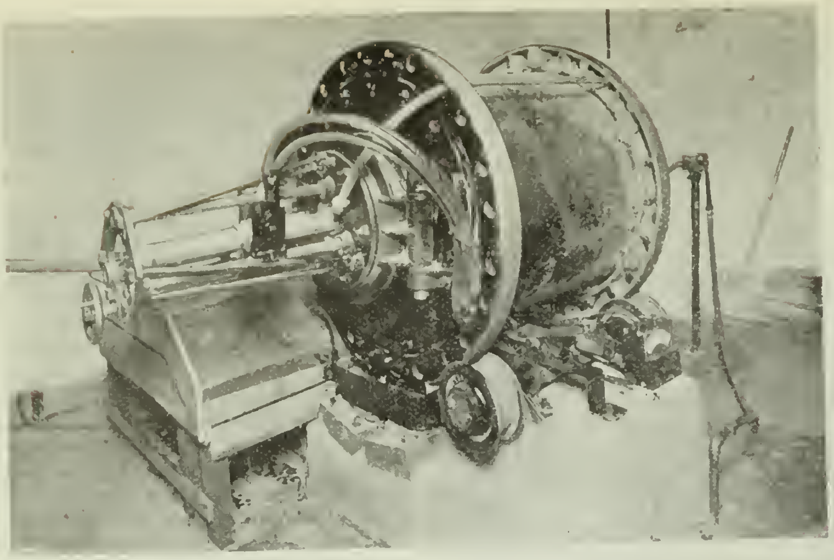


FIG. 4—ARRANGEMENT OF ELECTRODE GEAR.

Yellow brass turnings and borings; concentrates from floor sweepings; grindings; foundry scrap; copper wire; sheet copper; red brass ingots; yellow brass ingots; copper ingots; pig tin; lead pipe; pig zinc; German silver.

So that the furnace has been thoroughly tested on many classes of material.

Power Consumption and Shrinkage

In melting down turnings, borings and grindings with a hot furnace, 30 to 40 minutes is required per charge. With the small furnace shown a power consumption as low as 240 kw. h. per ton has been obtained. The average would be between that and 300 kw. h. per ton.

With yellow brass turnings and borings which are fairly clean, but on which no attempt has been made to remove any contaminating material, heats have been run with a total shrink of 1½ per cent. These borings, when charged, were in the same condition as received from the seller. Of course the percentage of shrink will depend on the amount of oil, dirt, iron and other extraneous material present, but the actual metal loss has proven to be very low. Due to the active mixing action of the rotation, the heat is applied to the turnings and borings in such a uniform manner that there is no local overheating, and a quick melt with low metal loss is obtained.

In melting concentrates from floor sweepings, which contain a considerable amount of dirt and moisture, and which when melted in crucibles showed a shrinkage of 30 to 40 per cent., the Booth Electric Furnace over quite a number of heats averaged 17½ per cent. shrinkage.

In melting ingots and heavier brass scrap, a heat will average from 30 minutes to an hour in length of time, depending upon the kind of metal poured and the size of the charges. A 300-lb. charge of copper ingots requires about an hour to melt and pour, while a 300-lb. charge of yellow brass about 40 minutes. The shrinkage with yellow brass ingots averages about 1 per cent. and on red brass and high copper bronze under 1 per cent. With the furnace hot the power consumption will run from 250 to 350 kw. h. per ton.

One heat was made with a charge running about 50 per cent. zinc and 40 per cent. copper, totalling 250 lbs. 249 lbs. of metal were poured and the power consumption was 240 kw. h. per ton. This was in the latter part of the day when the furnace was hot, and the metal charged was all clean metal. The ladle was weighed as it was brought to the furnace, and then weighed after the metal had been poured into the ladle. Great care was taken on the part of the operators not to overheat the metal, and this is simply an indication of what results are accomplished where sufficient attention is given to melting. The heat following was a charge of 225 lbs. of red brass ingots, from which 224½ lbs. of metal was poured.

It is particularly difficult to keep account of the metallic shrinkage in a small furnace of 250 lbs. holding capacity, and consequently great care has been exercised. Arrangements were therefore made for a scale near the furnace, upon which the heated ladle was weighed when brought to the furnace and again weighed when filled with metal. Any drippings from the furnace were carefully collected and weighed and any slag coming out with the metal was skimmed from the pot before weighing, as even a small amount of one pound would mean almost one-half of one per cent. shrink. With a larger furnace, it would be much easier to make shrinkage tests without danger of as large a proportionate loss as with the smaller furnace. In other words, if one pound of metal poured did escape being weighed, it would not represent as much shrinkage as in the case of a small furnace.

Lining Wear

To date about 130 heats have been run and the lining on the furnace illustrated shows no perceptible wear. The lining is sintered upon its surface and appears to be in as good condition as when originally installed. This is the first lining installed in the furnace. The material of which the lining is made is such that it does not shrink, spall or crack, although the furnace is run on an average of 8 hours per day. Based on a great many years' actual experience in the operation of electric furnaces of many types, our engineers feel confident that linings of this type will last from 600 to 1,000 heats, and possibly longer, with proper care on the part of the operator.

Another important characteristic of this method of lining is due to the fact that there are practically no joints, which serves to keep the lining clean and prevents any considerable amount of slag or metal sticking to it.

Electrode Consumption

With furnaces of this type the graphite electrode is to be preferred, due to its greater conductivity, which permits the use of the smallest size of electrode practical for the current to be carried. On this furnace electrodes of 2½ inches diameter are used, machined and equipped with what is known as nipple joint. These are 30 inches in length. The electrodes enter the furnace through graphite sleeves. This opening is also protected by a water-cooling copper casting

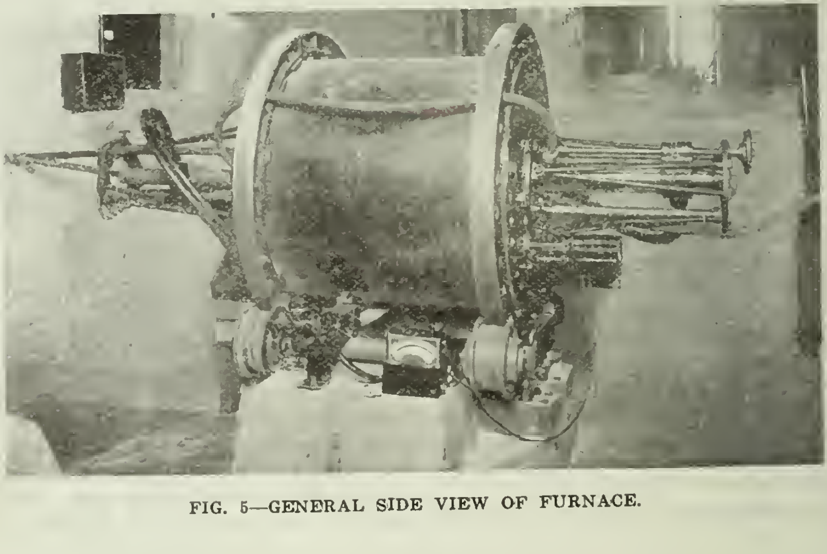


FIG. 5—GENERAL SIDE VIEW OF FURNACE.

which serves to protect the electrodes from burning at this point.

Even with the small 250-lb. furnace shown, the electrode consumption is low. If the furnace is kept in operation fairly continuously during an 8-hour day, the consumption will average about 3 lbs. per ton.

The electrode supporting mechanism has been so designed that it not only permits of adjustment in case electrodes are slightly out of line, but at the same time serves to protect the electrodes from breaage, due to the accidental falling of bars or other material against the end of the furnace.

CORE VENTING WAX

In our February number we had an inquiry regarding wax covered string for venting cores; this we answered, and we think our answer was correct, but at the same time we do not believe that a wax-covered string is really advisable. The United Compound Co., 228 Elk Street, Buffalo, New York, inform us that while they still manufacture this sort of wax, fully 90 per cent. of their product is made without string or thread. The string has already become an old-time method and foundrymen are appreciating more every day, wax without a string. The great objection seems to be the danger, especially in smaller sizes, of the string burning and leaving an ash which may obstruct the vent. Then again, if it does not burn it has to be pulled out after the core is baked.

Vent wax is a comparatively new invention and there are perhaps some foundrymen who have not yet become acquainted with it. The demand of modern times upon the foundries to furnish castings requiring very intricate core work, has made necessary a reliable method of core venting. Prior to 1908 most every foundryman remembers the very unsatisfactory methods known and used for venting cores, none of which really did the work properly, and practically no two foundries doing work in the same manner.

Realizing the demand for a material that would vent the most complicated cores, with positive results and that would standardize core venting, the United Compound Company, of Buffalo, N. Y., in 1908 introduced a wax for this purpose, manufactured by them and marketed as Buffalo Brand Vent Wax.

This wax is of a proper combination of waxes and oils to produce a hard, pliable wax, which, at an ordinary temperature, will not stick together.

It is pressed into strands of round and flat oval shapes. The required size and shape is simply bedded in the core when ramming, leading to the proper outlet, and the wax is entirely absorbed by the core when baking. If the core is sawed to pieces after being baked, it will be found that no injurious effect has been produced by the absorption of the wax. The vent hole will be found to be clear and the sand surrounding it will be the same as the rest of the core.

CORES AND CORE OVENS

It is not my purpose in this article to discuss the different classes of cores which the coremaker is called upon to make, so much as it is to emphasize the importance of properly dry them. There is no part of the foundry equipment which is so little studied as the core oven, yet there is nothing which requires more study than this very subject. The one great feature of a core oven is to have it under absolute control. It is an easy matter to damp off a fire if it is going too strong, but it is not easy to make a fire burn up when it has poor draft. Every oven should have good draft to the fire place so that when a good lively fire is required it can be had.

In drying cores a certain amount of judgment is required in order to heat them to the proper temperature. The very reverse to drying a brick kiln is necessary in core drying. In drying bricks a very slow fire is kept up until all moisture is evaporated, after which the bricks are heated to a red heat, but bricks are made chiefly of clay, and the moisture filters out very slowly, and if heated to a high temperature while still damp, the brick will melt and run. With cores, made from grained sand as all cores should be, this programme is reversed. If a large core is subjected to a slow heat the outside has a tendency to dry to dust while a little below the surface, the core will become hard, while the interior is still damp. If a higher temperature is now brought to bear upon it, the outside will burn before the inside gets heated.

If on the contrary, a good hot fire had been burning in advance, and the oven heated to a high temperature before putting the core in, and the oven kept hot until all the moisture had evaporated out of the core, the core would not burn, but the dampness from the inside would continue to keep the outside damp as long as there was any dampness in the core. As soon, however, as all the dampness is out of the core, the temperature should be reduced, or else the core will be burned. But it is not necessary to go to these extremes. If the oven has a good draught, it can be so regulated that the core will bake properly. If a core oven smokes it is not properly constructed. It should be possible to light the oven fire any time of the day without causing any smoke to permeate the atmosphere of the foundry or core-room, and if the draft is sufficient to admit of this, it will be quite possible to get the temperature up to the proper degree before the core has taken harm, and it should not take long to know how much fuel to use in order to have the fire die out at the proper time to not burn the core, but the core should be kept at a high degree of heat until it is thoroughly dry, as a second drying is never satisfactory.

While a core oven should never be allowed to smoke, it is difficult to avoid the gassy smell which comes from the cores —not from the fire. This gas should be attended to by means of a hood connected to a tall stack, or to some mechanical suction arrangement, and carried outside of the building. Core ovens usually constitute about the worst nuisance in the foundry, but there is no occasion for it, and when proper attention is given to this subject one of the worst menaces to the health of the foundry workman will have been eliminated.

WHAT ASBESTOS IS

Asbestos is a variety of hornblende which is itself classed by Dana as a synonym or subdivision of amphibole. He says that the several varieties of amphibole, and notably tremolite and actinolite when they have little alumina in their composition, tend to become fibrous, in which case they are called asbestos. Havy regarded the fibres as rhomboidal prisms. As the etymology imports, asbestos is exceedingly infusible, at least in a mass, which is to say, it is practically proof against fire. While it is not absolutely fire-proof, it is probably as near to it as any material known. If the fibres are torn apart and mixed with something more fusible it is possible to consume it with fire, but if made up in a compact body or in a sheet, it can be held in close proximity to enormous heat without apparently absorbing any heat itself.

Asbestos is found in many varieties, such as: (a) amianthus, in which the fibres are so exceedingly long, flexible, and elastic, that they may be woven into cloth. (b) Common asbestos, with the fibres much less flexible, it is heavier than the first variety, it is dull green, sometimes pearly in lustre, and unctuous to the touch. (c) Mountain cork, light enough to float on the water. (d) Mountain leather, also very light, but thinner and more flexible than the last. (e) Mountain paper, a designation formerly given to fine, thin specimens of mountain leather. (f) Mountain wood, which, in the external aspect, resembles dry wood. It will be seen from this that asbestos is formed in almost any state or condition which could be desired and can be used whenever a heat-resisting substance is required. Canada produces practically all the asbestos which is used. Eighty-five per cent. of the world's supply is mined in the province of Quebec, it is taken from the ground in the form of rock although as we have already shown it has more the appearance of wood. It is run through crushing rolls which separate the fibres from the smaller particles. The long fibres are used for weaving in cloth. The dust is used for fireproof paint, while the various other grades all have a place to fill in some line of usefulness.

A CORE MAKER MURDERED

The body of John F. Barry, a core maker, was found in a mill pond at Milford, Mass., with hands and legs bound and nose and mouth gagged. Robbery was the only motive suggested by the police.

Research Work on Malleable Iron—*Continued*

Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

39. In order that there will be no doubt as to the reliability of the carbon determinations, it can be stated that the drillings were secured by milling off the metal at the reduced part, the milling cutter passing over the entire cross-section until sufficient drillings were obtained for the carbon determinations in duplicate. The drillings were then very thoroughly mixed. The carbons were run through by combustion in a platinum tube with all precautions deemed essential for trustworthy work. It can be further stated that all of the bars were regular ones sent in for test to this office, and it was unknown to any one that these analyses were to be made.

40. Without practically writing at too great a length on the subject, it would not be possible to cover completely certain facts of interest in connection with air-furnace work, proper construction of furnace, furnace operation and suggestions for further improvement in this direction.

Annealing of Hard Iron

41. When a piece of air-furnace hard iron is gradually heated, a temperature is finally reached where many of its properties are very different from what obtains a very slightly lower temperature. It will cease to be magnetic. Its structural composition will be different. The size of the crystals will be much finer than was the case under this particular temperature. It can be carburized beyond its original carbon content if packed in a carbonaceous material and held at this temperature for a sufficient length of time, while, if packed in material that yields oxygen it can be decarbonized almost completely if the piece is thin. Also the carbide of iron can be broken up into its two soft constituents at the temperature referred to. This temperature is called the critical temperature, or critical range, and for air-furnace hard-iron castings it is in the vicinity of 1440 deg. Fahr. It is the lowest temperature at which hard-iron castings may be successfully annealed. This statement must be modified by the further statement that in an oven under perfect control this temperature is the one that would be selected. In practice it would not be safe to adhere too closely to it, for the reason that should the castings, while being held "at temperature" fall under the critical range, it would undo in large measure what had been accomplished above it. In the annealing of the castings one of the things to be avoided is oscillating temperatures, or temperatures alternating above and below the critical range. For this reason it is necessary to select a temperature some 100 to 150 deg. Fahr. above the critical, say, 1550 Fahr., in which event, even if due to carelessnes the temperature does drop a little, it will not be liable to fall to a dangerous point. There is another reason why this latitude is deemed essential, though this does not obtain to-day to the extent it did formerly, due fact that in large ovens it requires considerable ingenuity to arrange flue openings, drafts, etc., in such a manner that the temperatures in all parts of the oven will be uniform, for which reason it is necessary to make sure that the temperature at the coldest corner is somewhat above the critical range, which will serve to safeguard oscillations in these locations.

Preparation of Castings for Annealing

42. In order to anneal the hard-iron castings that have previously been barreled or sand-blasted, chipped, gates ground off and inspected, they are packed in cast-iron pots where they are surrounded by an oxidizing packing. The packing has a dual function: to furnish oxygen through whose agency the castings will be decarbonized to the extent that is possible, and to avoid kiln warp, that is, prevent the castings from distorting. The pots, or stands, are sectional and each comprises a casting which forms its bottom, upon which four or five sections are superimposed. Each section consists of a rectangular or circular "ring" by which name they are known, whether they are of the former or latter shape. These rings are about 1¼ in. thick and vary in size at different plants, depending upon the dimensions of the castings to be annealed, but they would average, if rectangular, about 14 in. by 24 in. by 14 in. high. In building up a stand, a ring is placed on the stand bottom and then carefully filled with castings that are surrounded with packing. When the ring is completely filled, it is hammered on the sides with a light sledge in order that the packing will run down and fill in all voids. The second ring is then placed upon the first one, and this is filled in the same manner, which procedure is followed until the stand of four rings is completed. In Fig. 8 can be seen an annealing oven, partly filled with stands that are each four rings high. The top ring is filled with castings only to about two-thirds of its height, for if they were brought to the top they would be exposed to the oven gases. Instead, the top third of the ring is filled with packing and this in turn is covered with an iron plate. The top and all joints in the stand, are then mudded or luted in order to prevent the entrance of the oven gases, after which the stand is lifted up by the charging truck and placed in position in the oven.

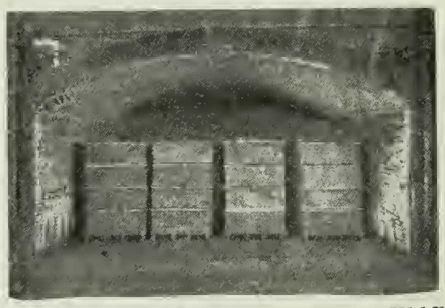


FIG. 8—ANNEALING OVEN PARTLY FILLED WITH ANNEALING POTS.

43. The ovens are usually of rectangular shape, and vary in capacity from 15 tons for a very small oven to 50 for the largest ones. Their average capacity is about 25 tons. The usual fuel is bituminous coal, but hard coal, powdered coal or oil are used. The matter of construction must be dismissed with the statement that these ovens are being standardized and designed with a determination of securing uniformity of temperature throughout, and a great deal of study and experimentation is being devoted to this proposition. The flues are not only being properly proportioned for the draft used, but the flue openings so dimensioned that the heat can be drawn to any part of the oven in amounts sufficient to equalize temperatures, while provision is made whereby they can be easily kept clean. In the plants of the association practically all of the ovens are under pyrometer control, and equipped at a central station where it is possible at any moment to ascertain the temperature at the hottest and coldest part of any oven, while a master pyrometer is used as a check on those that are permanently located. In this manner it is rather difficult for things to go wrong without detection. Air-furnace and annealing-oven operations have also developed from extremely crude methods to intelligent control, and this in large measure accounts for the improvements in the uniformity of the product.

Length of Annealing Time and Temperature Limits

44. In annealing, the castings are brought "to temperature" that is, to 1550 deg. Fahr., or as high as 1600 deg. Fahr. if thought best, as rapidly as it is deemed they can absorb the heat. Too great a forcing of the heat during this period is avoided, for if it is done the rings expand much more rapidly than the material within them, which, leaving a space between ring and contents, will allow the packing to bleed down from the top towards the bottom of the stand lessening the compactness in the upper rings. In average practice it takes about 48 hours for the oven to arrive "at temperature." The temperature of anneal

is then maintained for a minimum of 48 hours, the time recommended being 60 to 72 hours. Firing is then stopped and then oven sealed tight in order that the castings will not cool faster than from 8 to 10 degrees per hour while passing through the critical range. To safeguard this very important detail, this rate of cooling is maintained until the pyrometers indicate that the oven temperature is less than 1100 deg., for, on cooling, the castings are liable to be some 200 deg. higher than indicated by the pyrometer in the oven. After the temperature has been lowered to that point an opening is made in front of the oven in order to allow it to cool more rapidly, for the reason that once the castings are at a temperature under the critical range no change can take place in their structural composition, so the only remaining precaution is to see that the castings do not cool so fast that internal strains can develop in them. From the foregoing it can be readily seen that the average length of anneal occupies about seven days From theoretical, as well as practical considerations, the writer does not believe that there is a possibility of safely lessening the time for this operation by much more than one day without taking chances. He has designed on oven in which the temperature of 1600 deg. can be easily attained in 25 hours, and he is aware that when the composition of the hard-iron castings is such that the hard carbide is in its most unstable condition that even less than 48 hours will suffice for the precipitation of the carbon, so that these two periods can be reduced somewhat, but danger is ever present if liberties are taken with the cooling through the critical range. In order, then, to safeguard the consumer as well as his own reputation, the manufacturer should make no serious attempt to shorten the anneal unduly. The annealing capacity should be such as to make the attempt unnecessary. If it is made, however, then the pyrometer element should be inserted directly into the centre of the pot, placed for that purpose in contact with the side wall of the oven in order better to determine when the castings have actually arrived "at temperature" and the moment when he can commence to record the time the temperature can be started on its downward course, which procedure will enable him to operate more closely and accurately.

A Conversion Rather Than an Annealing Process

45. From what has preceded it should be evident that the second step in the manufacture of these castings should not be known as an annealing process, but more appropriately as a conversion process. The dominant function of an anneal is to obliterate coarse crystallization or an unsuitable one, and replace it by the most suitable that it is possible to produce in the object treated, and incidentally remove internal stresses Annealing does not imply structural changes in the piece when cold, aside from grain size and grain refining. In the annealing of malleable-iron castings the dominant object is to convert white, hard iron, in which all of the carbon is combined, into a soft, tough, ductile iron in which no part of the carbon is in that state. In order to achieve this, it is necessary to maintain for a sufficient length of time a temperature just in excess of the critical range, which, as has been pointed out, coincides closely with that at which grain refining occurs, so it happens that during the conversion both objects can be practically attained.

Structural Constituents in Iron and Steel

46. Before briefly entering into the rationale of the annealing operation and subsequently taking up certain facts in detail concerning the finished product and the conditions that influence the appearance of the fracture and physical properties, some particulars regarding the structural constituents in iron and steel should be presented in order that the exposition may be intelligently followed. Steel and iron crystallize upon solidification, and if a piece is properly polished and etched, the crystalline boundaries can be developed and seen under proper magnification. If a sample of pure iron is thus tested, its structural composition is considered to consist of 100 per cent. ferrite, because the latter name has been given to iron which contains no carbon. (See Fig. 9.) If the iron were contaminated with the other four impurities to which we have alluded, it would still be considered to consist of 100 per cent. ferrite. For example, ferrite has the property of dissolving silicon and its physical properties can be changed thereby, under which condition, however, it would still remain ferrite.

Malleable Iron Replaces Bronze

Two Castings Made of Malleable Iron in Preference to Bronze, Where Human Life Was at Stake

Malleable Castings Replace Bronze in Specially Designed Transmission

Captain observation balloons, even in the absence of any risk from enemy attack, operate with considerable danger to the occupants, and require instant "release" and "recovery" by the mechanician who operates the specially designed apparatus at the ground end.

Through the courtesy of The American Malleable Castings Association, we are permitted to show that part of the equipment where 100 per cent. efficiency is required for the protection of the lives of the observers.

This is the transmission, and is connected with the windlass through the bevel pinion meshing in the bevel gear which is attached to the winding drum. This transmission has three brakes, one of which, composed of a steel band lined with copper segments, operates on the surface of the large case or drum. This latter is specially designed not only to function with the brake but to house the transmission. The gears inside this case, which is shown separately, operate in oil, and at such high speed that tremendous pressure is exerted against the sides of the case.

TRANSMISSION DRUM

The case must not only be entirely free from the slightest flaw and of great tensile strength, but its texture must permit such accurate machining that the escape of the slightest amount of oil is prevented in order to insure the efficient operation of the brake. In the original French design this case was made of bronze, but in this country it was possible to secure a malleable casting meeting all the requirements of the Government's specifications, and in some respects proving much superior to any other material.

For obvious reasons the identity of the foundry manufacturing these parts cannot be stated, except to say that the maker is a "certified" member of The American Malleable Castings Association, and licensed to make "Certified Malleable Castings."

The separate casting after machining weighs 40½ pounds, and has an outside diameter of 12⅝ inches, and a wall ½-inch thick. Total depth at hub 6½ inches, at outer rim 5 inches.

Practical Hints for the Brass Founder

MIXING MANGANESE BRONZE

To the Editor:—In your December issue you gave a formula for an "excellent manganese bronze," providing proper facilities were at hand for melting and mixing the different ingredients. Will you kindly advise me what equipment I will require, and how I will proceed? Be sure and explain how to mix iron with brass of any kind.

Answer:—I will dispose of your last question first. Your experience has probably been the same as that of other brassfounders, viz., that iron does not mix with melted brass in any other manner than in spots which will be so hard that the lathe tool will jump over them. If brass turnings are melted and a speck of iron or steel happens to be in it, this speck probably does not melt, because it takes a higher temperature to melt iron than is required to melt brass. This speck just gets in a partly-melted state, and gathers some of the melted brass around it, which is carbonized by the chemical action of the carbon contained in the iron, making the brass which comes in contact with the iron much harder than the iron itself. This effect will be overcome by the introduction of the aluminum. As regards introducing the iron. If the brass foundry is in connection with the iron foundry, melted iron can be secured from the cupola; but in ordinary brassfounding, it is introduced in the form of tin-plate clippings from the tinshop. This material is mostly iron, but carries enough tin to require consideration.

Before mixing alloys, it is well to know the temperature at which each one melts, and put them in the pot in rotation, so that one will not be overheated in melting another. But this is not always adhered to, neither is it always necessary. For instance, copper melts at slightly under 2,000 degrees; but will require to be hotter than this in order to be poured, and if heated to 2,300 degrees, it is not hot enough to injure it, if kept well covered with charcoal; and at this temperature it will readily dissolve the tin-plate scrap.

Manganese copper carrying 2 per cent. managanese is on the market, and if it is desired to introduce one pound of manganese into the mixture, it would require fifty pounds of manganese copper, the balance of the copper in the mixture would be pure copper.

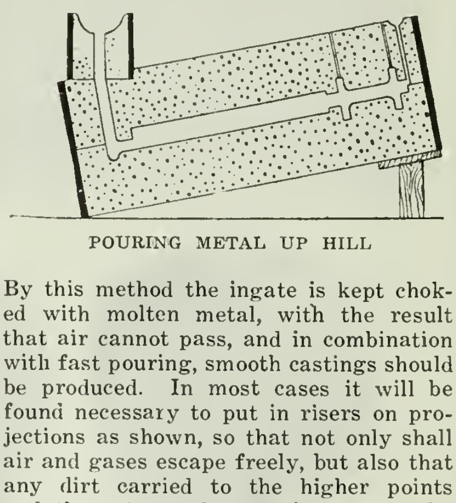
Melt the pure copper first, with a little salt and charcoal in the crucible with it; next put in the tin-plate scrap, and stir it well to be sure it is melted, after which put in the aluminum, then the manganese copper, and finally the zinc. If the amount of tin which was introduced with the iron is not sufficient, the balance can now be put in, and also the lead.

It makes a better casting if the metal is poured into ingots and re-melted before pouring it into castings.

Ferro-manganese in various proportions of iron and manganese is sometimes used in order to introduce both manganese and iron; but it is usually highly carburized, and is not very satisfactory.

A WRINKLE IN BRASS CASTING

In casting brass and some of the bronzes on the flat there is often a very great tendency for the castings to become "smoky,"as it is termed, this, in reality, being caused by a series of cold sheets in more or less developed stages. Assuming that the metal poured is clean and in a good fluid state, this points to the fact that too slow pouring has been used and waves of air have passed in with the metal, the remedy being obvious. As an additional precaution, however, it is well to adopt an uphill method of pouring, as shown in the illustration, the flasks being placed at an angle of roughly 20 deg. from the horizontal, with the ingate to the mould at the lower end.



POURING METAL UP HILL

By this method the ingate is kept choked with molten metal, with the result that air cannot pass, and in combination with fast pouring, smooth castings should be produced. In most cases it will be found necessary to put in risers on projections as shown, so that not only shall air and gases escape freely, but also that any dirt carried to the higher points and there trapped may rise out of the way in the readiest manner.

This article was taken from "The Practical Engineer," and we will not attempt to throw a hint about where they got it, but by a strange coincidence we had it in CANADIAN FOUNDRYMAN in the issue of old 1918. Of course, there is nothing particularly new about the idea, but it is not generally followed, although it is the proper way to get a sound casting, either in brass or iron.

For an iron casting of this description, it would be best to cover the risor until the pouring was done, but with brass the risor should be left open for the escape of air.

MOULDING AND POURING NICKEL

It would be difficult for a reader of THE CANADIAN FOUNDRYMAN to read it from cover to cover without knowing of the Canadian Hanson & Van Winkle Co., Toronto, yet perhaps some will not grasp the importance of some of this company's achievements, and a few lines on the subject will undoubtedly be of interest. One of the main stays of the business is platers' supplies, which includes everything in the line of platers', polishers' and buffers' equipment and supplies, such as welded steel tanks, lead lined wood tanks, dynamos, rheostats, etc., and incidentally the anodes which are used in the plating operation, and it is of these anodes and the method of making them that we will speak.

Nickel although a semi-precious metal, is melted in a similar manner to the other non-ferrous metals, and is poured into moulds which are similar in appearance to other molds, but it does not follow that every foundryman would feel at home in handling nickel. On the contrary they would not, as nickel has characteristics which must be understood if success is to be insured.

Nickel is a hard, malleable, ductile, metallic element of the iron group, nearly silver white, capable of a high polish, and resistant to oxidation. It is attracted by magnets and has a specific gravity of 8.8, or approximately 20 per cent. greater than that of iron. It melts at a temperature approximating 3,000 deg. or about 25 per cent. higher than that required to melt iron.

From this it will be seen that to melt nickel in a crucible requires an enormous fire, considerably higher in temperature than that of the cupola used in an iron foundry. It will also be seen that the metal being much heavier and at a higher temperature will have a more cutting and damaging effect on the mold. This coupled with the fact that the anodes must be clean, and homogeneous adds to the perplexity of the situation. However, the whole secret is in the knowing how, and this "knowing how" must be gained by experience, as there are few places from which to gather the information by any other means.

The Hanson & Van Winkle Co., have gone into the matter so thoroughly and have had such wide experience that there is very little which is worth knowing that they have not at their command. This company claim no monopoly, but they are certainly into it on a big scale, as shown by the volume of business done.

The equipment of their foundry department includes two ordinary crucible brass furnaces, two oil-burning crucible furnaces especially for melting nickel and one open hearth furnace with a capacity of two tons per day.

As we have shown the equipment is similar to that required in any non-ferrous foundry and the company has for years manufactured castings from all metals for electroplating, which must be made from the purest of metal, and essentially homogeneous and smooth. They are now prepared to supply castings of every description in brass, bronze, aluminum, zinc or nickel.

Nickel castings would not likely be called for to any great extent for other purposes than anodes but many nickel alloys are called for, such as German silver, etc.

The company has for some months past been doing an exceptionally large business in aluminum castings.

The entire plant presents an interesting hive of industry, but it is not our purpose to be interested outside of the foundry and plating departments.

What Nickel Is

From the above we have seen that nickel is a hard, malleable, ductile, metallic element of the iron group, nearly silver-white, capable of a high polish, and resistant to oxidation, and that it is attracted by magnets. Nickel is usually confused with silver, and is often looked upon as a low grade of silver, when in reality, it is not in the silver class at all, while it is a much less expensive metal than silver it has certain qualities which are superior to those of silver, as in our definition we have shown that it is almost as white as silver, and it is capable of a high polish. To this we add the fact that it resists the action of oxygen, which is to say it does not become tarnished through contact with the oxygen contained in air or water. A properly nickel-plated iron casting remains untarnished while a silver-plated casting required to be kept polished or it soon becomes dark colored. Nickel was discovered in 1751 by a German named Cronstedt. It was at first thought that it was a copper producing ore, but on finding that such was not the case the miners called it "Kupfernickel" or "copper nickel," meaning demon copper, "nickel" being the German for "demon." The copper idea was found to be erroneous, and that part of the work was dropped and the name "nickel" remained as its permanent name.

FLUXES FOR BRASS

What is commonly termed a flux is any substance which, when introduced into a pot of non-ferrous metal in the melted state, will gather up the impurities and bring them to the surface where they may be skinned off. Some of the names used by educated experts would be more effective if translated into foundry language or else some sort of an explanation given regarding their meaning. For instance, Tincal, Boron, Natrium and Sodium are all given as wonderful purifiers. Now what are the wonderful discoveries? Tincal and Boron are the same material, and this material is the crude mineral from which borax is extracted. Natrium and Sodium are just different names for another material, the principal constituent of which is salt. So here we have the whole thing in a nut shell. Salt and boraxes were the fluxes of the ancients and are still on the job under assumed names. Salt, as a subscriber pointed out a short time ago, has one objectionable feature, it emits a most nauseating odor which drives the men out of the shop. Were it not for this characteristic, it would be a valuable cleansing material. If we drop the salt, we have borax, which is all we did have in my apprentice days. Neither salt nor borax has any chemical effect on the metal, it simply gathers up the non-metallic material which is contained in the molten metal and brings it to the surface.

Introducing zinc at the last minute has a good effect but it changes the composition of the alloy and must be allowed for in calculating the proportions. Some formulae do not call for zinc and this metal must not be added. Phosphorous is another material which has beneficial effects, but it also changes the character of the alloy. If a small amount of salt is put in the crucible in advance, it will not make such an awful smell, but it will make a thin coating of slag on top of the metal as it melts. This is similar to the limestone slag in a cupola. The slag forms before the metal melts, and as the metal melts it passes through this slag and the oxidized metal and other impurities is held in the slag. Borax is added after the metal is melted and has a boiling effect. It also goes to the surface, taking with it certain material which it gathers from the metal. Putting a piece of glass in the metal does not flux but it forms a heavy coating which prevents oxidization.

PORTABLE OIL BURNER

The Canadian Hauck Burner Co., Ltd., Port Hope, Canada, have placed on the market what is known as their combination Lead Melting Furnace and Portable Oil Burner.

This device is actually two outfits in one. When used as a melting furnace, 200 lbs. of lead or babbitt can be melted in 15 minutes and kept in a molten condition at the cost of a few cents per hour. Additional supply of fresh lead melts instantly.

When not used for melting lead in pot, the burner may be detached from the furnace and used for melting babbitt out of bearings, rebabbitting, bending pipes, straightening, preheating in connection with welding, brazing, expanding to make shrink fits, etc.

MELTING LEAD WITH HAUCK BURNER.

The device consists of a furnace on three legs, supplied with 200-lb. capacity pot. The 12-gallon oil tank is of heavy steel, equipped with pressure gauge, hand pump and fittings. The burner is of the Hauck Hand Pump Type burning kerosene as fuel. Burner does not consume any air from the tank. The pressure secured by the use of the pump is simply to force the oil to the burner, where it is vaporized. A single pumping will operate the apparatus for three hours.

This device will, no doubt, interest anyone connected with the machine tool industry.

BRASS COMING TOO HARD

A subscriber has asked the question which has been bothering a good many brass foundries of late. He says that he is using all scrap brass and melting good and hot, and when the castings come out they are of a whitish appearance and very hard, and he wants to know how to overcome it. To answer a question on the subject of all scrap brass is quite an undertaking. In olden times, when either copper and tin or else copper and zinc were used, it was no trouble to distinguish a defect in the composition by looking at the metal, but since all the ingredients in good mixtures have become so expensive cheaper substitutes have been used in varying proportions. This, coupled with the difficulty in getting tin at any price during the war, makes the scrap pile a queer subject to deal with.

Certain rules in connection with the actions of various alloys should be of assistance.

Non-ferrous alloys should not be melted at a high temperature, but when melted at a temperature sufficient to prevent the metal from adhering to the stirring rod it should be properly fluxed and stirred. This should bring the oxidized metal and other undesirable material to the surface and the metal remaining in the pot should be found to be clean. If castings made from this are too hard and at the same time too light-colored, the only conclusion to arrive at is that the copper content was too low in the first place, for the reason that over-heating or even proper melting has a more reducing effect on the white metals than on the copper.

One of the results of the war was the high price of new stock and the determined efforts on the part of founders to avoid using new material as much as possible. Old copper culinary utensils, insulated copper wire and various articles of a similarily unreliable class were weighed up as copper, whereas probably half of this was dross. If the castings are coming too light in color, more copper must be introduced. If this is of no importance, the introduc-

(Continued on page 85)

Various Methods of Making Column Patterns

Describing Sweep and Strickle Methods of Core Making, etc.

By JOSEPH HORNER

IN last issue it was shown how the radius of the sweeping board could be set by measurement from the core bar, but inaccuracies in diameter were liable to creep in with varying metal thicknesses in the castings.

Fig. 11 shows a scheme by which this risk can be prevented, when quantities are required. Discs A, A, of wood or metal, are fitted over the bar near the ends, and the print edges of the board are brought up against these. All cores swept will then be of the same diameter.

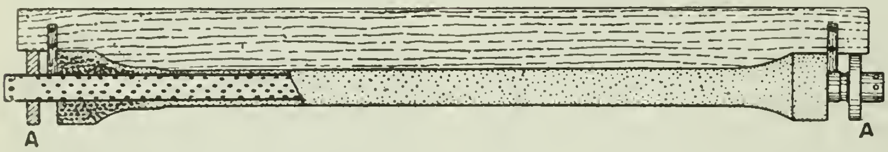


FIG. 11

The foregoing examples have been those of columns with plain shafts. We now consider other patterns of a more or less ornamental character.

Fig. 12 shows how a fluted column must be jointed for delivery. The undercutting of the flutes entails making the flutes in strips or lags separately from the main portion of the pattern, which forms a central backing, and supports the flutes. In Fig. 12 this is shown lagged in wood, but instead of turning the outside, the lags are made flat, strips of parallel thickness, on the faces of which the fluted lags are fitted. The section shows a six lags to the circle, but a larger number would have to be fitted in larger columns. The number of divisions must be selected not only to avoid having strips too wide, with risk of shrinkage, but they must be so disposed as to have no undercut. The accurate method of jointing for the particular example given is shown. The joints are not radial, but delivery of the flanking lags is provided for by the non-radial jointing shown. The flutes are screwed during rammings, with screws inserted from within, as illustrated. After the ramming has been done, these are withdrawn, leaving the lags loose, to be taken out after the removal of the central backing, the lags at the sides coming first, the bottom one afterwards.

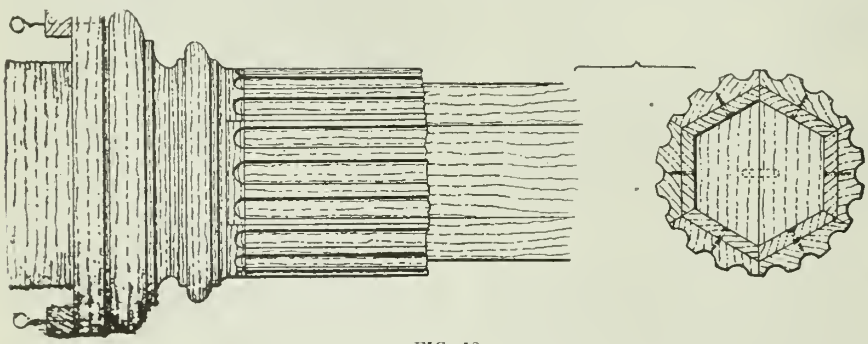


FIG. 12

The flutes terminate in a radius next the moulding. The portions in which the radii are cut are prepared separately from the lags in order to permit of planing the flutes along their whole length without any obstacle. These are screwed on the ends, and the lags are screwed to the backing, and turned in the lathe. The flutes are then divided round, and marked out, the strips removed, the ends unscrewed, the flutes planed right through, the ends returned to their places, glued and screwed, and the radii worked with a gouge. The moulding is shown as cut in solid stuff. Joggles are seen skewered on, which is often done when columns are set in stones, to prevent risk of possible shifting.

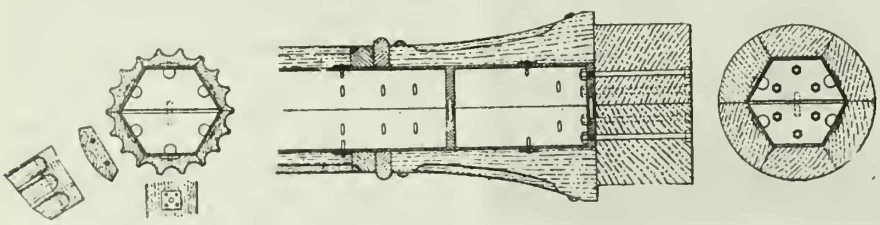


FIG. 13

Fig. 13 is a column pattern from which a large number were cast, which enabled this method of construction to be adopted. Instead of laying the fluted lags on a central body of timber, a cast-iron centre was made to preserve permanence of form. The centre was cast from a pattern, and planed on the outside faces and in the joint. The method of fitting the lags is shown by the section and details at the left hand being in the main similar to that shown in Fig. 12. It was necessary in this case to let the square metal plates shown into the fluted strips, to receive the screws inserted from within, because wood screws strip the timber and run loose after a few insertions and removals. And instead of having heads for a screw-driver, the thumb screws shown allowed readier manipulation. The centre view shows the fitting of the capital of the column, also fluted and jointed like the lags, and secured similarly. A bead breaks joint between this and the flutes of the shaft. The fitting of the print at this end is also shown. It is made separately, and firmly secured to the cast-iron centre with three long bolts in each half. This is the column for which the sweeping board made in Fig. 11 was used.

There are many other designs besides the fluted forms, several of which are seen in the groups, Figs. 14 and 15. In Fig. 14, at A and B, strips or bosses are shown, which may, or may not, have to be left loose, according to the way in which they are disposed, relatively to the joint of the pattern. At A the two side strips must be loose. At B they can be fast, provided the taper indicated is imparted. But the joint of the pattern and mould goes through the centre of strips, leaving a joint mark on them for the fettler to remove. Very often the way of jointing is determined by other details of a column. The lags at C must be made loose in three sections. They are shown as attached to a solid centre, in which case the heads of the screws must be sunk in, or, as is frequently done, skewers are thrust from the outside into the centre. It is not well to use solid timber if it exceeds about 4 in. in diameter. At D also the four strips must be loose, those at the sides being withdrawn first, and the jointing being as shown, not quite radial. At E and F alternatives are illustrated of making a square column base. F is preferable to F as a general rule, because the diagonal disposition of the sides is more favorable to delivery than the vertical sides at F. In each case portions must be left loose. But often the jointing is settled by some other portion of the column, and then either E or F may have to be accepted.

The group in Fig. 15 shows portions three designs of lamp columns. At A the flutes are wide and shallow, being in this respect unlike those previously shown. Each half of this pattern will deliver freely without diagonal jointing. Bosses are shown on a belt of moulding. Some of these, standing out at the sides, must be left loose. They are secured during ramming, each with an skewer through the centre. At B a diamond pattern is seen, rhomboidal, having recesses and bosses. This can be moulded by the longitudinal jointing shown. The pattern is turned and marked out, and the strips removed, and cut separately with chisels, and a router plane for the uniform depthing of the recessed portions. This is a rather troublesome pattern. The flutes are like those in C Fig. 14, but the jointing is unequal in this case. After the flutes have been worked, the spirals are fitted to them in lengths to correspond with the joints of the fluted strips. These are then marked in place, removed, and worked separately, and afterwards screwed on permanently. Enough taper must be given to the edges to permit delivery.

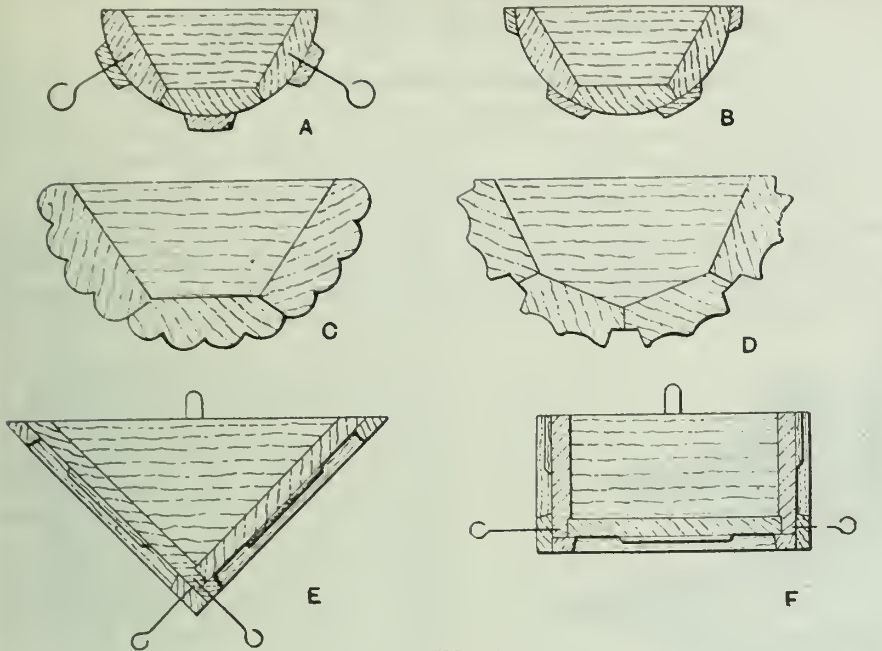


FIG. 14.

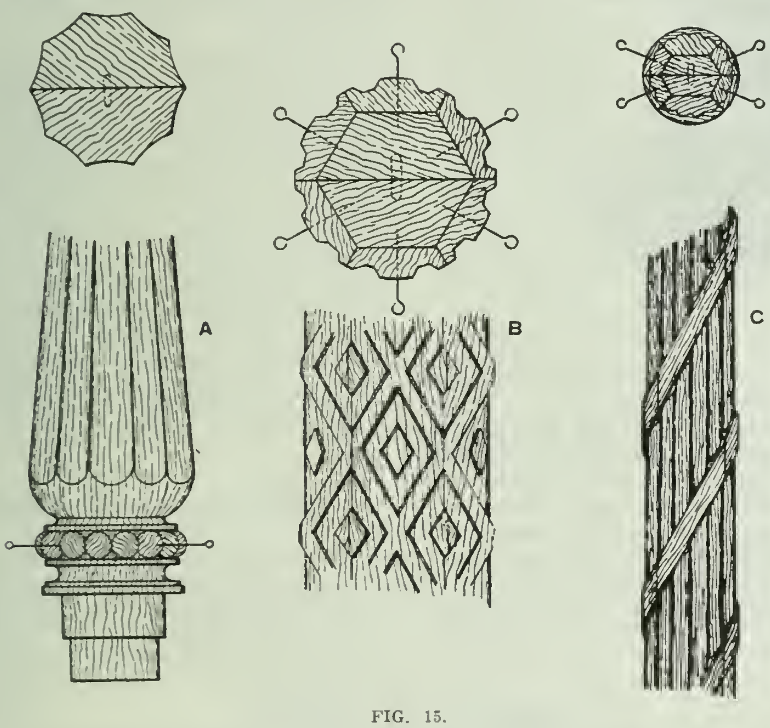


FIG. 15.

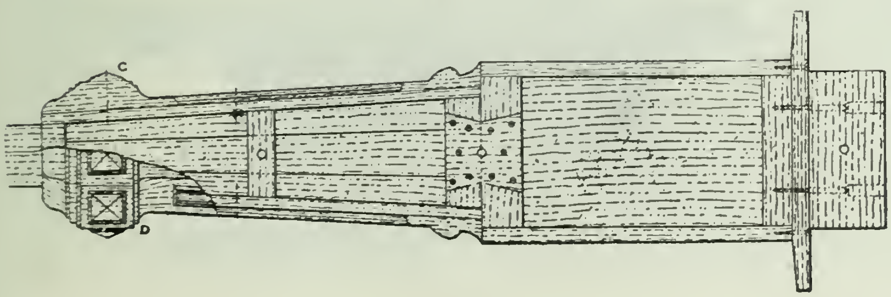


FIG. 16.

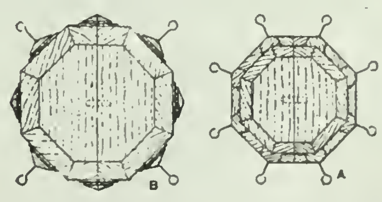
Fig. 16 illustrates a rather elaborate pattern which is the lower portion of a lamp standard. The square base is prepared separately from the upper ornamental portion, and the two are united with a butt joint, and dovetails inserted in each joint face. This is secure if the jointings are close. The upper portion is lagged, the lower is boxed-up. The upper part is of fluted design, the sectional shape being seen at A. The body of the shaft is lagged with permanent joints, the flutes are formed with strips of the shape seen in the section, and all are skewered on. The upper band of ornament is cut as shown, and is seen in cross-section at B. The pattern, open in the joint face, is seen at C, and its external appearance at D.

THE REMOVAL OF PAINT FROM IRON AND STEEL SURFACES

By F. A. McLEAN.

Scraping or burning paint from the surface of iron and steel structures previous to the application of a new coat is a slow and laborious process. An easier and more rapid way of doing this work is the method used by the United States Coast Artillery, for cleaning the exterior portions of the big guns and gun carriages in their care.

In practice, a one pound can of concentrated lye is dissolved in three quarts of boiling water, and to this mixture sufficient lime is added to emulsify the solution. This solution is freshly mixed each time it is to be used and is applied with a brush and allowed to remain until it is almost dry. It is then removed and unless the paint is very old and thick it will come off with it. If one application of the mixture does not remove all of the paint, the surfaces are washed off and a second coating applied. Before a new coat of paint is put on, the surface of the metal should be thoroughly cleansed with a solution of washing soda (in the proportion of one-half



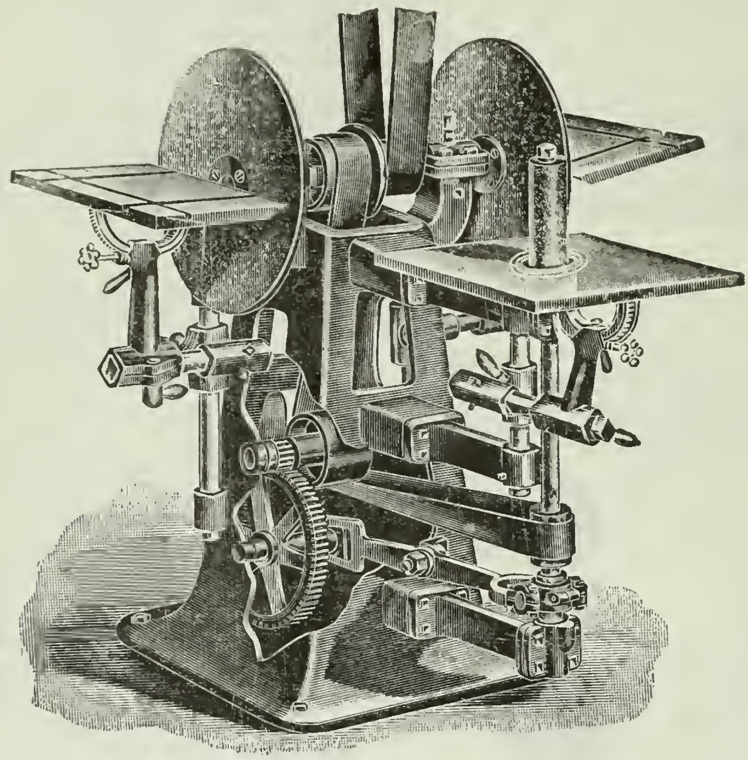
pound to two gallons of hot water), and well dried either by wiping with soft cloths or by the application of heat.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

THE DOWNER GRINDER AND SAND-PAPERING MACHINE

THE Downer Grinder, shown in the illustration, while not exactly entitled to a place in the new equipment section, will undoubtedly be new to many pattern-makers, and a few points treating on its many interesting feature will be of interest. The illustration, while true to design, shows the frame broken away, thereby exposing to view the internal mechanism of the machine, which, as will be seen, is very simple. This, of course, is not visible on the machine, but is encased, leaving the machine a perfect "safely first" tool.



Money Saved By Its Use

Every pattern-maker is aware of the enormous amount of time expended in finishing up with the spoke shave, the chisel, and in the hand sand-papering of wood as well as in the hand filing of metal. By the use of a machine, the greater portion of this expensive time can be eliminated and productive capacity of the shop thereby materially increased.

A machine of this description is especially designed to meet the requirements of the pattern-maker, but is equally as valuable in any wood-working establishment. In pattern-making, such parts as ribs, hulls and brackets, or in fact any regular or irregular shape can be readily ground to dimensions and shape by the use of this machine.

It consists essentially of two double-sided discs and a vertical drum, thus allowing three operators to work without interfering with each other.

The Vertical Drum

The vertical drum, when in its vertical position, has an up and down motion while revolving, thereby banishing all possibility of having the work scored. This, we believe, is a feature not found on any other machine.

This vertical drum can be readily removed and attached to the main arbor, thus forming a horizontal drum, which we also believe is a feature not possessed by any other machine, and when in this position has the advantage of having a table underneath, which can be adjusted to suit any thickness or any angle and is valuable in grinding to thickness or size as it is equivalent to putting work through a planer with the advantage that the tables can be adjusted to grind the stuff parallel on both sides or to any desired level.

The Tables

The tables may be lowered to the extreme edge of the disc, and can be readily removed, leaving the entire surface of the disc exposed where the workmen can handle large pieces inconvenient for table work.

All the tables on this machine are readily adjusted to bear any desired relation to the abrasive surfaces, such as tilting to any desirable angle, close up to or away from the abrasive surfaces by means of worm and worm segments, and are readily locked in any desired position without the aid of wrenches or screw-drivers, as all adjustments and locking devices are part of the machine. It is without doubt a most flexible machine as far as scope of adjustments is concerned.

Equipment

The equipment of the Downer Grinder is: Four double-sided discs, 23 3-14 inches in diameter, four drums of different diameters from 7 inches down to 1½ inches.

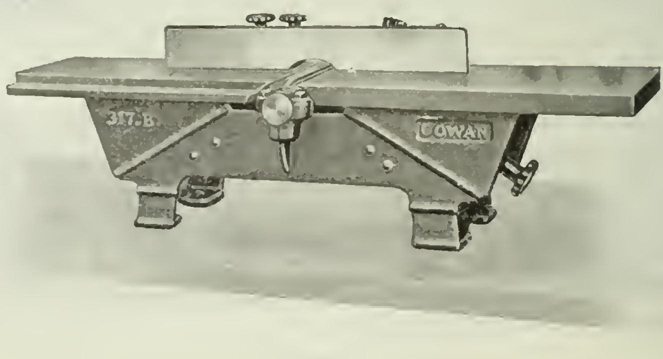
This machine, as we have said, is not a real new machine, but has been in use long enough to be thoroughly tried out and many of the best establishments in Canada and the United States have them in use. They are well built from the best of material, all arbors being made of nickel-steel. The machine weights 1,300 lbs. and requires floor space of 42 inches x 48 inches.

Mr. J. M. Downer, of the Downer Pattern Works, Toronto, is the inventor and patentee, and holds patents in Canada, United States and Great Britain.

The E. J. Woodison Co., Limited, Toronto, have the selling rights for Canada.

PATTERN MAKERS' BENCH JOINTER

One of the handiest and most useful tools about a pattern shop, or any wood-working establishment for that matter, is a buzz planer, but for the bulk of work done by pattern-makers, the small



bench jointer, shown in the illustration, will be found to have many advantages. This jointer can be placed on a bench or shelf convenient to the pattern-makers and for work within its capacity, it will save many dollars in wages and add much to the quality as well as the quantity of the output of the shop.

This machine has a six-inch round safety cylinder with bearings 1 11-16 inches in diameter and pulley 2¼ x 2¼. The table is 8½ inches wide and 38 inches long. The rear table is grooved for rabbitting. Both tables adjust on inclines or can be drawn back level for setting or adjusting knives. The cylinder runs from 3,000 to 3,600 revolutions per minute. The machine may be driven from motor by belt, or from countershaft, or when current is available it may be run by motor, direct connected to the cylinder.

This machine is manufactured and has been recently put on the market by Cowan & Company of Galt, Limited, Galt, Ont. It is known as Bench Jointer 317 B.

The Grinding Room Department of a Foundry

Demonstrating the Importance of the Grinding Wheel in Foundry Work, Together With a Short Story of the Emery and Other Abrasive Wheels

A DEPARTMENT of the foundry which is sometimes overlooked, but which nevertheless is of vital importance to the foundryman, his employees and his customers is the grinding room. In every foundry, large or small, this department must exist. It consists of a room equipped with vise benches and grinding machines. When the castings are taken from the foundry they are taken to the rumbling room or the sand blast, where they are cleaned of all burned sand, leaving the base iron exposed to view. All superfluous metal, such as fins, strains, uneven gates and roughness of any kind, is, however, still intact. This superfluous metal must be removed before the castings are delivered to the machine shop or the assembling room. Bolt holes, etc., are corrected by chisel and file on the vise bench but all other metal is removed by the grinder. Grinding was formerly done on grindstones, but of late a grindstone is never seen. In the place of the grindstone came the emery wheel, frequently but erroneously spoken of as the emery stone. Emery might possibly be classed as a species of stone or rock, but was not used in that condition. The emery, which was mined chiefly in Turkey and Naxos, was crushed and granulated to the proper mesh, after which it was mixed with proper binders and rammed into a mold similar to ramming up a core. It was then put in a kiln and baked. After being trued up, it was put on a mandrel and used similar to the grindstone but run at a much greater speed. These emery wheels where such a vast improvement on the grindstone that any and every kind of abrasive wheel which came on the market went by the name of emery wheel, although emery was frequently eliminated.

Turkish and Naxos emery were species of corundum and other varieties of corundum were found in Madagascar, India and elsewhere. These deposits were found to yield valuable abrasive material which became prominently identified in the construction of grinding wheels. These in time were supplanted to a considerable extent by artificial abrasives.

In fact, few people, not connected with the foundry business, realize the great improvements made in recent years in the manufacture and adaptation of grinding wheels.

Where formerly wheels were sent out with a certain amount of regard as to speed of wheel and work, and other particulars as to condition under which they were to be run, science has stepped in and insisted that for every operation in grinding, the proper wheel made of suitable abrasives, of the exact grade and grain required to give the most satisfactory results, must be provided.

Previous to the war a large percentage of grinding wheels used were made of the natural abrasives, spoken of, but with this supply cut off by the breaking out of war, the production of artificial abrasives was stimulated, with the result that for a time the natural stone was displaced almost entirely by the artificial. The demand for this material, however, became so great that, until very recently the supply could hardly keep pace with the demand.

This condition has now been remedied, and from the ample supply now on the market of both natural and artificial abrasives the grinding wheel business is again in a flourishing condition.

The modern process of making abrasive wheels is not without interest, and a visit to a plant where it is done will well repay the visitor.

Through the courtesy and cordiality of the genial Mr. E. W. Sawyer, general manager of the Dominion Abrasive Wheel Company, Limited, Mimico, Ont., it was our privilege a few days ago to visit the plant of this company.

This company has been in business in Canada for ten or twelve years, but have recently built an entirely new plant with four times the former capacity, and have also become connected with subsidiary companies, whereby they now manufacture their own artificial abrasives, thus being in a position to guarantee uniform quality and grade to their output.

As we have said, science demands that wheels be made for the purpose for which they are intended, and for this reason they are made in different grades as well as different grains and mixed in varying proportions as required. The abrasive material might appear in the form of gun-powder, buckheat or dust according to the purpose for which it is to be used.

Mr. E. W. Sawyer, the general manager, is an interesting personage, having served his apprenticeship in the pottery business. As the early grinding wheels were made in potteries, he had the opportunity of learning every detail as fast as it was learned by those who had the experimental part of it to attend to and to-day there is very little to know about an abrasive wheel which he is not conversant with.

But to get back to my story: The grinding wheel has become one of the most essential of tools in the modern foundry, and the modern foundry has become one of the greatest fields for the operation of the grinding wheel.

Grinding wheels are made in every immaginable shape, to fit different shaped operations. They are also made to attach to a flexible shaft, by which means they may be carried to the job, and large engine beds and propellor wheels, machine frames or any casting too heavy to handle may be ground where they stand.

The "Labor Gazette" (February) says: The lockout of moulders at Brantford, and the strikes in the moulding trade at Sherbrooke and Toronto, which commenced on May 1, September 23 and May 1, respectively, were still unterminated, although in all three disputes most of the orignal strikers had secured work elsewhere. The strike of shipbuilders at Sorel, which commenced on August 12, was also unterminated. Four strikes in this group commenced during January. The most important of these was the strike of 120 machinists, involving five firms, at St. John, N.B. This strike commenced on January 27. The men demanded a minimum of 68 cents per hour and an eight-hour day, instead of the former minimum of 50 cents per hour and a nine-hour day. Later developments of this dispute would seem to indicate that the principle of union recognition was also a factor. This group closed for the month with eight disputes unterminated, involving 943 employees and an approximate time loss of 21,202 working days.

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Vol. XXI. Toronto, March, 1920 No. 3

CONTENTS

The 1920 Foundrymen's Convention

AS was announced in our last issue, the next Annual convention and exhibit of the American Foundrymen's Association will be held at Columbus, Ohio, and all things considered should exceed all previous conventions. The 1919 convention and exhibit, at Philadelphia, was certainly a success, surpassing by far anything preceding it. The room where the convention was held was everything which could be desired, and the building where the exhibition was held could not have been more suitable, but the one drawback was that the convention and the exhibition were of necessity held in different parts of the city, making it difficult to attend both on the same day.

In the case of Columbus, Ohio, this objection will not be in evidence, as the buildings of the Ohio State Exposition afford the most extensive and best accommodations that have been provided both for the convention meetings and the exhibits.

Columbus is a city of two hundred and fifty thousand inhabitants, situated on the Scioto River, and is located practically in the centre of the State of Ohio, as well as in the centre of the iron and steel industries of the country, which include the western part of Pennsylvania, the northern half of West Virginia, the eastern half of Indiana, and the southern part of Michigan.

This territory, which is within a radius of two hundred miles of Columbus, takes in the cities of Pittsburgh, Allegheny, Indianapolis, Detroit, Cleveland, Cincinnati, etc.

Columbus has many attractions which will be described in later editions of this paper. One feature which is of vast importance is that being the capital city of the State of Ohio it is as a matter of course well provided with first-class hotel accommodation.

From Toronto to Columbus is practically the same distance as it was to Philadelphia, and we bespeak for the Columbus convention a bumper attendance from Canada, so let us begin early to make preparations to attend.

Our Pattern Making Department

IT may not be generally realized how closely allied the pattern-making department is to that of the molding department in a manufacturing establishment. Although in the one case the material which forms the foundation on which the business rests is wood, while in the other iron is the mainstay, the two callings are so interwoven with each other that in order to follow either as a profession, a working knowledge of the other is essential.

We have, therefore, made it a point to always have an interesting section devoted to pattern-making in which every phase of the craft is treated upon. We have on our staff of contributors, pattern-makers of the first order, both in Canada and Great Britain. As in the case of foundry work, the CANADIAN FOUNDRYMAN is the only publication in Canada treating upon the subject of pattern-making, and is, therefore, the only medium through which to interchange views and get information on this subject.

It is likewise the only feasible channel through which to advertise anything in the line of pattern-makers' supplies or machinery, and many of the manufacturers of machinery, suitable for pattern-making establishment have learned its value and are making good use of its pages for this purpose. As we have always advised reading the advertisements we again take advantage of an opportunity to advise those who are interested to look through this issue and see if there isn't something which is just what was wanted for the pattern shop. One prominent manufacturer informed us recently that his company had just completed a large contract as a direct result of an article which appeared in the CANADIAN FOUNDRYMAN.

The Questions and Answers privilege is included in the pattern-making section the same as in every department of the paper.

The Strike! Yes, the Molders' Strike

THE molders' strike which began on the 1st of May, 1919, is still dragging along with apparently no settlement in view, and bids fair to drag along and be a nuisance in the path of the 1920 strike which will be due in a few weeks. We could see this predicament coming and deliberately crowded ourself into the conflict and offered to be the kind goat over which both parties could climb, but, candidly, we did not get a very cordial reception from either side, and have, of course, withdrawn from the field determined to let them go it alone until such time as we are invited to take part.

We have no desire to deprecate the actions of the working man in making demands which he considers justifiable. Neither have we any right to find fault with the employer for resisting these demands when he does not think that they are justifiable. It is a two-sided question, and each side has a right to its views, but to keep up an industrial warfare of this kind all the year round would look to an outsider as an expensive way of settling a feud and entirely uncalled for, particularly when it does not settle the feud.

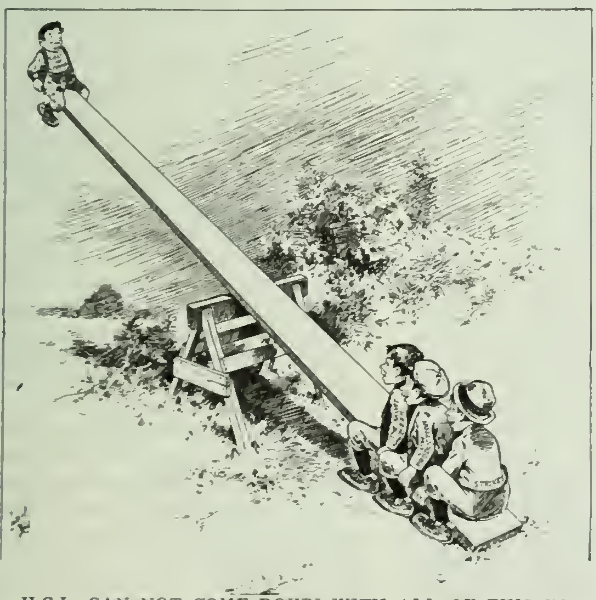
Of course, it is not having any particular effect on the business of the country, the molder simply goes where there is no strike and the foundryman sends there and gets his castings, so the business of the country goes merrily along.

While we sympathize with the molder more than with any other man in the world, and would gladly do anything in our power to assist him, we cannot help but think that he is the loser in the long run by not keeping himself better educated. Had the molders taken the trouble to look the situation squarely in the face last spring, and weigh the possibilities of winning out, they could not help but have seen that the odds were against them, as there was hardly a shop on the continent but what was slack. Things are more favorable now, and there is no reason why every molder is not holding down a good job at his trade.

What this paper would suggest would be for the foundrymen to offer the molders a wage such as would support life, and then for the molders to go to work and make hay while the sun shines, and when things get down to normal and work shows signs of slacking off it would certainly show a brotherly spirit to reduce the hours of labor rather than allow some of the men to be laid off, but just now it does not seem possible to get the 44-hour week, and inasmuch as the bulk of the foundries in the United States and Canada are working at least 48 hours and made very little effort to have it reduced, there was not much chance for a few Canadians to win out, even though it might be desirable.

On another page of this number will be seen several letters from Canadian, English and American writers on the subject of strikes, etc., and we hope the molders will read them and see if they cannot get some inspiration.

The idea of having the hours arranged so that each man will have steady work all the year round is most commendable, but it is not always within the power of the employer to arrange things that way. However, as we have already said, we are out of it. We had a nice plan all arranged and would have had everybody satisfied if we could have got them together in some sort of a peaceful mood. But it was no use. Wages must go up on account of the high cost of living, and the cost of living must go up on account of the high wages.



H.C.L. CAN NOT COME DOWN WITH ALL OF THIS TO CONTEND WITH.

The U. S. Steel Corporation

PEOPLE are talking and thinking in terms of millions now. It was not many years ago that a millionaire was photographed and bowed to. Folks wondered how he took that much money away from the rest of the people.

In Canada we speak glibly of the millions we have raised in our war loans. We are thinking in sums away beyond and over our heads.

The United States Steel Corporation announces an increase in wages on February 1—rather a decent thing to do just after breaking the strike directed against it. Well this increase will amount to $24,000,000 a year, a sum equal to a five per cent. levy on the entire common stock.

Chances are that holders of common stock will not be called upon to put up this levy. The over-anxious public, now willing to pay premium and super-premium prices for steel, will see that that extra $24,000,000 is provided.

Now to get back to the question of millions again—this new increase makes the annual pay roll of the U.S. Steel Corporation more than $475,000,000 per year.

For an organization that has been assassinated and dissolved and dispersed and broken up several times each way by the Sherman anti-combiners, said Steel Corporation seems to be in fairly good health yet.

Ask Yourself—

Am I hitched up right, or am I a round peg in a square hole?

Do I feel every drop of blood and every fibre in me tugging away at my ambition, saying "Amen" to my work?

Am I backing up my chance in life in every possible way, or am I sliding along the lines of least resistance?

Am I keeping myself fit to do the biggest thing possible to me every day of my life?

Am I working along the line of my talent, or am I getting my living by my weakness instead of my strength?

Am I strengthening my weak points, making my strong points stronger, and eliminating the things which are keeping me back, the enemies of my success?

Do I decide things quickly, finally, or am I forever on the fence, fearing to make definite decisions which I cannot reconsider?

Have I the initiative which begins things without being told to; which does things without waiting for others' instructions?

Do I dare to attempt the thing I instinctively feel capable of doing, and I know that I ought to do?

Have I the courage which dares to branch out in an original way, dares to make mistakes that may humiliate me if I should not happen to succeed?

Do I try to develop that bigger man back of the smaller man I am, by obeying the God-urge that ever bids me up and on to greater endeavor?

If you can answer the above questions in the right way, you will bring out a hundred per cent. of your ability instead of the fifty per cent. that the majority of young men are content to develop; you will attain your ambition and be what you long to be.—*Success.*

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—We have several thousand sulky wheel hub cases to nickel-plate. In buffing these cases we find a large percentage of them spoiled by the nickel peeling on the run which holds the spokes. In some cases, the nickel cracks off in flakes and in other cases the nickel curls off in strips. We have used extra care in cleaning, but the trouble continues. Please advise us as to method which will correct the difficulty. I may add, we nickel-plate directly on the steel.

* * *

Answer.—As you have neglected to mention particulars respecting actual working conditions in your plant, we are compelled to reply to your question in a rather general manner, that is, we can only surmise that certain conditions exist and advise you accordingly. There are several conditions which would be favorable to peeling on the hub case run. Too high voltage, solution temperature too low, poor conductivity of solution, alkaline solution, low metal strength, unclean rim. These are some of the more probable causes, of these we are inclined to believe poor conductivity and alkalinity, or poor conductivity and low temperature are the causes which you should look to first. To increase the conductivity, add to each gallon of the bath 2 oz. of magnesium sulphate and 2 to 3 oz. of nickel sulphate. Dissolve these chemicals in a portion of the solution which may be placed in a clean whiskey or wine barrel or a stoneware crock. Then add to the solution in plating tank, stir the whole thoroughly and allow to settle before using. Use a long stem testing thermometer to obtain correct temperature of solution near bottom of the tank. A nickel solution operated at a temperature below 60 degrees Fah. is liable to be very "tricky." If you cannot maintain the solution at higher temperature during nights and week-ends, you may improve your working conditions by removing about one-fourth the volume of the bath to clean barrel and heat the solution by injecting steam, then replace in plating tank by pouring through a fine mesh sieve or cheese cloth strainer to avoid disturbing slime at bottom of the tank. Increase the conductivity of the solution and the proper ampere current density can be obtained without increasing the voltage. In fact, you will probably be able to use a higher current density at a lower voltage than you now employ, thereby reducing the tendency to brittle deposits even though the nickel solution be a little unbalanced respecting acidity. Inspect the anode surface, see that each anode has good contact with positive tank rod, and that each anode is disintegrating properly. If you find that the nickel solution requires frequent additions of nickel salts to maintain a certain density (Beaume), you may conclude that the anodes are not feeding the solution properly, possibly because you have an insufficient number of anodes in the solution, or they are of an inferior quality. Now, remember the nickel content of the anode may be high, or up to your specifications, and as a nickel casting it may be absolutely perfect, but, as a anode to be used in an electrolytic process such as electro-nickel plating, it may prove to be practically useless. Why? Because it will not disintegrate properly in any nickel solution. The anode may break up and wear away, but the structure is of such nature as to make it practically impossible to dissolve the anode, it therefore gradually falls to the bottom of the tank and forms small mounds of metal beneath each anode, and is finally shoveled out as waste, yet, this material often contains as high as 56 per cent. nickel in the form of shreds. After giving the above details due considerations it will be well to again take notice of your cleaning operations, simplify them as much as possible, but, be sure the surface of the work is chemically clean when placed in the nickel solution. A dilute hydrofluoric acid dip is a splendid final safeguard for steel, keep the surface of the final acid dip free from slightest film of scum.

> **AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.**
>
> **Officers for 1919-1920.**
>
> President—Mr. John A. Magill, 591 St. Clarens Ave., Toronto.
>
> Vice-President—Mr. T. G. O'Keefe, 147 Dupont St., Toronto.
>
> Secretary-Treasurer—Mr. O. Holtham, 328 Carlton Street, Toronto.
>
> **PLACE AND DATES OF MEETING**
>
> The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

* * *

Question.—My helper added fifteen pounds of nickel carbonate to a 150-gallon cyanide copper solution, mistaking the nickel carbonate for copper carbonate. The deposit obtained after the addition was of a greyish tone and nickel deposits which were obtained on the work, subsequent to coppering in above solution, withstood the buffing operation, but, proved non-adherent shortly after being subjected to ordinary wear by purchasers of the completed product. In each case, the nickel separated from the copper and the exposed copper was a dull dirty grey color. We have ceased to use the solution and will await your advise respecting a possible method of saving the solution by some process which will remove the nickel or render it harmless to copper coatings. The solution is used hot with a current of about 5 volts.

Answer.—Do not add anything to the copper solution, simply heat it as usual and suspend a bunch of small wires in the solution, turn on all the current possible and allow to plate in this manner for at least three or four days. If the anodes coat over with dark oxide do not interfere with them as it is not necessary to get a copper deposit, you require a condition which will tend to permit the removal of the nickel from the solution, in doing this as here suggested you will deplete the copper content of the solution to some extent but not seriously. After three or four days' operation as above described, add enough sodium cyanide to clean the anodes and proceed to plate the bundle of wires as before, note carefully the shade of deposit obtained with varying current densities at this time and if the clean pink tone characteristic of pure copper is not obtained, continue the electrolyzing treatment for a day or so longer and test again as before. The nickel will eventually be removed sufficiently to permit the regular use of the solution for general purposes as originally intended. If the copper solution contained caustics it would alter the results, the above remedy is intended for copper solutions prepared and maintained without introduction of caustics. If your product is of a nature which encounters exceptionally frictional wear in ordinary use, we would advise prolonged electrolytic treatment before using same for plating purposes. Build up the metal strength with copper cyanide and there will be no excuse for any one mistaking nickel carbonate for the proper copper salt when replenishing the solution.

* * *

Question.—I have constructed a simple rotating plating machine similar in design to those sold by supply firms, the apparatus works very satisfactorily as regards deposits, but, I notice that the current at the ordinary nickel tanks is considerably weaker. I have no means of measuring the current and am at a loss to know what to do as the machine has proven a great help in handling small pieces which were formerly plated in trays. Kindly inform me respecting the amount of current usually required to operate a plating machine of the rotating cylinder type.

Answer. — The average mechanical plating machine of the rotating type operating in a nickel solution which contains approximately four ounces of nickel per gallon, the cylinder containing a charge of steel work which fills from one-third to one-half the cylinder and connected to a five-volt circuit, will usually consume from fifty to eighty amperes of current. If you are not using the entire output of your generator elsewhere or very close to it, the addition of the machine to the circuit should not make a noticeable difference at the still tanks, possibly you have neglected the generator and it is not producing as much current as it otherwise would, or there may be a leakage or ground in the circuit, perhaps the generator is actually over-loaded. Ascertain the real cause by using a testing ammeter which may be obtained from the nearest electrical supply house, correct the cause and then procure a voltmeter and an ammeter and cease working under prehistoric conditions. You will not progress or even keep up with the present trend of plating processes unless you adopt modern improvements more liberally. These instrument are not expensive and will solve many problems for you if you study their uses and employ horse-sense in the application of your practical knowledge.

* * *

Question.—We nickel-plate small wire pins, one-eighth inch diameter by three inch long. These pins have a head on one end and are suspended in perforated pieces of brass while being plated. Recently the lower ends of the pins have acquired a tree-like formation of nickel during the one-hour treatment in nickel tank and the removal of this excess metal often results in large quantities of scrap pins. The condition is becoming more serious every day. Kindly advise us of cause and remedy at earliest convenient date.

Answer. — Filter the nickel solution, clean the anodes, replace solution and anodes in tank and test the solution for acidity and metal. You will probably find it deficient in both. Add nickel sulphate to restore normal metal strength and if the solution is still too near neutral point add sulphuric acid until liturnes blue is quite perceptably changed, add acid occasionally to maintain good working condition and if further difficulty is experienced of same nature, increase the conductivity of the solution by adding either magnesium sulphate or sodium chloride, say, wo ounces per gallon. We do not believe you will experience any difficulty after cleaning and replenishing the bath.

* * *

Question. — We have contracted to manufacture and nickel-plate a steel cup-shaped article about one inch diameter by one and one quarter inch long, the cup is turned from solid steel and is hardened before going to finishing operation. We have found that polishing costs too much. How shall we proceed to obtain a reasonably good finish on the cup by tumbling?

Answer.—In any event it will pay you to attend to all cutting tools used in the process of manufacture so that a smooth surface is obtained by the screw machine operation. This would assist in reducing cost of polishing and also facilitate rapid finishing if tumbling is adopted. To tumble the cups we would advise use of sand and water for first or roughing operation, add enough soda ash to water to act as lubricant and retard rusting. Rough for about 12 hours, or if cups are scored possibly 24 hours will be necessary. Remove from tumbler, wash free of sand and place in a wooden or wood-lined iron tumbler with alkaline water, treat at same speed for at least six hours; remove, rinse, place on racks or plate in mechanical plating machine rotated at very slow speed; the deposit obtained in the machine may be buffed if the duration of plating treatment is not hastened.

BRASS COMING TOO HARD

Continued from page 77

tion of lead will act as a softener.

Other difficulties with scrap is that some contains phosporous while other will contain aluminum. Even antimony is sometimes used as a hardener, and when all of these come in contact, a good mixture is uncertain, because phosphorous and zinc do not work well together and aluminum has a bad effect in most cases. Good work should have at least some new copper and by adding zinc at the least. Just before withdrawing the crucible or even afterwards the entire mass will mix on account of the boiling effect of the zinc, making a homogenous mixture.

REPAIRS TO WATER WHEEL

Continued from page 69

plant operator and the mechanical engineering field in general, is shown in the accompanying illustration. In the initial construction of these water-wheels, difficulty has frequently been experienced in obtaining a firm and rigid connection where the vanes join the supporting rings. Generally speaking, the vanes are steel castings that are placed in position in the sand mold so that the molten iron will flow about the edges and form an integral casting. However, the result has often been unsatisfactory, as the subsequent expansion and contraction of the vanes and the rings causes a looseness in one or more of the connections. The peculiar construction of the vanes makes it difficult to use the oxy-acetylene process in uniting the vanes to the retaining rings, and relatively poor success has, so far, been obtained by the use of the electric process, when working together steel and cast iron. However, the St. Lawrence Welding Co., of Montreal, who accomplished the repair on the wheel here shown, have effectively formulated a special influx that overcomes former difficulties, and the vanes can be rigidly secured to the cast-iron rings, by means of the electric arc method, so that the force of a sledge upon any of the vanes will not produce the slightest defect in the welded joints. The cut shows the work immediately after welding; the rough appearance of the added metal was subsequently removed by grinding, leaving a smooth fillet weld in from the outer edges. Water-wheels treated in this way have shown greater efficiency after welding by this method.

OBITUARY

Arthur E. McClary, only surviving son of the late Oliver McClary, one of the founders of the McClary Mfg. Co., of London, Ont., died at his home in that city on February 21st, after an illness of several months.

The late Mr. McClary was born in London in 1863, but of late years has not enjoyed the best of health, and as a consequence had lived a somewhat retired life. He was a son-in-law of the late Squire Whetter, and leaves to mourn his loss, a widow, one son Oliver, and one daughter, Mrs. Clifford L. Grey, all of London.

In the death of Mr. Wm. H. Wortman, which took place at London, Ont., a short time ago, Canada loses a prominent citizen and a successful business man. Mr. Wortman was born in Pennsylvania, but spent his youth and early manhood at Rockford, Ill., where he became interested in the Ward Manufacturing Co. of that city. Some 40 years ago he came to London and started a foundry under the name of Wortman and Ward, in which business he remained until 1912, when sold out to Beatty Bros., of Fergus, On Needless to say he became a British su ject shortly after coming to Canada and took a deep interest in Canadian affairs, although never aspiring to public life. He was 78 years of age at the time of his death, and leaves to mourn his loss his widow, who is a daughter of James Percival of London, and two sons, Wm. G. Wortman and Dr. Charles M. Wortman, all of London.

Edward L. Goold, president of the Goold, Shapley & Muer Co., Ltd., Brantford, Ont., died at his home in that city on February 16th, after an illness of but a few days. He had been out of the city on business the week before his death and returned, not feeling well, and shortly afterwards pneumonia developed, although not in severe form. His progress was regarded as satisfactory, but later on heart failure supervened and death ensued.

It can be said of him that he originated or became associated with more local industries than any other one resident. As a matter of fact, the name of Goold has been identified with the manufacturing interests of the place for over 70 years. Mr. Goold's father was in the foundry business as senior member of the firm of Goold, Bennett & Co. as early as 1850.

Mr. Goold was interested in the business of J. O. Wisner, Son & Co., until its absorption by the Massey-Harris Co. He was also the leading figure in the Goold Bicycle Co., manufacturers of the "Red Bird" bicycle, where 600 hands were employed in the days when bicycles were all the rage. He was also interested in many other industries, but most prominently in that of the Goold, Shapley & Muer Co., of which he was president. He is survived by his widow and three sons, Lyman (flight lieutenant), Marsden and Charles.

Scraps from the Foundry Scrap Pile

Another New Foundry.—The town of Georgetown has become the possessor of a new industry in the shape of the Central Foundry Co., which has commenced operations with a staff of 20 men. The president is A. L. Wynston, and the secretary-treasurer, H. J. Selfred.

Lawrence & Langley, of Galt, manufacturers of brass and aluminum castings of every description, aluminum match plates and aluminum solder, have found their present premises too congested for their expanding business and contemplate extensive additions as soon as weather conditions permit in the Spring.

Electric Smelting Furnaces for British Columbia.—A representative of the firm of Thomas Summerson & Co., Ltd., of Darlington, Eng., was recently in British Columbia making investigations with a view to establishing electric furnaces to smelt iron ore. He stated that his company had abundant capital at its back, and, providing suitable offers were made, they were prepared to start operations at once.

New Foundry at Lachine, P.Q.—A new foundry equipped for the purpose of turning out the special castings required for paper making machinery and also for the heaviest class of general castings has been built and put in operation by the Dominion Engineering Co., Ltd., a $2,500,000 subsidiary of the Dominion Bridge Co., Ltd., of Montreal. The company intend to do a line of work for which there has heretofore been no capacity in Canada.

Toronto Plant To Be Enlarged.—The Canadian Fairbanks-Morse Co., Limited, are preparing for large extensions to their Toronto plant. The company views with optimism the future prospects of the Canadian field and are prepared to invest their money in anticipation of the business which they know will exist in the future. The extensions will be mainly to take care of their large engine business. This is distributed through their branch houses in every part of the Dominion of Canada.

Million Dollar Extension at Montmagny, P. Q.—The National Farming Machinery, Limited, Montmagny, P.Q., have taken over the plant and business of the General Car and Machinery Works, Limited, and will operate a steel, iron, brass and aluminum foundry, and in addition will manufacture agricultural implements and gasoline engines as well as the regular line of steam engines and boilers, saw-mill machinery, wood-working machinery, and good-roads machinery. They will also operate a small rolling mill in connection with the steel foundry. One million dollars will be expended in the extensions which are being proceeded with.

United States Supply House Accepts Canadian Checks.—In view of the premium of United States dollars in Canada, the S. Obermayer Co., Chicago, Ill., will accept Canadian checks at par in payment of all accounts with them.

The Courtney-Fraser Co., Inc., of Buffalo, N.Y., have made arrangements with the Charles C. Kawin Co. to take care of their business in the Buffalo laboratory, and have sold their Akron, Ohio laboratory to the Charles C. Kawin Co. Neither Mr. Courtney nor Mr. Fraser is now connected with the C.-F. Company.

The Wentworth Mfg. Co., successers to the Wentworth Brass Co., contemplate enlarging their brass foundry to double its present size and capacity. The company have recently gone extensively into the manufacture of aluminum ware, some of which calls for cast parts, which have to be welded to the spun bodies.

Philip Gies Foundry, manufacturers of mining cars and special machinery, iron, brass, bronze and aluminum castings of every description, have let the contracts for a new and up-to-date foundry, which will be commenced about the middle of March. It will be equipped with ten-ton electric crane, electric elevator, direct connected blower for cupola, exhaust tumbling barrels, molding machines, new core ovens, etc. It is expected that the new plant will be finished and in operation about the first of May.

Alderman Joseph Crowe, 376 Brock Street, Peterboro, Ont., while on a business trip to Toronto, paid the CANADIAN FOUNDRYMAN sanctum a pleasant call a few days ago. Alderman Crowe is a prominent moulder of Peterboro, and in the course of his conversation expressed his satisfaction and the satisfaction of all his acquaintances at our attitude of fairness to both sides in all our editorials regarding the working man and his employer.

He reports foundry business as exceptionally brisk in Peterboro, with all labor troubles settled in a manner agreeable to all parties.

Smoke flying at the Norton works.—The new plant of the Norton Co. of Canada, Ltd., Hamilton, Ont., now presents the appearance of a full-fledged manufacturing establishment with all its numerous kilns belching out smoke, but it is a little premature as the kilns are just being dried preparatory to the real business, which will begin in a few days. Mr. Douglas, of Worcester, Mass., will be the manager of the plant, and will make his permanent home in Hamilton, is expected on or about March 15, when operations will begin. The company will manufacture both their celebrated brands of alundum and crystolon abrasive wheels.

Fire at Toronto foundry.—Damage to the extent of fifty thousand dollars was done to one of the buildings of the Reid & Brown, Structural Steel and Iron Works, Ltd., Esplanade Street, Toronto, on the morning of February 29. The company is very busy and will continue to fill their orders with their usual promptitude as the output has not been impaired through the fire. The foundry was not affected, and other buildings are available for the structural steel work. The damaged building will be immediately rebuilt.

Alberta Foundry Preparing for Production.—The Alberta Foundry & Machine Co., Ltd., Medicine Hat, Alberta, are just starting operations in the implement business. They are not pushing production yet but are making all preparations to push things to the limit during the coming summer. They are optimistic regarding the outlook in Western Canada and are anticipating extensions to the plant in the near future. It is their intention to do an export trade with Australia. Tractors will be a prominent factor in their output

Foundry to be reopened in Dunnville.—The foundry department of Canadian Engines, Ltd., Dunnville plant, which has been closed for a short time, has been reopened under different management. J. Mills, recently manager of the Welland Electric Steel Company, Joseph Hurley, formerly of Canadian Engines, and Mr. Fowler, have leased the foundry from the company. They will engage a full complement of moulders, and in addition to supplying the company with their castings will also do contract work. We bespeak for them success. A foundry to be operated successfully should be operated by foundrymen, and these gentlemen are all tested and tried foundrymen.

Winnipeg Foundry Expansion.—The Magnet Metal and Foundry Co., Ltd., which was organized in Winnipeg in 1918 with Hugh R. Eade as president, and A. E. Donovan, W. R. Ingram, E. G. Powell, Albert Hoiland and Hamilton Echlin as directors has increased its capital stock and will proceed at once to enlarge its capacity and extend its field of operations. The company owns a site of 2½ acres in Elmwood, with a 600 ft. spur track. Their present foundry machine shop, forge shop, and pattern shop are of solid brick and the extensions will be equally as well constructed. They manufacture farmers' hardware and light implements and have recently secured exclusive Canadian rights on several implements and tools, and are insured a permanent run of business which enables them to safely make the extensive improvements which are being added.

Removal of Offices.—The Hauck Burner Service Station, at Pittsburgh, has moved its offices from 2930 Penn Avenue to 105 Wood Street, where they have a large display window and are more able to give better service in every way.

The Hauck Service Station, at Boston, has moved from 70 High Street to larger quarters at 149 Berkeley Street, corner Columbus Avenue. This office consists of a large display window, store, office, and space for demonstration.

The Hauck Burner Service Station, at Cleveland, has moved from 2114 Superior Viaduct. It is now located at 1106 Walnut Avenue, where the representation is in a better position to give excellent service, make demonstrations, etc.

Extensions to Plant of Percival Plow and Stove Company.—The Percival Plow and Stove Company of Merrickville, Ont., claim that the year which has just passed has been the busiest in their history, being fully 10 per cent. better than any previous year. They make no pretensions to do export trade and have been forced to refuse offers which were made to them. On account of the encouraging outlook they will erect new buildings which will increase their output by 20 per cent.

New Concentration Mills.—Consolidated Mining and Smelting Co. of Canada, Ltd., have plans to build two large concentrating mills in British Columbia. One will be for the purpose of concentrating the copper ores of the Rossland Mines. The mill will cost $800,000 and will treat 1,500 tons of ore per day. The other mill will be for the concentration of the silver, lead, zinc ores of the Sullivan Mine at Kimberley. A mill with a capacity of 2,000 tons of ore per day will be erected. The product will be lead and zinc concentrates, both of which will be shipped to the Trail smelter for treatment in the existing zinc plant and the existing lead smelting and refining plant. The market for the increased output of copper is already in Canada, but for the zinc and part of the lead, export markets will have to be sought.

The Mahr Manufacturing Co., of Minneapolis, Minnesota, have recently put on the market a new oil-burning torch, known as the "Jiffy," for drying moulds and sundry other purposes. It is made in two sizes, one-half and one gallon. This tank, though resembling the gasoline torch which carries a pressure of air in its tank, is worked on an entirely different system. The tank carries the kerosene or whatever oil is to be burned and the pressure is derived from air compressor which is used for other purposes in and about the plant. It operates on compressed air at any pressure but no pressure is carried on the tank, and it burns light fuel oil or coal oil equally well without being generated. The intense blue flame produced makes it especially adapted for brazing, heating, for bending or straightening, preheating, melting babbitt out of boxes and similar work, as well as for skin-drying moulds, etc. The company also manufactures a self-contained type of torch for lighting cupolas, drying ladles, thoroughly drying large moulds, preheating and general foundry purposes.

NEW FOUNDRY SUPPLY DEPARTMENT ESTABLISHED IN TORONTO

Mussens, Limited, manufacturers of and dealers in foundry, railway, mining and contractors' supplies, with head offices at Montreal, and branches at Toronto, Winnipeg, Vancouver and Cobalt, have established a strictly "Foundry Supply" department in connection with their Toronto branch. Mr. A. E. Cambridge, formerly in charge of the foundry supply department in Montreal, and a gentleman of sterling reputation and well up in the business, has been transferred to Toronto and placed in charge of the foundry supply department. Mr. Cambridge is the right man in the right place and we bespeak for Mussens, Limited, a goodly share of the business in the line of foundry supplies under his management.

CAPTAIN A. E. CAMBRIDGE, O.B.E., Royal Flying Corps, who is in charge of the foundry supply department of Mussens Limited, Confederation Life Building, Toronto.

Mussens, Ltd., are the sole Canadian representatives of the Sterling Wheelbarrow Company, of Milwaukee, manufacturers of the famous Sterling rolled steel foundry flasks, skimming gates, and foundry harrows, catalogues of which will be ready in the course of a month or so.

They are also exclusive Canadian representatives of the Macleod Co., of Cincinnati, Ohio, manufacturers of sand-blasting machinery; The Reading Products, including electric cranes, hoists, trolleys, multiple gear chain hoists, chain, etc., and the Barber-Crane Company, of Aurora, Ill., manufacturers of standardized material-handling machines.

In addition to these specialities, a full line of foundry supplies will be handled.

CATALOGS

The Canadian Hauck Burner Co., Port Hope, Ont., have just issued their bulletin No. 119, which illustrates and describes in detail the many different types of efficient oil burners manufactured by this firm. The book has also plenty of pictures showing the practical application of the Hauck burners to various types of furnaces.

Furthermore, part of the booklet is devoted to sketches showing other ways and means of using the burners. Throughout the entire book are given results of tests, and on the whole, the book is exceedingly complete. These bulletins are ready for distribution and will be sent on request.

"Belts" is the title of a neat and interesting booklet published by the Federal Engineering Company, Limited, 172 John Street, Toronto. Needless to say it is chiefly devoted to the subject of belting, its uses and abuses, stretching, slipping, etc., but interspersed with this is much valuable information on shop practice, together with some innocent jokes.

Reading Chain and Block Corporation, Reading, Pa., have issued their 1920 literature, treating on their line of chain hoists, trolleys, electric hoists, travelling cranes, fire-welded chains, etc. Explanations of the different products are clearly given, and the illustrations are profuse. Mussens, Ltd., Montreal and Toronto, are their Canadian representatives.

"Graphite," for January, published by the Joseph Dixon Crucible Co., Jersey City, N.J., is the beginning of the twenty-second volume of this publication which is devoted to the plumbago or graphite products of this company. It contains much useful information on the subject. The word "crucible," which is attached to the company's name, is only one of the products. Foundry facings and lead pencils are also products of graphite, so is graphite paint, and all are manufactured by this company.

Dominion Abrasive Wheel Co., Mimico, Ont., have handed us their profusely-illustrated catalogue of abrasive wheels, the contents of which includes grinding wheels of every grade, grain, size and shape. The number of shapes in which grinding wheels are made is a marvel, being made to the proper shape for any special or standard job. Useful tables of speeds and the proper sizes of wheels to be used are included, as well as much valuable information on how to select the proper grade of wheel for the job in hand.

He met her on the stairs
And, of course, he kissed her.
Then he said, "I beg your pardon,
I thought it was my sister."
She murmured, "Pray, don't mention it."
GREAT SCOTT! It was his sister!

Money still talks, but contact with the high cost of living seems to have given it throat trouble.—"Arkansas Gazette."

Proper Education Would Put Things Right

A Prominent American Figures That We Are All Workers and the More We Produce the More We Will Have to Divide Up

THE lesson that is to be learned by American industry to-day is that men must not be handed anything which they do not deserve and that surplus in industry must only be distributed for actual service, for goods delivered, declared John Calder, formerly director of the Business Training Corporation of New York, and now manager of Employees' Relations, Swift & Company, in an address before the Chicago local of the National Safety Council here to-night.

Speaking on "The Foreman In Industry And His Education," Mr. Calder preceded this remark with the statement: "One of the most difficult things we have to accomplish to-day is to convince labor that all surplus in commodities is obtained from production, not from capital. No matter what hours we work and no matter what pay we get in dollars, our real wages are measured by the quantity of things there are to divide and by the size of the surplus after our necessities have been obtained."

The importance of the foreman in industry has long been recognized by the members of the National Safety Council and because of the remarkable results accomplished in accident prevention wherever safety work is carried on largely through the medium of the foreman, there is now apparently a rapidly growing tendency among industrial concerns to train the foreman in other phases of his work as he has been trained in safety work.

Addressing the men who have charge of employment, safety work and other branches of industrial relations at the principal plants within the Chicago industrial district, Mr. Calder said in part:

"In some plants I visited I know cases where workmen have a big grudge against their employers, simply on account of the "bullying" of some foremen or assistant foremen. Some executives and departments' heads are sore and not able to concentrate fully on their tasks because they are abused verbally and in other ways by men still higher. Government by fear and espionage is both despicable and futile. This is inexcusable folly. It kills all teamwork and it lies at the bottom of a surprising amount of executive soreness and of labor unrest which manifests itself usually in extravagant demands often far removed from the actual causes. An employer is often misrepresented to his workers by his own foremen. You must also remember in your team-work, that the bridge of words between you and your workers is frequently very weak and that ideas often fail completely to get over. Much of our poor work is due to the fact that the workmen does not understand his orders.

"One factory I know of, kept in its employment to the wonder of people a very stupid man and the explanation the manager gave was that when he had a bulletin or instruction of general interest to issue, he always tried it out on this man and when he was sure the stupid man understood it, he knew it was perfect. Nowadays, to insure in industry a great success, foremen and executives must split up into closely related groups or we won't get any real co-operation or team work. We must organize to restore personality in big business and we can only do it through the foremen. I saw a dog smell the third rail once. He was full of information in a moment but he was a dead dog. He died of intensive education. Such a fate will not befall any foreman, I am sure. If an associated, enlightened group of foremen anywhere will tackle production problems and production people in the proper way, I venture to say that industrial troubles will not prove insoluble and industrial goodwill will be restored. Healthy discontent is the normal American outlook while all of our efforts should be towards eliminating the unhealthy kind based on untruth, ignorance, suspicion and abuse. Nobody was ever yet educated by merely "pumping in" facts and opinions; unless there is a measure of "drawing out" there is no education. To-day the whole world is intensely interested in Modern Production Methods. Everywhere, even in prolific America, goods are scarce and are getting scarcer, and there is much cry about " higher wages" but little or none about " more work" and it is only more work that will produce more THINGS.

"One of the most difficult things we have to accomplish to-day is to convince labor that all surplus in commodities is obtained from PRODUCTION; not from capital. No matter what hours we work and no matter what pay we get in DOLLARS, our REAL WAGES are measured by the quantity of THINGS there are to divide and by the size of the surplus after our necessities have been obtained.

"The lesson for industry is that men must not be handed anything which they do not deserve and that surplus in industry must only be distributed for actual service, for goods delivered.

You may remember that when Hinnissey asked Mr. Dooley, "Is worruk a nicissiry evil"; the wise philosopher of Archy Road said, "If it's nicissiry, it's not an evil and if it's an evil, it's not nicissiry," and David Harum reminded us that "Fleas is good for a dog, they keeps him from thinking about being a dog." What we call the "Economic Urge" is a wise dispensation of Providence that keeps us always on the jump when things are not running as they should be.

"Nevertheless, some people have failed to learn the lessons of human history. In Russia, for instance, Lenine and Trotsky wrote a beautiful treatise on Liberty, Equality, and Fraternity guaranteed on six hours a day of work, to be reduced ultimately to four. After they failed to frame a successful plan for a new order of society they issued a proclamation which declared that the only way to get enough production in any soviet factory was to lay down rigid rules for each man, and to apply military force, if necessary, to get them observed. The other day, I saw a copy of Lenine's proclamation printed in seven languages and dialects, in which he defined the Soviet Government as the absolute rule of all the people, but, actually, Russia has a brutal and unscrupulous dictatorship, which is at its wit's end to-day, with famine and want everywhere prevalent.

The ability of management has been persecuted there, banished or imprisoned and in some cases they have cut its throat. Russia, including its crazy leaders, has learned the bitter lesson that there is no particular virtue in running either a Government or production by unintelligence and by ignoring brainy team work. They are now searching in vain for executives while we are magnifying the non-commissioned officer of industry and developing his ability by education."

McCLARY COMPANY CAN NOT GET MOULDERS

McClary & Co., of London, have appealed to the Government immigration department to be permitted to import 100 English or Scotch moulders, and have been refused. The department followed the usual procedure of inquiring from the Dominion Trades Council if there were any idle moulders in Canada, and if so, how many. The reply came back that there were 45 moulders idle. The department thereupon instructed McClary & Co. that they must first employ these 45 men. The company claims that they have been quite unable to obtain the men and that their output is being held up to the extent of perhaps one-third, because of this lack of men to initiate the mouldings.

STRIKE EXPENSES ARE HIGH

A report from London, Eng., reads as follows: "The general Federation of Trades Unions announces that during the last quarter £145,700 was paid out by the organization in connection with the cotton employees' and iron molders' strikes." "The saddest thing," says the federation, "in connection with the announcement, is the failure of this expenditure to obtain anything beyond what might have been secured through negotiations."

UNION GETS VOICE IN SHOP CONTROL

"The Cleveland Plain Dealer," of Feb. 14, contains the following item, which, while not bearing upon the foundry field, is at the same time one solution of the problem of unrest between the employer and the employee and might be successfully applied to the foundry industry.

Organized labor in the women's garment industry in Cleveland has joined hands with the manufacturers in employing a firm of New York industrial engineers to devise a system of wage payment which shall offer incentives for increased production, substitute weekly wages for piece rates and reward workers on a basis of jointly controlled methods of scientific management.

This is the first time organized labor has had an equal voice in determining what "efficiency" is, and consequently the first time organized labor has co-operated in installing methods of scientific factory management in this country, according to Meyer Perlstein, head of the Cleveland locals and vice-president of the International Ladies' Garment Workers' Union.

The engineers, Miller, Franklin. Basset & Co., who are consultants on factory management, began their survey of the Cleveland industry yesterday. The union is paying half of the cost, the whole expected to total $20,000. Six months will be required.

Continuous Work is Aim

The investigation of the wage system is only part of a broad programme which includes an effort to bring together the retailers in the cloak and suit trade on a plan to stabilize styles, cut down the rush season and give the workers continuity of employment throughout the year.

Both sides agree that production can be increased, labor turnover reduced and a new spirit of co-operation instilled into the industry.

Organized labor throughout the country will watch the progress of the undertaking, Mr. Pelstein said. Two national magazine writers are on their way here.

About 6,000 factory workers are affected, 75 per cent. of whom now work on piece rates. The project is an effort to carry out the agreement signed by the Cleveland Garment Manufacturers' Association and the union about three months ago.

The arrangements, the agreement reads, "shall have due regard to the production value of the individual worker, based on fair and accurate standards."

In determining the standards, Mr. Perlstein said. the engineers expect to make time and motion studies, something organized labor usually has strenuously resisted.

Next Tuesday the members of the union's executive board and the engineers will go through the plant of the H. Black Co., where the system of factory control generally known as "scientific management" is regarded as having been brought to its greatest advance in the garment industry here.

Factory officials and foremen will go over everything with the union executives and the industrial engineers and tell them the reason for every method used.

The installation of the new systems will be made by joint agreement between the union, represented by Mr. Perlstein, and the manufacturers, represented by F. C. Butler, labor manager.

Features of the new wage system to be worked out, acording to Mr. Perlstein, will be:

A protected minimum scale whereby the minimum or poorest worers will receive a living wage which will give them fair comfort.

Additional payment for greater production.

Joint control by management and workers which will avoid the disadvantages of a "speeding up" system.

Wages based on yearly income rather than weekly pay, with the elimination of the rush seasons.

Simplification of methods in one or two plants where refinements of scientific management have outrun the rest of the industry.

"Co-operation is better than coercion; that is the keynote of the new era in the garment industry," Morris Black, head of the H. Black Co., said yesterday.

The approach to join control of production matters as they affect the workers in the shop has worked out excellently through a shop committee system in his plant, Mr. Black said. The success of the system of co-operation in the last year and a half augurs well for the success of the new venture in the industry, he believes.

"Mutual understanding has meant mutual confidence. Whenever the shop committee has been convinced of the reasonableness of requests of the management, the committee has been active in seeing that the requests have been complied with," he added.

The committee, one from each department, sixteen in all, meets with the plant officials once a week. Minor shop discipline has to a large extent been turned over to the committee for handling.

The committee also handles some interdepartment changes of employes which hitherto generally had brought dissatisfaction on the part of those transferred.

THE MATCH PLATE IS NOT ALWAYS THE RIGHT THING IN THE RIGHT PLACE

The match plate is one of the first, if not the very first, move which was ever made to get away from molding in the ordinary way from loose patterns, and the match plate has been brought to a degree of perfection unsurpassed by any other improvement in foundry practice. In fact, the match plate is a part and parcel of some of the most improved molding machines on the market, yet there are places where it can be used and be an absolute disadvantage. This can be attributed to fellows not up in foundry work taking positions of responsibility and attempting what they cannot handle.

I remember once being employed as a—well, I was going to say—foreman in a foundry but I will withdraw that and make it "engaged." I was engaged as a foreman and thought that was what I was to be, but it was a joke. I wasn't the foreman, I was just there, I don't know what for. Well, they had a job which was one of their regular line and it called for quite a number of gears about 9 inches in diameter and 1½ inch face and 2 or 3 teeth to the inch. They had a nice pattern on a follow board and a man could jog along on that wheel at five cents and make good pay, but the boss thought he could improve on that, so he got a gear blank cast in aluminum and had the teeth cut on it with a gear cutter, leaving them perfectly straight, but smooth and nice as anyone could wish for. This pattern, he attached to an aluminum match plate which was equally as nicely finished. He thought that by this means he had accomplished two very important points. He thought that the work could be done at a much more rapid pace, and better than that, he did not think he would require to have molders do it. He had in view a class of men which he designated as handymen. These were the boys who would make the gear wheel match plate hump itself.

Now, leaving out the question of handymen, can a real good molder picture himself drawing out a pattern with long, slim, parallel teeth, hid under a plate where he has no chance to see how he is progressing, and no chance to swab his mold? Needless to say, it was a nuisance and we took the screws out of it, leaving the pattern loose, but with the core print in the centre keeping it in place. We would ram it up the same as any match-plate job and when the time came to draw it we would simply lift away the plate and swab the pattern and then draw it out. The match-plate made parting sand unnecessary but otherwise it just added to the work. That would have been a capital job for a stripping plate machine, but if the outlay for a machine was considered to be greater than the demand for the wheel called for, a much better arrangement than the plain match-plate could have been rigged up by making the pattern, say, a quarter of an inch deeper than was required and then make a quarter inch stripping plate and bit it to the pattern. The pattern would, of course, be fastened to the match-plate, and when about to be molded the loose stripping plate would be chopped over the pattern, leaving the depth of pattern required protruding through it When the time came to draw the pattern, it would be done the same as with any match-plate, the stripping plate acting as a guide and preventing the pattern from tearing the teeth. After drawing the pattern the stripping plate is lifted away, and the mold is ready to be cored up and close. An ordinary match-plate for molding gearing is certainly the most impractical idea which I ever saw tried out.

Aesop's Fables Up to Date

By the Editor

Æsop was a Greek fabulist who lived some five hundred years before the birth of Christ, but even in those, way-back days he observed many things, which are still plainly visible at this later day. One of his stories, and one which is probably as well known as any of his innumerable ones, is the one where the boy and his father were trying to get donkey across the bridge, and no matter how they proceeded to act there was always some one to suggest a different way, and each suggestion was acted upon by the man and the boy, until they attempted to carry the donkey over and in doing so they let him fall into the creek where he was drowned. They then discovered that in trying to please everybody they had pleased nobody and had lost their donkey in the bargain.

Where they made their mistake was in not using discretion. Some suggestions are worthy and should be acted upon, while others are unworthy and should not be acted upon.

The same difficulties confront the editor of a paper. An editor receives many suggestions, and if he is a successful editor he will weigh each one and value it according as it appears to be of value.

In editing the CANADIAN FOUNDRYMAN we have received many valuable suggestions from subscribers and we believe that as a result we have a publication now which gives general satisfaction. We have certainly received many flattering testimonials from satisfied subscribers, but we have also heard remarks which were truly amusing although annoying. For instance a foundry foreman made the remark that he did not care anything about electric furnaces and didn't see why we would waste space on that kind of material, yet that same foreman's employer told us that he did not know any more about ordinary cupola practice than he did about electric melting, and that if the melter took a day off they just about had to shut down. Now this man was an expert moulder and a good foreman, but he had never put his mind to anything outside of the rut into which he had drifted, and the only class of work which he could read about with any satisfaction was the moulding of some large piece of casting.

On another occasion we had a shop superintendent tell us that he thought we put too much stress on big work and not enough on light work such as he was doing. Now contrary to both of these we had the foreman of a pattern shop tell us that while he, of course, took particular interest in our pattern-makers section, he also took exceptional interest in our contributions on malleable iron. There is not the remotest possibility that he will ever follow up malleable work, but it is a pleasure for him to get the knowledge which is at his disposal.

Once the habit of reading is acquired and the contents of the articles remembered, it becomes a pleasure to read and become educated on subjects which are apparently far removed from our regular thoughts and activities, and the knowledge thus gained cannot help but be beneficial. To read about things which we already understand refreshens our mind but it is not as beneficial as to read and learn about things of which we are in comparative ignorance. In the pages of CANADIAN FOUNDRYMAN will be found interesting articles on every phase of actual foundry practice, including moulding in loam, dry sand and green sand, core making, working in grey iron, malleable iron, steel, semi-steel, brass, aluminum, etc. Various types of cupolas, air furnaces, open hearth furnace, electric furnaces, and Bessemer converters. We also have sections devoted to pattern making, plating and polishing and dozens of minor topics such as moulding sand, plumbago, fire clay and such like. We also make it a special feature to answer questions. Our columns are open for communications on foundry matters and we appreciate anything and everything which is of an educational nature.

SOME OLD TIME ASSOCIATION

On January 14 last the Philadelphia Foundrymen's Association held their 293rd meeting at the Manufacturers' Club. Besides the election of officers, an interesting and instructive entertainment was put on, in which Professor Emory R. Johnson, dean of The Wharton School of Finance of the University of Pennsylvania, gave an address, and J. S. Kunkle, of Philadelphia Bourse, gave a moving picture show of the mercury trackless trains as at the Foundrymen's Convention in September. Two new members were admitted in the persons of W. A. Barrows, representing E. Arthur Tutein, Inc., and H. R. Willi, president, Royersford Foundry and Machine Co., Royersford, Penn. Thos. Devlin is the president of the Association and Howard Evans is the secretary.

ELECTRIC SMELTER FOR VANCOUVER

Mr. A. P. Gillies, heretofore identified with many promotion schemes, is now communicating with the Vancouver City Council proposing an electric iron smelter for Vancouver.

His letter states that the purchase of a $5,000,000 bond issue has been arranged for the establishment of such a smelter in British Columbia. The city was asked to submit a by-law, it being understood that if the investment were made here, the city would guarantee the principal and interest on the bonds. The proposal was for 200-ton capacity for the first unit of open-hearth furnaces and rolling mills, providing that 50.000 horsepower electricity at $10 per horsepower per year could be secured for twenty-four-hour service.

A FOUNDRY, NOT A BRASS FOUNDRY

We might as well acknowledge that we had the flu last month and as a consequence let quite a few little mistakes slip through, but anticipate no serious results as a consequence. In our description of the foundry branch of the big new plant of Crane, Limited, Montreal, we referred to it as a brass foundry, which was to a certain extent misleading. This establishment has as a part of its make-up a thoroughly modern brass foundry with 16 furnaces, which certainly entitles it to be recognized as a brass foundry, but it also has an iron foundry with a good, big cupola, and another one under way which would entitle it to be classed as an iron foundry. This company manufactures valves and fittings of all sizes from the smallest to the largest in both brass and iron. The foundry, extensive as it is, is only one department of this enormous plant, but it is the only department which would be of interest to readers of a foundry paper.

"SAFETY DOLLARS"

On the theory that the workman would take it home, give it to his children and thereby start an endless discussion on safety, E. Ross Farra, employment and service manager of the Jackson & Sharp plant of the American Car & Foundry Company, Wilmington, Del., recently designed a "Safety Dollar" —a bit of green paper the size of a dollar bill on which was printed some interesting safety propaganda—one of which was folded with the money in each employee's pay envelope.

Mr. Farra reports that the comment heard about the plant during the following week indicated that the company in this manner had brought the safety gospel home to the workmen much more effectively than can ordinarily be done with pay envelope inserts.

"How Many Real Dollars Will You Save By Being Careful?" was the title of the story told by the printed matter on the "Safety Dollar."

THE LARGEST DAM(N) IN THE WORLD

One of the largest and most complete dam(n)s in the world was the one heard coming from the cellar a few nights ago when Dad let his only bottle of booze fall on the cement floor with disastrous results.

An alloy of aluminium with 10 per cent. of calcium is said to be not only lighter than aluminium itself, but to have exceptional merits. It can be readily remelted, does not decompose in water, and is more resistant to corrosion than alloys of aluminium with copper, tin, or zinc. In castings, it takes on minute details of moulded designs, it machines well and satisfactorily, and is free from brittleness.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
	Per 100 lbs.	
Copper, light	$15 00	$14 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 00	17 00
New brass cuttings	11 00	11 75
Red brass cuttings	14 00	15 75
Yellow brass turnings	8 50	9 50
Light brass	6 50	7 00
Medium brass	6 50	6 00
Scrap zinc	6 50	6 00
Heavy lead	7 00	7 75
Tea lead	4 50	.5 00
Aluminum	19 00	20 00
	Per ton—Gross	
Heavy melting steel	18 00	18 00
Boiler plate	15 50	15 00
Axles (wgt. iron)	22 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	25 00	25 00
No. 1 machine cast iron	32 00	33 00
Pipe, wrought	12 00	12 00
Car wheels	22 00	26 00
Steel axles	22 00	20 00
Mach. shop turnings	11 00	11 00
Stove plate	25 00	25 00
Cast boring	12 00	12 00

PLATING CHEMICALS

Acid, boracic	$0 23
Acid, hydrochloric	0 03¼
Acid, nitric	0 10
Acid, sulphuric	0 03¼
Ammonia, aqua	0 15
Ammonium, carbonate	0 20
Ammonium, chloride	0 22
Ammoniaum hydrosulphuret	0 75
Ammonium sulphate	0 30
Arsenic, white	0 14
Copper, carb. anhyd	0 41
Copper, sulphate	0 16
Cobalt, sulphate	0 20
Iron perchloride	0 62
Lead acetate	0 30
Nickel ammonium sulphate	0 08
Nickel carbonate	0 32
Nickel sulphate	0 19
Potassium sulphide (sub.)	0 42
Silver chloride (per oz.)	0 25
Silver nitrate (per oz.)	1 20
Sodium bisulphate	0 11
Sodium carbonate crystals	0 06
Sodium cyanide, 127-130%	0 38
Sodium hyposulphite (per 100 lbs.	8 00
Sodium phosphate	0 18
Tin chloride	1 00
Zinc chloride, C.P.	0 30
Zinc sulphate	0 08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4 60
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	0 09
Pumice, ground	0 06
Emery glue	0 30
Tripoli composition	0 09
Crocus composition	0 12
Emery composition	0 10
Rouge, silver	0 60
Rouge, powder, nickel	0 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$0 08½
Grits, 80 and finer	0 06

SHEETS

	Mont.	Tor.
Black sheets, 28-g	$ 8 25	$ 8 50
Black sheets, 10-g	7 30	8 00
Can. plates, 52s (box)	11 25	10 00
Queen's Head, 28-g	11 25	11 40
Fleur de Lis, 28-g	10 75	10 90
Zinc sheets	17 00	20 00

Prices per 100 lbs, unless otherwise stated.

MISCELLANEOUS

Strictly solder	$0 40
Commercial solder	0 38
Red lead, 100-lb. kegs	0 16½
Crystal borax	0 13
Sulphate of copper	0 12

Per lb.

PIG IRON

Gray forge, Pittsburgh	$42 40
Lake Sup. charcoal, Chicago	57 00
Stand. low phos., Phila	50 00
Bessemer, Pittsburgh	43 00
Basic, Valley furnace	42 90
Can. fdy. pig, No. 1	52 00
Can. fdy. pig, No. 2	50 00

METALS

	Gross Mont.	Tor.
Lake copper	$25 00	$24 00
Electro copper	24 00	24 00
Castings, copper	23 50	24 00
Tin	77 00	76 00
Spelter	12 00	12 00
Lead	11 50	12 00
Antimony	14 00	14 00
Aluminum	33 00	35 00

Prices per 100 lbs.
Prices per lb.

ONLY LIMIT NOW IS TOOL SUPPLY

Demand is Good, But Securing of the Goods is Another Matter—Scrap Metals Are Up

TORONTO.—One dealer, sizing up the situation, brought out something that gives a pretty fair index to trade conditions in the machine tool line. His point was, "The way business is going just now makes it almost impossible to train salesmen for machine tool lines. About six to ten years ago we had to get out and hustle for business. A prospect was something and the signed orders was another. But it is all different now. All that is necessary is that the salesman be able to tell the prospect that he knows where he can get a machine for him."

It is a fact that the shortage of machinery and the sustained demand have helped to bring business to a peculiar basis in this country.

Dealers, at the same time, generally recognize that these are abnormal conditions, and they are not altering their sales policies to any extent. They realize that they have to keep before the trade, for the time will undoubtedly come sooner or later when they will find it necessary to get out and chase business as they had had to do in the past.

The question was asked of several of the machine tool dealers in Toronto this week if they could see anything in sight that would indicate a holding-up of the demand for machine tools, or for the other lines they were handling. In every case the answer was the same, and that was that the only thing that was holding up trade was their inability to get the goods to meet the demand.

The steel trade marked up a good many items this week. The base price on iron and steel bars is now at $5.50 at practically all the jobbers in this district. There has been for some time a change in effect for the selling of cold rolled shafting. The old list that has been worked on for some time was prepared in pre-war days, and was not at all representative of conditions now. It made the dealers and mills take the position of raising the figure they would have to add to the list all the time. This really became a top-heavy way of doing business, and it was a rather complicated affair. The plan employed at present by dealers here is to put $6.25 per pound base. For lots of less than 1,000 pounds there is an extra of 35 cents, making $6.60. The base size is 2¼ in. to 3 in. Anything outside of that scope comes as an extra for size.

There is a fairly good tonnage moving in certain lines. As a general thing, though, considerable of the material that is coming in now has been bought at quite a premium in order to secure delivery. The firms receiving this are not anxious to take it into stock, hence the movement is quick, in and out again, and as a result the warehouses are as bare as ever, although certain of the manufacturers may be better off—but at a price.

When will prices cease to rise? Here is the answer of one Toronto steel man: "We look for still higher prices." It is a fact that some of the Canadian steel mills will have to purchase scrap before very long. Some of them have held out for quite a while, hoping that prices would sag in the meantime, and in this way they would not have to increase their selling prices. It begins to look as though, were they to come into the market now, they will have to meet the U. S. prices, and it must be remembered that exchange is quite an inducement to sell into the American market just at this time.

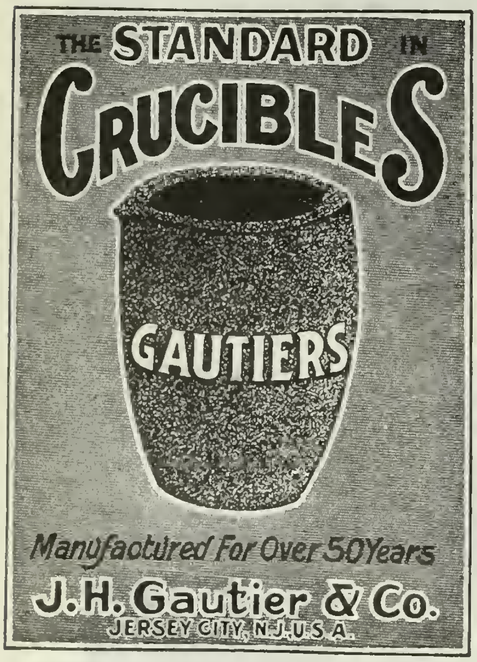
All classes of scrap iron and brass and coppers went up in the scrap market this week. There is nothing to show any improvement in the cast iron or stove plate situation. In fact there is a greater demand than previously for iron and steel. The steel mills in some cases are in the market again, and they buy in large tonnage. The call for material for the steel mills has been somewhat hung up lately in the hope that the peak of prices might be passing. The result is that when they do come in now they will find that they will have to face a market that is fairly well depleted. Heavy melting steel is hard to obtain and any holders that may have some in stock, if there is a stronger demand for it, may ask their own good price for it.

"SINDER MILLS"—"SNIDER MILLS"

In our last issue we undertook to announce to the foundry public that the Preston Woodworking Machinery Co., of Preston, Ont., had begun the manufacture of wet cinder mills for recovering the good metal from the drop of the cupola. After all our years around the foundry we missed our guess on how to spell "Cinder," and we started it with an "S." making it read "Sinder." The compositor knew it was a mistake, but instead of rectifying it, he improved on it and made it read "Snider mill," leaving the reader to wonder whether it was meant to manufacture sniders or to grind up the ones we had, but it was for neither; it was simply for grinding cinders.

It is but a short distance from Preston, over to Kitchener, and there are innumerable Sniders over there, and some staunch good fellows at that, but they are not in this mill deal.

We take great pleasure in announcing that it was a misprint and that the Preston Wood Working Machinery Co. are putting on the market a new and improved "Cinder Mill."



On the Move! A Moulder's Story

Showing What a Fellow is Driven to Do When Out of Employment and a Panic Staring Him in the Face

By JOHN WOODSIDE

[Continued from January issue]

WHEN we left our hero in January he had arrived in New York City, where he had an uncle living. The uncle's address was on Water Street, and a policeman was directing him to the place, which was opposite the new Brooklyn Bridge, which was under construction at the time.

This big enterprise must have been a boon to many New Yorkers this summer, for there did not seem to be much else doing. Gone was the roar and rattle of Broadway, you could cross it comfortably at any time now without the aid of a policeman. I got a warm welcome, and my uncle, who was a resident of the city for many years, guided me around to some big iron works, which were half idle, and each had a train of anxious waiters for vacancies. So I persuaded my uncle to take a holiday, and we took a steamer down the Sound to visit another uncle located at the village of Greenport, L.I. He pointed out, as we passed, the works at Hellgate reef, now almost ready for the explosion. Greenport was a quiet village, affording an occasional day's work with the village blacksmith, or in some of the surrounding gardens, but no foundry. The shade trees along some of the streets were the big English cherry trees, now pretty well loaded with ripe fruit, which I took to be a great improvement on the horse chestnuts of Toronto. To while away time we went over to the Sound and fished sea bass and flounders, and thus supplied a share to the table fare. Strawberries were largely grown by the farmers around the village and shipped largely to New York, though a boat ran regularly across to New London, Conn., during the berry season. Tiring of the idleness, I proposed a trip across to try my luck in Connecticut. The skipper, an old friend of my uncle's, readily gave me a free trip and I made the acquaintance of New London, but found little in the foundry line to interest me. One of the boys, however, told me that at Willimantic, some 20 or 25 miles inland by rail, they had a busy shop or two and times had been reported good last month. So I decided to try it, and I even formed some vague plan of continuing on down toward Boston if I should not strike a job sooner. And now to economize my few dollars, generously helped out a few by a parting gift from my Greenport uncle. You must remember that my first start was by a country road, with no definite guide to it, but here was the railroad, leading direct to Willimantic, and an agricultural shop; so in the afternoon I bought some lunch to pack along, shouldered my valise and set out inland. I got a bit of chaff from a section foreman and gang a mile or so down the road, who advised me to keep count of the ties as I went, just for a bit of practice. Toward evening I was out in a sparsely settled country; I ate my lunch by a stream, and kept busily on until it was quite dark, when, a bit tired, I went to bed on the grass over by the fence, where a tree shaded me from the dew. The night was warm and I slept well until near midnight, when I was rudely awakened by the roar of a train coming down upon me; its great headlight caught me and dazzled me into confusion. A bit unnerved by the racket, I climbed the fence and sought a more retired place beneath a clump of trees. In the morning I was somewhat disgusted when I saw a short way ahead a dilapidated old barn partly filled with hay, and with no owner in sight. I breakfasted on strawberries, which grew plentifully on the banks, and, lo, as I passed a farm I saw suspended to the upper rail of an old fence, a seething ball of bees, which had swarmed from some neighboring apiary. Seeing a farmer at work in a potato field, I hailed him and told him of my find, he promptly claimed the swarm, hustled a boy off for a hive, and I waited to witness the delicate job of introducing the bees into their new home. The farmer gave me polite thanks and I had not cheek enough to ask for breakfast in return. I got into Willimantic early and visited the shop, with the usual result, the hurry of the season over and likely to let some moulders out soon, and no country behind it worth trying.

(To be continued

C.M.C.

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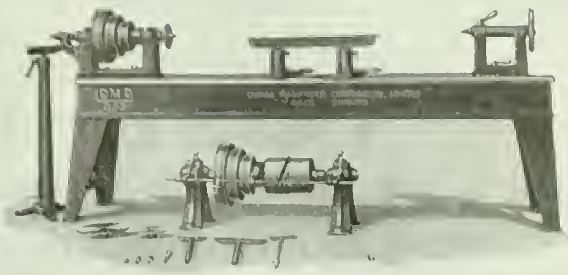

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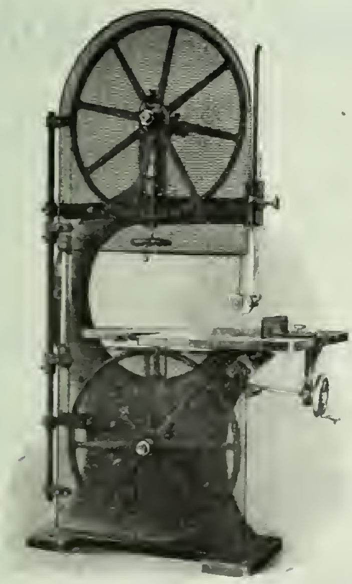

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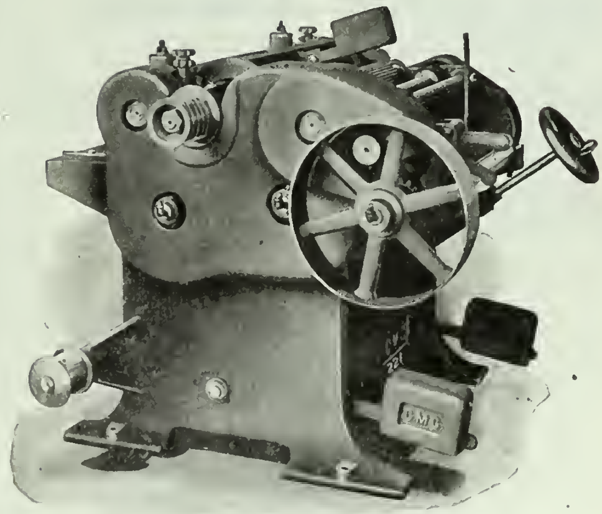

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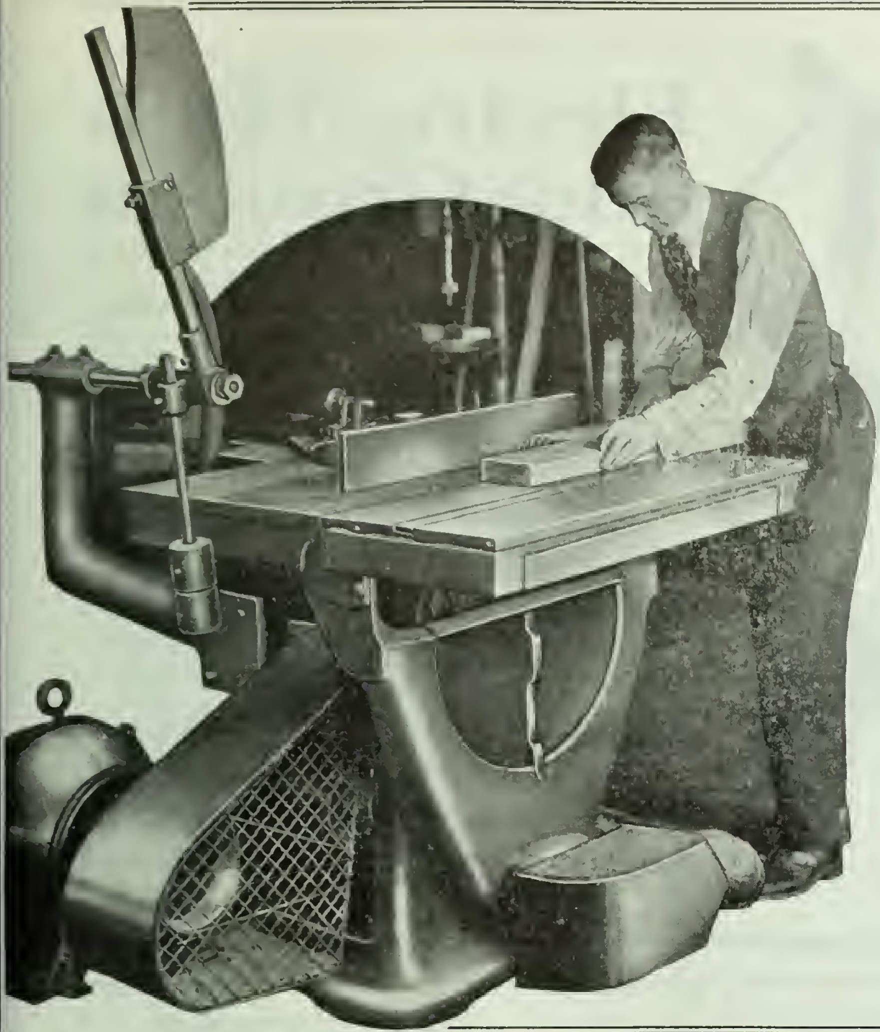

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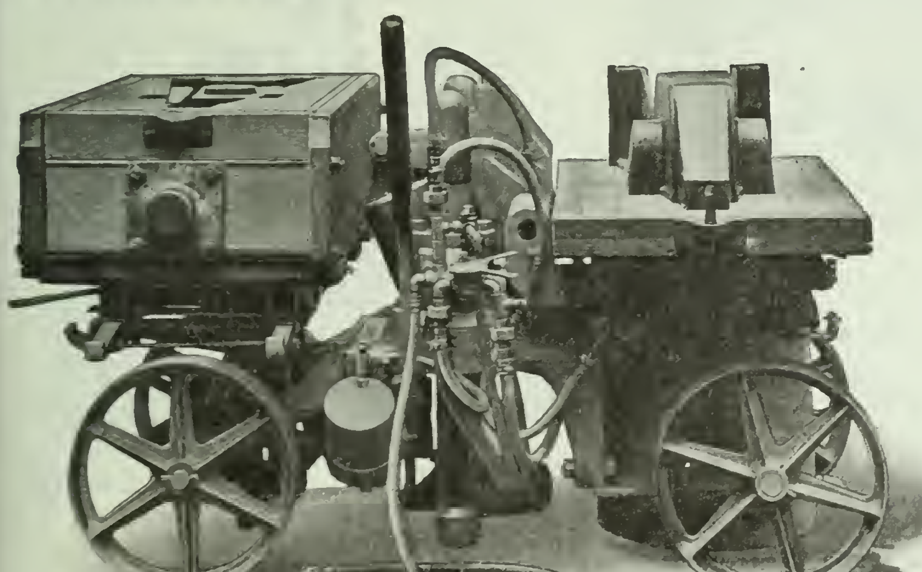

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Frederic B. Stevens, Detroit, Michigan.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
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Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

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Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Obermayer Co., S., Chicago, Ill.
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
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Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Hyde & Sons, Montreal, Que.
Woodison Co., E. J., Toronto.

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General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
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Hamilton Facing Mill Co., Hamilton, Ont.
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Whitehead Bros. Co., Buffalo, N.Y.
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SAND BLAST SHOT
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Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

When writing to Advertisers kindly mention this paper

INDEX TO ADVERTISERS

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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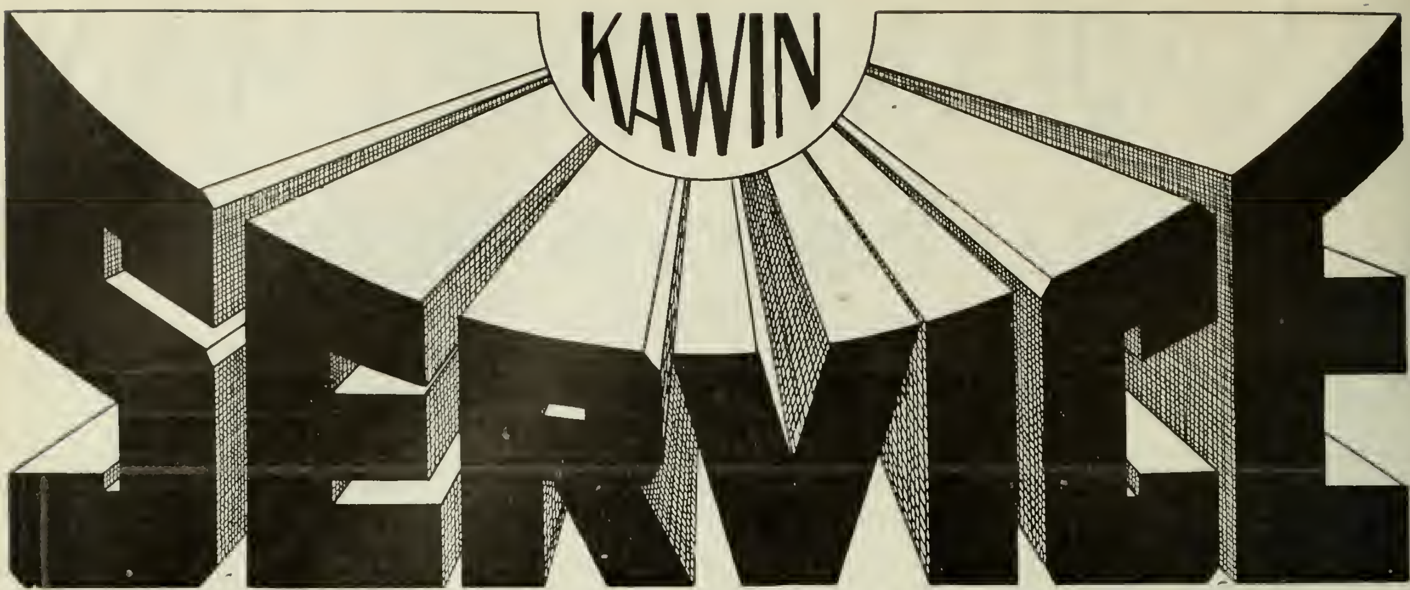
VOL. XI. PUBLICATION OFFICE, TORONTO, APRIL, 1920 No. 4.



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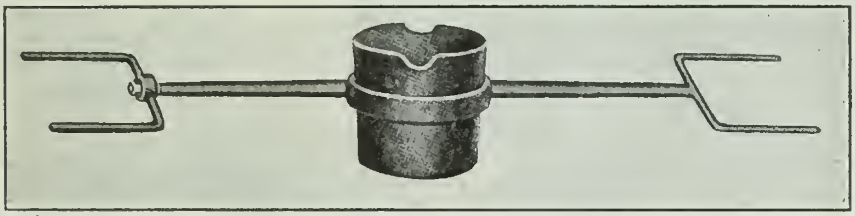
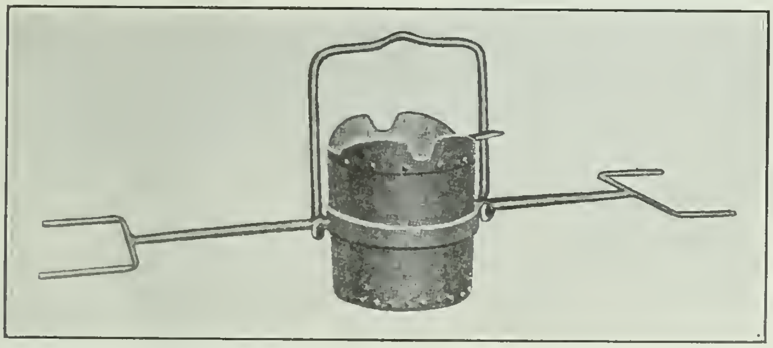
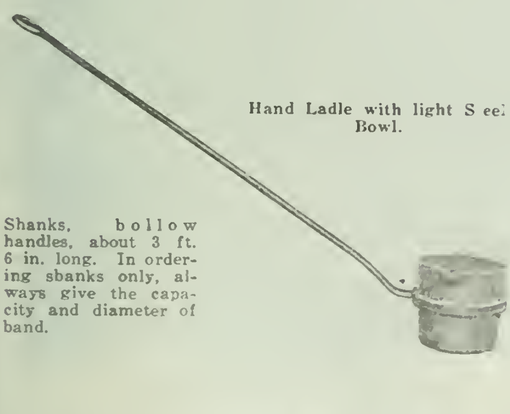


Flat Bottom, Steel Bowl, Bull Ladle with Double End, Swivel Shank. Capacities 100 to 1,000 lbs. inclusive.

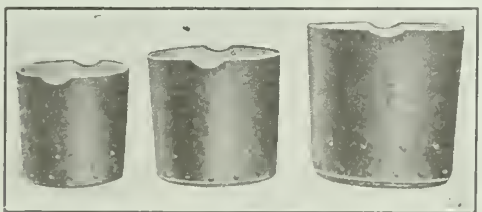


No. 1 Lips, No. 1 Bail. Capacities 400 to 1,800 lbs. inclusive. All Crane Ladles have a dog on side of Bowl to hold Ladle in vertical position.



Hand Ladle with light Steel Bowl.

Shanks, hollow handles, about 3 ft. 6 in. long. In ordering shanks only, always give the capacity and diameter of band.



Flat Botton Steel Bowls. Capacities 50, 100, 150, 200, 250, 300 and 350 lbs. These Bowls have heavy steel plate sides and head. When ordering ladle bowls state inside diameter of shank ring that they are expected to fit.

THE E. J. WOODISON CO., LTD., TORONTO

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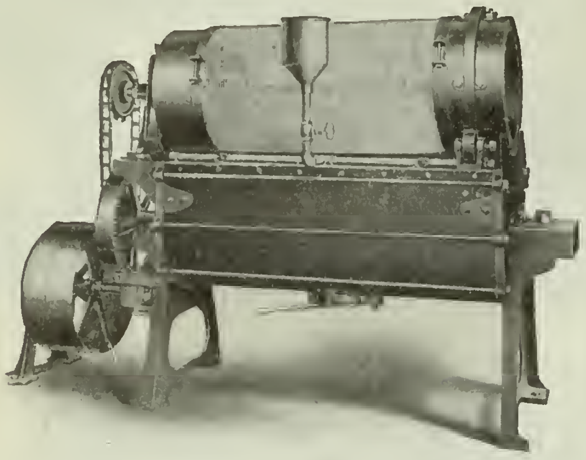
The Standard
Core and Facing Sand Mixing Machine



No. O-A Standard Improved Sand Mixer

Cuts over and mixes 4 cu. ft. of sand 120 times a minute—equivalent to the labor of 50 men.

Screens, tempers and mixes sand in one continuous operation and with but one handling.

When the batch is prepared it may be emptied into a wheelbarrow or car by opening the discharge gate underneath the mixer.

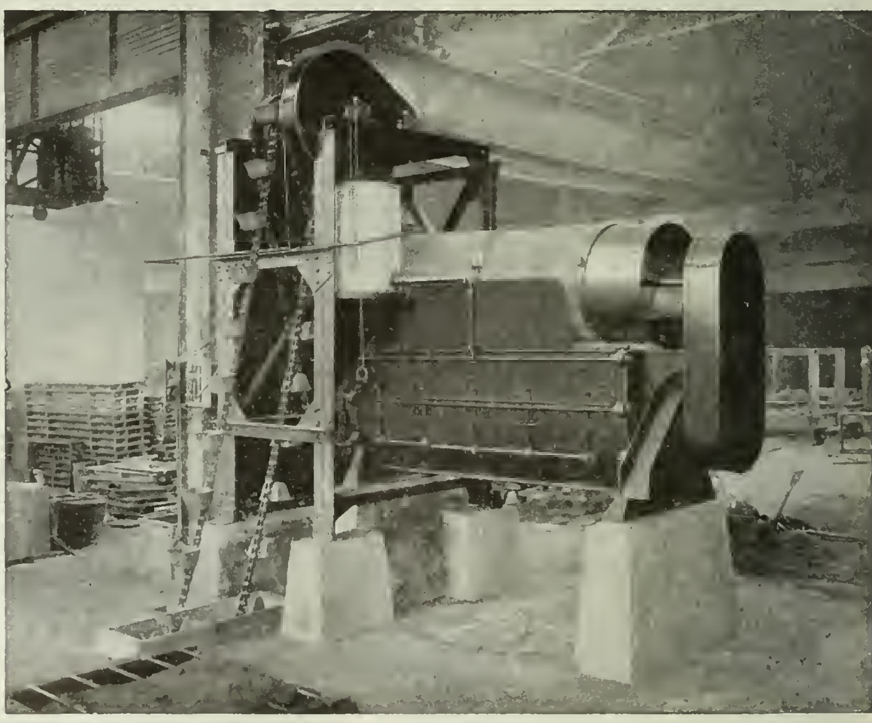
From three to five minutes mixing will uniformly blend and temper Core and Facing Sand with any tempering liquid or binding compounds which may be used. The cost of hand labor to do this work would pay for a STANDARD MIXER in a few days. Furnished with or without screen.

WE MEET THE TONNAGE REQUIREMENTS OF DIFFERENT FOUNDRIES WITH SIX SIZES OF "STANDARD" MIXING MACHINES, RANGING FROM 1 TO 60 TONS PER HOUR.

No. 4 Standard Improved Sand Mixer

Cuts over and mixes 27 cu. ft. of sand at one batch—EQUIVALENT TO THE LABOR OF 200 MEN.

Designed to meet the requirements of large foundries. Will mix sand in large quantities for core, facing, heap or backing sands.



THE STANDARD SAND & MACHINE CO.

CLEVELAND, OHIO, U.S.A.

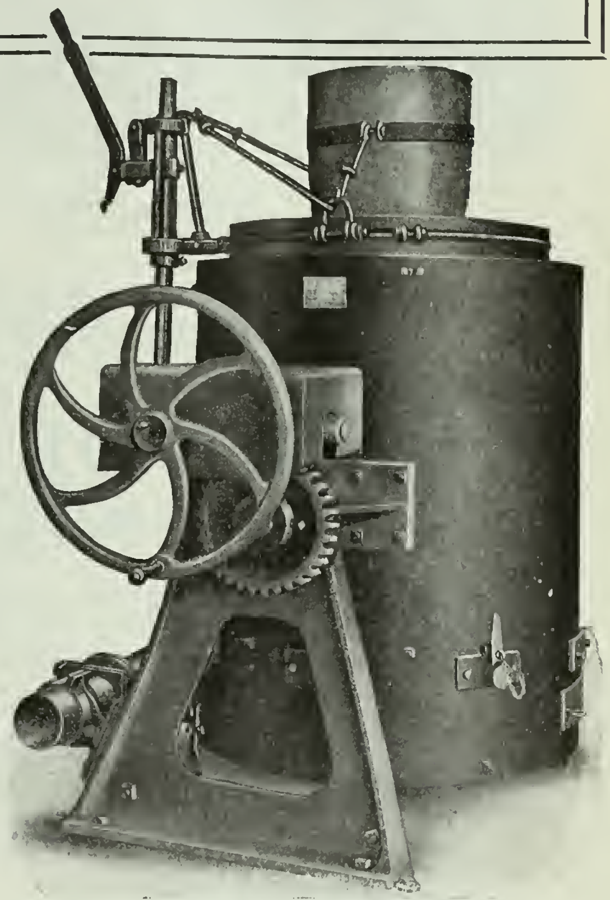
MONARCH FURNACES

Enable You to Cut Production Costs

Buy your foundry equipment as you would buy an automobile. When you buy a car you don't jump to conclusions, you investigate! Then you decide which make suits your purpose best. The same process of reasoning should apply even more rigidly to your foundry equipment—it means dollars and cents in production. In the course of your investigations do not fail to give MONARCH foundry equipment your careful attention. MONARCH products represent many years' experience in catering to foundry requirements. If it's a MONARCH Melting Furnace or a MONARCH Core Oven, or any other MONARCH equipment you can depend upon the design being according to most modern foundry practice—*built to save time and expense.*

Enquiries Promptly Answered

Monarch Coke Tilting Crucible Melting Furnace. Equipped with Hopper Feed and Shake Grates; rests above ground; made for various size crucibles. Unequalled for economy and efficiency in its class.

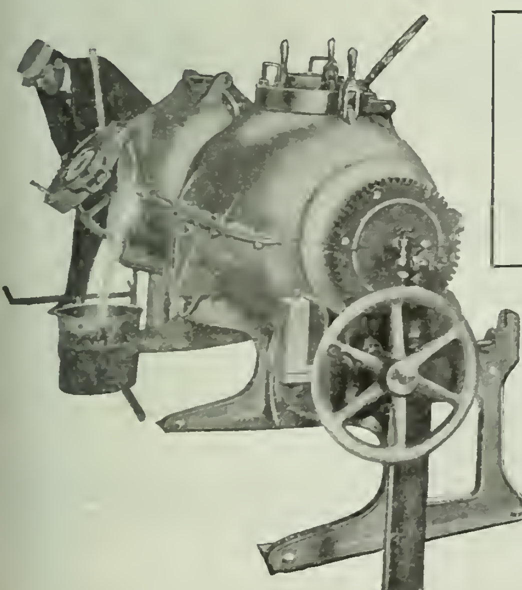


Catalog C.F. 3, 1920

The Monarch Engineering & Manufacturing Company

1206 American Bldg., Baltimore, Md., U.S.A.

SHOPS AT CURTIS BAY, MD.



Monarch Double Chamber Melting Furnace. While Melting in one chamber, the exhaust heat brings the other chamber to the melting point. Fuel cost is extremely low. No crucibles required. Burns oil or gas.

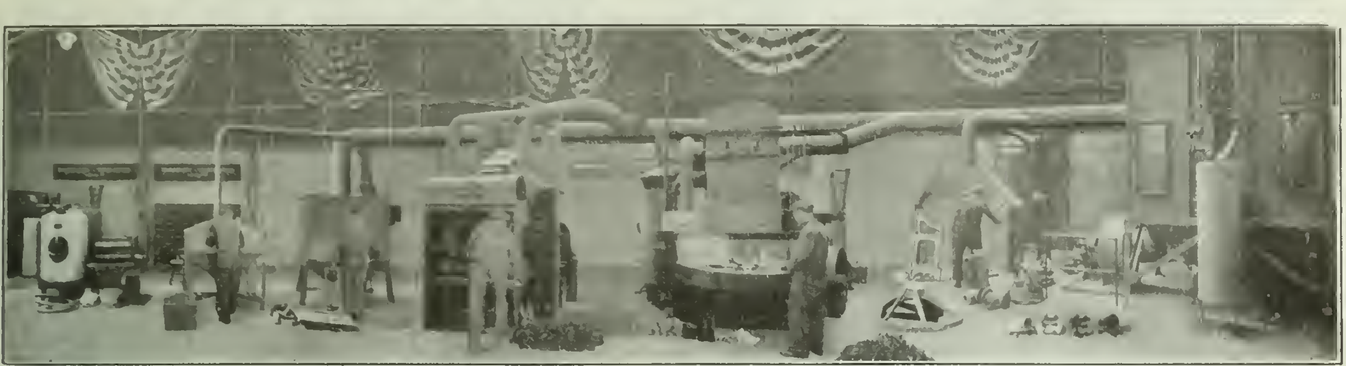
We are prepared for quick shipments for Overseas trade

Monarch Core Ovens, both Arundel and Acme Models, are built in larger sizes than formerly; orders are received for any capacity, width, length and height of shelves as may be desired.

Monarch "ARUNDEL" Drop Front Core Oven - Any Fuel

HOLLAND PRODUCTS
GOOD PRODUCTS ONLY

"PANGBORN" SAND-BLASTS



Installed in Foundries 10 years ago are still full duty to-day. Wages saved alone have paid entire installation cost in less than a year.

CABINETS BARRELS TABLES

In Automatic Hygienic types that confine the blasting operation and entirely remove the operator from all contact with the dust-laden air, are made in sizes for every character of output and any volume.

"PANGBORN" ENGINEERING SERVICE

Will assume your "Sand-Blast" problems from inception to completion, providing that correctness of design, arrangement and installation and operation that means economy and satisfaction.

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. Box 8508

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

The Sanitary Sand Blast Helmet

The Most Efficient Helmet You Can Buy

A light aluminum helmet that is comfortable,, sanitary, and perfectly effective as a protection for the men. Six times as effective as the ordinary germ-laden helmet—a money saver for the consumer and a big step towards betterment of the men.

Benton Harbor, May 24, 1917.

Dear Sir:
We have your favor of May 23 relative to Sanitary Sand Blast Helmet. We are very much pleased to advise that we find the helmet which you manufacture sanitary in all respects, durable, and in the end the cheapest. We find that when the canvas is worn, it is a very easy matter to insert new canvas and the helmet is just as good as new. We are very much pleased with the ones we have in use. When in the market for any more helmets, we will gladly favor you with our orders.

Benton Harbor Malleable
Foundry Co.

Good live Canadian Representatives wanted.

J. A. Spangler

Benton Harbor, - - Michigan

Sturtevant

REG. U.S. PAT. OFF.

PUTS AIR TO WORK

Are Your Cupolas Getting Enough Blast?

Insufficient blast caused by lack of pressure brings down cupola capacity—a big handicap to the maintenance of steady production.

The New Design 4 Pressure Blower

supplies a steady, production-maintaining blast to your cupolas under any working requirement and the sizes are so complete that any foundry can be satisfied.

The illustrations below clearly show the heavy construction and simple design of this practically-tested blower. With small expense, little space, and minimum inconvenience this compact unit can be installed, with the result that your cupolas are placed on a maximum-output basis.

Catalog 258 B explains fully

B. F. Sturtevant Co. of Canada, Limited

HEAD OFFICE AND WORKS: GALT, ONTARIO

SALES OFFICES: TORONTO AND MONTREAL

SLY FOUNDRY EQUIPMENT "UP - TO - DATE"

30-40 Sand Blast Mill at Olds Motor Works, Lansing, Mich.

Is the Finishing of Small Parts and Casings Costing You Too Much?

Here's a profit leak that bears close analysis. The cost of small parts may become out of proportion to the cost of larger parts unless they are finished in sufficient volume in the least possible time and with the minimum amount of labor.

Since cost depends on volume, where 6 or 8 tons a day have been cleaned by one method or another, the installation of a 30/40 Sly Sand Blast Mill actually turns out 8 to 20 tons a day and with the minimum amount of labor.

Drop forgings, stampings, small gears, auto parts, brass and bronze work and malleable iron castings that are put through a 30/40 Sly Sand Blast Mill are cleaned with the thoroughness of a sand-blasting operation that imitates hand work, lessening machining on parts that are to be machined; eliminating defective parts; giving a surface that is ready for plating.

It is your privilege to draw on over forty years experience in the business, by putting your cleaning problem up to us. Write or wire.

The W. W. SLY Mfg. Co.

Main Office and Works:
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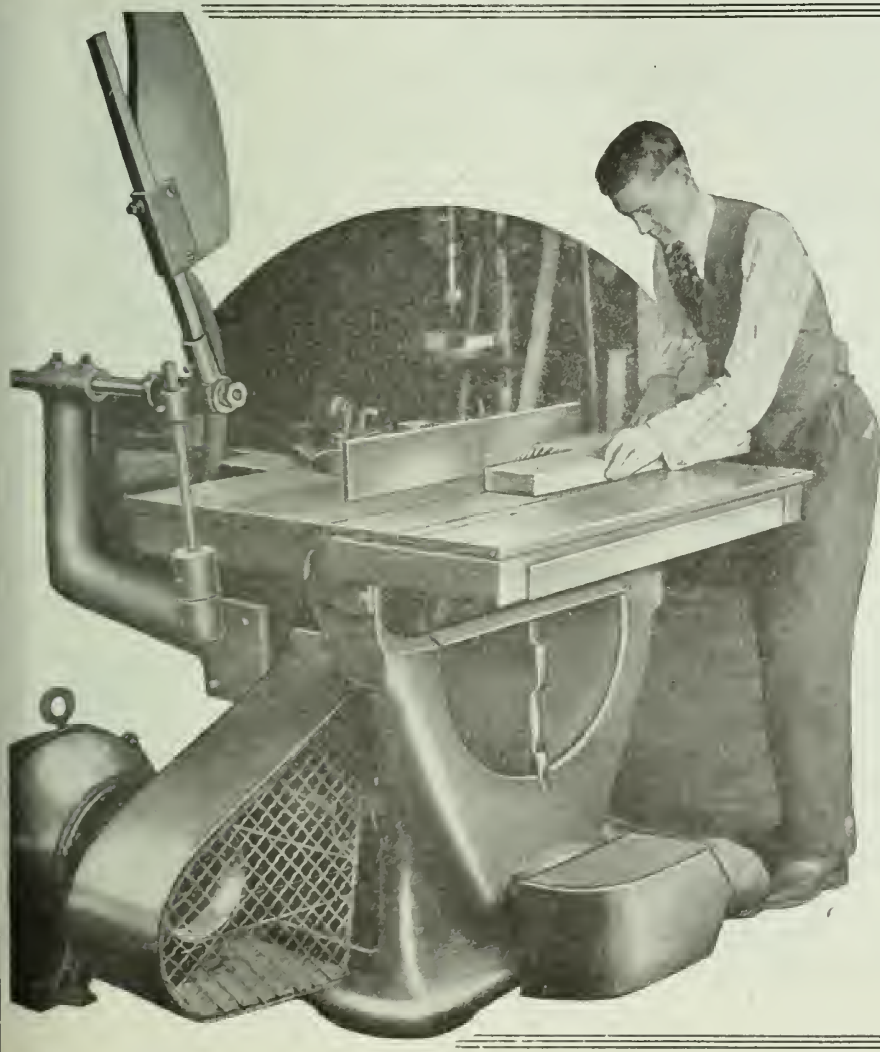
Sand Blast Rooms
Sand Blast Cabinet
Sand Blast Rotary Tables.
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers



An OLIVER

Universal Saw Bench

helping to

MAKE PATTERNS RIGHT

in the pattern shop of the American Can Co., Newark, N.J., where there is an up-to-date set of woodworking machinery.

The Oliver Universal Saw Bench is shown here with guard raised, ripping a piece of pattern lumber. By simply turning a crank the rip saw will disappear and a cut-off saw will come into position. The table tilts and has a rolling section. The ripping fence is completely adjustable.

The "Oliver" line of PATTERN-MAKING MACHINERY is complete and uniformly high-grade.

Oliver Machinery Co.

Grand Rapids, Mich., U.S.A.

Light, Safe, and Easy to Move

Curtis I-Beam Cranes are made in various types, hand and pneumatic in capacities up to 20,000 pounds and in spans up to 40 feet. All parts are extra strong, with a margin of safety much in excess of the rated load. They are equipped with Hyatt Roller Bearings throughout, making them easy-rolling and long-lasting. Write for descriptive literature.

Curtis Pneumatic Machinery Co., 1637 Kienlen Ave., St. Louis, U. S. A.

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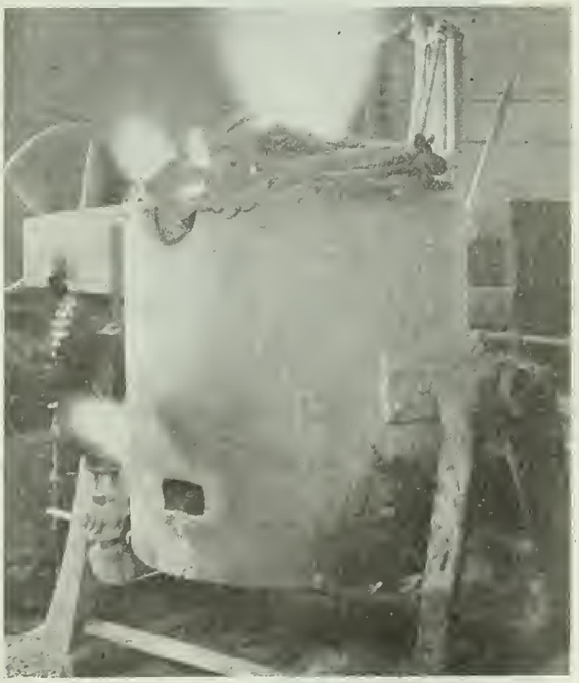
Showing Hyatt Roller Bearings

CLINTON CEMENT

For any refractory lining that gives trouble



If you have a firebrick lining that won't stay set — that cracks, burns out and falls apart after a few heats — you have exactly the lining for which Clinton Cement is made.

Clinton Cement joints set to a flexible, glass-hard surface that allows for expansion and contraction and withstands a temperature of 3,000° F. Clinton Cement cannot dry out and sift away from the bricks like fireclay. It protects the corners of the bricks from checking and crumbling. It is used with great success in brass furnaces like the one illustrated.

A five-pound tin of Clinton Super-Heat Cement is sent free for trial.

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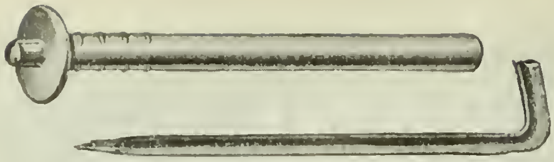

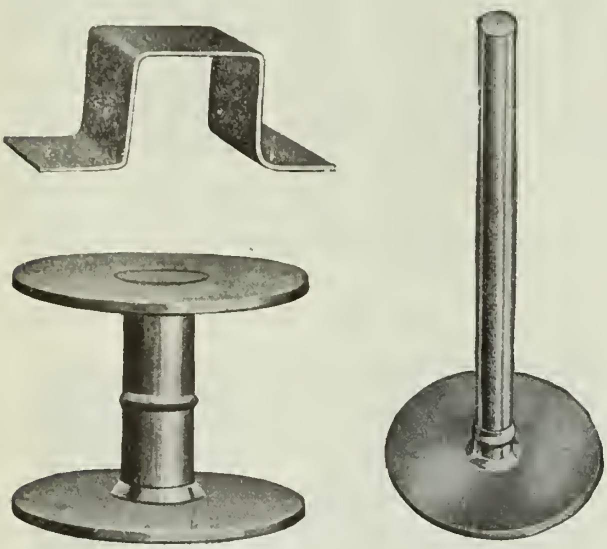

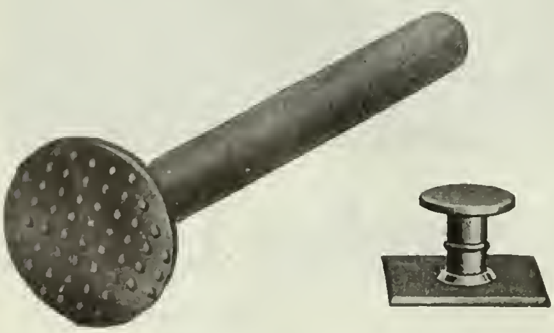


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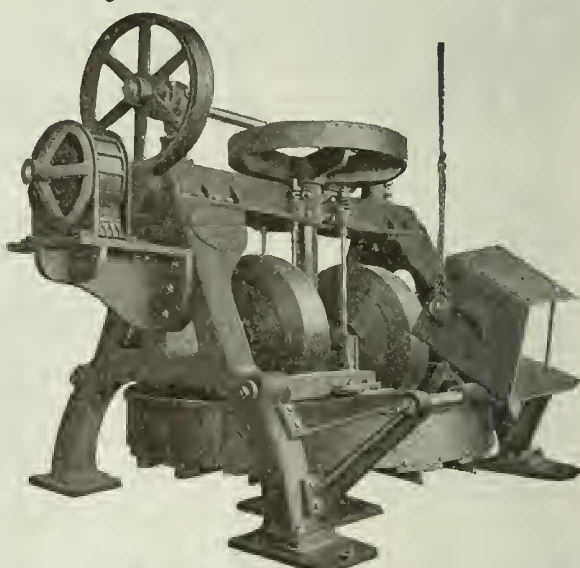


CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Molding a Heavy Band Wheel Without a Pattern

This Wheel Was Swept Up in Halves, One Half at a Time. The Mold Consisted of Loam, Skin-Dried Sand and Cores

By F. H. BELL

IN a former issue of CANADIAN FOUNDRYMAN was described and illustrated the moulding and pouring of a kettle at the foundry of Miller Brothers and Sons of Montreal, in which loam and dry sand were both used.

The mould described in the present article was also made at this plant and includes loam, dry sand and cores.

While this class of moulding presents, perhaps, few features which would be new to the practical heavy machinery moulder, it presents many interesting and instructive points for the junior, and for those who have not been privileged to experience this class of work, and it should also be of interest to those of more advanced experience in foundry work.

The mould described and illustrated in this article is for one-half of a band-wheel, 10 feet in diameter and 4 foot face. It is 2¼ inches in thickness of rim, with internal flange 1 x 2 inches, top and bottom; is double-armed, as shown in Fig. 2, and will weigh, when completed, about 7 tons.

In filling an order for a casting such as this, where only one wheel is wanted, it is not profitable to go to much expense in the way of pattern making, neither is it necessary.

Equipment and Material

The outside is swept up in brick and loam, while the inside is swept in sand and the arms are made in the hollow cores already spoken of, all of which is clearly shown in Fig. 2.

A half pattern is required for the hub, and a half core box is required for the arms. A few other inexpensive core boxes and a few sweep boards complete the outfit.

As we have already stated, this is only half of the wheel. Two of these halves are made exactly alike and bolted together, making the complete wheel. From this it will be seen that lugs will have to be cast on the inside of the rim to accommodate the bolts which will hold it together. See Fig. 1. Provision will also have to be made on the hub for bolts.

How the Mould is Made

To begin with, a pit of sufficient size and depth has to be dug in the floor; the spindle put in place and the bottom swept perfectly true and level. The sweep board used for making this bed is now removed and one similar to Fig. 3 is put in its place. A half circle lifting plate, shown in Fig. 4, is placed in such a position that the sweep will follow it around, missing it by about ¾ of an inch. The brick wall is built on this plate to the proper height and is plastered with loam and struck off true to the sweep on top of the wall, as well as on the face. The ends of the wall must also be exact, so as to make the casting an exact half circle with additional metal for machining. This is done by standing boards up at the proper place and bracing them from the back.

When this part of the mould is finished and blackwashed it is lifted away and put on the oven car and dried. The lifting plate, as will be seen, has four lugs by which it is lifted. These lugs must be so placed as to balance while suspended in the crane. This plate will, of course, be staked to the floor before lifting, so that it may be returned to the proper place when assembling the mould.

While this part of the mould is being dried, the inside, Fig. 1, is proceeded with. The half pattern for the hub, with lugs for bolts, has a groove in the back, which exactly fits the spindle. This is stood up in its place and cores, A-A, the full height of the rim are placed at either side to form the lugs for the bolts. The cores are simply flat cores, with the impression of the lugs on the face of them. They stand exactly where the sweep for the inside will touch, but pass them. They are aligned with each other and with the hub by means of a straight edge with a notch in it to fit around the spindle. This may be done before removing the outside wall, which was, in fact, the method adopted in the present case, as it was considered more certain to be right.

The cores, which, form the arms, are simply plain square cores on the outside, with the impression of half an arm on one face. Two of these cores are clamped together, forming the complete arm, as shown in Fig 5. These cores will fit tight against the hub pattern and will project out to where the sweep, Fig. 6, which sweeps the inside of the mould, will just nicely miss them. Some moulders would block the arm cores up to the proper position before putting in

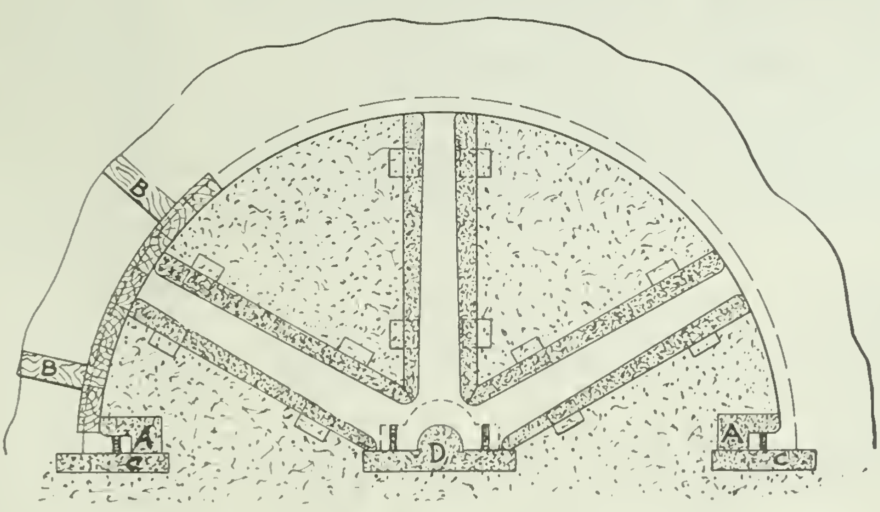


FIG. 1—FIRST SET OF CORES IN POSITION AND SEGMENT OF RIM BLOCKED INTO PLACE.

any sand, but this is not an advisable plan. The cores A, Fig. 2, for forming the bottom flange are, however, put in place and trued up to the sweep, Fig. 6. The sweep arm A, Fig. 6, is fastened at

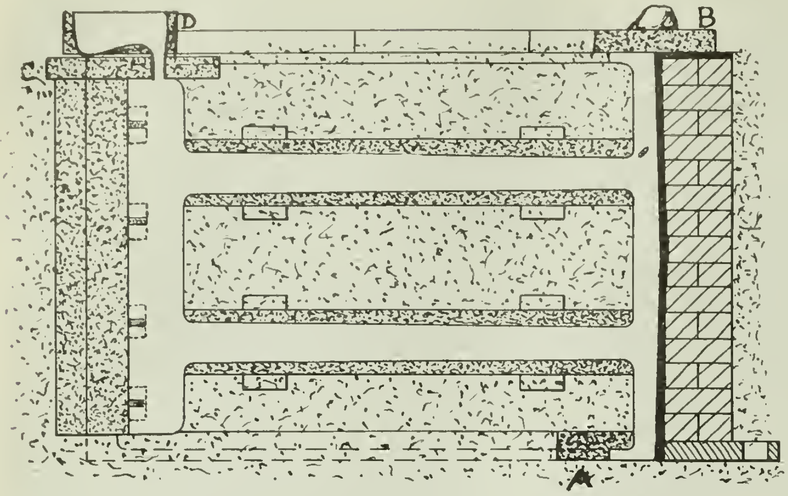


FIG. 2—SHOWING LAYOUT OF ALL PARTS OF THE MOLD

the proper height for the bottom of the arm cores and the sand is rammed to this height and struck off level, making a bed for the cores to rest upon.

Before beginning to ram the sand, flat boards are placed along the flat side from the hub to the cores A-A, Fig. 1. These boards are well braced from the back and form a backing against which to ram the sand for the inside of the mould. For the curved face a section of a circle is built up of slats nailed to forms which have been sawed to the proper curve. This improvised segment is also staked from the outside as shown at B-B, Fig. 1, and is intentionally placed so as to leave the sand slightly larger than is required, so as to have plenty of material to sweep off. When sand to the height required for the first row of arm cores has been rammed up and struck off, as already described, the sweep arm A is loosened and shoved up to the proper height for the upper arms. The ramming is then proceeded with as usual and when the bed is swept for the upper arm cores, the sweep arm A is removed entirely, and the ramming is continued until the sweep arm B is reached. When struck off to this level it is completed as far as ramming goes. This level must be the same as that of the wall which forms the outside of the mould, so that the cover cores will touch both sides.

Remarks

If a properly constructed segment of the wheel had been available the sweep and spindle would not have been required on the inside, as the segment could have been placed against the cores and the sand rammed to it. But a properly constructed segment represents a lot of expense, and expense is what is being avoided.

In ramming to a rough segment such as is here described the segment is moved from place to place as the ramming proceeds: the sweep, of course, being kept to one side of where the segment is, and when a spot is rammed and the segment removed, the sweep can be pulled around onto the rammed part.

When the ramming is completed and the segment pattern and the flat boards are removed and the hub pattern drawn, a final sweeping and retouching is given to the face of the mould, when the spindle and sweep will be removed.

The face of the mould which, incidentally, was made up of facing sand containing a bond of flour or molasses, or anything which will prevent it from crumbling, is now skin-dried, after which all loose sand is blown from the arms and brushed from the bottom joint or parting. The brick-work forming the outside of the mould is now returned to its place. If proper care has been taken in all the details as the work proceeded, the ends of the outside wall will be in exact alignment with the cores forming the lugs on the inside and also with the face of the half hub. Flat cores C-C, Fig. 1, for covering the end space, and also carrying the bolt hole cores are now placed in position and propped from the wall of the pit. Another core D, which forms the flat face of the hub and also carries the half round core for the centre and the bolt hole cores, is also put into position and propped. Flat covering cores B, Fig. 2, are now put over the rim resting on the inside and outside wall of the mould, a few pieces of pig iron being sufficient to hold these down.

Another cover core C, Fig. 2, is put over the hub. This core has openings for the gate and risor.

The entire pit is now rammed full of sand to hold the mould together and to prevent any metal from leaking out of the joints. The pouring basin and feeding head, D, Fig. 2, are now built up on the hub and the mould is finished.

Perhaps a little more careful explanation of the flanges which project inward on the edges of the rim is in order. The bottom flange is covered by cores of the proper curve. These cores are about 6 inches wide and 2 inches thick, with the flange, which is 1 inch thick and 2 inches wide, cut from the bottom face. This leaves 4 inches of bearing on the ground and 2 inches overhanging. The sand is rammed right over these cores. The top flange is simply swept out of the green sand and covered with the flat cores which cover the rim. Some little discussion might arise regarding the propriety of pouring such a heavy casting without binding it tighter, but it must be remembered that there is practically no upward pressure on a casting of this kind, the tendency to spread being the chief difficulty to be guarded against.

Another disputed point is in regard to the feeding of a casting of this design. Some moulders would have one or more risers on the rim in addition to the one on the hub, but Mr. Donaldson, the manager of this plant is a staunch believer that one is sufficient, particularly when he never uses any more than one and has the best of results. Mr. Donaldson is reckoned to be one of the most successful foundrymen in Montreal and establishes no systems which he has not carefully studied and proved.

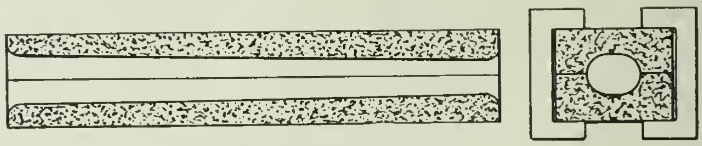
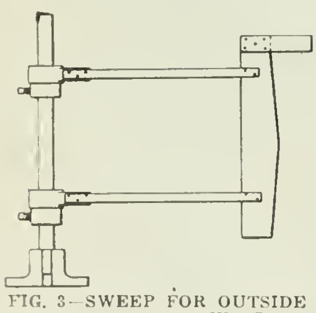


FIG. 5—END AND SIDE VIEW OF ARM CORES. NOTE THE CLAMP HOLDING CORE TOGETHER.



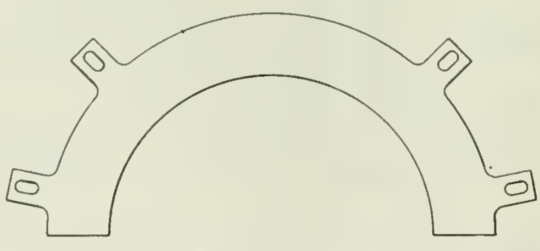


FIG. 3—SWEEP FOR OUTSIDE BRICK AND LOAM WORK. FIG. 4—LIFTING PLATE ON WHICH BRICK AND LOAM WORK IS BUILT.

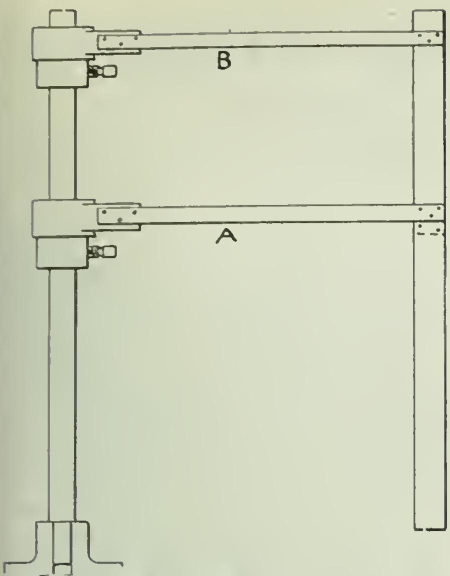


FIG. 6—SWEEP FOR INSIDE OF MOLD. ARMS A AND B ARE USED TO LEVEL UP BEDS FOR CORES AS WELL AS HOLDING SWEEP BOARD.

THE APPRENTICE BOY'S COLUMN

The apprentice is surely going to remain with us, and moulding will continue to be a mechanical profession as long as the world remains, and with this in view we should always endeavor to interest the apprentice in subjects which he might overlook.

Ramming

The subject of ramming the mould is one of vital importance. Too often bad castings are attributed to hard ramming, when, in reality, it was soft ramming which made the trouble. This will undoubtedly arouse the ire of a good many old-established moulders, who think it is impossible to ram a mould too light. Certainly it is an easy matter to ram a mould too hard and make trouble, but right here is where study and common sense are called into action, or at least should be called into action. If it was hard ramming which made the trouble, why was it? What did the hard ramming have to do with the conduct of the iron which entered the mould? Supposing the mould had been made of granite or diamond, what difference would that make to the melted iron? These are questions which the apprentice, and also the journeyman, should ask themselves and try and figure out the answer. The whole thing rests on giving it vent. When the metal is poured into the mould, if there is anything which will burn, it burns, or tries to burn, and in doing so creates a gas which must escape, just the same as occurs when pouring metal against a core. If the gas can not get through between the pores in the sand, it will cause a certain amount of explosion which lifts certain parts of the sand. That is what is known as scabbing. If the sand is not very rich in clay, it will stand hard ramming if the vent wire is used properly. If the sand is quite rich in clay, more caution must be exercised. A question which is sometimes thoughtlessly asked is, Why some commotion does not take place when metal is poured into a permanent mould, such as an iron mould. This is because the iron does not throw out gas to any extent when melted metal is poured against it. If a sand mould is rammed so tight that all the pores are closed, the gas is formed just the same, but it cannot escape, and if vented with a wire it just escapes where there is a vent hole, and these would require to be very close together in order to take care of it all. Soft ramming assists in disposing of the gas, but it lacks strength to hold the mould together against the metal. The butt of the rammer is capable of doing harm where not expected, even though the ramming is light. For instance, if in a deep drag it is considered advisable to butt each layer of sand before putting in the next, it should be remembered that gas will not pass through the smooth spots left by the rammer. All such spots should be opened up before putting in any more sand, if only to the extent of scratching it with the fingers.

In ramming around the outside of the pattern it does no harm to ram as hard as possible, and it has the effect of making the sand at the joint of the mould hard enough to resist the pressure of the metal and thereby avoid running out. Judgment should always be used in ramming a mould, as no mould is to be rammed the same all over. If a little study is applied it is easy to figure out where the hard ramming and the light ramming are most to be desired. Hard ramming is to be avoided where it does harm, but it gets blamed for a lot of mischief that it does not do. For instance, kettles made with the bottom up and pop-gated will scab and the moulder will think hard ramming did it, whereas if gated on the side the scabbing is eliminated and the ramming can be done just as hard. It is the same old story, "Education" is required in ramming a mould just as much as in any other job.

REALIZES THE BENEFITS TO BE DERIVED FROM READING TECHNICAL LITERATURE

The Port Hope Sanitary Manufacturing Co., Ltd., who are constant readers of CANADIAN FOUNDRYMAN, and who realize its educational value, have just subscribed for five additional copies each month, to be given gratuitously to their apprentices. This we consider a wise move. It shows the cordiality which exists. It also shows that the company is anxious to employ properly educated workmen, and that any workman who graduates from their works will be of that variety, and it shows that in their good judgment CANADIAN FOUNDRYMAN is the source from which this sort of education is to be secured.

TO A FIVE-DOLLAR BILL

(Chicago Tribune)

Crinkle, crinkle, little bill,
Goodness gracious, you look ill!
Are you losing all your power?
You seem weaker every hour.
"Now that prices are so high,
I'm so tired that I could die,
I just circulate all day,
No one dare put me away.
When the evening board is set
With the fruits of father's sweat,
My small voice is hushed and still,
I am in the butcher's till.
And no matter where I go,
People disregard me so;
I don't seem to count for much."
Bill, take heart, your luck may change,
I'll admit the time is strange;
Though you're weak I love you still—
Crinkle, crinkle, little bill.

FOR SLEEPERS IN CHURCH

"Hear this, ye sleepers, and be wise,
And shut no more your slumbering
eyes,
For 'tis an awful truth to tell
That you can never sleep in Hell."
—From a little girl's poem.

"A little kissing now and then
Is why we have the married men.
A little kissing, too, of course,
Is why we have the quick divorce."

A Foundry Foreman's Opinion

Mr. George O. Vair, who for the past eight years has been foundry foreman at the works of the R. McDougall Co., Limited, Galt, Ont., in a letter to the editor has the following to say regarding CANADIAN FOUNDRYMAN: "The writer has been for the past thirty-five (35) years a reader of foundry literature, and has no hesitancy in saying that the same is a great help toward a good general knowledge, both to the management and the moulder.

"In connection with this will add that no matter how good a mechanic a man is, he will still be able to get a lot of 'pointers' from mechanical journals, and to keep posted on all up-to-date foundry equipment, all of which is to be found in the CANADIAN FOUNDRYMAN of to-day.

"Having been a reader of the CANADIAN FOUNDRYMAN ever since the paper was first issued, I think it will be nothing but well-deserved credit to congratulate you on the vast improvement which has taken place in the past two years, both in quantity and quality of material contained in it."

Molding a Marine Engine Junk Ring or Follower

Demonstrating the Practical Training of the Foundry Apprentice and His Relation to the Ultimate Cost of Production

By JOHN H. EASTHAM

IF the stock phrase to the effect that every boy born in the United States is a potential president carries any weight, each foundry apprentice is a forthcoming possible executive, given the opportunity to exercise and develop his gray matter, and in this connection there is a story.

A certain New England parson, when officiating at christenings, was of the grandiloquent type, showing a tendency to enlarge on the subject, and on receiving the child of a rural young couple prior to its baptism, held forth as follows:

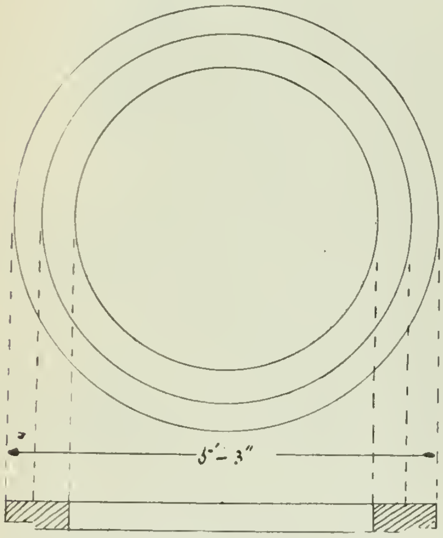


FIG. 1—JUNK RING OR FOLLOWER FOR PISTON, 63" DIAM.

"Ah, my friends, who knows what destiny has in store for the dear child now in my arms? To what sublime heights may this dear infant, perhaps, attain? Possibly we have here a prominent lawyer, a high-class engineer, a railroad magnate; nay, more, my friends, a state governor, or even a president of this mighty republic! What is this child's name?" and the fond mother replied: "Mary Ann." Oh, yes, I know it's old stuff to some of you, but it will bear re-telling. Fig. 1 represents a junk ring or follower plate, sixty-three inches in diameter, appertaining to a low pressure marine cylinder of similar calibre, a simple casting to mould, being what you would term a flat back, or a big washer, weighing seven hundred and fifty pounds.

You forward the blueprint to the pattern shop, as usual, and that department, in most cases, turns out a beautiful full pattern, painted bright red all over to show that the total area of the casting is to be machined, and that a perfectly clean, solid casting is necessary, after which one of the stars in the foundry makes it in a six-foot square box, either rolling it over or bedding it in the drag flask as circumstances permit, skim gates or pop gates being used to ensure good results, with a finished mould appearing about as shown at Fig. 2. Now, for later reference, take notice of the following details, taken from actual experience:

The foundry got an output of seven hundred and fifty pounds in eight hours from one moulder, which, with ordinary facilities, is high tonnage on high grade engine work; so, rating the moulder at 76 cents per hour (actual figures don't matter), the same applies to you in any section of the country, your moulding cost from a complete patterns is $6.08.

An average patternmaker completed his share of the work in eighteen hours, at the same rate per hour as the moulder, the cost of the finished pattern, exclusive of material, being $13.68, which, added to the moulding cost, shows an expenditure on skilled labor of $19.76.

Now, examine Figure 3. Presumably you have a two-inch spindle, arm, and foot socket, as shown at "A," for loam and general emergency purposes; if you have not, it is your duty as a foundryman to obtain them without further loss of time.

Using Sweep Board

With the four-foot board bolted to the spindle arm, exactly at right angles and dead level, sweep up a bed hard enough to stand the six-foot cope being rammed on it; scatter parting sand over its total area, then mark out two circles corresponding to the outer and inner diameters of the junk ring, plus contraction and machining allowances. You can easily do this by tying a piece of string round the base of the spindle, its other end attached to a nail and wrapped round and round, thus shortening the string till the outside diameter is indicated, a mark showing the casting limits being thus scratched on the parting sand, the wrapping process being then repeated till the inside diameter may be marked the same way. The cope flask is now placed on the joint. The spindle and board being first removed and the hole in the socket plugged with waste, the gate and riser pins being next placed in position, the two marked circles above mentioned saving any measuring, the cope flask being now rammed up, as shown at cross section "B" and plan view "C" in Figure 3.

The cope is then staked, removed, turned over, brushed clear of parting sand, and trued up with a short straight edge or cork rubber, its area over the mould being blacked and slicked to a fairly fine finish.

We now pass on to Figure 4, showing the spindle placed again in position, with the drag mould board screwed to the joint sweep, the rough outline of the mould being first cut away a little above casting size, facing sand tucked into approximate shape in advance of the sweep, the correct outline at the joint being made by a short segment pattern handled loosely, or in turn screwed to the main strickle as is deemed advisable, these details being shown in cross section and plan respectively to the left. The mould being finished and blacked in the usual way, the cope is replaced and weighted prior to casting. The skilled labor cost by this method showed, pattern making, seven hours, i.e., $5.32; moulding, nine hours, $6.84; a total of $12.16, as against $19.76 by the complete pattern system, or a saving of $7.60, with loud hurrahs from the pattern shop on account of the saving of $8.36 in that department, and corresponding gloom in the foundry, because of an increased moulding cost of seventy-six cents.

Moulding Without Flask

Now, suppose you get a job of this kind and you haven't a box big enough to make it in. No cost of equipment in that direction is necessary. The system of covering the swept-up mould by a ring of interlocking slab cores shown at the right of Fig. 4, in cross section and

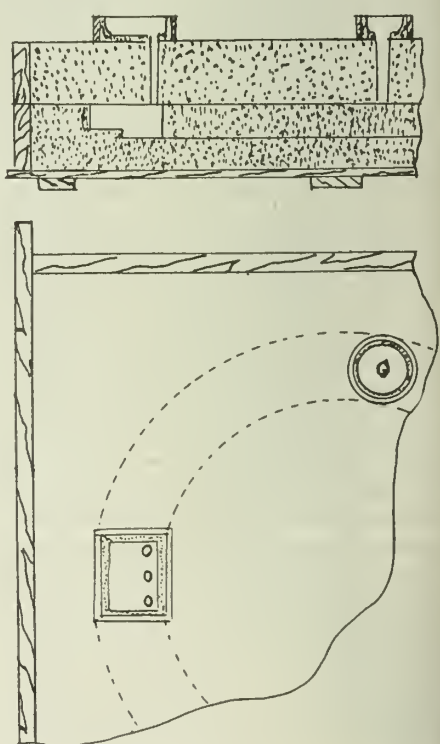


FIG. 2—FINISHED MOLD FROM FULL PATTERN.

plan, will serve equally well, so long as they are carefully weighted and rammed round to stop upward lifts or run-outs, runner and riser holes being pierced through the slabs wherever necessary.

Experience has demonstrated the cost of production by this means to be about the same as in the second example quoted, plus the cost of coremaking, approximately one dollar covering that item, or a total skilled labor cost of $13.16.

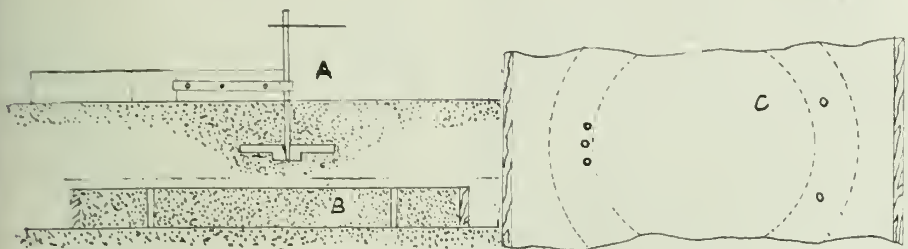


FIG. 3—SWEEPING UP MOLD WITHOUT PATTERN.

Give the Boy a Chance

But you are thinking by this time: "How does all this affect the training of the foundry apprentice?" Let us see. If you are running an average-sized jobbing shop, with from fifteen to thirty journeymen moulders, you should, according to ancient custom, be training three to five apprentices, with twelve or eighteen months disparity in their ages, one at least of them looking forward eagerly to the time when he will rank as journeyman. We will assume that he is nineteen years of age, and in possession of the abnormal appetite and other qualifications usually enjoyed by a husky youth who has worked three or four years at the trade, you know the type, he has just discovered that she is fair to look upon and therefore has become of late very particular about washing his neck.

Does he look upon his foreman as his benefactor? After he has left you and gone out into the world, will he think with gratitude of his preceptor, and defend your name against all calumny? That all depends. Perhaps he went with you to the pattern shop when you handed out the aforementioned simple strickle job to a highly-paid craftsman, and looked on it with longing eyes, while you were saying to him in his turn, "Here, Billy, make two hundred off these four grate bar patterns; that will keep you busy for a day or two," or, "Take hold of these couplings, Billy, and in your spare time make some of these three-inch pipes." And so on. He got lots of shovelling, ramming, and lifting, backed up by a plethora of carrying heavy shank ladles, and shaking out boxes, with much floor mixing to look forward to every morning before commencing his real day's work.

And if, in the course of his labors, he gets a bad lift, or suffers a reverse in the shape of a drop out, he encounters that species of heavy wit so common in foundry circles which counsels him to "clay-wash his rammer," or "use the crane handle for a gagger," instead of practical aid, can we wonder that he leaves the business, and is next discovered driving a grocer's rig? But, suppose you said to him, "Here is a nice spindle job for you to try your hand on," and give him a look over about every half hour or hour, let him think you have entrusted him with something worth making, something unusual, something which adds to his dignity. Have you ever noticed the gleam that comes into an apprentice's eyes when he is given a better job than he expected to get? or when he casts his first job with the crane ladle? And again, from your company's point of view, let us suppose that to match present inflated conditions he is getting fifty cents per hour at nineteen years of age, or about two-thirds the journeyman rate, and takes twelve hours to make the junk ring above described, as against the journeyman's nine hours, both the hourly rate and the time for making the job being generous allowances, your moulding cost would be six dollars, as against six dollars and eighty-four cents at the journeyman rate, giving, with the patternmaker's costs added, a labor cost of eleven dollars and thirty-two cents altogether, or a saving of eighty-four cents on your next lowest schedule.

In such a case profit would result to the firm, while the boy would certainly derive pleasure from the undertaking. Instances could be multiplied beyond count, the parable of the junk ring, albeit true, is only a case in point, looking round your own shop you have plenty of examples to work on.

And in conclusion, a word to the general manager may perhaps not be out of place, or presumptuous. You usually expect each department to make a good monthly showing, your natural object being a good showing in your own department as the result of their endeavors, but by creating a selfish attitude amongst your various shops towards each other, do you always get the best results? I think not. Co-operation for the common good will help you along much better than antagonism among foremen; so, before you allow your blue prints to be estimated on, get them together, ask their opinions, encourage them to work together towards a low ultimate cost of production, and as has been pointed out before in these columns do not allow any department to be subjected to the whim or control of a man who knows nothing of its workings, save such superficial theories as may be picked up at any night school. You can easily train your own staff of supervisors by taking an active interest in your apprentices; see that they are given the fundamental principles of the business, encourage them to read their trade literature, buy it for them, see that they read it by asking their opinions on the various articles appearing therein, have them taught everything in your foundry from making stock cores and mixing facing sand to producing light or heavy castings, and make every one of them take his turn at cupola for a short time, his freedom from such bondage to take effect when he has the ability to furnish you each morning with a comprehensive report of the previous day's melt, and with an approximate analysis of the next heat, drawn up from his own calculations after a survey of the foundry floor.

If you will do the things just outlined, gentlemen, the foundry world will not be so full of men who do not know how to obtain the area of a circle, the weight of a casting from a blue print or pattern and who cannot work out many others of the almost childishly simple problems connected with the business, but, on the contrary, the benefit of an improved foundry morale will be felt by you after many days.

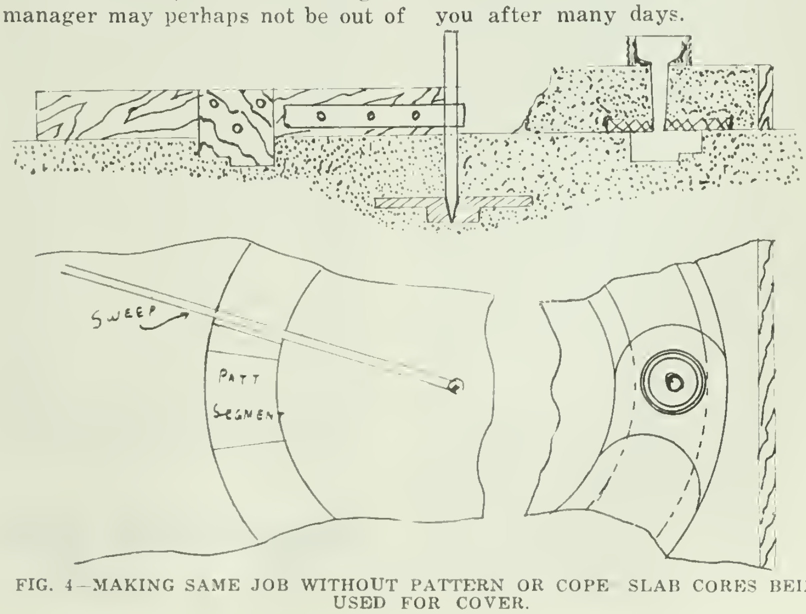


FIG. 4—MAKING SAME JOB WITHOUT PATTERN OR COPE SLAB CORES BEING USED FOR COVER.

Different Ways of Moulding Stove Lids

A Stove Lid is a Simple Casting, But in Making Them in Quantities It is Well to Consider Which Way is the Best

WHILE every branch of moulding has its peculiarities, it would not be expected that the stove plate shop would offer any very great variety of ideas which would differ particularly from the ordinary, yet a stove plate moulder has as many different points to consider as any member of the craft. We will not, however, attempt in this article to describe the art of stove plate moulding, other than to show how

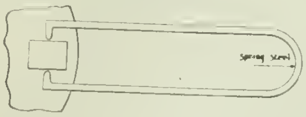


FIG. 1—HAND TOOL FOR MAKING CATCHES.

the lid is moulded in different establishments.

The lid, as everyone knows, requires to be cast face down in order to have it clean and sound, so we will take it for granted that all stove lids are cast with the face down. In gating a lid the old-time method was to put a flat gate on top of the pattern about the centre. This was a safe way, as far as securing a good run, but it had its disadvantages, in that grains of sand were liable to fall down through the gate and lodge on the face of the mould and show on the casting, making it inferior to one cast with the face up. Another drawback is that iron falling on the face left a mark which was hard to get away with, even if ground. Gating on the edge has, therefore, been found most satisfactory.

To mould a single lid in a flask, it can be put on a flat board and the cope rammed up first, which necessitates rolling it twice, so that a more advisable way is to have a follow board and ram the nowel first and roll it once only. A nail may be tucked into the little pocket where the lifter goes, but this is not necessary, because good stove shop moulding sand will generally be found sufficiently strong to hold itself. The one thing which requires the most attention is the catches for the lifter. These can be made by having the pocket pierced with two slots of the proper size and shape and then have a tool similar to Fig. 1. This tool is pinched into the slots, making the lugs on the inside, and the spring, which forms the back of the tool, automatically opens it again. The pattern is then drawn and the mould is practically finished. Stove lids may be made in snap flasks on a squeezer by having the pattern on a match plate and both halves squeezed at the same time. This has its drawbacks, which must be overcome. The two most prominent difficulties are that it has to be held down with a flat weight, and unless this weight is perfectly true on the face and the mould perfectly true on top it is apt to crush or drop. There is also trouble getting it squeezed hard enough on the joint without getting it squeezed too hard elsewhere. A mould for a stove lid has no bearing to hold up the cope excepting the little bit around the outside, and, unless this is very hard it will yield under the pressure of the snap weight and make the castings thin, or sometimes thin only on one side. This can be overcome by hand-peaning the outside or by having the squeezer so arranged as to do it. If the bottom boards, which are of a size to fit up inside the snap, as they must be for this kind of work, are made with a frame on them similar to Fig. 2, the sand will be pinched tighter where the frame comes. If the plunger on the squeezer has a similar arrangement attached to it, the cope will also be squeezed harder on the outside, making the joint hard on both parts, so that it will not crush down under the load of the weight. The one drawback which is hard to overcome is the fact that flat open work with no openings in it is safe in a mould which is held down with a weight, on account of the risk of dropping out. This same system of moulding can be adopted by using small flasks instead of snaps, and they can be fastened by clamping or hooking.

Another method, and one which has many points in its favor, has been adopted by the Clare Bros. Company, of Preston, Ont.

Their method is to have two one-faced match plates, one for the top and other for the bottom of the lid. Two lids

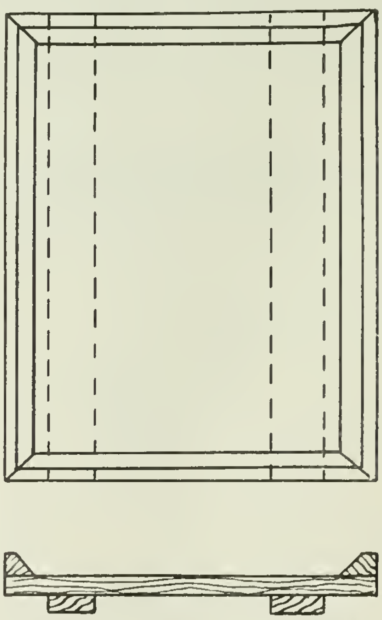


FIG. 2—BOARDS FOR SQUEEZING MACHINE.

are moulded together and iron flasks are used. The nowel is rammed up on the match plate shown in Fig. 3 and rolled over, as shown. The mechanism shown on the illustration consists of a short lever, shown to the left. A coil

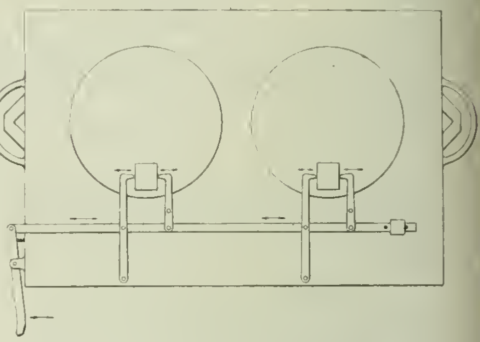


FIG. 3—MATCH PLATE FOR STOVE LIDS. CATCHES MADE BY STRIKING THE LEVER.

spring between it and the plate keeps it in place. By pushing this lever the rod shown on top is moved forward and the 4 little instruments for making the lugs will all move at the same time. As will be seen, two of them pivot on one side of the rod and two on the other. This makes them move in opposite direc-

FIG. 4—SHOWING METHOD OF CLAMPING.

tions. By releasing the lever the spring brings it back into its place and automatically withdraws the instruments which formed the lugs. The plate is now lifted off, and this half of the mould is placed on the floor. The other part of the mould is now made on the other plate and placed on top of this. An attachment which is fastened to the nowel at each end is swung up over the cope lug of the guide pin which secures it instead of clamping.

This method of moulding has no disadvantages. It takes two moves to place both halves in position on the floor, but it would take two moves to place two single moulds on the floor, and if two lids are moulded from an ordinary match plate, either in an iron flask or in a snap mould and closed up, on the bench, it is more than one man could be expected to lift alone, and his partner has to be called to his assistance on every occasion where a mould is to be put on the floor, which is, obviously, more expensive than for one man to make the two jobs of lifting it down. In shaking out there are no clamps to be removed, and all that is required is to raise one end of the drag and perhaps bump it against the next one when it can be lifted away with ease.

A stove lid may look like a simple casting to make, but still it is a casting which must be right. All stove work must be neat fitting and neat in appearance, and if the lid does not fit properly it is no use. It must be the proper thickness all over and it must be smooth and clean. The Clare Bros. Company make no pretentions at being the originators of this system, but they have adopted it because they consider it the best method of making high-class castings at the minimum expense.

RECEIPTS FOR CORE SAND MIXTURES

It is amusing to read the usual run of receipts or formulae appearing in foundry books for making core sand mixtures. They usually start off with so many buckets of white sand, so many of red sand, and so many of new moulding sand. This has to be mixed thoroughly and then a given amount of some specified binder is used. Now what does it all mean? This system of teaching core making is just like teaching a monkey so that he can imitate it.

In learning core making it is just as important as learning anything else. We should know what we are doing and why we are doing it. In the first place it must be understood that a core has to come in contact with melted iron and must be sufficiently refractory to resist the heat. It must also be remembered that the intense heat creates rapid combustion of whatever is combustible, and wherever there is combustion there is smoke or gas, which must find an outlet. In addition to these features it should be borne in mind that the core must be strong enough to resist the strain and wash of the metal. It must also be of such a nature that when the casting is cold the core will be burned sufficiently to admit of its being removed from the casting. When we get a core which will do all of these and leave a nice smooth hole we have accomplished about all that is required, and the next step is to devise means of accomplishing this with the least trouble and expense. The different sands mentioned in different receipts are simply the sands used in the neighborhood where some core maker happened to be located when he wrote the receipt. A better method would be to learn the scientific part of the trade and make cores according to it. For instance, a heavy casting will be harder on the core than a light casting and the core will require to be stronger to resist it. A heavy casting will generate more heat and the core will require to be more refractory to resist the heat. The core in the heavy casting will have more smoke and gas to dispose of in the shortest possible time and will require to be more open grained. Now how are we to go about it if we do not use some known receipt, or if we happen to be where the material at hand is different from what we are used to? Pure silica sand is about the only fireproof or near fireproof material that we can get, and if we mix this with a proper binder we get a good core which will vent well, stand the heat and fall out easily in the cleaning process. But for cores which have to stand up any distance it is difficult to get this kind of a mixture to stand, so we introduce moulding sand. Now what is moulding sand?

Moulding sand is silica sand in combination with a certain amount of clay, known in technical terms as alumina or kaolin. To this is added a certain amount of iron rust, lime, and other impurities, which help to make smoke and gas without doing much good. Now, if we had added the proper amount of clay without the other ingredients we would have accomplished the same thing as far as good is concerned and would have eliminated the evil effects of the useless material. If silica sand is looked at through a magnifying glass it will appear like so many big, rough stones. Now if we still use the glass and take any sticky material and dip these stones into it and then lump them together and dry them we will find that they have only touched in spots, leaving the remaining surface free with large open spaces between the grains. If heat is applied to this mass and smoke is generated the smoke will have no difficulty in penetrating through the pores or openings between the grains, and if a vent hole is pierced through the mass the smoke will penetrate the mass until it comes in contact with this vent hole which will lead it outside. Now a core of this kind would be ideal, as the sticky binder would burn out and nothing but the sand would remain, and this would fall out with very little effort on the part of the workman. The difficulty with this kind of a core is that it will not hold its shape while in the green state if very complicated. But if for very particular work it is better to use proper fitting driers, and if necessary bed the green core in moulding sand to keep it in shape until dried, rather than mix any moulding sand or clay into it. With good silica sand and proper binders it is quite possible to make very complicated cores and depend entirely on the openness of the core for the escape of the gas and not use any vent hole whatever.

Where castings of no great weight are being made and where the core is of considerable size, very little binder will do and a certain amount of water is used in its stead. In such a case always mix the dry sand thoroughly with the oil before introducing the water.

If it is found advisable to use moulding sand in the mixture in order to hold it up in high places it would be as well to use any brand of fine sand mixed with about five per cent. of clay, but it must be remembered that this fills up the pores, making the venting more difficult and calling for more vent wire work. It must also be remembered that the moulding sand or whatever filler is used prevents the core oil from coming in contact with the grains of silica and actually requires more oil to bind it. Clay would make a cheap binder for cores, but if enough is used to be effective it closes up the vents, causing the core to blow, unless some opening material such as sawdust is used. Another disadvantage is that clay and sand in combination only lack the required amount of heat in order to convert it into brick, and could not be removed from the casting. Clay and sand and sawdust is the mixture usually used for the outside of very heavy work, and is known as loam. Good core binders are on the market, and it is more satisfactory to buy a reliable binder than to undertake to use some cheap home production. Core making has undergone many changes and improvements in the last few years, and those who do not keep pace with the improvements cannot expect to compete with those who do.

CREATING AND PRODUCING

The following poem written by an anonymous writer should serve a valuable purpose in pointing out to the working man that while he is the real producer, and while his services are indispensable, he is only one of the cogs in the wheel or one of the links in the chain, and although his cog or link, if removed, puts a stop to the entire machine, his is not the only part which counts. It takes a lot of different kinds of people to make up the population of the world and to make the wheels of industry go round, and the men who do the thinking must not be classed as idlers or non-producers.

Creating

Back of the beating hammer
  By which the steel is wrought,
Back of the workshop's clamor
  The seeker may find his Thought.
The Thought that is ever master
  Of iron and steam and steel,
That rises above disaster
  And tramples it under heel.

The drudge may fret and tinker
  Or labor with laggard blows,
But back of him stands the Thinker,
  The clear-eyed man who knows;
For into each plow and sabre,
  Each piece and part and whole,
Must go the Brains of labor.
  Which give the work a soul.

Back of the motors humming,
  Back of the belts that sing,
Back of the hammers drumming,
  Back of the cranes that swing.
There is the eye which scans them,
  Watching through stress and strain,
There is the Mind which plans them,
  Back of the Brawn, the Brain.

Might of the roaring boiler.
  Force of the engine thrust,
Strength of the sweating toiler—
  Greatly in these we trust;
But back of them stands the Schemer,
  The Thinker that drives things through—
Back of the job—the Dreamer.
  Who makes the dreams come true

The Pioneer of Modern Foundry Cupolas

The McKenzie Cupola Was the First Step Away From the Old-Time Slow System of Melting and Has Many Excellent Features

By F. H. BELL

THERE are few among the older members of the foundry fraternity who have not heard of the Mackenzie cupola, and probably fewer who have ever had any experience with one, yet it has had an interesting and notable career. The Mackenzie idea was the first breakaway from the old-fashioned straight pipe with a small round tuyere on each side, and requiring all afternoon to pour off a small heat. This furnace derives its name from the inventor who was a practical foundryman and who realized that a great deal of the wages paid to moulders was for waiting on the cupola to melt the iron. He believed that a cupola could be made which would melt the iron in about half the time and with less fuel. He was convinced that sufficient air was not being admitted to the fire to produce proper combustion and with the idea of making larger tuyeres he could see visions of the blast not penetrating to the centre of the cupola.

To overcome this fault in the old cupola, and at the same time admit the blast to the stock evenly and freely, a belt tuyere was put in extending around the cupola, and to place the tuyeres nearer to the centre of the cupola, the lining was contracted or boshed at this point as shown in the illustration.

To avoid reducing the capacity for holding melted iron below the tuyeres, the lining just above the tuyeres was supported by an apron riveted to the cupola casing and the bosh made to overhang the bottom, leaving the cupola below the tuyeres the same diameter as before boshing.

This cupola, when first introduced, wrought great revolution in melting and in foundry practice. Heats that had required half a day to melt were melted in two hours; the quantity of fuel consumed in melting was reduced; the number of moulds put up by each moulder increased, and the cost of producing castings greatly reduced.

Many of these cupolas are still in constant operation, and for heats which can be run off in a couple of hours there is probably no system of melting which can surpass them, either for economy or rapid melting.

For continuous melting they were at a disadvantage, the tendency to bridge at the bosh being so great that it melts slowly as the heat is prolonged, and is frequently difficult to dump.

Experience has proved that the slag and cinder adhere to the lining over the tuyeres, and becomes very hard and difficult to remove, and if care is not taken to remove them after each heat the lining is soon out of shape, and the melting capacity greatly reduced and the tendency to bridge and hang increased.

The lining should be kept as near as possible to the shape shown in the illustration, Fig. 1, and all building out over the tuyeres and burning away in the melting zone should be attended to after each heat.

The pit shown under the cupola represents the old-time system of placing the cupola on a brick foundation instead of on legs, and having it down low enough to set the ladles on the floor, all of which necessitated having a pit underneath for convenience in dropping the bottom and removing the dump. In Fig. 2 will be seen a better view of the tuyere. This is the same tuyere attached to a more modern cupola. As can be seen, it is a continuous slot or sheet blast tuyere and is entirely inside of the shell. The tuyere box shown at the side does not extend around the shell, but is simply a connection for the wind pipe. The outside shell holds up the weight of the cupola and the tuyere belt simply hangs from the top and has no obstruction under it.

This cupola will give satisfaction if attended to by a skilled melter, but it will not permit of any careless attention.

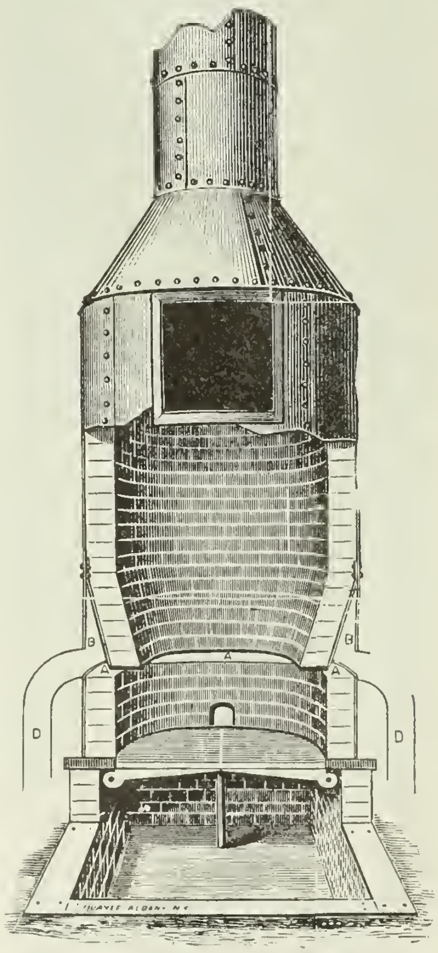


FIG. 1—THE MACKENZIE CUPOLA.

Originally, these cupolas were built oblong and had a tuyere box or connection for the wind pipe at each end and the tuyere belt being boshed in brought the front and back so close together that the blast from each would meet the other and they certainly got the full value of the fuel.

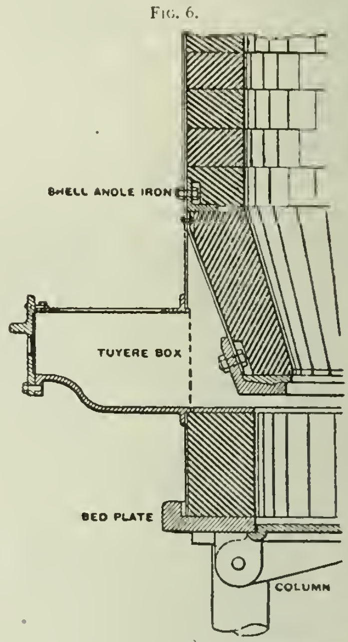


FIG. 2—MACKENZIE TUYERE.

As modern cupola practice has demonstrated, nothing is gained by holding melted iron in the cupola, the lining under the tuyere might as well have been built into the diameter of the tuyere belt, but this would not have effected the efficiency of the furnace for either better or worse.

HAS TROUBLE WITH HIS IRON

Editor CANADIAN FOUNDRYMAN.—From your foundry experience can you tell me what to do to overcome troubles in our iron from blow holes? In using No. 2 pig iron alone and melting with Connellsville coke, we had no trouble. With Latrobe coke we had a couple of heats that our fire was very slow and part of the melt ran hard iron. By melting faster we overcame the hard iron. But, in pouring some heavy castings weighing about four hundred pounds apiece, and having V-shaped races and a flat surface to plane off, they developed a regular honeycomb of blow holes. It is not dirt. It is a clean blow hole, and in a number of them is a small round shot of iron. These all seem to be on the upper side. Is our trouble from too much sulphur, which must be in the core, because we are using the same iron? We are getting in some No. 3

pig which is not so high in silicon and is a little higher in sulphur. Last summer we used scrap alone, and made nice soft castings by putting powdered silicon into the ladle. If we do this now with the No. 3 pig and the high sulphur coke, will that ferro-silicon clean the iron from whatever causes the blow holes, or will it only keep it soft? Is there anything else we could use to put in the ladle as well as ferro-silicon that would eliminate the blow holes trouble?

Answer.—During the war this trouble was experienced in almost every foundry, and we went into it very thoroughly in the issue of Feb., 1919, and the results of our research work and the benefits derived by our readers were very favorably commented upon. Following is a portion of one article which we published: "For the benefit of those who wish to use a large percentage of scrap and also for those who may have some of the 'war-time' pig iron on hand, we would suggest the use of 40 lbs. of 15 per cent. ferro-silicon and 10 lbs. of ferro-manganese for each ton of metal charged. This material can be bought in small chunks and should be mixed with the metal in the cupola. While both silicon and manganese are hard, the effect which they have in freeing the combined carbon and in neutralizing the effect of the sulphur makes them valuable in reducing shrinkage and in softening castings. Ferro-silicon is a by-product and is produced in different Canadian plants, while ferro-manganese is mostly imported from Great Britain. We are advised that A. C. Leslie & Co., Limited, Montreal, handle both of these materials.

FLUX, WHAT IT IS, AND WHY IT IS

The expression "flux" is quite a common one about a foundry. Yet few foundrymen seem to know what it means or what it is intended for. For instance, limestone is used in the cupola in connection with the fuel and metal as a flux. Fluor-spar is also used for the same purpose.

"Fluor" and "flux" mean the same thing and are both derived from the same Latin expression and mean to flow. Of course, if it makes the slag flow from the back of the cupola it might be made to fit in all right, but long before slag spouts were thought of "flux" meant "to flow." The ancient metallurgists may or may not have been right in their beliefs, but they were governed by the proofs which were before their eyes. They believed that limestone and fluorspar, which are simply lime done up in different kinds of parcels, had actual heat in it, which assisted in melting the metal. Sure it is that lime can become very hot by simply introducing cold water to it, which would indicate that the heat is in it, but, be that as it is, right or wrong, they knew that by melting the ore in a sufficiently heated crucible it would melt into a sticky mass which was neither metal nor dross, but by the introduction of lime it changed its state entirely and would flow; the dross or slag coming to the top and the metal to the bottom, but both in a condition to flow.

Webster describes flux as "To melt, To fuse, To make fluid." In melting iron in the cupola it is not necessary to use a flux in order to make the metal flow, as it has already had sufficient of the impurities removed to allow it to flow freely, but by using a flux it has the same effect in so far as it is able to be effective, by making it flow more freely, and any impurities which have not been entirely eliminated in former fluxing will be still further reduced. This effect takes place, even though there is no slag spout on the cupola, only that it cannot continue for any length of time on account of the cupola bunging up. Modern foundrymen seem, to a great extent, to overlook the value of flux as a cleanser and only look upon it as a means of removing the slag from the cupola after it has removed itself from the metal.

Quite frequently we see articles in technical books to the effect that some expert only uses a flux after the first five or six charges of iron and coke, knowing, of course, that the cylinder work or any castings to be made of a special brand of metal is usually done at the beginning of the heat in order to be sure of getting the proper metal. Now, if there is any part of the heat which requires to be fluxed it is the first part.

My own experience has always been such as to encourage putting the flux on top of the first charge of iron, not on top of the coke. I never put it on the coke of any charge. If the slag spout is not to be used I use flux the first and last charge. The first prepares the metal for special work and the last helps the drop to come out clean.

Another point worth considering is that if a real good casting is to be made of special iron, it is no trick to weigh out the exact amount required, and then weigh an exact amount to put in ahead of it. In this way some indifferent work can be poured with the first ladle, while the cupola is getting heated, and while the flux is getting melted and running down through the iron.

CENTRIFUGAL CASTING MACHINES

The process of pouring metal into a revolving drum and depending on centrifugal force to drive it to the circumference has been successfully carried on for some time in the manufacture of cast iron pipe, but it is not destined to remain as a pipe machine only. The new process has been introduced recently whereby certain engine details of iron and of nonferrous metals can be cast by a centrifugal method, the molten metal being introduced into a die which is rotated at a high speed. It is not necessary for the outer part of the casting to be strictly cylindrical, and this enables the method to be utilized for a great number of pieces for which other processes are not so suitable. As examples of goods which can be cast in this way may be mentioned turbine glands, piston ring pots, motor car sleeve valves for Knight engines, and various Diesel engine parts, such as engine liners.

There are metallurgical as well as mechanical advantages in the adoption of this method which will be appreciated by engineers. Amongst the mechanical advantages may be mentioned the absence of cores, gates, runners, risers, and feeder heads, the ease and rapidity of production, the absence of fettling, and the reduction of machining allowances to very small limits. With regard to the metallurgical advantages, it may be mentioned that the rapid rotation ensures quick cooling by which the grain on the outer side is very close, while impurities tend to segregate on the inner surface. This is particularly the case with slag, manganese, and sulphur. For piston rings especially the very fine crystalline structure, and the fact that the free carbon exists in a very finely divided condition, tends towards the production of extremely good rings. One of the most appreciated qualities is the soundness of the castings due to the absence of blow-holes.

HENRY CLAY FRICK

Henry Clay Frick, who died in New York a few months ago, was one of a class who enjoy the esteem of the wealthy and the odium of the poor. He was a success financially, but as such he won the uneviable reputation of having piled up the fruits of other people's labors for his own personal enjoyment, but did he take any more enjoyment out of life than the workmen who were employed at his plant took out of theirs? He had the satisfaction, if so we may call it, of being maligned and abused by his workmen probably more than any other man in the United States, even to the extent of being shot at, yet he lived to die a natural death at a ripe old age.

He belonged to a race of creators of industry and graspers of industrial opportunity, playing the game fairly as they understood it, and as it was played in their time. He was one of the founders of the mighty fortunes of which, in one form or another, the public is the residuary legatee. Never a friend of ostentation, if Mr. Frick built a palace on Fifth Avenue, it was as a museum for the inestimable treasures of art which it was his happiness to accumulate for the public benefit. As to Pittsburgh, he leaves a great park, so to New York and to the rest of the country he leaves a splendid gallery of art. Sic vos non vobis. The very rich are so mainly for others, not for themselves. They have but a life tenancy.

A lazy man is a dead one who can't be buried.

Research Work on Malleable Iron—*Continued*

·Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

IN the last chapter reference was made to ferrite being considered as pure iron, or more properly speaking, iron containing no carbon. Fig. 9 shows a micrograph of 100 per cent. pure ferrite.

47. Effect of Varying Proportions of Carbon. We have already seen that when carbon is added to pure iron it unites with it to form carbide of iron in definite proportion, to which compound has been given the name cementite. It happens, however, that cementite on forming invariably insists upon mechanically mixing with ferrite, in the proportion of about 12 per cent. of the former to 88 per cent. of the latter, and will never exist free unless there is a deficiency of ferrite to satisfy it in accordance with the above ratio. As the carbon content in iron is gradually increased from zero up to about 0.90 per cent., structures are obtained in which obviously the percentage of ferrite decreases from 100 per cent. to zero. while the pearlite increases from zero to 100 per cent. Any carbon steel therefore that contains less than about 0.90 per cent. of carbon consists of free or excess ferrite and that amount of pearlite that the carbon content was able to make. Fig. 10 shows a steel which contains about 0.20 per cent. of carbon, the white constituent being the ferrite and the dark the pearlite. Under a carbon content of 0.90 per cent., however, while not all of the ferrite will be used up by the cementite to form pearlite, all of the latter will be, so that none of it can, under these conditions, remain free, for it will all be used up in forming the mechanical mixture with ferrite, which in a slowly cooled steel, will consist of alternate layers of these two constituents in the definite proportion of 12 per cent. cementite and 88 per cent. of ferrite. When a steel contains about 0.90 per cent. carbon we find through calculation that it will form 12 per cent. of cementite, and as the remainder of the material must be ferrite and figures to 88 per cent., such a steel must contain 100 per cent. of this mechanical mixture, to which the name pearlite has been given, the appearance of which in malleable iron can be seen in Fig. 11. All carbon steels, therefore, in which the carbon is less than 0.90 per cent., consist of pearlite and some excess ferrite existing as such. If the steel contains more than 0.90 per cent. of carbon, then its structural composition consists of pearlite and the amount of cementite that was formed in excess of what was required to make pearlite, the pearlite growing less and the excess cementite greater with each increase in carbon content. Fig. 12 represents the structure of a steel containing about 1.10 per cent. of carbon, the white rivers being the free cementite and the dark groundmass the pearlite. The structural composition of both air-furnace white iron and white pig iron therefore consists of pearlite and excess cementite, the former shown in Fig. 4 and the latter in Fig. 3, the white constituent being the excess cementite and the dark the pearlite. While these constituents are stable under the critical range, on passing through and over it they undergo a change, and a new one is formed called austenite.

48. Austenite. This constituent differs greatly from the others that we have considered, particularly in the fact that it is of indefinite composition; that is, no matter how poor in carbon the product may be, or how rich, we will obtain austenite on passing over the critical range, for in the former case we obtain an austenite lean in carbon and in the latter one rich in carbon. In order that carbon may be precipitated during the anneal, the iron must be in the austenitic condition, and if it were not for the fact that austenite is of indefinite composition the precipitation of the carbon would not be possible. The mechanism of the operation can be made clear by stating that during the anneal, as soon as the hard iron attains its austenitic condition, graphitization starts with considerable slowness, the austenite crystals rejecting some of their carbon in a minute nucleus and in so doing becoming leaner in carbon. This operation continues "at temperature" until the austenite is practically carbonless and the carbon nuclei have balled up and grown through a segregation of the carbon into nodules. Coincident with this operation some of the carbon diffuses out of the iron due to the oxidizing action of the pot atmosphere, which fact in turn would not be possible were it not that the austenite was of indefinite composition. It is a well-known fact that it is not possible to heat any iron product, for such operations as rolling, forging, annealing or hardening, in an oxidizing atmosphere without surface decarbonization. In these operations, however, the material is, as a rule, exposed to a temperature exceeding that of the critical range for a comparatively short interval of time,

FIG. 9—MICROGRAPH OF 100 PER CENT. FERRITE SAMPLE.

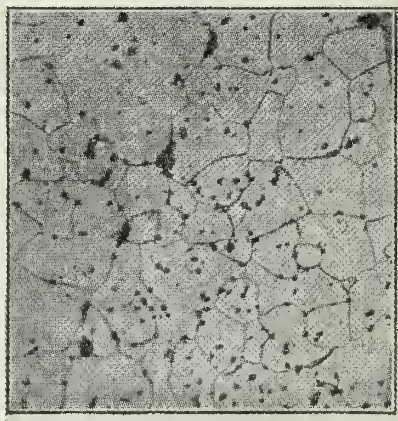
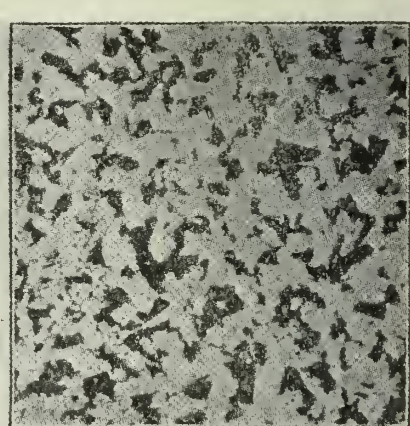


FIG. 10—MICROGRAPH OF STEEL CONTAINING ABOUT 0.20 PER CENT. CARBON.



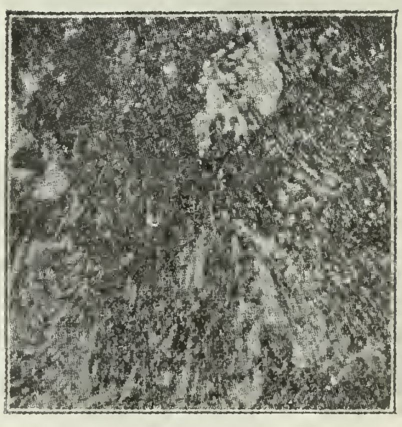


FIG. 11—MICROGRAPH OF PEARLITE IN MALLEABLE IRON.

FIG. 12—MICROGRAPH OF STEEL CONTAINING 1.10 PER CENT. CARBON.

while in the case of the annealing of malleable iron we have seen that the shortest time to which the product is subjected "to temperature" is 48 hr. so that diffusion has ample opportunity to exert a very pronounced influence on the carbon content.

49. That diffusion takes place right to the centre of such sections, as are generally found in quite the heaviest malleable castings, the writer has demonstrated in many instances, and when the mechanism of the operation is considered, it can be seen that this could hardly be otherwise, as the principle involves the simple fact that if we have a layer of iron with a lower carbon content than its contiguous layer, carbon from the latter will diffuse into the former until equilibrium is established between the two. As the surface of the casting during the anneal is being continually impoverished in carbon, there must be a travel of the carbon from the centre toward the surface, for it is correct to assume that once the process is started that part of the section from the surface to the centre consists of an infinite number of layers, each slightly lower in carbon than its contiguous one. The underlying principles in the manufacture of cement steel, and in case-hardening are just the opposite of those involved in the anneal, and there is abundant proof that the carbon can diffuse into the iron right to the centre of the section. As the rate at which the pot atmosphere acts to remove the carbon from the immediate surface and the rate of diffusion of carbon from one layer to another is not the same, we can expect to see an almost carbon-free surface rim or frame in the section. It can be stated that were it not for the fact that the precipitation of the carbon was taking place coincident with its elimination, all of the carbon could be removed from the iron.

Materials for Packing Annealing Pots

50. In connection with the material used as a packing, considerable could be written if time permitted. The object to attain is to secure one that will evolve oxygen just as fast as the carbon can be eliminated, and no faster. If one is used that is too strong in this particular, then the surface of the casting will be attacked and we will have scaled castings, which are very troublesome and costly to clean. In addition to this we will run into another trouble that will be referred to later. If, on the other hand, it is too inert, we will fail to eliminate sufficient carbon and will not obtain the highest degree of ductility. The usual packing consists of a predominating proportion of inert material, such as ground air- or blast-furnace slag, pulverized firebrick, etc., to which has been added iron oxide in some form, such as rolling-mill scale, hammer scale, etc. With a correctly sized inert packing it is possible to secure excellent results, provided the voids are of such capacity as will contain the right proportion of air to furnish oxygen for the reaction. This scheme is in a measure rather difficult to operate uniformly unless after each anneal the packing is again sized.

51. It is the practice in some plants to anneal without packing in what are known as muffle ovens. Provided precautions are taken to have a tight muffle and the latter is well filled with castings to allow of its holding but little air before the muffle is sealed, very good results can follow, provided further that the carbon in the hard-iron casting is low. As a matter of fact very creditable results can be obtained from castings that are very low in carbon (not so low as to prevent carbon precipitating) even if no carbon is eliminated, which means that the lower the carbon content in the hard-iron castings, the less dependent one need be in connection with the extent of carbon elimination. This matter is rather important in some instances where a reliable grade of malleable that can be machined at very high speed is desired. A rim of decarbonized iron can be so soft that in some machining operations the metal will crumble and tear in front of the tool edge and generate so much heat that it will be softened. Many samples have been sent to this office with the statement that the material was hard, which when examined were found to possess the character of skin referred to. The skin was dead-soft, and the castings proved hard to machine, due to the reasons stated. The general worth of a casting, its machinability and peculiar physical characteristics depend so much upon the structural make-up of the finished product, that some time must be devoted to a consideration of the factors that act to prevent either the structure or fracture or both from being normal.

FIG. 13 FRACTURES SHOWING WIDTH OF DECARBONIZED RIM.

Appearance of Fracture of Test Pieces

52. It takes a lengthy experience before one can tell from the fracture of the iron what may have caused its abnormal condition, which is one direction in which great progress has been made. When a normal, well-annealed piece of malleable iron is subjected to a steady, direct pull in testing machine, a point is reached at which the crystalline grains of which it consists are elongated permanently, the stretch continuing until fracture takes place. If the fracture is examined it will be seen that the grains have elongated into finely pointed spines which gives what is called a "tooth" to the fracture. When light falls obliquely on such a fracture, there is produced a play of colors that yields a sheen caused by a reflection from the points and sides of the spines and the shadows that fall between them. As the grains in the decarbonized rim are more ductile than the rest of the metal in the section, they will elongate to a greater extent, and if the fracture is held in certain directions to the light, the width of the decarbonized rim can be seen by contrast, its color appearing under those conditions a little lighter than the rest of the section. (See Fig. 13.) This explanation is made and entered into because such a rim or border must not be confused with and mistaken for the character of fracture that has a well-defined frame, that is, a border having not only a sharp line of demarcation between it and the core of metal which it surrounds, but an appearance wholly distinct from it. If the writer were asked to pass judgment as to the quality of a piece of malleable iron, based upon either the appearance of its fracture, or what would be shown by a polished and etched section under magnification, he is positive that he could render a more reliable opinion in the case of the former than would obtain in the case of the latter. The reason lies in the fact that even in a non-ductile product it is possible to have an absolutely normal structure, one which consists of a matrix of ferrite, throughout which are uniformly distributed nodules of free carbon, such as shown in Fig. 4, while if the fracture is as has been described, a normal structure at least can be predicted. If the ferrite is not ductile, then the crystalline grains will not elongate, with the result that we obtain a structural appearance that would be interpreted by those not familiar with the facts as belonging to a piece that had been insufficiently annealed. It has already been stated that when the silicon is too low a steely fracture will result, and also that the metal is liable to be unsound. In making this statement the writer is assuming that the silicon is low, not because too little was used in the charge, but low due to excessive elimination in the air furnace.

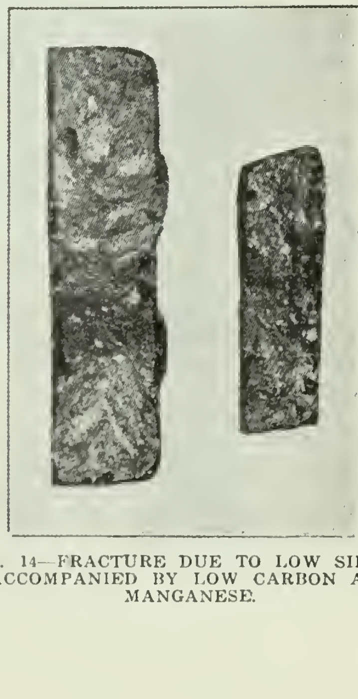


FIG. 14—FRACTURE DUE TO LOW SILICON ACCOMPANIED BY LOW CARBON AND MANGANESE.

The Ludlum Type of Electric Furnace

An Electric Furnace Distinguished by the Ellipsoidal Shape of the Hearth and by the Arrangement of the Three-Phase Electrodes in Line Which Ensures Proper Heat Distribution

By W. F. SUTHERLAND

IN the manufacture of tool and alloy steels, where refinement is the first consideration, the electric furnace has proven itself superior to the crucible, not only in turning out a more consistently uniform steel of any given analysis, but likewise accomplishing this at less cost than by the older method.

The reason for this is plain in the first place, when it is considered that the electric tool steel manufacturer does not have to purchase selected grades of raw material, but can refine the mix in his furnace.

So, too, in the foundry, the electric furnace is the modern method of melting. The demand is for superior castings. Consequently, the refinement of the metal must be almost as accurate as in the manufacture of tool steel. The rare alloys are frequently added in the process. The percentage of sound and serviceable castings is here the first consideration.

The electric furnace has yet another use in the metallurgy of iron and steel and for the production of pig iron from scrap it has found considerable use, particularly during the war. The Ludlum electric furnace described in this article is being successfully used at the present for the commercial production of the finest quality of cast steel, cast iron, low phosphorous pig iron and washed metal.

Low phosphorus, low sulphur pig iron has been made successfully, both in the plant of the Metal Alloys, Inc., at Watervliet, N.Y., and at the plant of the Omaha Structural Steel Works at Omaha, Nebraska. The operations at Watervliet were more or less in the nature of a war expedient and were abandoned after the armistice on account of the facilities being required for more remunerative work. At the plant of the Omaha Structural Steel Works, where the furnace was put in operation about August 1, they have been making high silicon, low phosphorous, low sulphur pig iron, using a charge consisting of 1,500 lbs. of cast iron borings and 500 lbs. of stove plate, or steel shoveling scrap in a one-ton Ludlum furnace.

Over 200 tons of cast metal have been made by this firm with an electrode consumption of as low as six lbs. per ton and with an average power consumption per ton of less than 600 kw.

The electrodes are 4 in. graphite, the transformer operating the furnace is a 400 kv-a., Pittsburgh, 3 phase, self cooled, and stepping down the high tension voltage from 13,200 to 110.

This particular furnace is basic lined and no replacements have as yet taken place, the only expense being a small amount of syndolag for patching the bottom, which consists of sintered magnesite on a base of magnesite bricks. It may be mentioned in passing that furnaces of this type operating under much more difficult conditions have been run for more than 2,000 heats with the bottom still in excellent condition.

The pig is run in a sand bed and is afterwards charged in a grey iron foundry in the ordinary way. Castings made from this metal carry a scrap burden equal to, if not greater, than ordinary pig and at the same time the castings made from it have grain about twice as close as the standard pig, are free from inclusions and have a tensile strength of about 3,800 lbs., as against 1,800 for grey iron. This same furnace at Omaha is used during the day shift for steel casting.

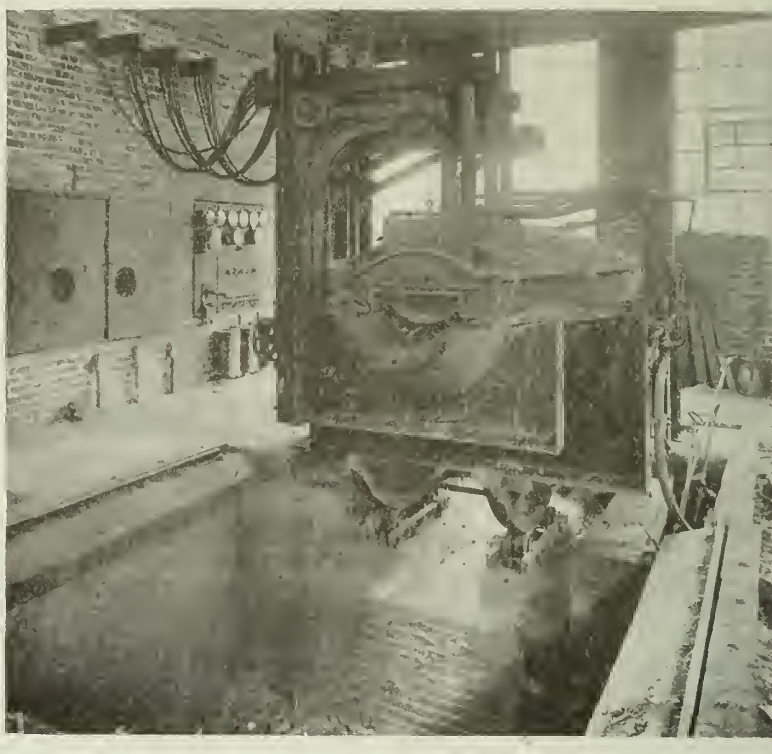
The Ludlum electric furnace is an ellipsoidal crucible, consisting of a steel shell, lined preferably with magnesite brick, and covered by a low arched roof of firebrick. Three electrodes are used and these pierce the roof along the centre line, and are held in position by bronze arms projecting from upright beams attached to the furnace structure. These arms can be raised and lowered either by hand wheels or automatic control. There are no bottom connections, nor water-cooled parts below the bath.

There are only two doors, one at either end of the furnace, and no spout. Through these doors every part of the interior is easily accessible from a variety of angles. The furnace can be charged from both ends at once.

The furnace structure is supported on two sets of rollers, and is tilted by an electric motor to pour through one of the doors. The latest model is built to pour at only one end, and is back heavy as a measure of safety.

The furnace is as small for its capacity as it can be made. This means a very high efficiency due to a minimum: First, of exterior radiating surface; second, of space in the furnace unoccupied by the charge third, of refractory lining required fourth, of electrodes exposed.

To anyone familiar with drawing and setting the slag in electric furnace operation, and patching the lining at the end of a heat the advantages of the design here described should be apparent. Every part of the slag and every part of the lining after the metal is poured is directly accessible through one or other of the two openings.



GENERAL ARRANGEMENT LUDLUM ELECTRIC FURNACE.

For basic operation the hearth is lined with magnesite to a thickness of 9 inches or more. A lining will last for several months of continuous operation, and with careful and proper patching its life should be extended many times that long. The shape of the furnace itself is conducive to long life since none of the walls overhang the bath, even when the furnace is tilted. Straight lines are eliminated and the lining is thus stronger through the keying action of the bricks themselves. When the Ludlum furnace requires relining, the whole job can be done from the moment the last heat is poured till the moment when fully lined and thoroughly dried, it is ready to be charged again, in twenty-four hours.

The roof of this type of furnace is a low arch built of fireclay brick.

The flat arch construction reduces the compression in the brick to one plane, instead of a number of planes as in the dome type. It has been found that it will last for several weeks of continuous operation.

In practice, an extra roof is built on a separate roof frame, and is ready to replace the old one at any time. This is most conveniently done when a new charge of scrap is loaded into the furnace, thus losing a minimum of heat in the operation. The charge hardly delays for a moment the ordinary routine.

Operation

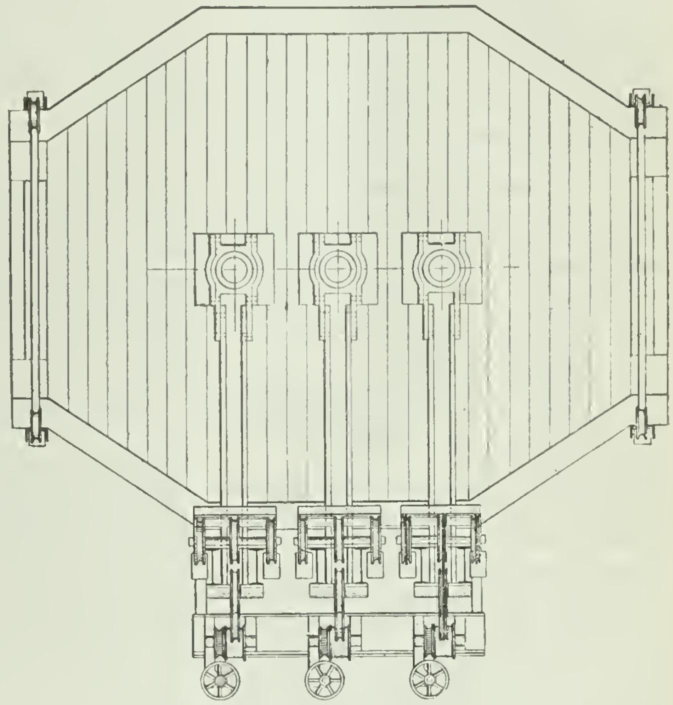
When a charge of scrap is to be melted down, the furnace is filled with the charge. There is no waste space to be heated and a minimum exposure of the electrodes within the furnace. The Ludlum is as small for its capacity as it can posibly be made and therefore as economical.

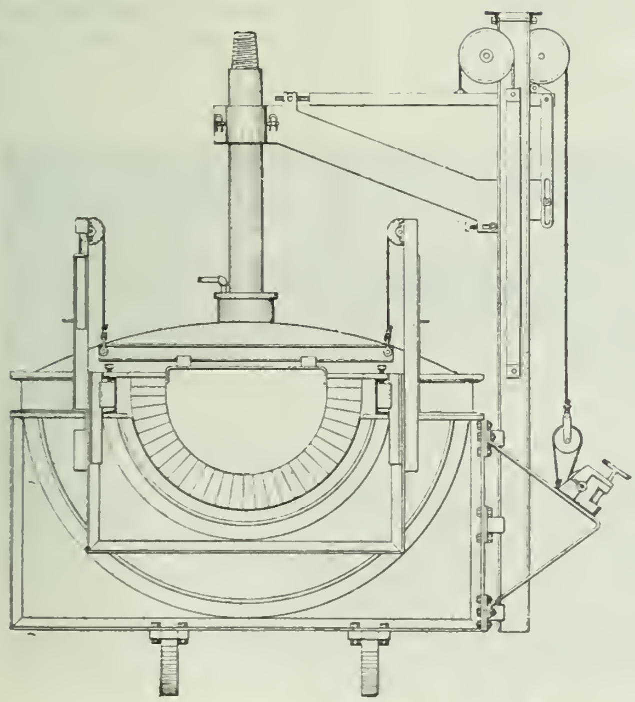
The electrodes at first rest on the charge and as soon as the current is turned on, eat their way through nearly to the bottom. By the time they have melted their way through there is a pool of molten metal beneath them, for there is no deeper part of the Ludlum hearth than that directly beneath the electrodes. The charge is melted from the bottom up, the arcs remaining smothered in the scrap until it is completely melted down. Practically no heat is lost in the operation and the roof is not exposed to the high temperature radiating from an open arc.

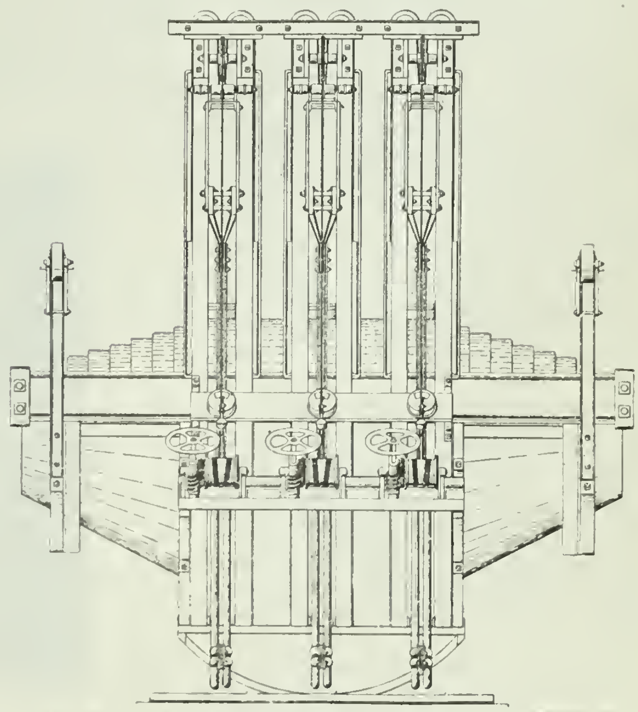
In refining alloy tool steel, with the use of two slags, the makers state that the current consumed is very small, about 500 kilowatt hours per ton. The power factor is about 90 per cent.

The use of the electric furnace for the production of high grade steels of all analyses for a period of years has convinced the Ludlum Steel Company of its superiority. This superiority results from the ability to use cheap raw material, even turnings, by reason of the refining ability of the basic hearth; low melting loss, even with small size scrap and an atmosphere which can be controlled to a nicety. This latter feature makes thorough dephosphorizing and desulphurizing, while it also prevents loss of alloys present or added to the steel by reason of the reducing atmosphere obtainable.

The electric arc permits the attain-







PLAN, END AND SIDE ELEVATIONS OF LUDLUM FURNACE.

ing of temperatures above those attainable by any other heating medium, while it gives a clean heat and introduces no contamination or chemical change per se in the charge. Thermal conditions can be accurately reproduced and maintained as desired.

Crucible quality steel of uniform analysis can be produced in large charges from cheap raw material because of the

(a) Refining ability.

(b) Control of temperature possible.

(c) Cleanliness of heating medium and ability to have heating uniform in all parts of the bath.

The electric furnace produces better ingots as flexible temperature control reduces piping and segregation by permitting pouring at the most advantageous temperature for the size of the ingot and the analysis produced by other methods, because of the absence of included slag, non-ferrous segregation and gases.

Specific Claims

The makers of the Ludlum furnace state that it operates smoothly, with small surges, which are prevented from reaching the power company's lines by the use of suitably designed static transformer equipment and automatic electrode regulation.

Due to the correct design of low tension conductors and other equipment, the average operating power factor is at least 90 per cent.

The Ludlum furnace may be provided with either an acid or basic lining, as desired, but lends itself most efficiently to basic operation, because of its maximum of refining ability. For this reason, except for a few special purposes, the makers advocate and furnish a basic-lined furnace, believing that the more expensive basic lining is more than compensated for by the lower cost of raw material used and the higher grade of the output obtained.

The design of the shape of the Ludlum furnace:—

(a) Permits supplying energy to the furnace at a high rate, within the critical limits of the refractories, resulting in quick heats which assist in attaining as low power consumption per ton of metal as is possible for producing a given desired temperature of the bath.

(b) Permits thorough refining by reason of the large area of contact between the slag and steel attained with a shallow bath of large superficial area.

(c) Permits the proper circulation of the entire bath for mixing the charge, which is brought about by the arrangement of the three electrodes in one plane coincident with the major axis of the elliptical hearth, whereby the reaction of the currents between the electrodes provide circulation by electrodynamic means as well as convection currents.

(d) This electrode arrangement, operating on three-phase energy, results in the production of an equal amount of heat at each electrode. The greater amount of heat in proportion to the mass of the bath at the ends cares for the greater radiation at the doors and results in an even temperature, gradient throughout the bath, which favors long refractory life.

(e) Makes sintering in lining easy, as but one piece of scrap electrode is required to reach all three arcs.

(f) Reduces danger of breakage of electrodes as the maximum of space for operating rabbles, test spoons, etc., is available without coming in contact with electrodes.

(g) The use of graphite electrodes reduces the weight of electrodes handled and storage space required; facilitates making of joints having the best electrical and mechanical properties and reduces the freight and handling charges for electrode material per ton of steel.

(h) Requires but two doors, one at each end of the major axis. These doors serve as charging doors and pouring spout and from them every part of the bath is accessible and the lining can be inspected and repaired with a minimum of effort. This makes the care of the bottom simple and results in long refractory life.

(i) The hearth meets the roof without any intervening vertical side walls so that no space is wasted. The contour of furnace interior approximates the natural contour of a pile of cold charge. The cubic contents of a Ludlum furnace is but ½ to 1-3 that of round or square shell types of the same capacity. This, and the small exterior surface exposed, results in high thermal efficiency and favorable power consumption.

(j) The comparatively low roof results in the reduction of electrode consumption as a minimum length of electrode is exposed to oxidation when dephosphorizing and when charging.

(k) This shape of hearth, tilted in a plane, parallel to the major axis of the furnace, permits thorough clearing of the metal with a motion of only 30° from the horizontal and no refractories overhang the bath at any position of tilting.

(l) No special shapes of brick or exceptionally skilled masons are required to line the hearth or roof and the expansion of the refractories, which takes place when the furnace is heated, is adequately cared for by its shape. The design of the roof arch is simple and provides a very uniform distribution of reflected heat. Favorable thermal conditions permit the use of firebrick roof, which somewhat reduces refractory costs as with proper care the basic sintered lining has an extremely long life.

(m) The arrangement of electrodes and the shape of the bottom results in the formation of a metal pool, which extends under all three electrodes by the time they have cut through the charge. This metal protects the bottom refractories from the arcs and allows melting from the bottom up without injuring the lining. The charge acts as a blanket, which absorbs the excess heat, increases the speed of melting, by being preheated therefrom and protects the roof from the heat until the entire charge is molten, when the covering slag tends to perform the same function.

If, in a photographic dark-room illuminated by red light, the face of a watch with a so-called "luminous" dial be observed, a curious effect is noticed. When the watch is moved to and fro, in the plane of the dial, the green luminous figures appear dissociated from the red illuminated dial and apparently are displaced and lag behind its movement. The illumination by the red light requires adjustment so as to be suitably related to the brightness of the luminous figures and the eye should remain in darkness for 15 to 20 minutes in order to get the best effect.

SHOWING DETAILS OF ROOF STRUCTURE.

HOW TO BE PROSPEROUS

Everybody pictures the American people as a prosperous, hustling and ambitious people, and the picture is not a bit overdrawn. A prominent manufacturer from the American Republic recently gave us an insight on how things are worked over there, and we cannot help but feel that a certain amount of the same thing might liven up things on this side of the line.

The gentleman spoken of is an extensive manufacturer of moulding machines, and is doing quite an extensive trade in Canada, but finds conditions different here, although we are exceptionally busy on regular every-day work to a greater extent than at any time in our history. In the United States the working men, particularly the moulders, and more particularly the foreign-born moulders, are making so much money that they have taken to wearing silk shirts. The silk shirt business received such a sudden awakening that the manufacturers could not fill the orders without installing more sewing machines. The silk mills could not supply the silk goods without installing more looms. The sewing machine manufacturers and the loom manufacturers were unable to supply the sewing machines or the looms after engaging all the moulders they could rake and scrape together, and as a consequence had to send in rush orders for moulding machines. The manufacturers of moulding machines were, of course, in the same predicament and could not fill their orders as promptly as they would like to have done, but by the aid of moulding machines in their own foundries they were able to relieve the situation without much delay, and the working man is now able to regale himself in silk shirts, etc., with less inconvenience than formerly.

This may seem like a fairy tale, but there is more truth than fiction in it. The working man is as much entitled to a silk shirt as anyone else, and the manufacturer is as willing to supply him as anyone else. The custom of the Americans is to keep things on the move and keep the money circulating. The manufacturer does not worry about the wages he pays his men so much as he does about keeping his business on the move. They do not set any higher rate of wages than we do, but the rate agreed upon between the employer and the employee is simply a minimum rate, which is to say, it is the least that the poorest dub is paid. Better men are better paid. When a Canadian goes into that country to work at his trade he goes there prepared to speed up and also to produce the quality, and when we hear of our boys making a good thing over there we must not overlook the fact that he is making good for his employer or he would not be getting the price

Canadian workmen can hold the good positions over the border and they could hold similar positions here, but the drawback in the past has been that the Canadian shops have not been properly equipped to give the men a chance to make a show. Things have changed, though, in the last few years, and Canada has begun to show the world something. We showed them something during the war, and we are showing them something since the war. At the present time new foundries and rebuilt foundries are the order all over Canada. To enumerate all that is going on in this line right now would be a big task, but just a few which have come to our attention to-day will show how the Canadian foundries are leaving nothing undone to make their foundries as modern, both as regards buildings and equipment, as twentieth century genius can make them.

From Brockville We Learn This

The plant to be erected this year by Machinery & Foundries, Limited, on the former Murray property on Pearl Street East and the North Augusta Road, will be thoroughly modern in type, and when completed will be one of the most up-to-date factory buildings in Eastern Ontario. Constructed of reinforced concrete, it will be absolutely fireproof and will have the additional merit of possessing adequate lighting by means of steel sash placed between concrete pillars.

The plant is to be built in the form of an "L," the machine shop facing on Pearl Street East, and the foundry building on the North Augusta Road. In addition there is a cupola building two storeys in height, and a boiler-house erected west of the foundry building.

A siding from the main line of the Grand Trunk Railway will skirt the western end of the machine shop, where the office and shipping room are located.

The machine shop building, 275 feet in length and 57 feet in width, will stretch along Pearl Street East to the corner of the North Augusta Road. It will be one storey in height and the office (with lavatory) 25 x 20 ft., the shipping room 35 x 30 ft., and the paint shop 20 x 20 ft., will be located in its western end. The whole will be of reinforced concrete construction with strictly up-to-date appointments.

The foundry building will be 120 ft. by 62 ft. and will join the machine ship building. It will be 25 ft. in height with ventilators. At its southern end there will be a mill room and a pattern storage room. Modern lavatories will be built at the junction of the two buildings.

Nothing which goes to make an up-to-date foundry will be omitted, electric and pneumatic tools, moulding machines of the latest type, etc., being part of the programme.

Another From Kitchener, Ont., Reads:

Philip Gies Foundry, manufacturers of mining cars and special machinery, iron brass, bronze and aluminum castings of every description, have let the contracts for a new and up-to-date foundry, which will be commenced about the middle of March. It will be equipped with ten-ton electric crane, electric elevator, direct-connected blower for cupola, exhaust tumbling barrels, moulding machines, new core ovens, etc. It is expected that the new plant will be finished and in operation about the first of May.

Another From Brantford, Ont., Reads:

The Dominion Steel Products Co., Ltd., are erecting a substantial addition to their present plant in the shape of a foundry building 100 feet by 160 feet, to be equipped with two cupolas, a 16-ton capacity air furnace, and an electric brass furnace, with a capacity of 300 tons per annum. The air furnace is being installed for the casting of heavy steel mill rolls, also the rolls for rubber-working machinery. The electric furnace is for melting all kinds of non-ferrous alloys.

With electric furnace and air furnace, along with the ordinary gray iron cupolas being installed, it is needless to say that everything about the plant will be the last word in perfection. If Canadian employers will remember that the men cannot do without good wages, and the men will remember that the employer cannot pay good wages unless they, the men, do their part in trying their best to earn the wages, Canada will see prosperity during 1920 which will surpass anything ever experienced in its history.

THE PROPER VIEW

Mr. H. R. Atwater and Mr. H. E. Deakins, of the Osborn Mfg. Co., Cleveland, Ohio, were welcome visitors at the CANADIAN FOUNDRYMAN sanctum recently and report business brisk to a degree bordering on phenomenal. Their common-sense argument regarding the moulding machine cannot help but meet with the approval of every intelligent foundryman. The argument is that the moulding machine increases the quantity and improves the quality of the output and incidentally lowers the productive costs, thereby paying big interest on the investment, but it must not be imagined that it will pay for itself in a few days. Therein lies the secret of opposition on the part of workmen toward the machine. The workman has learned to be suspicious of the machine entering the shop on account of the enormously increased amount of work which he is expected to do along with what the machine does. The argument advanced by Mr. Atwater and Mr. Deakins is that by letting the men know that part of the benefits derived from the machine will go to them and part to the company it will be an easy matter to reconcile the men to using the machine. If the man is given to understand that the machine was put in to speed up production and not for his benefit he is not apt to get enthused over the speeding up part of it, but if he is given to understand that the benefits are to be mutual it gives it a different appearance. The moulding machine is certainly necessary if we are to compete with the competition which is confronting us from every direction, and it is to be hoped that foundrymen who instal machines, as they will be doing, will take the same view as these gentlemen have taken.

Practical Hints for the Brass Founder

ALUMINUM AND ITS CHARACTERISTICS

Editor CANADIAN FOUNDRYMAN:

Will you kindly inform me what aluminum really is, what its characteristics are, and how it is affected by mixing other metals with it? I have been informed that it is not a metal at all but is a sort of clay and that it will not chemically alloy with other metals and that it cannot be soldered or welded, and that even varnish will not stick to it. I have also been told that it can be mixed with other metals and that unless it has some other metal mixed with it to harden it it cannot be used for making patterns or follow boards on account of being so soft and easily bent, and that if mixed with other metals the resultant compound is apt to be so heavy that very little is gained by using it, as lightness is the only real feature which it is supposed to be valued for.

Answer.— Aluminum certainly is a metal and mixes readily with other metals such as copper, tin, zinc, etc. It does not mix readily with lead. Until recently aluminum was a rare metal and too expensive to be used in ordinary work, but of late it has become better known The following definition will give some light on the subject, after which we will describe some of its characteristics:

What Aluminum Is

Aluminum is a bluish silver-white metal, very malleable, ductile and sonorous, and noted for its lightness (specific gravity 2.6) and resistance to oxidation. It is the most abundant metallic element, constituting, as is computed, 7.3 per cent. of the earth's crust, but always occurring in combination. Its principal minerals are cryolite, corundum, bauxite, diaspore, gibbsite, alunogen, aluminite, alunite, turquoise, wavellite, lazulite, and many silicates, as kaolin, feldspar and mica.

The metal was first separated by Wohler in 1828. It is chiefly manufactured from aluminum ore (a pure form of bauxite) by converting it into alumina and electrolyzing this in a fused bath of sodium aluminum fluoride. Aluminum melts at 657°C. or 1215° Fah. Weight per cubic foot 159 to 169 pounds. It is used as a material for electric conductors, cooking utensils, and various small articles, and in the construction of boats, etc., where lightness combined with strength is a requisite. It is also employed in the process of aluminography, in reducing and welding metals, and in the preparation of alloys.

Aluminum in its early history was used in connection with copper to form what was known as aluminum bronze: 9 parts copper and 1 part aluminum makes a pale gold-colored alloy used for guns, journal bearings, bells, etc., and also ornamental articles, watch cases, etc. It is hard and stiff and very homogeneous. Its specific gravity is 7.7. It is so ductile and malleable that it can be drawn down under the hammer to the fineness of a cambric needle. It works well, casts well, holds a fine surface under the tool and when exposed to the weather, and it is, in every respect, considered by some to be the best bronze yet known. Its high cost prevented it from being used to any great extent during the years when bronzes were at their zenith.

Aluminum, however, mixes readily with copper, and for match plate work it can be used in any proportion. If 9 pounds of aluminum and 1 pound of copper are mixed together it makes an alloy very much improved over the pure aluminum, and the difference in weight is hardly perceptible for the reason that the great difference in weight of the two metals makes the ten per cent. of copper by weight only about three per cent. of the bulk or volume.

Iron match plates were formerly used and gave satisfaction, but the weight was against them, and aluminum has been found to be the right material in the right place if a small percentage of hardening material is used. To demonstrate how slightly the weight is increased by the addition of a comparatively heavy metal such as copper, even if used in the uncalled for proportion of half and half, or 50-50, I will submit a formula for calculating. A cubic foot of copper weighs about 550 pounds, while a cubic foot of aluminum weighs about 165 pounds. If mixed in even proportions a person is apt to think off-hand that the resultant alloy would weigh in the neighborhood of 370 pounds, which would be about midway between, and approaching that of iron, which is about 500 pounds; but not so.

Let us assume that we have to make a match plate 1 foot square by ¼ inch in thickness, that is to say, the cubic contents of the plate are to be 36 cubic inches. On the basis of the above figures such a plate made of aluminum would weigh 3.4 pounds, while that of iron would be 10.4 pounds, and the average man would probably say that a 50-50 copper-aluminum plate would be around about 7 pounds, but on the contrary it would only be about 5¼ pounds. The formula for calculating the weight of a plate made in whatever proportion desired is as follows: Number of pounds weight of plate equals cubic contents of plate divided by $\frac{1}{165}$ of the proportion of aluminum + $\frac{1}{550}$ of the proportion of copper.

To put it in the form of an equation: Weight of plate in pounds =

$$C \div \left(\frac{P.A.}{165} + \frac{P.C.}{550}\right)$$

Where
C = Cubic content of plate in feet.
P.A. = Proportion of aluminum.
P.C. = Proportion of copper.

Let us verify the above instance with this formula:

C = 36 cubic inches, that is $\frac{1}{48}$ cubic feet. P.A. and P.C. each equal ½. Thus weight in pounds

$$= \frac{1}{48} \div \left(\frac{1}{165 \times 2} + \frac{1}{550 \times 2}\right)$$

$$= \frac{1}{48} \div \left(\frac{1}{330} + \frac{1}{1100}\right)$$

$$= \frac{1}{48} \div \frac{13}{3300}$$

$$= \frac{3300}{13 \times 48} = \frac{825}{156} = 5.28$$

Here we see that a plate which would weigh 10.4 lbs if made of iron, will weigh 5.28 if half copper and half aluminum, or almost exactly half the weight.

But supposing we make it of 90 per cent. aluminum and 10 per cent. copper where P.A. = 9/10 and P.C. = 1/10, here we have weight in pounds

$$= \frac{1}{48} \div \left(\frac{1 \times 9}{165 \times 10} + \frac{1}{550 \times 10}\right)$$

$$= \frac{1}{48} \div \frac{90+3}{16500} = \frac{1}{48} \div \frac{31}{5500}$$

$$= \frac{5500}{1488} = 3.69$$ or approximately 3.7.

Thus we see that whereas a plate which would weigh 3.4 lbs. if made of pure aluminum would only weigh 3.7 lbs. if reinforced by ten per cent copper and only 5.28 if half copper, whereas an iron one would weigh 10.4.

There are other metals which are used to good advantage instead of copper and easier to use, although not so generally satisfactory for pattern work, although by some foundrymen, considered all right. Zinc in different proportions makes a decided improvement to aluminum but gives it a rough feel, no matter how carefully finished. One pound of tin to ninety-nine of aluminum makes it as hard as anyone would want it for filing. These alloys have a tendency to stick to the pattern.

Aluminum castings are now being used for work where hard usage is part of the programme and where lightness is necessary.

All standard light alloys contain aluminum for a base. In fact, some of the fastest racing yachts in the world have had aluminum for their plates. An alloy containing 95 per cent. aluminum, 2½ per cent. copper and 2½ per cent. nickel will be soft and tough enough to roll into plates; its specific gravity is only 2.75, while it has a tensile strength of 40,000 pounds to the square inch.

An alloy of 70 per cent. aluminum, 25 per cent. zinc and 5 per cent. copper is suitable for gear wheels, and different parts of machinery. It has a tensile strength of 45,000 lbs. to the square inch and is quite dense. It is rigid and wears well. This alloy, if rolled, would crush, but if the zinc content is reduced by about half, it can be rolled into plates. If cast in chills or dies, the tensile strength of this alloy is considerably increased.

Magnesium aluminum alloys are, by some experts, considered to be the best all-round alloys for light castings. They contain from 2 to 10 per cent. magnesium, and the 10 per cent. alloy, if water chilled shows a tensile strength of 61.100 pounds and an elongation of 4.2 per cent.

INTERESTING DATA ON FUSIBLE METALS

Many times a person will want to make a cast or die in metal for use in embossing a token for Christmas or as a present, and for this and many other purposes the fusible metals are convenient on account of their low melting point. Some of them melt at even a lower temperature than is required to boil water.

Type metals, although they do not melt at very low temperature, are much preferable where a clean, sharp and fairly durable cast is wanted.

In order to mix and use these metals intelligently one should know something about their properties, especially those of antimony, bismuth and tin. Antimony and bismuth, each in their own way, have a marked effect upon any alloy with which they are incorporated. Antimony is very brittle; it also has the property of expanding when it solidifies; and, best of all, it imparts this property to its alloys, thus making them give fine, sharp castings.

Bismuth is very brittle; it forms alloys with other metals readily, and also imparts to them hardness and fusibility. In other words, it makes them melt at a lower temperature than they alone would melt. Most fusible metals contain bismuth.

Tin, when used with antimony, gives toughness and tenacity, and removes the brittleness caused by the antimony. Some formulas for the most common fusible metals are as follows:

1. Wood's metal—Bismuth, 4 parts; lead, 2 parts; tin, 1 part; and cadmium, 1 part. Melts at about 149 degrees F.

2. Fusible metal—Lead, 1 part; tin, 1 part; and bismuth, 2 parts. Melts at about 190 degrees.

3. Fusible metal—Bismuth, 8 parts; lead, 5 parts; and tin, 3 parts. Melts at about 200 degrees.

4. A tough type metal—Lead, 5 parts; antimony, 2 parts; and tin, 1 part.

5. Ordinary type metal—Lead, 5 parts; antimony, 1 part; and tin, ½ part.

By adding more lead in these type metals a softer alloy will be obtained. Some other useful formulas are as follows:

6. Stereotype metal—Lead, 5 parts; antimony, 1 part; and tin, ¼ part.

7. Non-friction metal—Tin, 10 parts; antimony, 1 part; copper, 1-5 part.

8. A German silver metal for casting —Copper, 2 parts; zinc, 1 part; and nickel, 1 part.

9. Pewter—Tin, 6¼ parts; antimony, 1 1-16 parts.

For the convenience of those who wish to use any of the foregoing formulas, the following table may be of use to determine the melting points. The degrees are Fahrenheit, and are the ones accepted by the United States Bureau of Standards.

Wrought iron	melts	at	2,737	degrees.
Copper	"	"	1,981	"
Bronze	"	"	1,692	"
Antimony	"	"	1,166	"
Tin	"	"	450	"
Bismuth	"	"	520	"
Cadmium	"	"	610	"
Lead	"	"	621	"
Zinc	"	"	740	"

WELDING BELL METAL

about 80 per cent. copper and the balance tin, with the addition of small amounts of other metals to produce tone. The proportions of copper and tin produce a very hard and brittle metal, one which becomes increasingly harder to handle in very large bells. A bell weighing as much as 1,500 pounds, for instance, is cast very thick, not for strength but for foundry reasons. This type of bell will cool very slowly and should be handled carefully.

To weld, first V out the crack and drill a small hole at the theoretical extension of the crack. This will prevent further cracking. Place the bell on a fire-brick platform, supported above the platform by fire-bricks. Heat the bell carefully and slowly. When it is hot enough to melt lead, choke off the fire. Be sure that the supports under the bell are so arranged that no part of the bell sags. Proceed to weld in the usual way for brass or bronze, using a Tobin Brone rod. A special rod, of the same metal as the bell, would be better. The line of the weld should be slightly overcharged. Allow the bell to cool very slowly. When cool, clean up the line of the weld. After the bell has entirely cooled, it is said that the original tone may be entirely restored by again heating the bell as before, after which it is cooled suddenly with cold water. Large bells may be cooled by using two or three lines of hose.—"Welding Engineer."

EGYPT SIX THOUSAND YEARS AGO

In some remarks contributed to the discussion on Sir Alfred Herbert's paper on "Machine Tools," read before the North-East Coast Institution of Engineers and Shipbuilders, Professor W. M. Flinders Petrie said that, regarding priority in the use of some machine tools, Whitworth, with his accurate facing plates, was not the father of mechanical accuracy. The Egyptians in 4700, B.C., habitually used great facing plates several feet wide, smeared with red ochre, to test the truth of large rock foundations and all fine joint surfaces of stone. They required the stone face to catch the ochre at spots not more than an inch apart all over. Later on, about 3400 B.C., there was a granite sarcophagus nearly 9 ft. long, with errors from true planes averaging 5-thousandths of an inch. Coming to the drawing-office, the Egyptians used large sheets of squared papyrus ruled in red for scale drawings of work, showing joints and details of construction. For drilling hard rocks tubular drills were commonly used armed with cutting points which could slice through quartz crystal. The regularity of the cores commanded the admiration of the modern engineer. Copper saws over 8 ft. long were similarly armed for slicing granite.

ALUMINUM BRONZE

Aluminum bronze contains from 1¼ to 11 per cent. aluminum and the remainder copper. It varies from a tensile strength of 25,000 pounds for the 1¼ per cent. aluminum to 90,000 pounds for the 11 per cent. aluminum alloy. More than 11 per cent. aluminum produces a brittle alloy. Aluminum bronze shrinks more than ordinary brass in casting, and hence care is required in pouring it into the molds. Aluminum bronze containing less than 7½ per cent. aluminum can be rolled, swedged, shorn or drawn.

SKELETON PATTERNS AND CORE BOXES

Continued from page 109

Open framed tables are of this kind, that is, tables the sides of which are made of half-lapped frames, the space between the bars being strickled out by the moulder. In some foundries large pipes are made skeleton fashion, so that the core is made inside the pattern. This is not to be recommended, except in special cases, as the patterns are very fragile and cannot be relied upon.

A winner never quits—
A quitter never wins.
Which of these two are you?

Some people are willing to be good if paid for, while others are good for nothing.

Some Skeleton Patterns and Core Boxes; Part I

Being a Series of Jobs Encountered in British Shops Doing Mainly Work in Connection With Ship Construction

By JAMES EDGAR

THERE is much difference of opinion about the relative advantages of skeleton and solid patterns, but in the following articles the construction of a few patterns which comprise between them the main principles involved in skeleton work will be described. Notwithstanding the bias in some pattern shops and foundries against this type of pattern, it may be confidently asserted that where one or two castings only are wanted the cheap skeleton will always find favor. Even where it does not reduce labor, it invariably reduces timber costs, and if handled by moulders accustomed to the class of work does not greatly increase foundry costs.

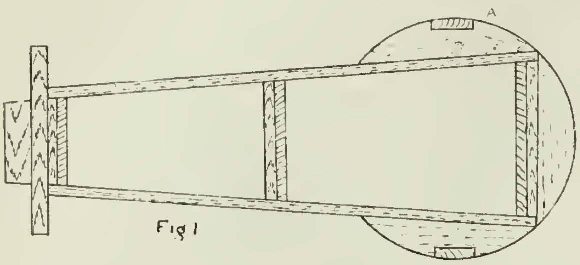


Fig 1

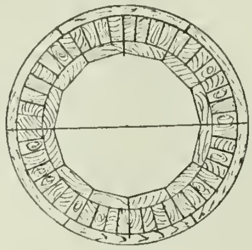


Fig 2

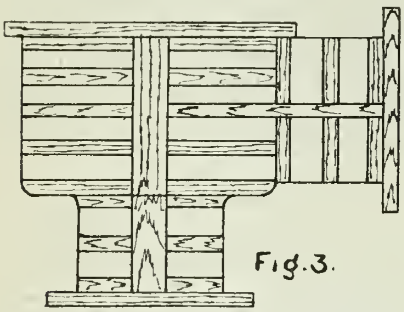


Fig. 3.

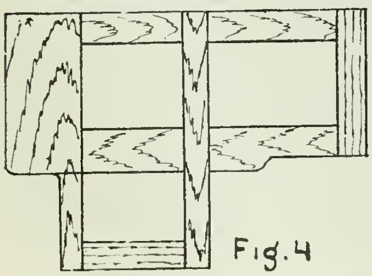


Fig. 4

Fig 6

Fig. 1 is a bollard. A plate could be made to the outline shown in the sketch, but where there is a stretch of straight pipe, whether tapered or of the same diameter throughout, it is better to make a staved barrel. It does not take the patternmaker much longer, and the moulder has not to form the shape. The spherical end, however, may be made skeleton. That part of the sphere which covers the end of the barrel may be turned in two halves—the pattern being in halves. In Fig. 2, the grounds around the barrel are shown jointed together, which is a good practice if many castings are needed and a solid pattern is essential, but one for every three shown would be sufficient for a skeleton. Of course, the grounds should be built so that the correct shape of the casting will be formed at the joint of the two halves. The grounds can be drawn from a template and sawn, so as to take a binding strip A, Fig. 1, which holds them firm. Filling up the spaces between the grounds with sand is quickly done in the foundry.

Fig. 3 shows a pattern made entirely skeleton. It is a very common type of valve, which varies only in minor details. Sometimes there are several diameters with large fillets from one to the other, and it is advisable to turn special rings at changing diameters. A frame like Fig. 4 should first be made. Sometimes this plate or frame is made to the face of the flanges and the flanges are checked over it. But it is equally as effective and less troublesome to make it to the backs of the flanges, squaring the end grounds from the joints, and then screwing on the flange as for a solid pattern. The ground, Fig. 6, which crosses the main body and forms the centre of the branch, should be screwed in place first and if the branch is then completed by grounds screwed on either side, a guide is made for cutting the other large body grounds. Where the large diameter and the small diameter join, the shape is defined by two grounds. Just as in the case of the bollard, a binding strip should be fitted on the top of the grounds, indeed in all skeleton work the grounds should be bound in this way, or when the moulder packs the sand between them they will yield to the pressure. If such a pattern is very large the ground ought to be framed as seen at Fig. 20. The method illustrated by Fig. 7 is a good one where the shape is awkward for semi-circular grounds. When the joint frame is made, supporting grounds AAA are screwed to them, on which the shaped grounds are screwed. One advantage of this way is the ease with which brackets may be fitted behind the flanges.

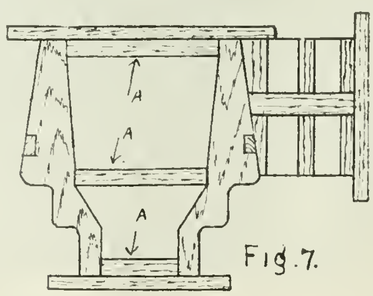


Fig. 7.

Figs. 8 and 9 is a Y pipe, each branch being of a different diameter. The simplest way of making it is to make a spherical or dome end of the largest diameter, and fit the others against it. This is so especially if the centres of the branches are not on the same plane. Barrels are not shown on the sketches, although the pipes are straight, because they are of small diameter. On the dome end, a small semi-circular ground is screwed to the last ground on the straight pipe, because it forms a good butt for the grounds that complete the dome.

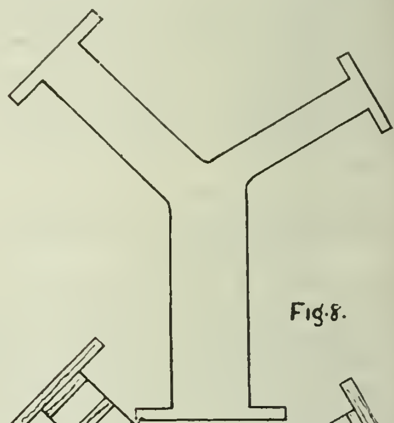


Fig. 8.

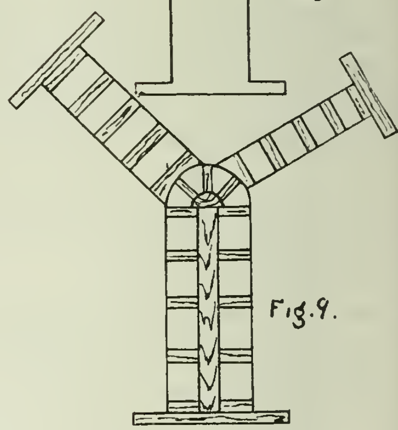


Fig. 9.

A straight pipe, which is made skeleton fashion, is shown at Fig. 10. It has a deck or bulkhead flange in the centre. A hole is cut in the bulkhead of a ship through which the outer flange and the pipe pass, and the middle flange is bolted to the bulkhead. This is a pipe that has to be fitted to place. The template that is used is quickly made into a pattern by adding thickness to the flange for machining and contraction, and a few grounds between the flanges for the shape. Fig. 11 shows how the bulkhead flange is checked to go over the joint plate.

The double bend pattern, Fig. 12 and 13, is rather difficult to make, and what adds to the difficulty is, that it is a usual type of pattern to be fitted to

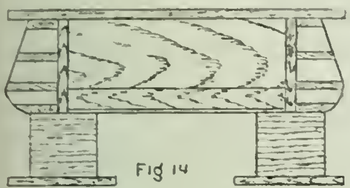


Fig 14


Fig 15

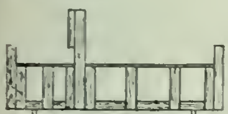


Fig.10.


Fig 11

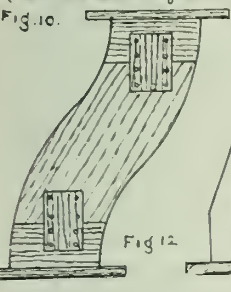


Fig 12


Fig.13.

place, the reason for the double bend usually being that it has to clear some other casting. It simplifies the work to make the joint plate with two breaks, so that the grounds will be semicircular or approximately so. It would be very difficult to make, and a bad pattern to mould, if the joint plates were crossed in a straight line from flange to flange with the grounds defining the shape.

It is not possible unless the pipe is very small, in which case it would be best made solid, to make the joint plates from one piece of timber. It is necessary to joint where the breaks are, and one wide or two narrow battens can be carefully planed to the correct angle and screwed on. They are shown in both Figs. 12 and 13. If the joint plates are made accurately there ought to be no difficulty in completing the pattern. Nothing has been said about prints on any of these patterns, but they should be made as for a solid pattern, either of one thickness timber, or if they have to be thick, of an inch plate with segments screwed on.

What are called double valve chests are much better made solid. There is no saving in making a skeleton pattern if it does not save carving or awkward shaping. That is why it is usually advisable to make a barrel for a straight pipe and never to make a skeleton of a square shape. If a valve chest like Fig. 14 is wanted in a great hurry, or if the use of a lathe is not possible at the moment, the ends may be left skeleton style. Fig. 15 shows the best way of building the straight part of the body. Of course, this method is only for a large valve, as small valves can be very easily shaped from solid timber. The joint plates should be made to the outward shape, and two or three grounds, according to the length of the body screwed to it and lagged over. The branches for these valves are usually short and should be made solid. It is not necessary to make the joint plates to carry the flanges. It may be here mentioned, as there are usually top branches on these valves, that it is never profitable to make them skeleton. To build up a skeleton branch on the top of a diameter takes much longer than fitting a solid branch, but the greater objection is that it does not deliver readily from the sand and would tear the mould. Anything that causes the moulder to waste time is not profitable. Ultimate costs are after all more important than immediate costs. Again it is wise to make a branch solid if part of it has to be left loose to get it from the mould. There are certainly exceptions, but generally it is difficult, if not impossible, to fasten a loose part satisfactorily to a skeleton.

Fig. 16 is a type of valve that at first glance would seem to be like Fig. 1. It is shorter, however, and because of the core and also the branches which are not shown, it is better to joint it as in the sketch. In this case again barrels should be made and screwed to the plates first. The branches could be built as part of the main pattern, but the advantage of making them quite separately is that their positions can be changed easily, whereas if they are built as part of the body it is an awkward job to make an alteration. It is often one of the disadvantages of a skeleton pattern that it cannot be altered as easily as a solid one, but if only one or two castings are wanted that does not matter. The sketches, Fig. 16 and 17, explain themselves.

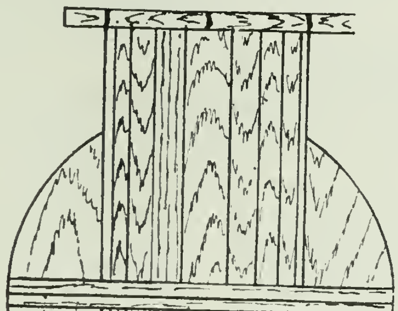


Fig.16.

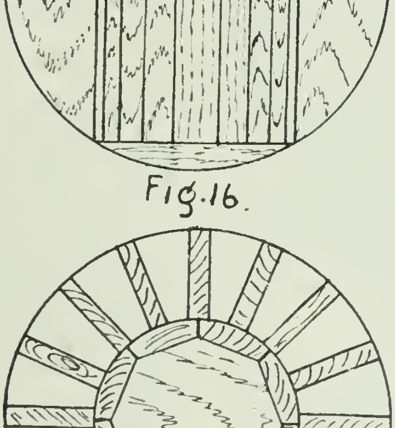


Fig.17

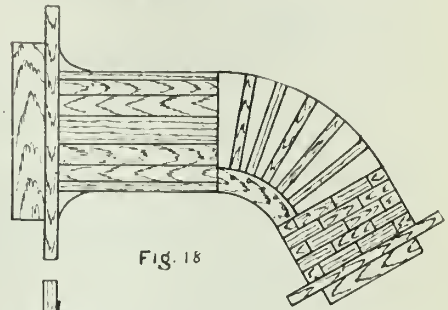


Fig. 18

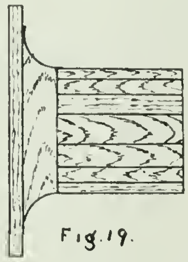


Fig. 19.


Fig 20

The top flange can be screwed in segments round the barrel. The best way is to make the barrel to the underside of the flange and screw on top a smaller diameter piece of the same thickness as the flange. This forms a shoulder for the flange. In Fig. 1 crossed grounds were shown for the barrel. This prevents the barrel from becoming elliptical, but it is not necessary when not for a standard pattern.

Some patterns can conveniently be made in a combination way, using a lagged barrel, skeleton grounds and segments. Fig. 18 is such a pattern. It is a bend pipe with a very large fillet at one flange, as the core inside is rounded off to a large diameter. The reason for making the short straight length of segment, as shown in Fig. 19, is because they could probably be built much quicker than if grounds and lagging were used. The curve is made skeleton, with a solid block, because it could be made thus quicker than even a built solid piece. The large fillet is a difficulty. A few pieces may be nailed round and the moulder left to fill in. A far better method, though, and one that is almost as quick, is to make the barrel shorter and turn a fillet piece in the lathe, the thickness of the joint plate being cut off after it is turned. It is advisable to have a fairly thick print at this end to leave a body of sand in the core beyond the fillets. A half lapped ground is shown in Fig. 20. They can be quickly made, the half laps being cut at a band or circular saw.

There are other forms of skeleton patterns which are not touched on in this article; patterns, that is, that might be more properly termed shell patterns.

Continued on page 107

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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Vol. XXI. Toronto, April, 1920 No. 4

Toronto's New Technical Schools

THE SUBJECT of technical education is one which should be of more than usual interest to foundrymen. Foundry work, as we have frequently pointed out, always was the most neglected of occupations from whatever angle it might be viewed, but regardless of its shortcomings, there was always a plentiful supply of applicants for positions.

Circumstances, the source of which can be traced both to the unpopularity of the work with the working class, and the lack of forethought on the part of the employer, have so greatly added to the perplexity of the situation of late that the climax has been about reached, and unless steps are taken to change conditions the foundry business will be in sore straits before long.

CANADIAN FOUNDRYMAN has always advocated technical schools where foundry work would be taught in a common-sense manner, and where all theories could be put to the test in actual practice and either proved or disproved, and where apprentices and prospective apprentices, as well as those who have served an apprenticeship under unfavorable conditions, can be shown the interesting features in connection with the work.

Foundry work in all its branches is interesting to an extent which can be truly called fascinating, if viewed from the proper standpoint.

Formerly apprentices were bound for long terms, at the end of which they were presumed to be journeymen. This system resulted in producing practical workmen, but in order to hold his own after spending his time in properly instructing an apprentice the employer could not pay living wages to this class of help. Now that work is plenty and men scarce it is a difficult matter to get boys who are willing to be bound for a term at small wages to learn a trade which has few attractions to offer.

As we have said, foundry work is fascinating if properly understood and properly handled, and the technical school is the proper place to bring out its interesting features in an atmosphere where business profit is not the predominant consideration with the instructor.

Many of our industrial centres now have technical schools where most of the arts and crafts are taught, but true to the usual custom, the foundry has been considered unworthy of consideration until very recently.

In Toronto there are five technical schools, one of which — the Central Technical School — takes second place to none on the continent. This school and its grounds occupy an entire block of six acres. The building is 430 feet long and 227 feet deep, and four stories high. It was completed in 1915, at a time when the youth of the country had other thoughts on their minds, but its promoters persisted in its successful development, with the result that it has been a phenomenal success. During the years 1918-19 sixty regular teacher were employed, being assisted by some 150 special and occasional teachers recruited from the industries of the city, and some ten thousand students were registered. Among the departments in this school are patternmaking shops equipped with 40 work benches, 18 lathes, and numerous saw and other machines; machine shop, forge and acetylene welding shops, equipped with everything required, and incidentally a cupola, three brass furnaces, one core oven, a lead-melting furnace, ladle heater, pneumatic rammer, moulding machines, flasks and tools. The foundry has been used to a considerable extent as an aid to patternmaking students in learning the requirements of the pattern in the foundry. The castings required in the machine shop department are also made here.

Beginning with the fall term of 1920, the foundry department will be up to the highest standard and full courses in every phase of foundry practice will be taught by thoroughly competent instructors. Instruction will also be given to patternmakers, designers and draughtsmen on such subjects as draft, shrinkage, etc., together with the general principles of molding as a guide to designing and constructing patterns in a manner most easily molded.

A. C. McKay, B.A., LL.D., is principal, and J. W. McBean, B.A., is director of shop work in the school.

Technical Plus Practical Education

TECHNICAL knowledge is not in opposition to practical experience — far from it; technical knowledge is an aid and abettor to the practical workman.

A common remark from the transient workman is that every shop he works in he picks up some new idea, which fact elicits the argument that the best workmen are to be found among the hobos, because they have the opportunity of seeing things which they could never see if they remained in one shop year after year. This goes to show that there is no shop but what has its little rut, into which the workmen fall. If a transient comes along who has been in some good shops, he brings along some ideas which might be adopted if the foreman was of the kind which cares for new ideas; but many employers do not care to engage this class of man, and as a consequence this source of knowledge is cut off.

The technical paper brings this knowledge much better than the restless hobo and can be studied at leisure. Workmen writing what they have experienced and selling it to the technical press to be delivered to other workmen cannot but be beneficial to both the workmen and the employer

There are other features of value which can not be learned through experience or through visiting other plants, such as results of experimental institutions, unless these results are being taken advantage of in the shops visited.

In the foundry business this sort of thing is just in its infancy and few foundries have adopted the improved methods, but are rapidly falling in line. Those which do not keep up to date will have a struggle competing, and the workman who adheres to antiquated methods will soon be a back number. Practical knowledge is the right thing if the right thing is being practised.

Took Nine of Them to Take a Man

IN YEARS gone by, before the advent of labor-saving machinery, and large industrial works, clothing was all made by hand, and in order to get a suit of clothes it was necessary to be measured and fitted, even though the clothes were for rough labor. It may be imagined that a lot of hands would be required to accomplish the work, and it may also be imagined that greater skill would be required to do the work by hand than would be required to make ready-made clothing by machinery. Yet what effect has machinery had on the working class in the clothing line, particularly as regards their income? Under the old system a tailor worked such long hours and was so poorly paid that it was a common expression to say that "it took nine tailors to make a man."

In those days moulders were highly paid mechanics, compared with tailors. To-day things have changed, and in spite of the machinery a man who is capable of making and fitting a suit of clothes is a higher-paid man than a moulder. This is no fault of his, nor the moulder's. It is just the ordinary course of events, and the same thing will take place in the foundry as has taken place in the clothing industry and almost every other line of work. The moulding machine will come into general use at a rate little dreamed of, and in very few years every foundry, no matter how insignificant, will have its quota of machines. It is an undisputed fact that more machines, twice over, will be installed in Canada this year than in any previous year in its history. But with improved facilities for producing castings it will be the good workmen who will survive, and the moulder who can put his hand to all-round foundry work will increase in value with every forward step in the progress of the modern foundry. The day of moulders floundering in the muck of the antiquated foundry has about seen its finish, and foundry work will henceforth see a new era.

Modern Molding Machines

THE moulding machines which are being put on the market to-day are a marvel, and are truly entitled to equal consideration with machines for any other purpose. The three fundamentals upon which the moulding machine rests are: Stripping plates, jolt rammers and squeezers. These various types may be separate and distinct machines constructed to suit the jobs for which they are intended, or they may be united into a combination machine in which each system plays its part. The stripping plate is chiefly advantageous as a pattern-drawing device. The jolter will ram a mould better and cheaper than can possibly be done by hand, and the squeezer excels in the matter of speed where it can be used. By taking advantage of the different methods a combination can be arranged to suit most any job with practically no manual labor.

Added to these systems are roll-over devices, pattern-rapping, vibrating, sand-sifting attachments, etc. For work where the rammer is used, the pneumatic rammer has every advantage over hand ramming. All things considered, the old-time system of foundry work has about run its course, and molding machnies will come to stay, not as strike breaks or slave-drivers, but as necessary adjuncts in the modern foundry.

New Dept.—Am. Foundrymen's Assn.

AT THE annual meeting of the American Foundrymen's Association, to be held in Columbus, Ohio, October 4th to 8th inclusive, a new department will be added to the programme, to be known as the "Non-Ferrous Casting Section." At the meetings of this section papers and discussions of interest to the practical brass and aluminum foundrymen will be presented.

It is understood that the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers will hold a meeting in Columbus during the same week, and it is proposed to have a joint session of the Non-Ferrous Section of the American Foundrymen's Association and the Institute of Metals division of the A. I. M. E.

This announcement will be of interest to the more than two thousand manufacturers of non-ferrous castings in the United States and Canada.

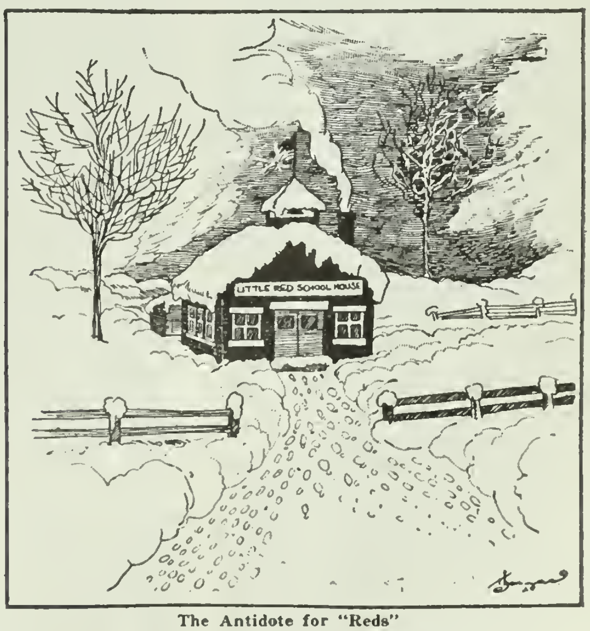
Mr. C. S. Koch, president of the American Foundrymen's Association, has appointed Mr. Lucien W. Mueller, of the H. Mueller Manufacturing Company, Decatur, Ill., and Mr. Robert S. Archer, of the Aluminum Manufactures, Inc., Cleveland, Ohio, as members of the papers committee to represent this new section.

The other sections that will be represented on the programme of the American Foundrymen's Association are the Gray Iron section, the Steel Foundry section, the Malleable Iron section, and the Industrial Relation section, and in conjunction with these meetings will be held the usual exhibit of foundry and machine shop tools, equipment and supplies.

The war is pretty much over in various corners of Europe, but we are approaching the season of the year when the speckled hen is apt to get over the fence and make a frontal attack on the neighbor's Dutch setts.

It is very easy to figure out that prices cannot possibly go any higher, only to come down to the office and find announcement of 'steen lines that have hopped over night.

When you see a man on the street with grey socks in this windy weather, and on the same street see some girl with silk hosiery — well, one's got too much on or else the other's not got enough. Great chance for a rather illuminating argument here.



The Antidote for "Reds"
—Thomas in the Detroit "News."

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question.—I am very anxious to find out the length of time it would require to obtain a really serviceable coating of nickel upon brass pipe. I mean such a coating as would resist ordinary polishing for at least five or seven years. What test could be made to determine whether the nickel plating on a brass pipe offered for sale was of such a thickness? Does the strength of the current in the plating bath vary? And if it varies, does that affect the amount of metal deposited per hour? Shall consider it a great favor if you will kindly give me above information.

Answer.—A nickel deposit on a brass pipe should be at least two one-thousandths inch thick after buffing to insure satisfactory resistance against occasional polishing with ordinary metal polishes, and the varying atmospheric conditions, whether indoors or outdoors, for the period of time you mention.

To produce a nickel deposit upon a brass pipe which would meet these requirements we would subject the article to at least two hours' continuous plating in a nickel bath of normal concentration with a current density of five amperes per square foot. Voltage at bath not to exceed 2 volts. Slower deposition and prolonged treatment would yield even better results. Our best work on brass tubing has been obtained by plating approximately three hours at low current density in an electrolyte containing about 2 oz. boric acid per gallon. Bath slightly acid to blue litmus paper. The modern tendency is to deposit nickel quickly in so many minutes instead of so many hours. This hastening of deposition is absolutely wrong where durable nickel plate is essential.

The only truly satisfactory test we have ever used was to expose the base metal by the careful application of nitric acid to a small portion of the plated surface and then use the micrometer, or make micrometer tests before and after plating. If the physical properties of the deposit are found correct by testing a strip of the nickel coating, which has been removed from a previously prepared test piece by subjecting to bending, twisting, rolling or hammer test, then the bath should be maintained constantly in same condition and the micrometer test will be found dependable.

We have grave doubts about your obtaining brass pipe plated commercially which will meet the aforesaid test. A thinner deposit might prove satisfactory in many instances, but for general trade purposes the thickness herein mentioned will be found much more reliable. With reference to varying current. Yes, the current varies with changes in temperature of bath or of any portion of the external circuit; it changes with varying chemical condition of the bath, the increase or decrease in metal content, the varying loads, the different cathode areas being plated, the resistance offered by imperfect contacts between anode or cathode and the rods from which these objects are suspended; poor anode corrosion eventually affects the current available; a wavering E.M.F. causes a varying current, etc. The varying strength of current does affect the amount of metal deposited per hour. One ampere of current will deposit a given amount of metal per second. Therefore, any reduction in the ampere hours means a reduction in actual metal deposited; likewise any increase in ampere hours means an increase in metal deposited. Slow deposition yields close-grained deposits. The time required to produce satisfactory nickel coatings for your purpose can be greatly reduced by employing mechanical means to facilitate rapid deposition of metal free from the detrimental effects of deposited or occluded hydrogen, that is, the cathode rod of tank could be kept moving during time of plating, or the bath could be agitated by small jets of compressed air; the temperature of bath could be raised to approximately 100 degrees Fah., and if a fluro-borate nickel bath is employed the results would be decidedly improved in a given time. The thickness of deposit is not always a safe guide; a thin, close-grained, hard deposit will resist more wear than a soft, thick, coarse-grained coating, so be sure to test the physical properties of the nickel.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—I have been operating a brass solution for the last two years. Have not had much trouble. Lately the work has had a brown scum on it. Scratch brushing takes the scum off and the brass is nice yellow color. Have added cyanide, but results are no better. I would like to have the work come from plating tank clean, so I would not have to scratch brush it. This is first time it has bothered me. Please publish reply in CANADIAN FOUNDRYMAN.

Answer.—When you are writing us for information, try and give us more details relative to the condition of bath or subject in question. In this case we have practically nothing to work on and must express our opinion in very general terms based on experience with brass baths of various compositions. Remove the brass solution from the tank and filter carefully, do not force it. If the density of the solution after filtering exceeds 10 degrees Beaume, remove a portion of the solution and dilute with clean, soft water until the density approximates 10 degrees Beaume. Stir well and add copper salt in small quantities; electrolyze with strong current. Now bring up color with small additions of zinc dissolved in cyanide. Keep sufficient free cyanide in bath to prevent rainbow colors on the work. The solution removed may be used to replenish the bath from time to time, or may be added to a cyanide copper solution a little at a time. Keep the metal strength of the solution up to maximum but avoid exceeding 10 degrees density by being cautious when prompted to add chemicals to the bath. If you use arsenic or ammonia, give the matter a little thought and you may conclude that you are simply making hard work for yourself by continuing the use of these two chemicals. Heavy, bright, clean, smooth brass coatings are easily possible from very simple brass solution free from either arsenic or ammonia, and such baths are not freaky, they require little attention and the upkeep is less than with more complex solutions.

Question.—We would like to obtain some information respecting the method usually employed in applying an oxidized finish to grey iron castings; also the necessary material for equipping a plant for this work.

Answer.—To prepare the castings for an oxidized finish it will first be necessary to obtain a smooth surface on the castings, either by polishing on emery-coated wheels or by tumbling in cylinders made expressly for the purpose. After the surface of the casting has been rendered smooth the casting is cleaned, as is usual for electro-plating and a deposit of copper is given the casting; a cyanide copper solution is necessary for the operation. The acid or sulphate solution will not suffice, as satisfactory coatings of copper cannot be obtained directly on iron from a sulphate bath except by using special methods and unusual care. If, however, a dark finish, uniform in color and unrelieved, will answer your requirements, you may resort to use of a black nickel solution or a phosphoric black. These finishes may be applied directly on the iron and may often be used to good advantage but to obtain the regulation oxidized finish on a copper base it will be necessary to use the cyanide copper solution as here mentioned. To expedite the process, it is advisable to avoid heavy matte deposits of copper unless a protective coating is desired; the deposit must be heavy enough in any event to resist the effects of the oxidizing solution and permit sufficient action to obtain a good finish and black color. A five or ten minute deposit from a warm solution, or a fifteen or twenty minute deposit from a cold solution will usually be found adequate for all ordinary purposes. If the castings are porous and spotting out results after coppering or oxidizing, we would advise a twenty minute copper deposit in an acid copper solution immediately following a thorough rinse after the cyanide copper plate is obtained. Or use a strong blast of compressed air on the cyanide coppered surface to effect a complete removal of the cyanide solution from the pores of the castings. A good cyanide copper solution for your purpose would consist of sodium cyanide, 6 oz.; copper carbonate, 3 oz.; bisulphite of soda, 2 oz.; carbonate of soda (dry), 1 oz.; to each gallon of water required to complete the bath. This solution may be operated either warm or cold, but much better results are obtained when the temperature of the solution is kept at about 130 degrees Fah. To prepare the solution with above mentioned chemicals begin by dissolving the total required amount of sodium cyanide in one-half the total required volume of lukewarm water, then dissolve the copper carbonate in this cyanide solution. This operation may be performed in a stoneware crock containing a small quantity of the cyanide solution; allow the solution to stand a few minutes after each addition of the carbonate has been stirred up well, so as to allow the undissolved portion to settle each time. Do not introduce any solid substances into the plating solution; use care to assure complete solution of all chemicals. When copper carbonate is all in solution, dissolve the soda salts in a small amount of water and add to the solution of cyanide and copper, then stir and boil for about one-half hour. Suspend electrolytic copper anodes on either side of the cathode rod and upon the positive tank terminals. Use a sheet iron tank for hot solution. A good wooden tank may be employed if solution is to be operated cold. Heavy matte deposits are not suitable for oxidizing if a gloss finish is desired; therefore, the copper deposit must either be obtained in a bright condition from the plating bath or the matte must be laid down by scratch brushing, the latter method permits best results, but entails considerable labor and time, and for cheaper grades of work the bright deposit is usually quite satisfactory and may be produced from the copper solution here given by adding 3 to 5 oz. of hyposulphite of soda per one hundred gallons of plating solution. Do not add the hypo crystals carelessly, as an excess will produce conditions which will require considerable time to correct. To oxidize the coppered solution, procure from a reliable supply house a quantity of oxidizing material. You will find this chemical on the market under various trade names. Some are rather inferior, so make sure you obtain a dependable article; in pre-war times German potassium sulphurette was universally employed, but the article available to-day is equally as efficient when used properly. Oxidizing solutions do not retain their effectiveness over long periods and must therefore be made up freshly when needed for use. When the oxidize is to be relieved in spots to expose the copper beneath, the black coating may be rendered softer by adding about one-fourth ounce of sulphate of ammonia to each gallon of the oxidizing solution. To relieve the finish, use a circular felt wheel, or if the entire coating of oxidize is to be finished with a lustre or gloss, use a circular brass wire scratch brush on a buffing lathe. The actual operation of oxidizing is simple. Merely immerse the properly surfaced clean castings in the prepared oxidizing solution and remove; then repeat the immersion without rinsing; continue this until the desired black is obtained; then rinse in cold water, immerse only momentarily in hot alkaline cleaning solution, rinse in cold water and dry off in boiling hot water. Too much oxidizing material in the solution will often cause too rapid precipitation of the sulphide and the coating will be nonadherent, flake or chip. It is advisable to use the minimum quantity of oxidizing material possible to effect the desired finish and allow the black color to develop slowly. The equipment required for this work as described will include a small generator of sufficient ampere capacity to plate the amount of work you wish to process at one time, with a current density of at least 6 amperes per square foot of surface, with an E.M.F. of 5 volts. A tank suitable to contain the copper solution, a rheostat or resistance coil to control the volume of current entering the bath, 1 sheet iron tank for cleaning solution, 1 wooden tank for cold water rinse and scouring, 1 clean barrel for hot water rinse, one or two stoneware crocks for oxidizing solution, copper anodes for copper plating solution brass rods or tubes and connections for same sufficient to equip the tanks using electric current, wires to connect tanks to generator, brushes for scouring or swabbing and the chemicals heretofore mentioned, together with a small quantity of pulverized pumice. If the surface of castings is to be polished, you will require in addition to above, 1 polishing lathe, 1 scratch brush lathe, wheels brushes, emery, glue and glue pots, tables, benches, stools, racks, etc. Do not purchase a generator of just the capacity you require, the larger the surplus the better. Any old dynamo will not give you satisfactory results; we would advise a compound wound machine of at least 50 per cent. greater capacity than you are liable to require for present work. Provide good ventilation in the plant and good drainage, plenty of clean water and an adequate steam supply at low pressure. Then get good conscientious, experienced man to take full charge.

Question.—The nickel solution I am using has been plating dark for some time and the several attempts I have made to correct the trouble appear to have failed. Will your correspondent kindly give me a few notes respecting the cause and remedy in cases of this kind? I want to get a white plate, and the dull dark deposits now obtained cause me a great deal of worry.

Answer.—A nickel solution contaminated with copper in any form usually indicates the fact beyond a doubt to the close observer and the effect is distinctly different from the dark effects caused by local changes naturally produced. To remedy the dark deposit, dissolve 4 oz. of nickel sulphate for each gallon of solution and add to the bath. If this addition brings the color up, let the solution work without further notice. If too acid, neutralize with nickel carbonite. Very frequently dark deposits may be corrected by simply electrolyzing the solution with strong current for a few hours. When time is too valuable to use in this way we would add either sodium chloride, magnesium sulphate or ammonium chloride to the bath in quantities ranging from 2 oz. to 3 oz. per gallon of plating solution. If the conductivity is satisfactory, but the deposit still grey or dark, add 2 to 3 oz. boric acid previously dissolved in a portion of the solution heated by means of injected steam. Double sulphate nickel solutions are more liable to yield dark deposits with slight change in chemical composition than single salt solutions and should not exceed 6 degrees Beaume density. 4 degrees or 5 degrees will prove more reliable over long periods if not overworked and are kept equipped with a plentiful anode surface. It is a grave error to equip a 400-gallon nickel solution with 200 or 300 lbs. of anodes and expect freedom from altering plating conditions unless constant care is given the bath, and this method will prove extremely expensive in the long run. Use plenty of anodes of good quality, see that they feed the bath and you will avoid the frequent addition of salts. Nickel solutions neutralized with ammonia are liable to plate dark and brittle; use nickel carbonate instead. The carbonate can do no harm if added in excess, and as it is dissolved by the free acid is converted into nickel sulphate and increases the metal strength of the solution. The excess simply goes to bottom of tank and remains there, unless disturbed mechanically. For conducting salt, the chloride of nickel is logically the correct chemical, but is not held in popular favor by platers.

Scraps from the Foundry Scrap Pile

Burnett and Crompton, Montreal, have purchased the plant and equipment of the Maisonneuve Foundry, 860 La Salle Street, and will remodel and equip it with the most modern appliances for doing foundry work.

Moffatts, Limited, is the name of a new corporation recently formed in Toronto, to manufacture iron, steel and non-ferrous metal castings. James L. Moss and Arthur B. Mortimer are the principal promoters. The company is capitalized at $1,000,000.

Adam Clark Limited. is the name of a new company which has just been incorporated in Hamilton, Ont., to manufacture stoves, furnaces, etc. William J. Clark and Alfred T. Harvey are the leading figures in the new concern. The capital stock is $250,000.

Hanover Foundry to Expand.—Peppler Bros. Co., Limited, has been incorporated with a capital stock of $150,000 to manufacture iron and steel products, etc., at Hanover, Ont. Messrs. Joseph M. Bullen and Norman S. Robertson of Toronto and others constitute the directorate.

New Brass Foundry for Brantford.—Mr. Richard Hart, of Brantford, has taken out a permit for the erection of a brass foundry at 22 Leonard street in that city. The building will be of brick, 20 feet by 36 feet, and the side walls will be 8 feet in height.

The Independent Steel Specialties Corporation, Limited, has been incorporated with a capital of $250,000 by William L. Davis, Alastair A. Gowan, Frank P. Turville and others to establish a foundry business in Montreal for the manufacture of iron and steel castings and other steel specialties.

Fred J. Passino Gets Promotion.—Fred J. Passino who for many years travelled out of the general offices of the Independent Pneumatic Tool Company in Chicago, covering the Southwest, has just been appointed assistant manager of the Eastern Division with headquarters at 1463 Broadway, New York City, N. Y.

Ground Broken for New Factory.—Ground has been broken and considerable progress made on the new foundry extension of the Philip Gies Foundry, Kitchener, Ont., which is expected to be in operation in May. All equipment will be of the most modern, including *electric* and *compressed air-driven* machinery.

Toronto Foundry Changes Hands.—The Ontario Foundry, Pearl St., Toronto, familiarly known as the Pearl St. Foundry, formerly owned and operated by Thomas Atkinson, has been sold to Fred Hamer, George Jones, W. J. Richards, L. Worsdall, E. Marriott, and F. Crosland. All the members of the new company are practical foundrymen and with business and conditions as they are this spring their success is assured.

New Foundry for Aurora, Ont.—F. Fleury's Sons, Wellington Street, have all plans prepared for the erection of a new foundry and will start building operations at once. The new foundry will be modern in every respect and will be equipped with the most modern moulding machinery and everything which goes to make it second to none.

South African Plant Increasing its Capacity.—The iron smelting and steel making industry of the Pretoria district in South Africa is developing to such an extent that the Union Steel Corporation is converting the 10-ton Siemens open-hearth furnace first erected at the works to a capacity of 20 tons. The plant will have two furnaces of this size.

Foundry Extensions at Goderich.—The National Shipbuilding Co., Limited, Goderich, have added a considerable extension to their foundry, and now have a floor space of 16,000 square feet. They have installed several *moulding machines* and other improvements. Two 25-ton cupolas will constitute the melting equipment.

Another Foundry for Kitchener.—Malcolm and Hill, Limited, is the name of a new concern which has recently been incorporated to manufacture machinery, implements, tools, etc., at Kitchener. George R. Sproat, Charles H. Kemp and other Toronto capitalists are at the head of it.

This, with the new works of Philip Gies, which is under construction, will make Kitchener a busy foundry centre this year.

New Coke Ovens for Toronto.—The Semet-Solway Co., Syracuse, N.Y., have secured an option on twenty acres of land on the eastern industrial area of the Toronto Harbor Commission. They are not prepared at the present time to give out much information about their plans excepting that it is probable that they they will utilize the property for the erection of a by-product coke oven plant.

Reopening Welland Steel Foundry.—The Welland plant of the Canadian Steel Foundries, Ltd., which was closed down last summer, will probably be reopened this spring. The company is negotiating a contract with the Belgian Government for the construction of cars, and it is expected that this will be settled and executed within the next few weeks. The plant will then resume operations with a full force.

Rapid Work on Core-Room.—Fire which did several thousand dollars damage to the core-room at the plant of the Taylor-Forbes Company, Limited, Guelph, Ont., on the 20th of February, caused the company some inconvenience but did not cause the men any loss of time. Structural material was delivered the same day as the fire and in less than two weeks the entire plant was running as though nothing had happened. In the meantime the company had not closed down and no one was out of work.

The Sherbrooke Iron Works has been acquired by George L. Downe and F. A. Schaff of New York, who will continue to operate under the name of Sherbrooke Iron Works. The new company will continue to carry on a general foundry and machine shop business, and in addition will instal machinery for the manufacture of superheating appliances for locomotive, stationary and marine engines as well as other steam specialties.

Fort William Foundry Reorganized.—As the result of inspection of various British pipe casting plants, the management of the Canada Iron Corporation's foundry at Fort William, Ont., have decided to reorganize their system of making standard cast-iron pipe, and are in consequence very busy at present in their jobbing foundry, the pressure of work being new equipment for their own use, in conjunction with their regular lines of custom work. Lack of skilled labor, however, is holding things up considerably.

The Smiths Falls Malleable Castings Co., Limited, who owns two malleable plants in that city, but who closed the larger of the two on the outbreak of the war, are now reopening the large plant and completely remodelling it, and installing the very latest improved types of *moulding machines*, etc. When completed they will have a capacity of 6,000 tons of all lines of refined air furnace castings, especially automobile and railway work. They have recently booked a considerable tonnage for United States export.

The Gartshore-Thompson Pipe and Foundry Co., Hamilton, Ont., are making considerable improvements and extensions to their foundry. The old foundry, which was their original plant, has been rebuilt and a new cupola installed with all-steel staging and everything modern. This will be an auxiliary to their pipe foundry, greatly increasing their capacity. The company has had a mutually agreeable settlement with their moulders. Although handicapped through inability to secure iron a few weeks ago they are now running about normal and receiving their share of the business with which Canada is blessed this year.

Electric Pig Iron and Alloy Plant.—The electric furnace plant of Fraser, Brace and Co., of Shawinigan Falls, Que., and the iron foundry of Normandin Bros., have been recently acquired by Shawinigan Foundries, Limited. G. G. McCartney is president of the new organization; W. G. Dauncy is vice-president and metallurgist, and Capt. C. M. Hallis is secretary-treasurer. The company intend to manufacture pig iron in one of the electric furnaces. They also contemplate the production of ferro-alloys and special steel. Extensive additions will be added to the iron and brass foundries to cope with the increased demand for castings. A special grade of semi-steel will also be put on the market.

Toronto Brass Foundry Damaged—The Runneymede Brass Foundry, 3360 Dundas Street, West Toronto, was damaged by fire, of unknown origin, to the extent of $2,000 on the morning of April 5th. The building was damaged to the extent of $1,000 and the contents $1,000. It will be repaired at once.

New Wage Demands.—At a meeting of the American Federation of Labor, held in Montreal a few days ago, the following decisions were arrived at: Demands will be made on the firms comprising the metal industries on the first of May for a forty-four-hour week. Wages to be 90 cents an hour for mechanics, 65 cents an hour for helpers, and 60 cents an hour for laborers. The Federation has 400,000 members employed between Halifax and Port Arthur.

The Natural Resources Intelligence Branch of the Department of the Interior. Ottawa, Canada have presented us with a map of Northern Alberta land districts which is a sample of the various maps which the Department is distributing free to those who ask. The other maps which are available include maps of the different provinces and show the different banks, elevators, cereal data, homestead lands, forest reserves, etc., etc. Various pamphlets and reports are included. They are well worth asking for.

CANADIAN FOUNDRYMEN HOLD ANNUAL MEETING

The first annual convention of the Canadian Founders' Association, an organization consisting of the foundry proprietors and officials of Ontario and Quebec, was held at the King Edward yesterday. There was a large attendance of delegates. The meeting was held in private and it was announced at its close that the discussion was relative to foundry operation methods, production systems and other matters of special interest to foundrymen. While only two provinces are represented in the membership oft he association, it is the intention of its officers to increase the organization to embrace all parts of Canada.

BURNED TO DEATH

Arthur Black, a core maker employed by the W. & J. G. Greey Co., Esplanade St. E., Toronto, was burned to death in his room at the Albion Hotel on the night of April 4.

Wisely organized industry does not aim at quick and enormous profits; quite the reverse.

One must be just, and, if just, if necessary, severe.

Remove the incentive to personal gain and human progress would not get very far.

A man must be shrewd, but never sharp.

The Lord never gave a man a good enough memory to be a successful liar.

DEATH OF WILLIAM FROST

The death of Wm. H. Frost, which took place at Smiths Falls, Ont., on March 18, has removed another of Canada's pioneer foundrymen.

Mr. Frost was born in Smiths Falls on the 10th of November, 1847, and spent his entire life in that town, with the exception of a short term spent in Chicago when a young man.

Mr. Frost's father was the founder of the Frost & Wood Agricultural Works, which has for so many years been the largest manufacturing concern in the place. Mr. Frost, who has just died, was the founder of the Smiths Falls Malleable Casting Co., Limited, which is the second largest establishment in the town. He, in company with Mr. Charles Jones, started this business in a small way in 1878. He shortly afterwards bought out his partner and continued to operate the plant alone until a few years ago, when the Smiths Falls Malleable Casting Co., Ltd., was incorporated, with Mr. Frost as president. Mr. Frost, in addition to being the leading figure in this institution, was also a director in the Frost & Wood Co. He is survived by his widow; one son, George Bartlett Frost; and two daughters, Mrs. F. C. Clayton and Mrs. (Dr.) Patterson.

HAMILTON FOUNDRY BUSY ON AUTOMOBILE CASTINGS

Mr. H. H. Todd, superintendent of the Hamilton Stove and Heater Company's works, informs us that they have closed a contract with the Canadian Products, Limited, Walkerville, Ont., for casting the fly-wheel housings, crank casings, oil distributors, pistons and sundry other parts for the Chevrolet and Buick engines to be used on the autos which will be built by the General Motors in their Canadian plants. The initial order calls for a tonnage of about thirty-five tons per day, which it is expected in the near future will be increased to fifty tons per day. This class of work is a good example of what can be profitably turned out on moulding machines. Ten power machines are used on this work. The company had four Nicholas machines and four Arcades, and have now installed two right up-to-date three-in-one Osborne machines. The operation of these machines is an interesting innovation in foundry work. All the machines are interesting, each having its own peculiar characteristics. Take for instance the moulding of a fly-wheel housing on the Osborne machines. The two machines, it might be explained, are used on the one mould. The cope is rammed right side up and does not require to be rolled over; it is therefore moulded on a plain jolt machine. The drag has to be rolled over, it is therefore moulded on a roll-over machine. In moulding the cope, the cope flask is placed on the table of the machine, which is in reality a stripping plate with the pattern projecting up through it. The sand is put in and a valve opened, admitting the compressed air, which jolts the mould up and down. The stripping plate pattern, together with the flask of sand, are all jolted together by this operation. The jolting settles the sand into every crevice where sand can go and leaves it sufficiently hard at the bottom, but not at the extreme top. This is put into proper condition by means of the squeezer, which is simply a stationary plunger, attached to the cross-beam of the machine. The table which is movable, is placed under the plunger and the air admitted underneath it, forcing the mould up against the plunger. This done, the pattern is stripped through the plate by means of the air, and the cope is done. This makes the three operations on the one machine, viz., jolted, squeezed, and the pattern drawn.

The moulding of the drag is done in the same manner with the exception that the machine for doing this has a roll-over attachment so that the drag may be made with the face down and then rolled over. Verily, the moulding machine only requires to be taught to talk, when it will be perfect.

CANADIAN HART PRODUCTS, LIMITED, INCREASE CAPITAL

Canadian Hart Wheels, Limited, Hamilton, Ont., has been reorganized and its capital stock increased to $500,000, divided into 5,000 shares of $100 each, of which 2,650 shares are common and 2,350 shares are eight per cent. cumulative preference shares. The name of the company which was originally the Hart Emery Wheel Co. and which was later on changed to Canadian Hart Wheels, Limited, will hereafter be known as Canadian Hart Products, Limited, this latest change in the name being made on account of the fact that it is the intention, in the near future, to launch into other lines than grinding wheels. The Hart Emery Wheel Co., as it has been most familiarly known, has had an interesting career. The business was established in 1869 and has been a success from the start. As is well known, the emery wheel was a crude affair in those days, but the Hart people were on the ground floor and worked up with the business, and their name has become a by-word in Canada in connection with grinding wheels. They can truthfully be called pioneers in the business and the new venture does not mean any slacking off in the present line.

As was explained in a former issue of this paper, the grinding wheel is an offshoot of the pottery business, and many of the processes of the one are similar to those of the other, and it is into this line that the company will ultimately launch.

Mr. Robert Meldrum, F.C.S., of Paisley, Scotland, who has, for a number of years, been chief chemist at the great Daulton works in that city, and in which the world-famous Daulton china is produced, is severing his connection with that institution and coming to Canada to be the leading spirit in the new department of the industry. Mr. Meldrum is a brother of Mr. A. T. S. C. Meldrum, the vice-president of the company, and, needless to say, is a thorough chemist.

The mineral resources of Canada are unbounded, and it has been demonstrated that potters' clay of the highest order is to be found in Canada, and it is no longer necessary to send money abroad to purchase this class of goods.

Mr. George R. Harvey is still the president, and Mr. A. T. S. C. Meldrum the vice-president of the new corporation, and the grinding wheel will continue to be the predominating product of the concern and its present high standard will be maintained.

THE SMALL FOUNDRY

By the Editor

Some months ago I published an article on what might be accomplished with a small foundry, and in this article I endeavored to prove that if a foundry 30 feet square and employing four molders were operated to its capacity, it could produce castings as cheap as a larger one. A few weeks afterwards I had occasion to visit a small foundry, and when the proprietor saw me coming in the door his first salute was to call me down for publishing that article. and in the course of his call down he proceeded to quote figures to prove that I was all wrong in my arguments. He went on to show me that his shop lost him so much and that his yearly output was so much, and so on he argued his point—the very reverse to what I had been adducing. Now, as a matter of fact he had a foundry floor big enough for at least twelve moulders, and instead of having twelve he had one besides himself. and they were running about one heat per week. I asked him why he did not fill his shop with men and cast every day, but he informed me that he did not have the business, and right there was where he upset his arguments. He had too big a foundry with too much money tied up and too much overhead expense for the amount of business, and if he had secured the business and engaged enough men to fill the shop his cupola would not have been near big enough to supply the metal, so that, all told, my argument still held good.

In going into business, estimate how big a business is to be done and build the foundry of such dimensions as will fill the bill and then equip it with everything proportionately to the size of the shop. My argument was that four moulders working in a foundry thirty feet square could turn out three hundred tons of average castings in a year, and if three hundred tons is as much as will be required there is no use in having it any bigger. I also claim that a foundry with capacity sufficient to turn out three thousand tons of castings per year will cost ten times as much to construct and ten times as much to operate. It will have the advantage of being able to fill orders for larger castings and larger orders for small castings, but it will not be able to produce them any cheaper.

The drawback to the small foundry is that it is seldom run to capacity and seldom properly equipped. Improvised rigging, such as is too often in evidence in the small foundry, cannot be expected to compete with the modern equipment of an up-to-date foundry. Jobbing work is done much the same to-day as always, but jobbing work is not a very extensive line any longer. Practically everything which can be thought of is a specialty with somebody, and the jobbing foundry cannot handle it in competition. But a moulder working in a small shop can do as much work as though in a large shop, and a cupola with a capacity of one ton per day can be run as economically as a larger one. A large cupola run to the limit will show a slight saving on fuel but the small cupola will show saving in other ways which will more than counterbalance this. A large establishment has the advantage in the matter of selling, for the reason that travellers can be engaged, and permanent selling agencies established, which would not be profitable with the small concern on account of not being able to fill the large orders which these agencies will have to secure in order to earn their way. But where work is to be had the small shop can do it as economically as the large one. There are many lines of work which can be done, or more properly speaking manufactured in a small foundry, but modern equipment must be installed.

In the last issue of the CANADIAN FOUNDRYMAN were shown four views of foundries with a description of each one. These were fairly large foundries but the ideas involved in the descriptions could be copied on a small scale. Other ideas, such as stacking the moulds, can be utilized to good advantage in the small shop. This kind of thing is practised in the largest of shops. All there is to it is to run the shop to its capacity and it cannot help but be profitable. The drawback to any business is to have a lot of dead capital in the form of equipment standing idle. For instance, if a shop is run on the system of moulding for several days before pouring off the cupola must be a big one representing quite an outlay of money, and all of this outlay is standing idle with the exception of the occasional hour when a heat is being taken off. When a shop is big enough to work on the system of casting once or twice in a week there is always a lot of it standing idle which cannot be expected to draw interest. An item of big consideration in pouring every day is that in the winter time the shop does not get a chance to cool off and is as a consequence easily heated.

FROM GREAT BRITAIN COMES THE SAME STORY

British foundrymen are beginning to open their eyes to the facts that we have been so persistently endeavoring to impress on to the minds of Canadian manufacturers. The foundry is the source from whence cometh the foundation of all machines, and unless good castings are delivered to the machinist the finished machine will be likened unto the ship built of defective timber. The idea of having a foundry under the control of men who are not practical foundrymen is certainly not the idea which will produce the best results. The following address by one of England's foremost foundrymen will be read with interest by progressive Canadian manufacturers:

Mr. H. E. Reason, in his presidential address at the first meeting of the session of the Birmingham branch of the Institution of British Foundrymen, on October 9, dealt with "The Past, Present, and Future of the Ironfounding Industry." The neglect of foundries in the past, both from the point of view of the welfare of the men and the introduction of labor-saving devices, was attributed, to a large extent, to the fact that works managers were generally machine shopmen, with little or no foundry experience. This lack of attention to what was the heart or mainspring of a works was, he said, difficult to understand, because, without good castings, it was impossible to make headway, and the firms which could produce the best quality castings for the work in hand were usually more successful. He was fully aware, however, that some of the largest and most successful firms had realized the necessity of taking a keen interest in their foundries, which were kept up to date with labor-saving devices, and had laboratories for testing materials. The war had undoubtedly taught the industry that in its previous methods there were weaknesses which must be remedied if it was to maintain its supremacy in the markets of the world. Most of them had found the task of readjusting the works to peace-time trade far more difficult than the change over to war conditions. The rearrangement of machinery in the shops, the making of tools to cope with the work in hand economically, coupled with reduced output and high wages, was throwing upon the captains of industry a terrible strain to compete in the markets of the world. If, before the war, the Government had taken a proper interest in industrial matters we should now have properly organized industrial research associations, with information bureaus, to which manufacturers could look for assistance in the great problems with which they were now confronted. We now found ourselves, after the gigantic efforts of the war with old works greatly improved and enlarged, and new works, many of which were striking into new fields of labor, spending time, which meant money, on experimental work which had been done, or was being done, by other firms in the same line of business. The nation could ill afford to continue wasting money to secure results which had already been obtained. A vast amount of valuable information was already in the nation's possession, only waiting for the proper institution to collect and tabulate it for reference. He pointed out that although the Government had placed a million pounds at the disposal of the Department of Scientific Research and Industrial Research, nothing had been done in connection with the industry which they represented. He feared that unless ironfounders took action at an early date the first Govern-

enterprising industries.

On the Move! A Molder's Story

Being the Final Chapters of this Interesting Narrative

By JOHN WOODSIDE

With this issue we finish a most interesting story by one of Canada's most interesting moulders, in the person of Mr. John Woodside, of Port Arthur, Ont. Our readers will learn with regret that Mr. Woodside is at present confined to his bed through illness and will all join in wishing him a speedy recovery. John spent his younger days at foundry work, when jobs were not hunting the men as they are these days. His reminiscences make interesting reading now that they are past, but would not be quite as interesting while being experienced.

In the last chapter we found him turning his back on the foundry and seeking other employment after vainly tryinf to locate foundry work.—Editor.

UNDER these circumstances I put up at a hotel for the night and next morning, finding that I had funds enough for a ticket back to New London, I took the train and beat a safe retreat, nor did I linger in the coast city, but finding a boat returning to Greenport that evening, I got aboard and reported duly at my refuge home. My last and most discouraging venture was at a brickyard a mile or two out of town. I went out in the evening, and at last obtained a job at $13.00 per month and board.

I might have rung in as a brisk moulder, but was content to take the humbler task of filling and emptying the mixer with clay from an adjacent bank. The grub was of the plainest; the bunks, blankets on a board bottom. We were out by sunrise, digging the tough mass out of the mixing place, and dumping it handy to the moulders. Then after a rough dinner we tackled the solid clay bank, the reserve material; our task was to refill the mixing machine. The July sun beat down pitilessly upon us; the stuff yielded only to solid pick and shovel treatment, nor was the yawning machine full until sunset, which also brought some alleviation of our distress and a chance for some supper. And this was the routine, day after day, for the month, and then we would each have a whole $13.00 earned, and which, it seemed to me, I could well take "without scruple," as it would be fully earned. An old Irishman, an old-timer, who lounged around with me after supper, wanted to know what a lad like me wanted in a such a hole as this, and advised me to "bate it," as new hands scarcely ever stood it out for a month and were not likely to get paid unless they put in a full month.

Having a mental comparison on, I remarked that I believed the army would beat this. My mentor replied, with some conviction that, "Hell would bate this." So I wandered forth townward, and left a day's pay to cover board expenses. This latter experience pretty well decided me on my next resort, yet I did not mention my plans to my disturbed relative, who, I saw plainly, was beginning to doubt my desire for a steady job. I joined in the great 4th of July celebration at Greenport, upon which occasion I tried to be liberal in spirit over the old question of who was right or wrong. I believe I was, personally, somewhat indifferent on this one hundredth anniversary, and would no doubt have forgiven Uncle Sam much if I could but have secured a steady, good-paying job. Incidentally, also, I met with the big Swede foreman of the brickyard I had so summarily quitted, and he told me I'd better come back, the boss liked my work and would pay $15.00 per month.

I was not to be shaken, however, and after helping a couple of the neighbors harvest their acre or two of early oats. I secured the price of a ticket to the city, nor did I dare divulge my plans to my hospitable uncle, for he would have held it as a breach of hospitality to forsake his board for army rations.

The country was seething still with indignation over the "Custer Massacre," and I knew that recruits would be mainly to fill the regiments on duty in the Indian country. It was a chance for adventure, and to cut clear of this o'er weighty care for a living, and of course along with the rest came the desire to try for some of that gold I had heard so much about last winter. I slid out one day and visited the recruiting depot for infantry. The officer in charge was polite, but lacked the warmth of the regular British recruiter and did not show up any "shilling." However, I was favorably impressed, and next day took my place in the line of applicants for a suit of blue, with shiny buttons and a gray blanket of the "doughboys" stripe. I got through on my good points of build and shape, which was always easy to fit a uniform to; but there were only four of us for the day's selection. That my intentions were honest may be inferred from the fact that I enlisted under my proper name, which I found later was not the universal custom, causing the long-suffering drill sergeant to remark to an absent-minded recruit at roll call, "You'd better write that name in your hat so you won't forget it so easy." Being chidden by my uncle when he visited me in my new home, I dilated upon the possibilities of a trip west, and some adventure, but I was fain to admit that if the service proved too irksome, the chances for change looked good, for out of a force of 25,000 men, the yearly desertions ran up to some 5,000 yearly, and if those discontented ones settled back to good citizenship, they were rarely disturbed. The Government used to pay a bounty of $50.00 for deserters, but as they found that it merely fed up a class of detectives and made criminals of a lot of men who would have settled back into good citizenship, they withdrew the reward and an arrest became a matter of some petty spite. There may be many objections to army life during peace times, but to me the change from the borderland of the hobo to a settled service of years ahead, was a great relief. And though the restrictions of army life might be galling at times, the knowledge that the job was not depending upon the caprice of a shop foreman, and a very slack demand for service, was comforting to one who could prefer the camp fires of the nation to his own little fire beside the "track," and assured army rations to the uncertain "handouts" and roasting ears filched from the corn field of a hostile settlement. So, for a time, adieu to Tubal-Cain and welcome Mars.

Grinding Wheels and their Various Duties*

By JOSEPH HORNER

MACHINISTS have travelled far since the early precision grinding machines were designed. At that time, and for a long subsequent period, there was only one material used for grinding wheels—the natural emery, and the term "emery wheel" exactly denoted its composition. Variations could be made in grain, and in grade, but no difference in the hardness of the grains. Further, the natural product was always impure, being contaminated with earthy matters that do not cut—oxide of iron and other substances. Naxos emery contains only about 63 per cent. of crystalline alumina. Corundum is a natural abrasive of which emery is a less pure variety. It occurs in two other forms of which the commercial kind is translucent. It is, next to the diamond, the hardest known mineral. It is also contaminated, but not to the same extent as emery. These are the only two substances which were used for grinding wheels before the possibilities of the

* From Hardware Trade Journal

electric furnace became realized. Since that era, the natural products have almost ceased to be employed for any work of high precision, having been displaced by the numerous artificial products of some form of furnace in which the work is either of a purifying, or of a synthetic —a building-up character. The story is almost like one of the romances of manufacture, since some very unpromising substances, coke and sand, are transmuted at temperatures far above that of molten steel, into abrasives only second to the diamond in hardness. These products are denoted by various trade names which alone reveal nothing. The result is that grinding wheels are now standardized, not alone in grain and grade, but also in regard to their cutting properties, which was never the case with the old emery wheels. The characteristics of a wheel are repeated precisely in all others of the same name and description. The value of this certainty in highly repetitive grinding practice need not be emphasized. No single firm now has a monopoly of grinding wheel manufacture. There are many in the market, some of whom have specialties of value prepared under their own methods.

What is Corundum?

Corundum—the purer emery—is a product of the electric furnace, but not in the same sense that the artificial abrasives are. The aluminum oxide is simply crystallized by the intense heat instead of naturally, and the product is not contaminated by foreign matters as the natural corundum is. The trade name of this is "oxaluma." With this exception all the products of the electric furnaces are prepared artificially by synthesis.

The first of these was carborundum, prepared at Niagara by power obtained from the falls. Coke and sand are the ingredients used. The first supplies the carbon, the second silicon, so that the product is a carbide of silicon. The diamond alone exceeds it in hardness. Sawdust is added in the furnace, but only to render the mixture porous enough to permit of the escape of the gases. A resistance core of carbon rods is inserted in the furnace, connected with the power cables, and a temperature of about 7,000 deg. Fahr. is maintained for something like thirty-six hours, after which the crystals produced are removed. Crushing, washing, and sorting the grains into the different sizes required follows.

Another carbide of silicon is that termed "Crystolin," prepared from coke, sand, sawdust, and salt. The method of production is different from the other. A core of small coke is raised to a temperature of 3,500 deg. to 4,500 deg. Fahr. by a current of 12,000 volts, which produces a chemical reaction without fusion. This material also is only second to the diamond in hardness.

Alundum is an artificial abrasive of a different class, being an oxide of alumina, resembling therefore in that respect the natural emery. It is prepared from the soft mineral earth, bauxite, which is the purest form of aluminum oxide found in nature. It is first calcined at a red heat to drive off moisture, and is then fused between electrodes until a mass of alundum of several tons weight is produced. This is broken up, pulverized, and sorted for grain.

Aloxite is also prepared from bauxite, and is hard and sharp, and suitable for grinding materials of high tensile strength. The bauxite is calcined to remove moisture, is then mixed with coke and placed in the electric furnace. The proportion of coke is adjusted to remove the oxides of silicon and of iron present, but to leave the alumina unreduced. The charge is fused between vertical carbon electrodes at about 4,000 deg. Fah. A mass of several tons weight is produced, which is broken, crushed, and graded for size.

These are the best known of the artificial abrasives, but there are others, and the number grows. The aspect which interests us is that materials are now exactly correlated to the work that they have to perform, which is not the case when emery alone is available. The point is that wheels are prepared suitably for the materials on which they have to operate. Materials of high tensile strength, as the steels, require wheels of a different character from the softer brasses, the bronzes, and the cast iron. That is the first fact. The second is that apart from the materials used, the size of the grains, and the character of the bond or matrix which unites them has to be selected to suit the harder or softer nature of the materials operated on. Broadly, hard materials require wheels from which the grains are torn away quickly, more than the softer materials do. But only broadly, since the question of clogging arises in some soft materials, as brass, for which soft wheels are required. In general, materials of high tensile strength—the steels—require abrasive wheels of an alumina oxide abrasive, those of low tensile strength—cast iron, the brasses and bronzes—wheels made of carbide of silicon.

An Important Point

The point to bear in mind always is that a grinding wheel is in effect an assemblage of millions of cutting points which, as they become dulled, must be torn away from the matrix, exposing fresh sharp grains for the work. The sparks thrown off from work that is being truly cut, and not rubbed, show under the microscope as veritable chips, not easily, unless care be taken to select a proper wheel, and to run it and the work at a speed suitable.

It has been stated that a wheel 24 inches in diameter, with 4-inch face, presents approximately 1,086,171,000 cutting points per minute to the work. The laws which govern the action of these multiple tools are as precise and inexorable as those which concern the more obvious cutting tools in the lathes, planers, milling machines. The great difference is that the first are thrown out and discarded after brief service, the second are resharpened.

This is the explanation of the bonds used, denoted by the term "grade"—that is, the materials employed to hold the grains securely just as long as they retain their cutting efficiency — their keenness of points—but not a moment longer. It is a nice problem, not easy of solution apart from experience, but information on which manufacturers are ready to supply. From this aspect wheels are hard, soft, or medium. A hard wheel does not signify anything concerning the character of the abrasive itself, but denotes the tenacity, the holding power, of the bond. The soft wheel may contain the same abrasive, but the bond does not hold so tightly, but permits the grains to become torn out more quickly than the hard wheel does.

This is entirely distinct from the question of the size of grains, which vary in degrees of coarseness, determined by the passing of the grains through sieves of various meshes, ranging generally from 24 to 60 per lineal inch. In the majority of instances the grains in a wheel are uniform in size. But combination wheels contain grains of different sizes, the object sought being to avoid changing wheels for roughing and finishing, the combination of grains of different sizes in one wheel permitting of employing the same wheel for roughing and finishing.

The Classes of Bonds Used

Different classes of bonds are used for groups of wheels employed for different classes of operations. There are the vitrified, that most widely used, the silicate, and the elastic, and vulcanite wheels for special work only, for which the wheels must be very thin.

The process in widest use is the vitrified, in which the wheels are burned in order to partly melt the bond that holds the grains. These wheels are porous and free cutting, and the bond is nearly as hard as the abrasive. But large wheels made thus are liable to crack, and the control of the burning process is difficult. They are of a reddish color, and ring when they are tapped. The bond used is a clay—generally a pure grade of kaolin. It is mixed with the abrasive to the consistency of thick paint, and poured into moulds. When very hard wheels are required, they are made in moulds under hydraulic pressure. Moulds are larger than finished wheels to allow for shrinkage in drying. They are burned in a kiln when packed in fireclay saggers, the kiln being luted during the burning, which is continued during from three to five days, followed by slow cooling for a week. Silicate of soda is the bond used in the silicate process. The mixture, with the abrasive, is tamped in moulds by hand, and baked in ovens at a temperature very much lower than that required for the vitrified process. These wheels are excellent for wet grinding, but are not so free cutting as the harder grades of vitrified wheels of the same grades are. They are of a light gray color.

The very thin wheels are bonded with shellac—elastic wheels, or with vulcanized rubber—vulcanite wheels, both be-

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$42.40
Lake Superior charcoal, Chicago	57.00
Standard low phosphorus, Phila.	50.00
Bessemer, Pittsburgh	43.00
Canadian foundry pig—	
No. 1, Toronto	52.00
No. 2, Toronto	50.00

NEW METALS

	Mont.	Tor.
Lake copper	$25.00	$24.00
Electro copper	24.50	24.00
Casting copper	24.00	24.00
Tin	77.00	75.00
Zinc	12.50	12.25
Lead	12.00	12.00
Antimony	14.50	14.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$15.00	$14.00
Copper, crucible	18.00	18.00
Copper, heavy	18.00	18.00
Copper, wire	18.00	18.00
No. 1 mach. comp.	16.00	17.00
New brass cuttings	11.00	11.75
Red brass cuttings	14.00	15.75
Yellow brass cuttings	8.50	9.50
Light brass	6.50	7.00
Medium brass	8.00	7.75
Scrap zinc	6.50	6.00
Heavy lead	7.00	7.75
Tea lead	4.50	5.00
Aluminum	19.00	20.00
	Per gross ton	
Heavy melting steel	18.00	18.00
Boiler plate	15.50	15.00
Axles (wrought iron)	22.00	20.00
Rails	18.00	18.00
Malleable scrap	25.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	12.00	12.00
Car wheels	22.00	26.00
Steel axles	22.00	20.00
Machine shop turnings	11.00	11.00
Stove plate	25.00	25.00
Cast borings	12.00	12.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.16
Iron perchloride	.62
Lead acetate	.60
Lead acetate	.30
Nickel, ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite, per cwt.	8.00
Sodium phosphate	.18
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.60
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.09
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09
Crocus composition	.12
Emery composition	.10
Rouge, silver	.60
Rouge, powder, nickel	.45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$42.50	$43.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	46.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	8.00	48.00
Copper sheet, planished, 16 oz. base	46.00	45.00
Braziers', in sheets, 6x4 base	45.00	44.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.75	$14.50
Sheets, 3½ lbs. sq. ft.	10.50	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.25	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 8.50	$ 9.50
Sheets, black, No. 10	8.50	9.00
Can. plates, dull, 53 sheets	8.50	10.00
Can. plates, all bright	8.60	9.00
Queen's Head, 28 B.W.G.	11.00	....
Fleur-de-Lis, 28 B.W.G.	10.50	....
Zinc sheets	16.50	20.00

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ing baked at a low temperature. They are very hard and tough, but do not permit of so fast grinding as the others do. They are used for saw gumming, for sharpening milling cutters and severing stock. They will run in water, but oil or caustic soda damage them. They are porous.

The grain of wheels—the degree of fineness or coarseness of the grains to linear inch—is indicated by numbers. The grades—the degree of hardness or softness of the bond—are indicated by letters. The lists of different manufacturers differ here, so that those of one maker do not afford exact comparison with those of another.

Since there are so many differences in materials, not only taking note of that which divides materials of high tensile strength from those which are of low strength, but also in alloys and mixtures of the same designation, the necessity for a wide selection of wheels is apparent. The steels include scores of combinations of a few elements in varied proportions. The brasses, the bronzes, the aluminium alloys, each include many differences.

And when the wheels most suitable for any single group or specimen are selected the ultimate end is not achieved. The relations of the wheels and the work, the speeds and the question of lubrication, entail variations in the wheels selected.

Contact Between Wheel and Work

The principal problem here is that concerned with the area of contact between the wheel and the work. Obviously there is little in common between grinding cylindrical pieces of small diameter with the edge of a wheel and grinding plane surfaces with the face of a large disc wheel. In the first case the arc of contact is little more than a mere line, in the second the area of contact will often amount to several superficial inches. In the first the grains will fall away directly they are released from their bond. In the second they will remain entangled between the wheel and the face of the work. The result is that the work will become heated up and will warp. In general, therefore, the larger the area in contact, the softer should be the grade of the wheel, and the larger the volume of lubrication to drive out the grains released. Strictly the term lubricant is not correct. The liquid is used solely for cooling, and for washing away the swarf. Enormous volumes are used in present-day practice in order to prevent risk of distortion of the work.

It follows that with small and moderate increases in the areas of contact, wheels of softer grades must be used. Since a cylindrical piece of work of large diameter offers a larger arc of contact to the wheel than one of small diameter does, a wheel of grade or two softer is desirable. So, in grinding bored holes, the arc of contact is much larger than when doing outside work, and again a softer wheel is wanted, and generally a larger volume of cooling liquid. Again, surface grinding with the edge of a wheel presents a larger area than cylindrical work does. And so we come to the most severe work of all, that of plane surfaces with the face of a disc wheel. And the wider the work the softer should be the wheel.

The man who aspires to operate precision grinders has much to learn, and he is always learning and gathering rich stores of experience.

The Present Status of the Electric Furnace

The Electric Furnace Has Found Its Own Particular Sphere of Usefulness and With Increasing Knowledge of Its Capabilities It Will Become a Necessary Aid in the Iron and Steel Industry

By W. F. SUTHERLAND

THE electric furnace as a metallurgical instrument has come to stay. Its importance during the war was very evident, and the ease with which it handled troublesome raw materials such as shell turnings, together with the high quality and comparative cheapness of the resulting product, brought it very prominently to the fore. Extravagant claims have been put forward as to a possible revolution in the steel industry through its aid and, equally pessimistic views have been held as to the future of electro-metallurgy—the truth will probably be found midway between the two extremes and the future work of the electric furnace in the iron and steel industry will be the making of steel industry through its aid, and equal- and complex alloy steels and the refining of hot metal from the open-hearth and Bessemer. There are also excellent possibilities for its use in the making of steel direct from ores; this feature is dealt with at greater length below.

The crucible process, while one of the earlier methods of producing steel, has been almost superseded by the electric furnace. Several factors are responsible for this. The crucible process is expensive and at best can never handle large quantities unless an enormous plant is installed. It is also subject to metallurgical limitations which are absent in the electric process. In the latter the carbon content can be more accurately controlled and refining is possible to a far greater extent. The costliness of the former process is also obviated.

When the open-hearth or Bessemer is considered the advantages are not so apparent, at least in the quantity production of steel. For plants working from cold metal the electric furnace is ideal and is rapidly supplanting the Tropenas convertor and the smaller sizes of the open-hearth. Better steel results; the ease with which occluded gases are eliminated, the refining operations which can be carried on and the facility with which alloying additions can be made, all serve to give the electric furnace a very decided advantage. While good steel does not necessarily result from the electric furnace, since it in itself is only a means to an end and depends like everything else upon intelligent operation for best results, it is possible to produce a much superior steel than that obtained by the other processes mentioned. It must be remembered in this connection that the better the product the more it usually costs and the production of high-grade steel in the electric furnace necessarily costs more than a poorer quality. Cheaper grades of scrap, cheaper because of their physical condition, can be successfully handled, thus the familiar shell turning of bygone munition days made an admirable raw material.

While the electric furnace process will likely supplant other forms of steel making from cold scrap, it is unlikely that it will ever entirely supplant the Bessemer and open-hearth in the making of steel direct from the product, either hot metal or in pig form, of the blast furnace. Rather, it will become an adjunct to these types of furnaces, being used for finishing off the product resulting from their operation. The reason for this is apparent when the reduction of the carbon content of the blast furnace iron is considered. It is entirely possible to bring the carbon down, but the reactions resulting from the addition of ore for this purpose are not conducive to furnace life and the time taken greatly increases the power input required. Finishing off in the electric furnace is entirely practicable and is being practised to-day with material benefit to the physical properties of the resulting steel.

The Electric Smelting of Iron Ores

Much effort has been expended on the problem of making iron and steel direct from iron ores. In its essentials, simplicity itself, many difficulties have been encountered and the cheapening of the process to a point where it would be able to compete with the blast furnace has been a matter of extreme difficulty.

The electric smelting of iron ores differs from blast furnace practice in that only sufficient carbonaceous material is incorporated in the charge to reduce the ore and to give it the necessary carbon content. None is needed for the supplying of heat necessary for reduction, this being furnished by electric energy. A material saving in fuel is thus effected, and where this is imported at considerable expense the process is economically feasible.

The blast furnace suggested one line of attack and the furnaces used in Sweden at present are the outcome These consist of a shaft and bush similar to those familiar in blast furnace practice, superimposed upon a hearth fitted with electrodes. The reduction is effected by carbon and a portion of the waste gases are recirculated. The electrodes are submerged in the charge and serve to furnish the heat for reduction to fluid metal. While the saving in fuel is important the consumption of power is considerable, ammounting to about 2,000 kw. hr. per metric ton.

The process also suffers from the further disadvantage of producing only pig iron. The iron produced under the best operating conditions is a white charcoal iron, and while of high grade, can only be used in the open-hearth as melting stock.

The direct production of steel from iron ore has been attempted by Stassano and others in the arc furnace, typified by the familiar types of the steel foundry, although differing from them greatly in design and construction. Here also a measure of success has been attained but at considerable expense, thus rendering the process economically impossible.

The true solution of the problem will be found in a discontinuous process—one in which the bath is subjected to the refining action of slag or other influences for the proper time. Furthermore the reduction of ore to the metallic state should be accomplished without the aid of electrically-produced heat. In addition to this the carbon content of the material changed into the electric furnace should be such as to eliminate a lengthy period for its adjustment.

The solution of the many difficulties surrounding the conversion of iron ore into steel without the aid of the blast furnaces and by the use of electric heat has been brought appreciably nearer solution by a method devised by J. W. Moffat of Toronto. An article descriptive of the process and outlining the patent claims appeared in CANADIAN FOUNDRYMAN last year, and a brief outline will be presented here.

The ore is first treated in a reducing furnace of comparatively low temperature in which it is deprived of its oxygen as completely as possible and is then in a physical form known as "sponge." This product is transferred, either hot or cold, into an electric furnace to be melted down and finished into metal. The finishing of the metal in the melting furnace makes the process a discontinuous one—more convenient in operation and more suitable for meeting trade demands.

The various phases through which the ore passes in its conversion into metallic sponge are of some interest. Hematite (Fe O) begins to be reduced at a temperature of about 300° C., and has been converted wholly into magnetite (Fe O) at a temperature of 450° C. This ore, with the natural magnetite in the charge, begins to be reduced to a ferrous oxide (FeO) at a temperature of about 500° C., and the reaction is complete at about 590° C. Ferrous oxide begins to be converted into iron (Fe) at 700° C., and the reaction becomes more rapid with increasing temperature until a temperature of 800° C. is reached when it is complete, all the iron being in a spongy metallic state. The sponge iron is all melted when temperatures of 1100° to 1300° C. are reached, there being some variation in the heat required according to the analysis of the iron.

BAWDEN MACHINE CO., LTD., TORONTO, ACQUIRE ENGLISH LICENSES

Following three visits to the United Kingdom by Mr. A. G. Hill, and negotiations which have covered a year, arrangements have been completed by which the Bawden Machine Co., Ltd., of Toronto, will manufacture under license several well-known varieties of British machinery. They will keep on hand a large stock of parts for repair of machines already erected here, thereby obviating the necessity of sending to England with the accompanying delay. This difficulty has often stood in the way of making sales of British machinery in Canada, and the new arrangements should be a great help to the sales efforts of the firms included in the agreement. The Bawden Co. will build up a competent engineering sales staff, and Mr. Hill is of the opinion that a very good business can be built up, especially under the present exchange rate, which is favorable to developing trade with English firms.

The firms whose lines will be carried will include some of the best known manufacturers in the United Kingdom, whose names carry a guarantee of excellence. They are Robey & Co., Lincoln, England, manufacturers of steam and oil engines, of the stationary and portable types, and boilers; Alley & McLennan, Ltd., Glasgow, Scotland, makers of air compressors, steering gears and water works supplies; John Thompson, Ltd., Wolverhampton, Eng., makers of water-tube boilers and corrugated furnaces; David Bridge & Co., Ltd., Castleton, Eng., makers of the Bridge clutch, rubber and textile making machinery; E. S. Hindley & Co., Ltd., Bourton, Dorset, Eng., high-speed steam engines; Brown Bros., Ltd., Edinburgh, Scotland, makers of telemotors, steering gears and marine auxiliaries; Bow McLachlan, Ltd., Paisley, Scotland, making the same lines.

The Bawden Company will continue the manufacture of the lines they have been making for several years, including pumps, valves, hydrants, rubber mill supplies, printing presses and automatic machinery and hydraulic presses. The new venture should ensure an era of continued prosperity for this enterprising firm.

THE BOSS'S FAVORITE

Even when factories and foundries were first invented, one of the old standbys was this:

Binks: "I don't like our boss. He has too many favorites."

Jinks: "I know he has. But did you ever notice that his favorites do most of the work around the place?"

Dear to the heart of the boss is the man who works, who eats work, talks work, lives work, whether the boss is standing over him with a club or not.

Any one can dream. Air castles require no gangs, and also pay no rents. Any one can get down on time and appear to keep busy all day. But some men actually work. They peel off their coats and get things done as quickly and thoroughly as though it were their own tasks they were tackling. Is it any wonder that such a man is the boss's favorite?

While other are getting ready to begin a job, he does it. While others are explaining why such and such a task is impossible, he interrupts with the news that he has done it.

Such men are naturally favorites. Do you wonder at it?—"Sly Process."

LOVE OF THE GAME

Human nature in general is a great lover of teamwork. Baseball is sport, not because we have Wagners and Cobbs, but because it takes good teamwork to win, and we all like to see good teamwork.

We like to work in teams. Harmonious co-operation makes a strong appeal to all of us, and the executive who plays the game that way fills his associates with an enthusiastic spirit of sportsmanship. Such a man secures wonderful cooperation and whole-hearted support from them.

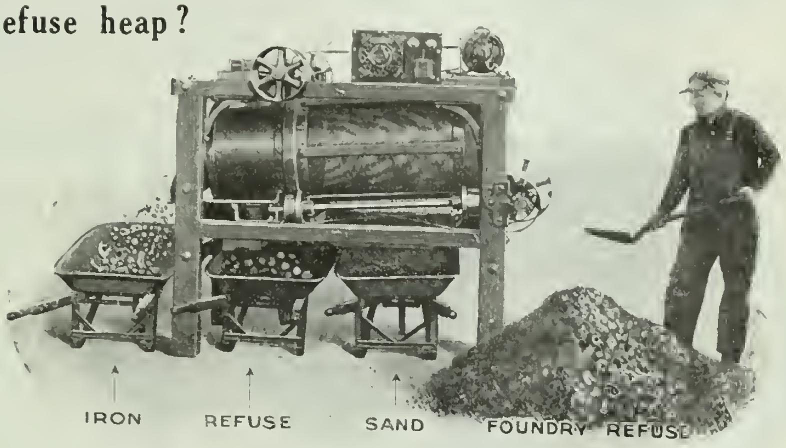
The executive who can inspire his working force with the feeling that they are a part of a winning business team will soon find that inharmony, bickering, and the petty internal strife with which so many organizations are cursed, will disappear like fog before the sunlight.

Employees will then see that they can have plenty of excitement in fighting side by side for the good of the business, instead of relieving their fighting blood by playing petty politics against each other.

AN ANCIENT TIN MINE

The Ding Dong tin mine, near Penzance, Cornwall, England, which was closed down early in the war, has changed hands, and has been reopened. This mine is reputed to be the world's most ancient tin mine, and is stated to have been intermittently worked since the time of the Phoenicians, over 2,000 years ago. Some authorities claim that the tin used as an alloy in the casting of the enormous brass castings used in Solomon's Temple was taken from this mine.

Credit for Machinery.—The War Finance Corporation, Washington, D.C., has announced further credits for machinery. The amount is $10,000,000 and the machinery is to be exported to England, France, Belgium and Italy.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CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

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ABRASIVE MATERIALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

AIR COMPRESSORS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

AIRCRAFT
Ministry of Munitions, London, England.

AIR HOIST
Curtis Pneumatic Machy. Co., St. Louis, Mo.

AIR JOLTS
Davenport Mach. & Fdry. Co., Davenport, Iowa.

ALBANY SAND
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

ANALYSIS
Hersey Co., Ltd., Milton, Montreal, Que.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

ARRESTERS, DUST
Pangborn Corporation, Hagerstown, Md.

BAND SAWS
Oliver Machinery Co., Grand Rapids, Mich.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, SANDBLAST
A. C. Leslie & Co., Ltd., Montreal, Que.
Pangborn Corporation, Hagerstown, Md.

BINDERS, SAND
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

BLAST GATES
Roots Co., P. H. & F. M., Connersville, Ind.

BLAST GAUGES—CUPOLA
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
Clark, Chas. J., Chicago.

BLAST METERS
Clark, Chas. J., Chicago.

BLOWING ENGINES
General Combustion Co., Montreal.

BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison E. J. Co., Toronto, Ont.

BOILER COMPOUND
Reynolds & Co., Toronto.

BOILER GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

BOILERS, STEAM
Ministry of Munitions, London, England.

BOOTS
C. H. Watt, Amherst, N.S.
Ministry of Munitions, London, England.

BORING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

BRACKETED JIB CRANES
Curtis Pneumatic Machy. Co., St. Louis, Mo.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison E. J., Co., Toronto, Ont.

BRASS GOODS, VALVES, ETC.
Crane Ltd., Montreal.

BRASS MELTING
General Combustion Co., Montreal.

BRICKS, RUBBING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.

Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRONZE CASTINGS
American Manganese Bronze Co., Philadelphia.

BRONZE FORGINGS
American Manganese Bronze Co., Philadelphia.

BRONZE INGOTS
American Manganese Bronze Co., Philadelphia.

BRONZE MANGANESE
American Manganese Bronze Co., Philadelphia.

BRUSHES, FOUNDRY AND CORE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CABINETS, SANDBLAST
Frederic B. Stevens, Detroit, Michigan.

CARBON BLACKING
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Woodison Co., E. J., Toronto.

CARS, CORE OVEN AND FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CASE HARDENING
General Combustion Co., Montreal.

CERAMIC KILNS
General Combustion Co., Montreal.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Chaplet & Mfg. Co., Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Lindsay Chaplet & Mfg. Co., Philadelphia.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

CLAMPS, FLASK
Diamond Clamp & Flask Co., Richmond, Ind.
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.

Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

COMBINATION JOLT ROLLOVER AND PATTERN DRAWING MACHINES
Davenport Mach. & Fdry. Co., Davenport, Iowa.

CONTRACTORS' STORES
Ministry of Munitions, London, England.

CONVERTER BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOXES (STEEL AND WOOD)
Diamond Clamp & Flask Co., Richmond, Ind.
Woodison Co., E. J., Toronto.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE JOLTS
Davenport Mach. & Fdry. Co., Davenport, Iowa.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRANES, HAND TRAVELLING
Curtis Pneumatic Machy. Co., St. Louis, Mo.

CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.


GENERAL VIEW HAMILTON WORKS
HAMILTON
BY-PRODUCT COKE OVENS
BLAST FURNACES
Quality
THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON—MONTREAL
Service
OPEN HEARTH FURNACES
DOMINION WORKS
ST. HENRY MILLS
ST. PATRICK MILLS
GENERAL VIEW OF NOTRE DAME WORKS
MONTREAL

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont

EMERY WHEELS—SEE WHEELS

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, STEAM
Ministry of Munitions, London, England.

FACINGS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FITTINGS, CAST IRON
Crane Ltd., Montreal

FITTINGS, FLANGED
Crane Ltd., Montreal

FITTINGS MALLEABLE
Crane Ltd., Montreal

FITTINGS, SCREWED
Crane Ltd., Montreal.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Diamond Clamp & Flask Co., Richmond, Ind.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FORGINGS
General Combustion Co., Montreal.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY EQUIPMENT
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton,
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY SUPPLIES
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Hyde & Sons, Montreal, Que.
Woodison Co., E. J., Toronto.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto Ont
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Black Donald Graphite Co., Calabogie, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEAT TREATING
General Combustion Co., Montreal.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
J. A. Spangler, Benton Harbour, Mich.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, CHAIN AND PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT ROCKOVERS
American Molding Mach. Co., Terre-Haute, Ind.

JOLT MACHINES AND SQUEEZERS
American Molding Mach. Co., Terre-Haute, Ind.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT STRIPPERS
American Molding Mach. Co., Terre-Haute, Ind.
Davenport Mach. & Fdry. Co., Davenport, Iowa.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J
Woodison, E. J., Co., Toronto, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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VOL. XI. PUBLICATION OFFICE, TORONTO, MAY, 1920 No. 5.

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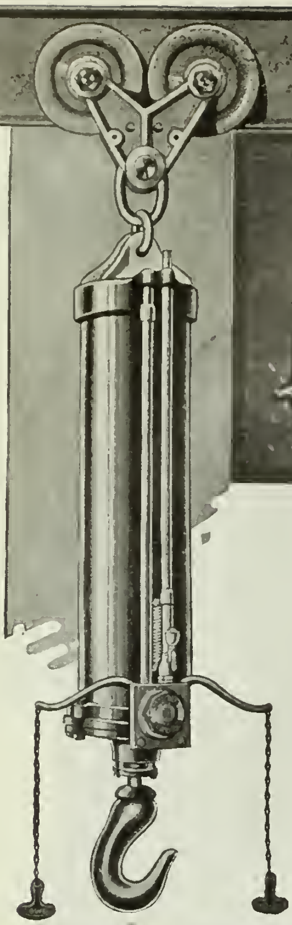

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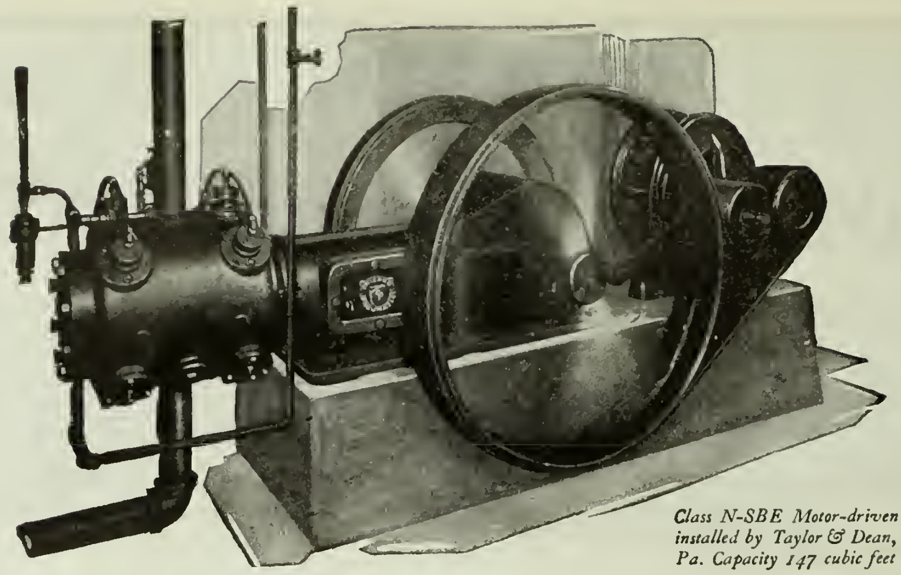

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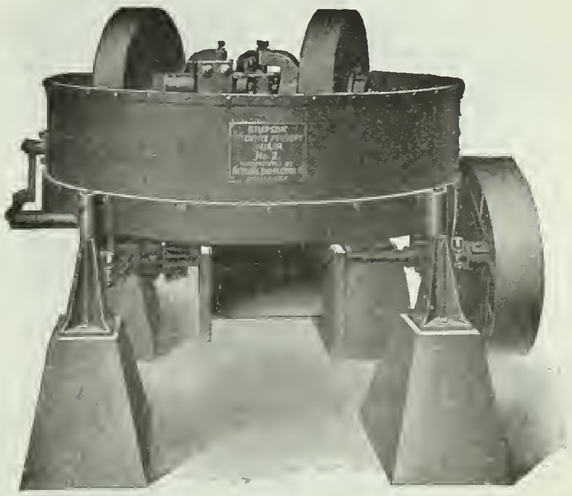

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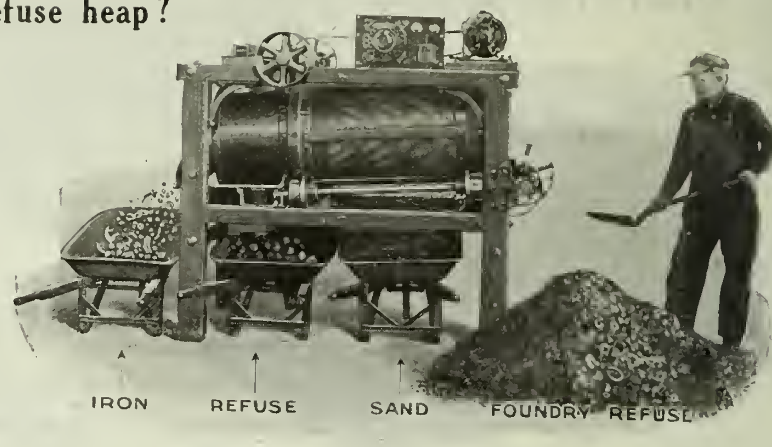

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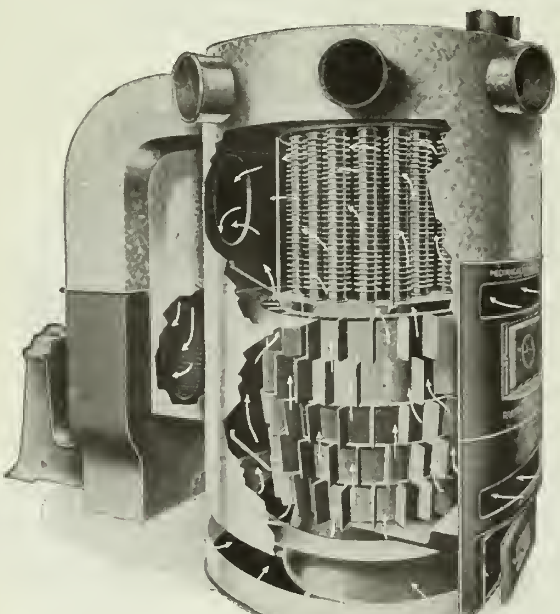

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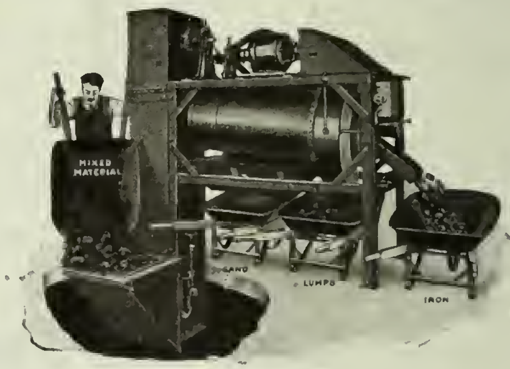

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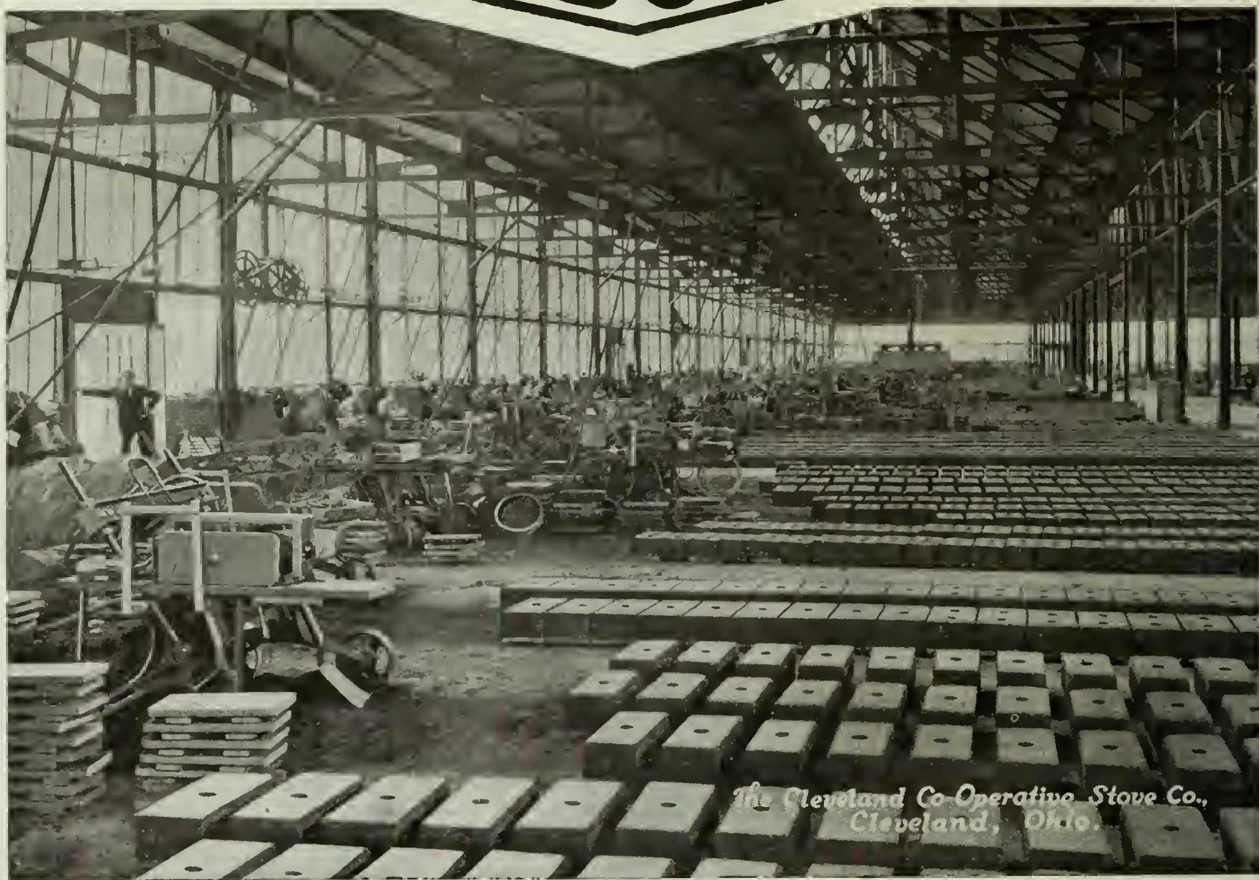

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Part of the foundry floor of the Cleveland Co-Operative Stove Company is shown in the view above. This modern foundry has installed over 100 Osborn Plain Air Squeezers of the Sand Straddler type for use on stove plate castings and other light work.

The merits of Osborn Moulding Machines are proven by the continued repeat orders received from many of the largest foundries throughout the country. Moulding Machines improve the quality of castings produced and increase production.

Consult our engineers if you are experiencing any difficulties with the quality of the castings you are producing or if you are considering increasing your production. They are solving problems like yours every day and will be pleased to work with you.

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No. 82	45"

Combination Jolt Squeezers
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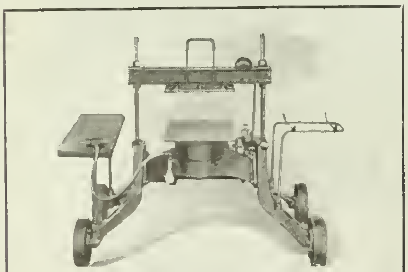
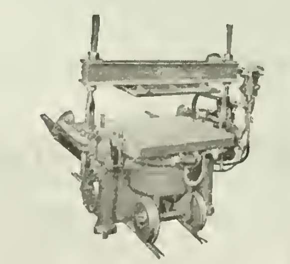
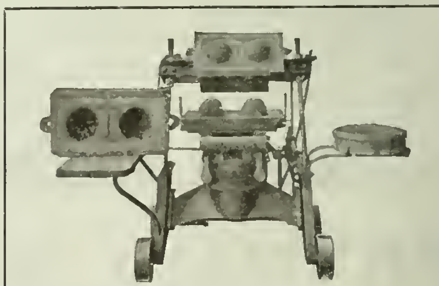
No. 76J	40"



No. 75W Sand Straddler Type Osborn Plain Air Squeezer



No. 81 Osborn Stripping-Plate Jolt Squeezer Machine



No. 75J Osborn Jolt Squeezer Machine

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS
Established 1909 Published Monthly

Different Ways of Moulding the Same Job

Showing How Lifting Ring Can be Utilized to Good Advantage, Saving Expense of Making Special Flask

By George O. Vair

THE accompanying sketches show a casting of which the writer was called on to have a pattern made, and furnish two castings.

The defective casting sent as a working sample had been moulded in a four part flask as shown at AAAA, Fig. 1.

To avoid the cost of making a flask to produce these castings, we cast an "open sand" lifting ring, the plan of which is shown in Fig. 3, same is seen in section at B, Fig. 1.

The three lugs, CCC, on this ring are used to lift; and also to guide check mold off, and to replace same correctly.

Fig. 2 is a plan view of these castings.

In making the pattern suitable to be moulded without the aid of a moulding flask, about the only difference in construction necessary was to make the branch D, Fig. 1, in one piece instead of in halves.

The method of moulding this casting was simply to strike off a level bed to the required pattern depth; and to the dimensions of lifting ring. After ramming the pattern to top of bottom flange, the lifting ring is put on and hammered down to a solid bearing. The ramming up of this mould can then be done in the usual manner.

In making these castings we need dry cores to form prints to carry branch D centre core. The branch pattern having to be drawn out of mould end wire neccessitated sliding the centre core for same through the outside print core into the inside print. Of course, the outside print core had to be taken away to withdraw branch pattern, and then replaced.

In using a lifting ring of this description, it will be, generally speaking, good practice to fill up pit on outside of lifting ring. However, as the sand back of ring has to be dug out previous to lifting of check ring; the size of covering cope will decide the better way.

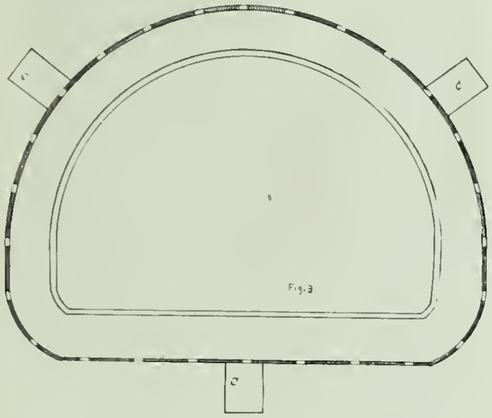
The moulder's time cost on this job was less, we think, than if made in a four part flask. And the lifting ring is a far better foundry investment than a special four part wood flask.

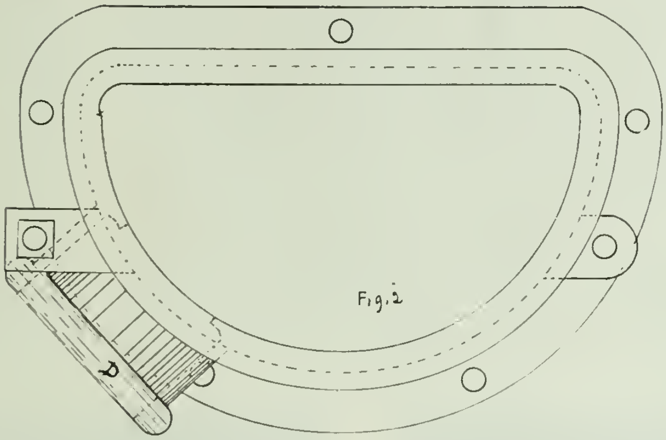
This style of lifting ring will be found adaptable to various irregular jobs that happen along about every so often, in the majority of foundries.

The weight of these castings was about 500 pounds.

The manner of getting these castings, although not shown herewith, was through a core gate on the inside opposite the bottom flange.

As the accompanying sketches will be self-explanatory, we do not deem it necessary to go further into moulding details.





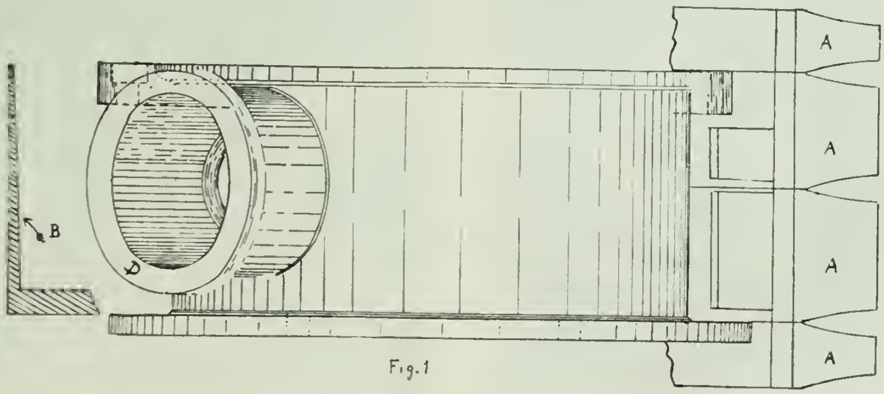


FIG. 1—SHOWS ORIGINAL METHOD OF MOLDING.
FIGS. 2 AND 3—SHOW ANOTHER WAY.

TO BRIGHTEN UP NICKEL

Nickel-plated articles which have become dull can readily be rendered bright again by means of alcohol to which 2 per cent. of sulphuric acid has been added. The liquid is applied liberally and after a few seconds is washed off with clean water. The surfaces are then rubbed over with a swab dipped in fresh alcohol, containing no acid, and finally polished with a dry cloth. This method, it is claimed, will give brilliance to the dullest piece of nickel-plating without damaging it in any way.

Education and experience should go hand in hand if we are to have first class mechanics and perpetuate the trade of moulding.

Core-Making Dept. of T. McAvity & Sons, Ltd.

Efficiency and Quality-Quantity Production Features of This Core Room—Thirty Girls Are Employed Making Cores for Small Brass Work and Have Here a Very Efficient and Smooth-Working Unit in Their Foundry Organization

IN conjunction with their large and up-to-date brass foundry at St. John, N.B., Messrs. T. McAvity & Sons, Ltd., of that city, have one of the most modernly-equipped and efficient core making departments in Canada. The best core-making machinery is installed here where some thirty girls are employed, and the health and comfort of these girls is well looked after.

The room itself is about sixty feet long by forty feet wide and is lighted its entire length and width by full-length windows and also by skylights. For work at night, individual drop bench lights are installed for the workers, and overhead are cluster lights to illumine the entire room. Steam heat from coils at either end keep it at an even temperature, while a system of suction fans to carry off gases, smoke and such dust as is bound to arise where work of this sort is carried on, keeps the room well ventilated and the atmosphere healthy. Good air at the proper temperature is one of the best promoters of good work, and this combination is worked out here with the best results.

The work benches are located on one side and also down the centre of the room and behind them are racks for temporary storage. Behind these again are the core ovens and then come other racks for storing the finished product. Detail arrangement has been carefully worked out and equipment placed to the best advantage.

Preparation of the raw material is done entirely by automatic machinery. Sand is riddled by electric riddles and the oil and binders are mixed thoroughly with it in the same operation. The strengthening wires are cut by an electric wire-clipping machine, which automatically straightens, stretches, and cuts to any desired length, any size core wire which may be required. Each worker is kept well supplied with material at all times and can work steadily without interruption.

This department is supervised and the work therein carried on under the direction of a forewoman, who has been in the company's employ for the past ten years and knows the work thoroughly from start to finish. That she makes an efficient head to this department is proven by the remarkable discipline that prevails here at all times and the volume of work turned out.

All the cores for the small brasswork the firm makes are made by these girls, and this work includes valves, bibbs, cocks and other plumbers' and engineers' brass supplies together with their parts. All sizes of work from ⅛ in. up to and including 3 in. can be done by a girl who knows how as well and is much faster than a man. An average girl makes in one day about two to five hundred cores according to their size and style. She would make about seven hundred and fifty body cores for a ¾ in. "McAvity" globe valve of fifteen hundred "bonnet cores" for the same valve in her eight hours of working time.

Each girl is provided with a uniform by the company of washable material and each week these are laundered at the company's expense.

At both ends of the room are situated the core ovens and these are of the latest type heated by gas and coke and equipped with automatic core reels which keep the heat inside the ovens where it belongs and prevents overheating the room. These ovens are a duplicate of the battery installed in the adjacent department where about fifteen men are employed on large core work such as that required for locomotive inspirators, whistles, etc., and all the large brass and bronze fittings which Messrs. McAvity make a specialty of. In this section the work is handled under much the same system that is incorporated in the illustrated department, with the exception, of course, that the equipment is on a much larger scale to handle the larger work.

All large cores are black-washed and skin-dried with electric torches, and this has been found to be the best method to follow to secure the best results.

Small cores are made with multiple boxes, making at one operation from two to ten according to size, and driers take these cores just as they come from the boxes direct to the ovens. This eliminates all handling of "green" cores and gets the work out in quantities.

A new girl requires from three weeks to a month to learn to make good cores at any kind of speed, and during this period the beginner is paid a flat rate for her work. After she has become trained she goes on a piece-work basis, which works out to both the workers' and the firm's advantage.

T. McAvity & Sons, Ltd., in their foundry, make up the necessary brass-work for all kinds and types of valves, both iron and brass, cocks, bibbs, engineers' and plumbers' supplies, pulp mill bronze, marine work, and all classes of locomotive material.

PLAYING THE GAME

Business is as much a game as golf or baseball or football. Life itself is aptly likened to a game. To win, to earn and enjoy the fruits of victory, you must play fair.

A cup or medal or other trophy is not real prize, the real reward, is the satisfaction derived from superior, worthy achievement.

Wealth is not the real prize of life, it is only a trophy, a symbol, and may carry with it no satisfaction; indeed it does not carry with it genuine, lasting satisfaction unless it has been won fairly, honestly, honorably.

DIFFERENT VIEWS OF GIRLS WORKING IN CORE ROOM.

Reducing Casting Losses in the Brass Foundry

The Writer Believes That by Proper Gating Much of the Trouble is Overcome, But Proper Skimming and Pouring Are Essential as Well as Properly Proportioned Patterns

By P. W. Blair

IN the brass foundry today one of the chief items is to produce sound and perfect castings. When the foundryman scraps from 15 to 25 per cent. of his castings when his loss should be 5 per cent. at the most and when he considers the unusually high cost of molding and melting and overhead at the present time he has anything but a pleasant fact confronting him.

One of the main causes of foundry losses in the brass foundry today and nothing which is so much neglected and given enough of consideration is the science of gating. And there is no mistake it is a science and many foundrymen are beginning to realize this fact who have given it any consideration. Many a foundryman thinks only of keeping his runner gates small, knowing that by so doing he is keeping down his costs as an additional pound of metal poured into a gate runs up his cost on the castings he produces.

Some foundrymen carry this too far. Their gates are too small, their runners are not large enough to float the oxides common in all non-ferrous metals and pieces of charcoal and dirt that very often get by even the most careful furnace tenders. Then again their branch gates are too small and an otherwise perfect casting will show a draw sometimes at the gate and sometimes with the casting itself. Then we have the foundryman who makes his gate much larger than the casting requires and others who do not discriminate, placing large gates on small castings and small gates on large castings.

By far the most number of foundrymen are to be found who use a large gate but do not use it to the best advantage. The patternmakers and foundrymen who insist on putting the runner gates on the drag instead of in the cope do it for the only reason that men before them did it that way. It does not take a very long investigation to be convinced that such gating is wrong. If a runner gate shows the presence of any oxide dirt, charcoal or any foreign substance you will find nine times out of ten on the top. The oxides and charcoal being of less specific gravity than the metal they will float on the top. Putting the rnunner in the drag makes the top of the flow gate flush with the top of the branch gates and consequently any oxide, charcoal or foreign substance floating there will be washed into the castings. On the other hand when the runner is placed in the cope, the dirt is floated above the branch gates and in a way kept out of the castings. Another fault that is practiced is stopping the flow gate at the last branch gate. This error does not cause anywhere near the trouble that a runner in the drag will but it is one of the errors that is well worth correcting. The flow gate should extend some distance beyond the last branch gate, the distance depending somewhat on the nature of the work and the length of the runner. On ordinary bench work where a man uses a 20 in. or 24 in. flask a ¾ in. addition should be enough. Before a moulder when pouring gets his sprue head full, a certain amount of dirt gets into his gate and this small extension acts as a pocket for this oxide and dirt and helps considerably in keeping the castings at the foot of the runner free from dirt and produce, solid, perfect castings.

There is another important item to be taken into consideration to get clean castings and that is the sprue. The sprue hole means considerably more than a mere hole in the sand and care should be used in selecting different sizes for different jobs. I could mention many cases where the gating was proper and the pouring and skimming good and still the results turned out very poor and this was found due to the improper selection of a sprue cutter. Generally speaking the area of the sprue should be larger than that of the runner so that the proper pressure is exerted there also, or in other words if the sprue is smaller than the runner it is impossible to keep the latter full and if clean castings are to be had the runner must be kept full so that the dirt can be floated. But even though the sprue and the flow gate are properly proportioned, dirty castings can result from the wrong relation of the runner to the branch gates. The area of the runner should be at all times larger than the area of the gates feeding the respective castings. Or in other words the branch gates should not take the metal faster than the flow gate gives it. If these proportions are observed and the man pouring gets a good start and keeps his sprue hole full and the skimmer does his work right, clean and sound castings will be the result. This means also that foundry men afraid of scrap on account of the dirt it contains can use considerable of it without danger. Good results can also be obtained by cutting it on a slight angle, tapering toward the flow gate. With nickel, silver and monel metal this is absolutely essential for good results. I have seen good results when pouring by the use of a hardwood block that fits over the lip of the crucible. This block has another function, it not only is the best skimmer a man can get, but while burning on the top of the pot it throws off enough of smoke to keep the metal from being attacked by the atmosphere. It is surprising how much oxide can be formed in the process of pouring when the metal is very much exposed.

What I have written so far about gating has been in keeping castings clean. You will hear many foundrymen say any old gate will run a casting if it is plenty large enough. In many cases I will admit this is true, but in many other other cases entirely wrong. A branch gate must not only be large enough to fill a casting but to feed it when it shrinks and calls for metal. The skimming gate is a gate to be used not misused. Clean metal is one thing to be considered and missruns and draws another. A foundry can lose considerable money either way. The iron men have little trouble with draws and shrinks. The brass man has considerably more especially when he is running manganese, bronze, nickel silver and aluminum. It it therefore impossible to lay out a set rule on branch setting as each type of pattern has its own peculiarities and the gating depends not only on its shape and size but on the kind of metal to be poured into it.

To make a casting of nickel silver it may be correct to gate in the same place one would in making this casting of brass or bronze, but the gate would have to be larger or a draw would be the result on account of the greater shrinkage of the former. I have seen some castings that could not be corrected even by the best of gating. Many designers forget the foundryman and his troubles, and castings have to be made often out of patterns that are out of all reasonable proportions.

Many times these faults cannot be corrected by proper gating and it becomes necessary to use other ways. For instance a heavy spot runs into a light spot at an inconvenient place and must be fed through it. The light spot sets while the heavy is still liquid and when the latter calls for metal it cannot get it and the result is a draw condition and many times a crack clear through a number of castings. Sometimes similar difficulties are cured by chilling, sometimes by risers and off-shoots. In the use of chills and risers in many intances they slow up production and in a number of cases it is not practical. Often times a small change on a pattern will give the desired result. As an illustration an instance came under my observation of a disc-shaped casting having a heavy hub and an outer flange

(Continued on page 42)

Can Canada Produce Good Marine Cylinders?

The Writer Knows That These Castings Can be Made in Canada Just as Well as Elsewhere if Foundrymen Will Abstain From Makeshift Methods

By F. H. Bell

IN a recent issue of "Canadian Machinery" there appeared. editorially, an article emanating from a leading shipping concern to the effect that marine engine cylinders could not be produced in Canada, and that most all attempts by Canadian foundrymen have proved to be dire failures, and that those which had been accepted had fallen down under the burden of duty to which they had been subjected when put to the test of actual service.

This is certainly a hard pill to swallow and being a life-long Canadian foundryman I am loth to accept it in its entirety although there have been so many proofs before my eyes that it has been impossible to ignore them.

The article spoken of proceeded to state that over the line (meaning in the United States) they did not have any difficuly in securing satisfactory cylinders.

Looking at the matter through the eyes of a molder I fail to see what difference it makes what country the casting is made in, as regards its quality. Neither do I see what difference it makes what nationality a man has sprung from as regards his ability as a workman. But the fact still remains that Canadian foundrymen have had terrible hard luck in trying to produce this very important class of casting, and I think I am safe in saying that out of all the cylinnders cast in Canada since 1914, more than 50 per cent. of them were failures in the foundry, and that of those taken to the machine shop more than 50 per cent. were rejected after being machined, and of those which were accepted we have the statement above quoted, that they were not equal to the task set before them when called into service.

Now, what is the remedy? Or shall I first say what is the reason for all the trouble? To answer this I might advance different suggestions, which would appear plausible, but I will take as the foundation of my argument the total lack of self esteem in Canadians as a people. Now, self esteem is just a polite way of describing conceit and Canadians have the least conceit of any race of people under the sun. If I were a politician I would attribute it to the fact that we have always realized that we were only colonials and were content to be considered as subjects in stead of citizens. We placed little dependence on ourselves, knowing that the mother country did our thinking for us. When we talked of building ships to add to the strength of the Empire's navy, some of our leading politicians were proud to take the public platform and publicly proclaim that Canadians could not build ships, and if they could they could not man them, meaning, of course, that we did not know enough, and we were conttent to let it drop at that.

Now, as I have endeavored to point out on former occasions, Canadians can hold down any job which comes their way when they are away from home, and why do we let it be said that we cannot make marine cylinders? Particularly when we have to admit that over the line they have no trouble.

In the United States they depend on themselves and know what they don't do for themselves is not done, and they are certainly not backward about letting the world know that they can do anything which can be done. Canada did show the world something in the way of shell production, in fact she made the best showing of any but she had to wait for outsiders to put her wise to this fact.

Now, as a matter of fact we can make as good marine cylinders as any country in the world, and if we have made some skips there is no reason why we should continue to do so. A few fundamental prinicples which should be kept in mind when making cylinders are in order right now.

Never, under any consideration, pour a cylinder lying on its side. No matter what anyone says to the contrary, don't make a cylinder. Don't try to do this kind of work in a green sand mold, because the risk is too great. You might get a casting but you might not. If you don't understand loam moulding learn it; it is the simplest kind of moulding and the least likely to make trouble. In preparing the iron to pour the cylinder, be sure and have the cupola working at its best Use low silicon iron and and melt it as fast as it is possible to melt it so as to avoid taking up sulphur from the fuel. Break away from the notion of too much fuel and too much blast being as bad as not enough. Perhaps it is, but is isn't any worse. If you don't have enough fuel and enough blast you can not have good metal for cylinders. Too much fuel is a waste, but otherwise I have never seen any bad results from it. Personally I never had as good success in melting ten to one as I did eight to one, and I had still better results melting seven to one. This might be extravagance for ordinary work, but not for cylinders. Another practice which shows lack of ability in the handling of the cupola and which is, by the way, practised in every country is that of using the first iron from the cupola for special work, such as cylinders. No cupola does as good work at first as it will do later on, and there is no object in using this metal in a cylinder. If the foundryman has learned how to properly handle his cupola he should be able to put his cylinder iron in any charge. Supposing he wants to draw out seven ton of iron for a cylinder and he is going to melt twenty ton for the heat, it is no trick to put in three ton for some ordinary work and then put in the cylinder iron. If iron is properly charged it will melt exactly as it is charged, and anyway, iron which is suitable for a cylinder is not necessarily any more expensive than any other and it is quite suitable for other castings. Supposing he charged on two and a half tons of any kind of iron required for other work and then put on eight tons of cylinder iron he would have a half ton to play on at the beginning and at the end of the cylinder charge, and he would be getting the iron for his cylinder when the cupola was working at its best. Cylinder iron requires to be melted good and hot and it can be poured at a fairly high temperature.

The Mold

In molding a marine cylinder there is only one kind of a mold which is worthy of consideration even though a complete pattern is provided, and this a loam mold. Loam molding is a simple operation but it requires some judgment for all that. Molding sand rubbed onto a brick wall does not constitute loam moulding, and by the introduction of clay wash it is not converted into loam molding. Molding sand and clay wash and saw dust is another excuse which is used as a loam mixture on some occasions, but only constitutes a make-shift. Loam must have clay in it to make it resist the melted metal, and as everyone knows, clay closes up every avenue of escape for the gas which forms, and this necessitates using some opening material which will not weaken the mold. If saw dust is mixed through it separates the grains of sand which, of course, means weakness, but unless an enormous lot of sawdust is used it does very little venting. If horse manure is dried and sifted it is just a lot of very fine fibres about a quarter of an inch long, and these if thoroughly mixed through will perfectly vent the mass as these fibres will touch each other, where as the saw dust could not unless the mixture was half sawdust. A good mixture for heavy castings is to use two parts of silica molding sand such as is used in steel foundries and one part of fire sand, commonly known as silica sharp sand. To four parts of this use one part of horse manure. Mix thoroughly and temper with water to the consistency of mud and plaster onto the bricks with the hand. CANADIAN FOUNDRYMAN has on several occasions shown methods of molding cylinders in loam and we invite suggestions and criticisms. There is a difference between molding a cylinder and a plow point and it is useless to try to do the one in a manner which is suited to the other. Don't make plow points in loam molds and don't make marine cylinders in sand molds.

Now we like a good kicker and will be pleased if some practical man who knows we are wrong will just write and tell us how to properly remedy this touble.

CIRCULATION IN ELECTRIC FURNACES

Mr. Editor.—With reference to the article which appeared in your issue, Volume XI, pages 102 to 104, on the Ludlum furnace, should like to point out a glaring error. Item (C) of the specific claims, page 104, states that by arrangement of three electrodes in a straight line over an oval bath, "reaction of the currents between the electrodes provide circulation by electro-dynamic means as well as convection currents."

It is a well-established scientific fact that the passage of an electric current from one electrode to another in any position has not the slightest stirring or circulating effect on steel, whether cold or molten. The metal simply carries the current. Any schoolboy can prove this fact, therefore it is surprising to see such a claim advanced by an electric furnace manufacturer.

Also, regarding the writer's mention of circulation due to convection currents —when the charge is molten and capable of circulating, the heat of the electrode arcs is always above the bath. Convection currents can only take place when the liquid is hotter at the bottom than the top. Convection currents are always upward—in this case all the heat is at the top, which is several hundred degrees hotter than the metal at the bottom where it is in contact with the cooling lining. Therefore no circulation of molten metal is or can be possible, due to convection currents or to that mysterious "electro-dynamic means" mentioned in the article.

The only case—apart from rocking or rolling furnaces and mechanical stirring —in which circulation can take place in an electric furnace, is in furnaces similar to the Greaves-Etchells type, where one phase of the 3-phase supply can be attached to a resistive hearth. The heat generated in that portion of the furnace lining lying directly in contact with the charge by its resistance to the natural flow of current through to complete the electric circuit—generates a large amount of heat under the steel. This alone causes convection currents and circulation.

F. HODSON

IRON IS COMING HARD

Editor Foundryman: Would you kindly tell me how to make soft iron in a crucible. I have tried to make some iron but it has been hard. I can melt the iron very easily in the coke-fired brass furnace. I have used mostly scrap with a piece of pig iron and a little silicon. I would be much obliged if you could tell me why it comes hard and how to make it come soft.

Answer: If you are using a clean crucible you should get the best of castings, but if you are using a crucible which has any remnants of brass from former heats adhering to the inside it will make trouble. The least bit of zinc or tin will harden iron. Tin mixes readily with iron but makes it white hard. Your greatest trouble, however, is most likely in the using of silicon. If you are using 50% ferro-silicon you will of course be introducing a pound of silicon for every two pounds of the ferro alloy. Silicon, it must be remembered is very hard and is only allowable in cast iron to counteract the effect of the carbon. If used in excess of 3¼ per cent. it reduces the strength and hardens the iron. Your iron probably had sufficient silicon in it but if not a very small amount would be required to build it up. If your scrap was soft the reduction in silicon would be almost nil in crucible melting and a pinch of powdered ferro silicon, such as would be picked up with the thumb and finger would make all the chemical change required.

It is an erroneous idea which foundrymen frequently have that silicon is soft. Silicon is taken from silica or sand; so is glass.

SULPHUR ABSORPTION BY IRON WHICH IS NOT YET MELTED

An item in Mr. Ellis' article on another page of this issue brings out a point which few foundrdy-men are apt to realize. Does iron, which is not melted absorb sulphur from the fuel if exposed to it? His point is that grate bars, after being burned out are so saturated with sulphur that castings made from them will be white hard. Every foundryman knows this to be a fact, but probably has not given much study as to why. The only conclusion which the average man comes to is that the metal was burned. Slag should remove the burned material as good as ever, but it does not. Proper fluxing will remove the useless material which was burned and have it carried away in the slag, but what is left is always hard, and the only plausible conclusion to be arrived at is that the burned part was saturated with sulphur, and when it was melted along with the good metal the sulphur was absorbed into the good iron before the flux could remove the bad material. The grates, while being used, were not melted but were simply hot, and the sulphur in the fuel was actually absorbed by the grate in this condition. This confirms the argument of Mr. Ellis and also the contention that CANADIAN FOUNDRYMAN has always stood for—that iron should not be allowed to lie on the burning fuel with the idea of partly melting it before putting on the blast. Certainly if the fire is going strong enough to partly melt the iron without blast there is no reason why the blast should not be put on at once and finish melting it. Our recommendation is to get the furnace in full blast as soon as possible after touching the match and the best results will be secured.

Charging the Coke

Another point which will bear investigating is of putting all the coke in the centre and the iron around it. He says that this has been proved to give the best of results. If it has we cannot argue against it; we never had any experience of this kind, but it might be worth trying.

THE PROPER KIND OF SOLDIERS' RE-ESTABLISHMENT

The subject of re-establishing the returned soldiers is one which is, and which rightly should be, of great moment to the people of Canada, but how to go about it has been a great problem to be solved by those who had it in hand.

Those who came back to us in a disabled condition must be established in as comfortable a position as it is in our power to place them, but for those who came back able-bodied, opinions will differ. For a man who has had a long siege of enforced hardships and anxieties never knowing what the next minute had in store for him and where his every movement was dictated by someone else, it is not the easiest matter to know how to proceed when again thrown upon the world to provide for himself.

Some seem to be utterly helpless, although in apparently good condition, and depend entirely on gratuity until such time as they can get their nerves in condition to get down to business. Others are willing to accept employment if such is secured for them, and they are told how to proceed. But there is still another kind, and it is on this last-mentioned variety that we will pass a few comments. These boys went to the front as a patriotic duty, and after doing their bit and coming home safe and sound, they disrobed themselves of military apparel, looked upon the war as a thing of the past, and proceeded to re-establish themselves.

Of such material are the half dozen practical foundrymen who have formed themselves together and purchased the Ontario Foundry on Pearl Street, Toronto, from Mr. Thomas Atkinson, and launched into a general foundry business. These gentlemen, Messrs. Fred Hamer, George Jones, W. J. Richards, L. Wolsdall, E. Marriott, and F. Crossland, are all working like nailers and we are glad to note are receiving the volume of business to which they are entitled. CANADIAN FOUNDRYMAN wishes them every success in their enterprising ventu1e.

Steel Castings by Electric Furnace Process

The Fundamental Principle of the Electric Furnace, Together With Other Data, is Given. The Methods Adopted by One Firm in Turning Out Steel Castings by Electric Process is Also Described

By J. H. Moore

THE electric furnace as a means of melting scrap, while familiar to many, still remains a mystery to others, so that, before entering on the description of the plant of the Canada Electric Castings, Ltd., of Orillia, Canada, we will proceed to a brief talk on electric furnaces themselves.

The electric furnace is a metallurgical instrument in which any desired temperature up to the point of fusing of the best refractories obtainable can be attained and perfectly controlled. At these high temperatures chemical reactions take place more rapidly than in other processes, and the most refractory metals and alloys can be reduced to fluidity. The flexibility of the electric furnace also gives it a great advantage, and the superior quality of the product obtained is very marked.

Scrap containing valuable alloying metals, such as nickel, tungsten, chromium, vanadium, etc., can be melted without loss of these elements. Steel swarf and scrap, cast iron borings, etc., can readily be used in the electric furnace. The charge can be made up entirely of scrap and turnings. No expensive raw materials are necessary, with the exception that alloying metals can be added, if desired.

The steel from the furnace is finished off under a reducing atmosphere of carbon monoxide and a slag, out of which metallic oxides have been reduced. The steel is, therefore, free from gases and blow-holes when cast.

Generally speaking, an electric arc furnace for steel making consists of a steel tank, lined inside with certain refractory materials, and fitted with loading doors, and a tilting arrangement for pouring. Carbon or graphite electrodes of a suitable size are inserted through the roof of furnace, or, in some cases, the walls, and may be regulated either by hand or automatic control. Usually, both hand and automatic controls are used.

A high tension supply is brought into a transformer house adjoining the furnace and the power is brought down to a low pressure current for the operating of furnace.

The method by which the heat is introduced into the steel bath varies, and is dependent on the type of furnace. Each maker has his own particular method, so that, for our purpose, we will only describe the method employed by the firm whose plant we intend discussing. Before speaking of this, however, let us delve a little further into other points of interest in the electric steel casting process.

By the use of the electric furnace, steel of any composition made by other processes can be duplicated; but, in addition to this, steel which would be impossible by older methods is now obtainable. It is, no doubt, a well-known fact that this system has become an economical means of producing suitable electric steel castings. The electric furnace is a very rapid, accurate and clean method for producing any grade of steel. In any steel foundry, speed is specially important, for, with the heats coming so rapidly one after the other, a smaller furnace can be used than otherwise possible. This feature enables a foundry to produce their required tonnage with less floor space, equipment and a smaller set up of moulds. The steel can also be poured off more rapidly, so that there is less loss by miss-run and cold shut castings, in this way still further increasing the foundry's production.

It is also practical to superheat the steel to any degree desirable, without any hit or miss rule, so that small thin castings are commercially possible.

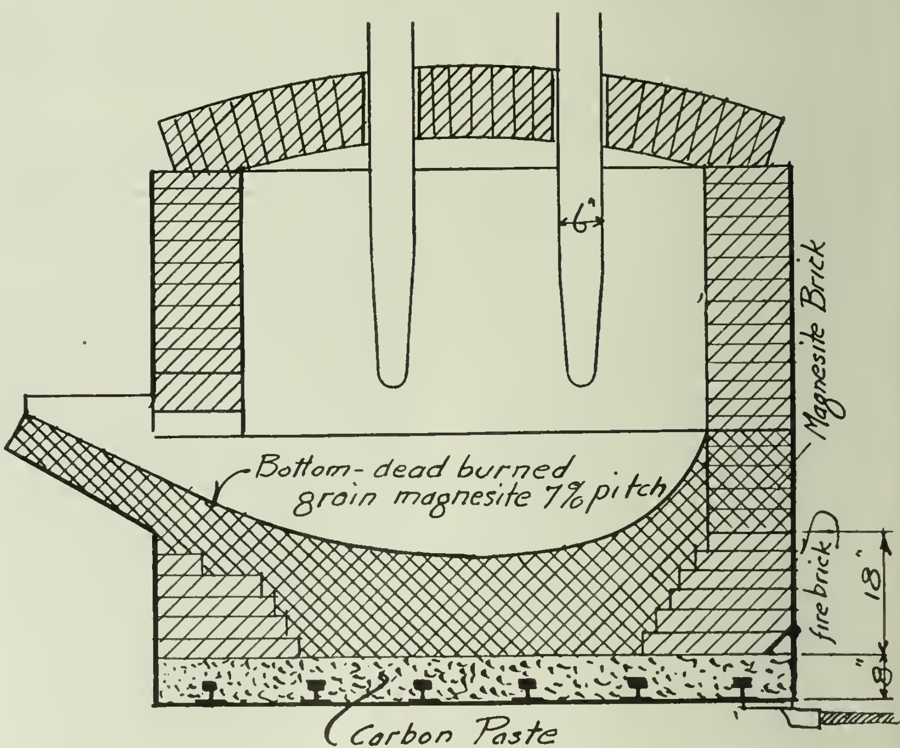
In the ordinary steel foundry making medium and light weight castings, the most favored size of furnace has a nominal capacity of 1½ tons per heat. In some cases, a 3-ton is used, but for average work, a 1½-ton will be found to be sufficient.

The Plant Itself

The Canada Electric Steel Castings Company have found the 1½-ton size ideal for their purpose, and to give readers an idea of the interior construction of this portion of the furnace we show the accompanying sketch.

The furnace was designed and built by themselves, and is what is known as a 1½-ton electric two-phase neutral bottom basic type. The two electrodes going through the roof are 6-inch Acheson graphite electrodes. The regular brickwork is of silica above the slag line, and magnesite is the basic lining used below. It will be noted that six steel rails form the bottom of the furnace, and that the neutral connection is attached to these rails. Carbon paste is rammed between the rails to a depth of 4½ inches. Next comes a further layer of carbon paste 3½ inches thick, after which a backing of silica brick arranged in the form shown was built up.

Into this form the magnesite and pitch was rammed. The magnesite was heated to about 100 degrees Centigrade, and the pitch, in molten state, was thoroughly mixed with the magnesite. The magnesite lining comes level with the pouring lip, as shown, and a magnesite wall is also built up slightly above the slag line. This wall is made 12 inches. The other details will be self-apparent from the sketch.



A SECTION THROUGH THE FURNACE.

The electrodes are controlled by 1½

h.p. shunt wound motors both automatic and hand controls being used. A graphic record is taken of the furnace at all hours.

The current enters the transformer house at 2,200 volts,and uses about 1,300 k.w.h. per ton of liquid metal, starting with cold scrap. The rate of heats varies, of course, on conditions and requirements.

The benefit of the furnace shown in the illustration is that it can be used for both desulphurizing and dephosphorizing, being a neutral basic bottom furnace.

With the electric furnace, steel castings of medium and light weight are made in the green sand moulds faced with silica sand, and gated very much like iron foundry practice. It is necessary, however, with any steel casting, to add sink heads, or feeders, to take care of the extra shrinkage. Apart from these few differences, the process of preparing the mould is similar to the iron foundry.

The concern we speak of handles all styles of steel castings. The writer saw in preparation parts for different types of machines, and the range of work possible is so varied as to practically defy classification. Enough to say that any castings which should be made of steel is what this firm caters to. Cylinder heads for gasoline engines, agricultural parts, miscellaneous machine parts, etc., etc., readily lend themselves to the use of steel in casting.

One job in particular that claimed the writer's attention was that of casting what is known as the Foley tractor wheel, for use on all styles of trucks. This wheel is somewhat of the same shape as any tractor wheel, and has the regular shaped treads, or grips, to aid the traction. It fastens on the regular wheel of the truck, but is so arranged that when the truck is running on normally hard ground the tractor wheel is clear of the ground, and only the tire is in running contact. Immediately the ground softens and the tired wheel sinks in the ground the tractor wheel takes over the work. Around this wheel is also placed a chain of the usual style adopted.

This tractor wheel, as can be understood, is made in different sizes, and its construction is such that it is especially difficult to mould. By the ordinary method of casting, it is questionable if as good a product could be obtained as by the electric furnace process. The strength of these wheels is the main consideration, so that the analysis of the metal must be perfect. This is where the electric furnace shines, for control of the metal is easily obtained by the electric process. It might be well to add that this firm takes a careful analysis of all metals produced, in order that they can be sure that only first-class material leaves their plant.

In discussing the future of the electric steel casting business with Mr. Lamble, the manager of this concern, we asked his opinion on the outlook for steel castings by the electric furnace process.

"If I say that we hope to enlarge our present premises in the near future, will that give you any idea of our viewpoint of the advancement of this field?" he replied. And we admitted that the reply answered our question admirably. When a firm starts enlarging its premises, they must have not only faith in, but definite knowledge of the future of, the steel casting business.

How Ford Automobile Castings Are Made

This Subject Should be of Interest to the Working Man and the Employer Alike

By F. H. Bell

From the standpoint of efficiency on the part of the management and satisfactory working conditions for the employees there is probably no establishment on earth which can surpass the Ford automobile works in Detroit. This plant and its creator are probably as well known as any under the sun, yet the magnitude of the plant and the remarkable genius of its founder are but feebly comprehended by those who have not been eye-witnesses.

To describe in detail from the Alpha to the Omega of an automobile would be out of the province of a foundry publication, interesting as it would undoubtedly be, but by describing in a fairly comprehensive manner the part which comes within our own realm, sufficient ground will have been covered to convince the reader that perfection has been about achieved.

Those who remember the advent of the automobile will remember that it was originally known as the horseless carriage, and many jokes were propounded about the jealousy of the horse on account of the opposition which this new motive power—whatever it might be—would be to the horse. But the horse was not the only power which was to meet with opposition. The mechanical device which would supplant Dobbin had to be decided upon, and several aspirants for the position were on hand. The old reliable steam engine claimed first place but the more modern electric motor was just coming into prominence and claimed some consideration, so likewise did the gasoline engine, which was also just beginning to make itself seriously felt in the engineering field. After a fair and impartial trial the gasoline engine seems to have won the day, at least to the extent that it is the one adopted by most automobile manufacturers. and incidentally by the Ford Motor Company of Detroit.

Inasmuch as the engine and its accompanying mechanism constitute the bulk of the work on an auto, and being constructed of iron and steel they, like all machinery constructed of iron and steel, begin their career in the foundry, and while the foundryman's labors are hidden away from view on an automobile, the same as on almost everything else. it is nevertheless the most important part of the automobile, and nothing could cause more real trouble than a defective casting. It is therefore obvious that defective castings will not do.

There is probably no class of casting which requires to come nearer to perfection than that used on the gasoline engine, being a regular system of vacuums and suctions, the slightest porosity in the metal making it worthless. To build an engine and find on testing it that the castings were defective would not be considered for a moment these days, but to produce castings on scientific principles which will insure proper results is the order now. To produce them in quantities such as are required in this plant and of the proper quality is the subject matter in which we wish to interest our readers.

Beginning with the next issue of CANADIAN FOUNDRYMAN we will publish a series of short articles on the Ford Foundry, together with some of the more interesting features of the factory throughout.

An idea of what the plant is like will be had from studying the following figures:

The property consists of 305 acres; there are 88.22 acres of floor space actually under roof. The annual business of the company is approximately $450,000,000, which means that each acre of floor space produces at the rate of $5,000,000 annually. Some 50,000 men are regularly employed, 6,400 being employed in the foundry department, some $6,000,000 is paid out monthly in wages. Every day is pay day and it depends on which department a workman is employed in, when his pay day comes.

Fifteen cupolas, five feet inside the lining, are required in the foundry, and these run continuously. Everything about the place is in proportion to these fifteen continuous cupolas. It will, therefore, be seen that the automobile. while something of a luxury, means a lot to the working man as well as to the business man and keeps a lot of money in circulation. To describe even the foundry alone in one issue would be a big task, so we will describe it serially, and trust that our readers will take an interest in what can be accomplished in a foundry when properly undertaken.

The iron deposits at Boisdale, Cape Breton, Nova Scotia, are being opened up by the Dominion Steel Corporation in order to determine the quality and quantity of the ore. At the present time it is understood that fully 10,000,000 tons are in sight, and it is believed that this is not by any means the full extent of the deposit.

Research Work on Malleable Iron—*Continued*

Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

IN such cases the low silicon will be ganese. Such fractures are shown in accompanied by low carbon and man- Fig. 14. In Fig. 15 can be seen the structure of a piece that had a silicon as low as 0.33 and a manganese of 0.089 per cent. The fracture of this piece was uniformly bright and coarsely crystalline. It had no frame. The structure consists of a matrix of pearlite and throughout it are distributed particles of undecomposed hard carbide (cementite) and small, well-rounded nodules of graphite, or temper carbon, as that carbon is called which separates out during an anneal. The casting from which this piece was taken was in an oven in which castings of correct composition annealed perfectly, and the presence of the particles of undecomposed carbide simply means that the anneal was not carried on for a sufficiently long time for this character of product. The casting, however, would have been very inferior even if all of the carbide had been broken up.

Picture-Frame Fractures

53. Very frequently low silicon-carbon-manganese of certain compositions will yield what are known as picture-frame fractures, such as are shown in Fig. 16, which are typical and have the following composition: Silicon, 0.54; phosphorus, 0.162; sulphur, 0.053; manganese, 0.108; total carbon, 2.01. This piece when polished and etched showed the following characteristics: a decarbonized surface border, an inner ring of coarsely laminated pearlite, and within this a core corresponding in structure to that of normal malleable iron. Fig. 17 shows the decarbonized border surrounding the pearlitic ring, Fig. 18, the structure of the pearlitic ring, and Fig. 19 the core within the pearlitic ring. It is the presence of this ring of pearlite whose ductility is so much less than that of the metal in either the decarbonized border or core that produces on fracture the sharp line of demarcation between frame and core. While in this particular fracture the frame is fiery bright and finely crystalline and the core black, there are picture-frame fractures that show various color characteristics of frame and core, but it will be found that invariably the frame has its pearlitic ring of greater or less breadth. The pearlite is not always coarsely laminated, but as a rule has the appearance and consists of an amount of pearlite that would correspond to a 0.35 per cent. or 0.45 per cent. normalized carbon steel.

54. If the sulphur in the hard iron is unduly high and particularly if not well balance by the manganese, the castings will almost invariably show a picture frame on fracture, and especially is this true if the temperature of anneal is too high for such a composition. If the manganese is too high and not well balanced by the sulphur, the same result will follow. In each case there is an appearance to the frame and core

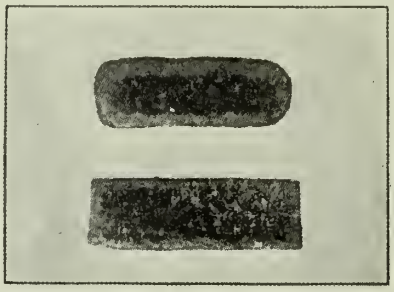


FIG. 16 — PICTURE-FRAME FRACTURE IN LOW-SILICON-CARBON-MANGANESE SPECIMEN.

indicative of which is which. The frames shown in Fig. 20 are rather typical of the latter. In this case the frame is dove-colored, while the core is black but sparkling.

55. While time is not available to enter into a full discussion of what has been discovered in regard to picture-frame fractures, there are some points that can be recorded. There are some compositions that unquestionably have frame-producing tendencies. These compositions will not produce a frame when annealed in an atmosphere that is not oxidizing. The surface structure of the hard iron has nothing to do with the problem as the writer has had ¼ in. ground off of one side of hard-iron samples and upon annealing the frame was in evidence equally on all sides. It is believed that the following facts are pertinent to the situation: Not only do certain compositions affect the ductility of ferrite, but the same is the case with a pearlitic structure. We can have ferrite that will elongate into very long spines and ferrite that will fail to elongate at all. We can have a pearlitic grain that can be ductile and those that are not. The foregoing is stated because the writer believes that whether or not a frame will be produced in the fracture depends upon the breadth and ductility of the pearlitic ring, because a slight pearlitic ring can be present within a decarbonized border without a picture-frame fracture being produced. It is his belief that whether there will be a pearlitic ring or not depends upon the rate of surface decarbonization, as compared with the rate at which a dissociation of the cementite takes place. When conditions are such that there will exist a region between the decarbonized surface border and the core that will have a carbon content of about 0.90 per cent., equilibrium seems to be established in this region, and if any carbon passes from this region to the decarbonized border it is replenished by carbon from the core.

The Pearlitic Ring

56. The writer believes that such is the case, and is of the opinion that perhaps the samples shown in Fig. 21 may have a bearing on the case. A well-annealed bar was cut into eight pieces. A section from the first piece was polished and etched, and the other pieces all packed together and given another anneal. The second specimen was then prepared like the first. The remaining six were then given a third anneal, and the third piece polished. As this procedure was continued, it follows that the eighth bar had eight separate and complete anneals. It will be noted that this very faint pearlitic ring which shows

FIG. 17—MICROGRAPH OF DECARBONIZED BORDER.

FIG. 18—MICROGRAPH OF PEARLITE RING.

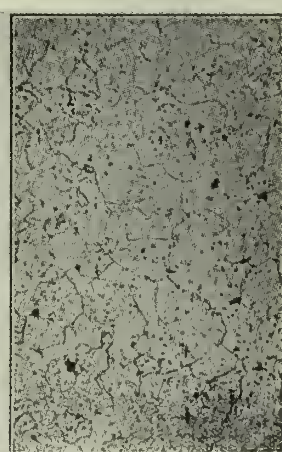


FIG. 19—MICROGRAPH OF CORE WITHIN PEARLITE RING.

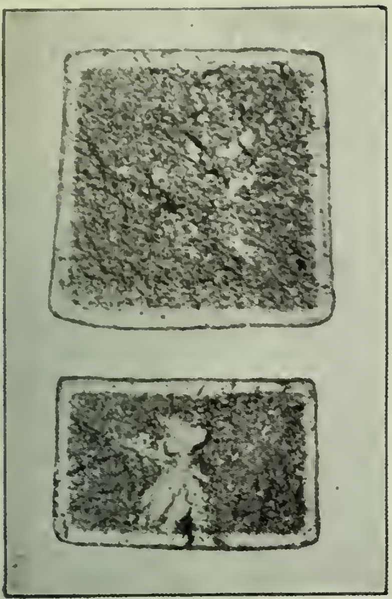


FIG. 20—PICTURE-FRAME FRACTURES IN HIGH MANGANESE SPECIMEN. NOT BALANCED BY SULPHUR.

whitish and very faint in the once-annealed bar, is very distinct and well defined in the second and that it is wider and further in toward the centre. It will be seen that with each anneal the pearlitic ring has widened and has a smaller periphery. As it was found that with each anneal the total carbon content decreased, it is plain that once the pearlitic ring has formed, it does not act as a seal for the passage of carbon from core to surface and that the width of the pearlitic ring is built up and added to more quickly from the core than it is robbed of carbon by the decarbonized border. The matter can be summed up as follows: If conditions are such that a region containing about 0.90 per cent. or less carbon is formed, this region while permitting carbon to migrate or diffuse through it will at the same time be incapable of having its carbon precipitated. Under proper conditions the region can alter its position and increase in extent. For such a region to have a start it is essential that there be a very substantial difference in carbon content in two parts of the section.

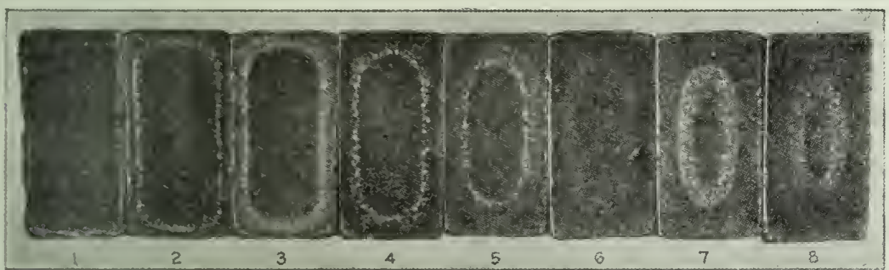


FIG. 21.—PEARLITE RING IN SUCCESSIVE STAGES OF ANNEALING.

Structure of High-Strength Malleable Iron

57. Malleable iron of very high strength accompanied by a ductility that can be considered good enough for certain purposes, has already been alluded to. While no effort has been made to exploit this product as yet, it would appear to the writer that there is a very large field in which it could be used to advantage. In Fig. 22 can be seen the structure of a sample that stood an ultimate strength of 84,000 lb. and had an elongation of 5.20 per cent. This material can be made with uniformity and it is believed from experiments that have been under way for some time that a 90,000 lb. ultimate and a 10 per cent. elongation might be uniformly maintained. It will be noted that the structure consists of a ground mass of pearlite, in which are more or less uniformly distributed nodules of temper carbon. The structure readily explains why the product is of high strength.

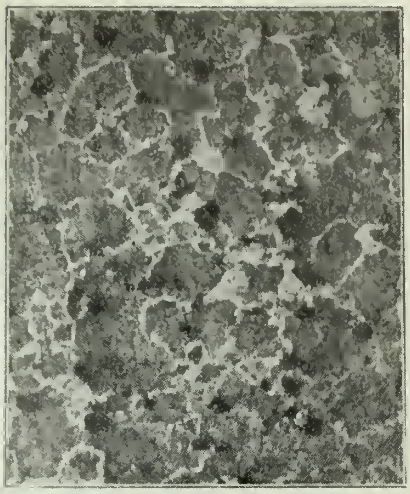
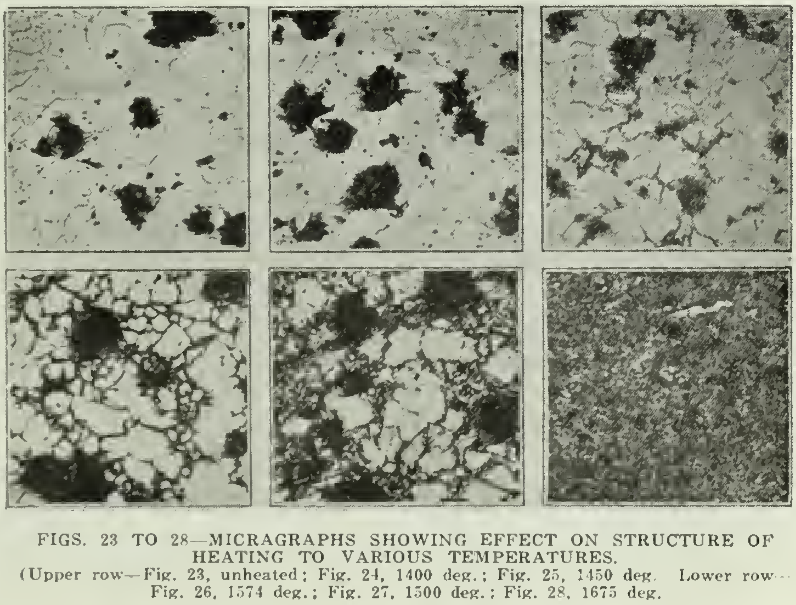


FIG. 22—MICROGRAPH OF MALLEABLE IRON OF HIGH ULTIMATE STRENGTH.

Effects of Heating Malleable Iron

58. As it is frequently necessary to to heat the finished product for the purpose of straightening it, for galvanizing and other purposes, it may prove instructive to see what happens when an annealed piece of malleable iron is heated up to and beyond the critical range. Ten pieces were cut from a normal, well-annealed malleable-iron bar. Fig. 23 shows the structure of this bar at $\times 200$. The ten pieces were then placed in an annealing oven in the writer's laboratory that can be controlled with great accuracy. When the pyrometer registered 1250 deg. Fahr., one piece was withdrawn and allowed to cool in the air. When the temperature reached 1,300 deg. Fahr. another piece was withdrawn. The other pieces were withdrawn at temperatures of 1350, 1400, 1450, 1475, 1500, 1550, 1600 and 1670 deg., respectively, Fig. 24 showing structure at 1400 deg. Fig. 25 at 1450 deg., Fig. 26 at 1475 deg., Fig. 27 at 1500 and Fig. 28 at 1675 deg. All of these micrographs were taken at a magnification of 200 diameters. It is apparent that no change has taken place in the structure up to 1400 deg., but that somewhat between 1400 and 1450 deg. the structure starts to alter in appearance. An examination of Figs. 25 to 28 shows that increased amounts of pearlite result as the temperature is increased, and that in Fig. 28 nearly all of the temper carbon has been dissolved. It follows that for straightening, brazing and other operations that necessitate the heating of a malleable-iron casting, the temperature used should be well under 1400 deg. Fahr.

(To be continued)



FIGS. 23 TO 28—MICRAGRAPHS SHOWING EFFECT ON STRUCTURE OF HEATING TO VARIOUS TEMPERATURES.
(Upper row—Fig. 23, unheated; Fig. 24, 1400 deg.; Fig. 25, 1450 deg. Lower row—Fig. 26, 1574 deg.; Fig. 27, 1500 deg.; Fig. 28, 1675 deg.

Charging the Cupola and Soaking the Iron

The Writer Believes That the Sooner the Iron is Melted and Taken From the Cupola the Less Sulphur It Will Absorb, and He is Right, No Matter Who to the Contrary

By W. W. Ellis

IN DISCUSSING, for the benefit of the student, the subject of charging the cupola, we should start from the bottom-plates. So assuming that the lining, breast, and bottom-plates are all fixed up, the cupola is now ready for the sand bed. I might state here, though, that we make a permanent breast. That is, we brick up the breast with firebrick so that it will last several months. The tap-hole alone has to be touched up every day when fixing the lining of the cupola. This method saves considerable time and worry as there is never any fear of the breast giving way. The next operation after the bottom plates are in place is to get a load of rough sand from under the cupola-drop, making a bed of this sand about two inches deep. This sand is full of fine coke and cinders, and acts as a cinder bed to carry off the gases while the iron is melting. We now get a load of good sand from the moulding floor to put on top of the rough sand, making the bed in all about four inches deep. We now tamp this bed about the same as a bed in the moulding floor for a large casting, taking care to slope it toward the tap-hole from every direction so that all the iron can drain from the cupola.

If wood is used to fire the coke, the general practice is to get a sackful of wood shavings and dump them on the sand bed. These shavings will help fire the wood, and also help protect the sand bed from being disturbed and cut when dropping the wood from the charging door into the cupola. When sufficient wood has been charged, nearly all the bed coke should be dumped on top of it. The fire can then be started when convenient. However, the most up-to-date method of firing the coke is with an oil torch, without using any wood. The torch is inserted through the breast, which is made up later with sand after the fire has been well started. When the fire has been burning an hour or so the lining of the cupola will be fairly dry and hot, unless the lining material has been daubed on extra thick. This is a mistake, because, if the lining is too thick, it will crack while drying and is likely to scale when charging begins. The remainder of the bed coke should now be added and leveled. The cupola is then ready for charging the iron. When the iron is first dumped on the coke bed its weight will settle the coke from 8 to 12 in., but that is taken care of when the right height of the bed is determined by the method explained later.

As soon as possible after the cupola is charged as high as the charging door, I believe the blast should be put on, because it is my opinion that the longer the iron lies on top of the burning coke in a semi-melted condition, the more sulphur it will absorb. In support of this opinion is the practice of converter steel men of never using first charges when engaged on government work to strict specifications. The reason is that first charges always have a higher sulphur content than the following charges, although all the material charged may originally have had the same composition. I believe that few foundrymen would think of casting their fine particular work from the first tap. C. M. Henderson, in commenting on my book, "The Metal Mixer," in the May issue of "Metal Trades," under the heading of "Soaking Iron in the Cupola," says: "With but one exception I am in accord with his manner of operating it." He states, "It is not very good practice to let the iron soak too long in the cupola before starting the blast, as the iron absorbs more or less sulphur from the fuel during that time."

Mr. Henderson says: "This is a mooted question well worth a thorough investigation by every foundryman. An unbiased investigation would cost nothing and would convince many that a reasonable soaking has advantages and no disadvantages. The majority of melters agree with Mr. Ellis in starting the blast as soon as the cupola is filled to the charging door in the belief that any further delay will permit the iron to absorb sulphur from the fuel, and also that the fuel is being burned away and wasted." Mr. Henderson does not deny that first charges contain more sulphur than later ones, but contends that such is the case whether the iron has been allowed to soak or not. He quotes other authorities in favor of long soaking besides making some experiments himself, "which showed on every count in favor of soaking." He says "Iron will not begin to melt in the cupola until after the last is put on, and has no affinity for sulphur until it becomes molten. In the latter state it will readily absorb sulphur until its temperature approaches 3,000° Fahr. and at a higher heat will expel much of this absorbed sulphur." I have not been in a position to do much experimenting, but base my opinions chiefly on personal observations. One thing, however, I would like to have explained, namely, if iron does not absorb sulphur until it becomes molten, why should Mr. Mulcahy mention in a note at the bottom of the reference card of "Approximate Analysis of Various Material" (prepared for the California Foundrymen's Association) "The amount of sulphur in grate-bars will depend on service bar has been subjected to" Mr. Mulcahy must thing that iron absorbs sulphur before it melts. However, as Mr. Henderson says: "The soaking of iron is a mooted question." And, like him, I would like to hear the opinion of other foundrymen on this subject. However, until further proof is presented I will continue to believe that soaking is not necessary and that it is always best to get the metal melting as soon as possible after the cupola has been charged.

This is why I believe that we should not get the coke bed too high and not put too heavy a first charge of iron on the bed. I believe the melter that will take the trouble to find the proper height of the coke bed for his particular cupola and then make all his charges of iron from first to last as near the same weight as possible, will get a more uniform grade and a more even flow of iron with far less coke consumption than the man that crowds his coke bed to the limit with an extra heavy first charge of iron. The proper practice calls for a uniform weight for all charges. This weight is determined by multiplying by 10 the weight of coke required to fill a space 4 to 5 in. high in the cupola. That is, if it takes 150 pound of coke to fill a space 4 to 5 in. high in the cupola the iron charges should weigh about 1,500 pounds. Foundrymen have proved by experiment that the melting zone averages 4 to 5 in. deep, and they have also found that fairly good coke will melt ten times its weight in iron. When that amount of iron is melted the bed is ready for another layer of coke.

When I speak of a layer of coke I do not mean that it is necessary to put a layer of coke all over the inside area of the cupola. That rule is only used as a standard for figuring the iron charges. In fact it has been proved that the best results have been obtained by putting all the coke in the centre and all the iron as close to the lining as possible, except when making different mixtures, which must be separated by the coke. By this method of charging the lining will last much longer, and the rate of consumption of coke will be entirely dependent upon the temperature of the iron required in the ladle.

When the bed is the proper height, only the top 4 or 5 in. does the real melting. If the bed is higher than it should be the extra coke will be burned and wasted until it lets the iron down to the real melting-zone, which will vary from 15 to 28 in. above the tuyeres, according to whether the blast is high or low. The main point is to find the proper height of bed for every cupola. The best way to determine this is by observing the time required for the iron to drop lively, as seen through tuyere-glasses, after the blast has been put on. If it takes more than three minutes at the most, the bed is too high, and the extra time will be spent in burning the coke that it not required. It is generally upon high coke beds that extra heavy first charges of iron are put, because the melter believes that so much coke on the bed ought to melt a much heavier first charge than the rest of the charges. This, however, is not so.

Another reason for heavy first charges, and a fairly pardonable one too, is that most foundries have some special mixtures to make, different from their regular run of work. If these happen to be heavier than the regular charges the bed is considered the best place for them so as to get them down and out of the way of their regular mixtures. But, as we must put a heavy split of coke between two different mixtures, the bed is built up somewhat, according to the amount it has lost through having to melt a heavy first charge. I believe that having to put a heavy split of coke between two first different mixtures has saved many a coke bed from getting dangerously low without the melter being aware of it. Here, however, is the point: We all know that if we wish to retard the melting between two different mixtures, we must put a heavy split of coke between them. By so doing we keep the iron high above the melting zone until part of the coke is burned away, when the top part, namely the last 4 in. of the coke, will drop to a point where it can melt the iron above it. The same reasoning applies to the high bed. It is only the last or top 4 in. that does the real melting, and, like the heavy split of coke, even that 4 in. will not melt iron until it drops to the real melting zone, and even then it will only melt so much, so if burdened with an extra heavy first charge of iron the bed proper is bound to suffer and can only be built up again at the expense of irregular iron melting and expensive extra coke, which would not be the case if all the charges had been made as near as possible what they should be according to the size of the cupola. That is why I maintain that if the melter will take the trouble to find the exact height the coke-bed should be for his particular cupola, and then will make all his charges of both iron and coke as near as possible what they should be, he will stand a much better show of getting a more even grade and a more continuous flow of iron, with much less coke consumption than the man who crowds his coke bed to the limit with an extra heavy first charge of iron

A HANDY STAND LADLE

The contrivance shown in the accompanying sketch Figs. 1 and 2 is what might be termed a spout ladle and while simple in appearance and construction it is probably the latest and best device for handling a continuous stream. This is an ordinary bull ladle with a spout extending out on a line with the bottom as shown in Fig. 1. This spout is enclosed in a caisson of iron, the same as that of the ladle, and doubled to give an opening of four to six inches inside diameter. When placed in the position shown in Fig. 1 it forms a continuation of the cupola spout, which may be given any desired pitch, by tipping the ladle. When it is desired to hold the stream while ladles are being changed, the ladle is tipped back as shown in Fig. 2. In this position it may be made to hold the stream for a minute or two while

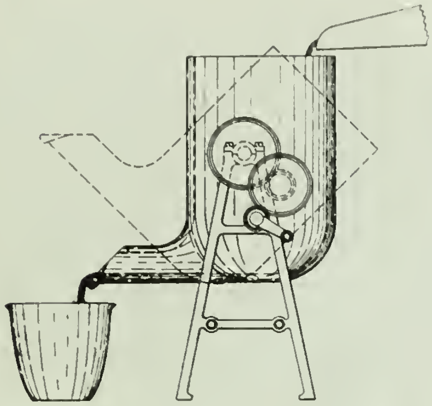


Fig. 1

ladles are being changed. Or it may be filled to its capacity before it becomes necessary to stop in the cupola. The stream of iron continually flowing through the ladle keeps it hot, and when tipped back the iron is not chilled by the ladle. When it is desired to fill the ladle from the spout ladle when it is full or partly full, the large opening in the spout admits of the iron being dumped from it very rapidly and the ladle fillled at once.

The spout ladle may be constructed of a size to suit the ladles to be filled or the amount of iron that may be necessary to hold while waiting for a ladle. It may be mounted upon a permanent frame as shown or it could be on trunions resting on trestles and turned with a bar. By the last mentioned method it would be possible to remove it easily

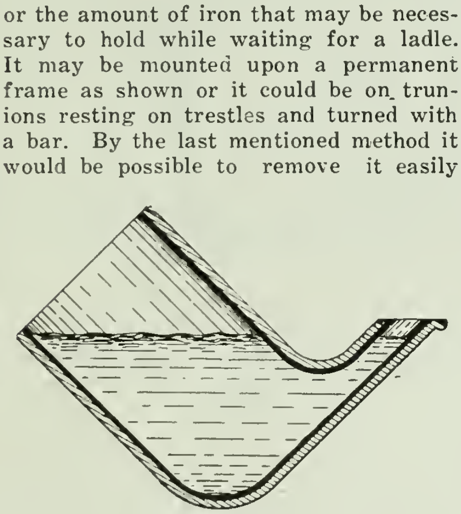


Fig. 2

in case a large crane ladle is to be filled direct from the cupola, but the style shown in the illustrations is much more to be desired. The spout could have a breast built into it if so desired and stopped in the same manner as with the cupola and topped when wanted. By this means it could be used as a skimming ladle or receiver for keeping all dirt to the top and drawing the sound metal from the bottom.

A ladle of this kind has many advantages and can be utilized for whatever class of work comes in from day to day. These ladles are sometimes made with a lip on the top for pouring either top or bottom. In shops where only an occasional big piece is made and where no crane facilities are installed a ladle of this kind can be blocked up in a position for pouring the big piece and filled by hand. By this means pieces weighing up to the capacity of the spout ladle can be poured.

The Electric Furnace Construction Company, Philadelphia, announce the closing of a contract with the Emery Steel Company, Baltimore, Md., for an Electric Furnace of new design for annealing steel castings.

BRANTFORD FIRM JOINS ONE IN ERIE

A Large Factory is Under Consideration —John R. Hall Co. is the Canadian Concern

The John Hall & Sons, Ltd., pipe machinery manufacturers of Brantford, have merged with the Williams Tool Corporation of Erie, the largest manufacturers of pipe machinery in the United States, with a capital of one million dollars. John R. Hall & Sons, Ltd., are the largest manufacturers of pipe machines in Canada.

The Brantford plant will be known as the Hall plant of the Williams Tool Corporation. At present it is running to full capacity, and have been operating a night shift for some months past. No radical change will be made in the management.

Leslie S. Hall, president and general manager, will be vice-president of the American company, taking an executive position between the two plants. A. R. Hall will be manager of the local plant, and E. L. Williams in charge of the office. E. W. Hall is retiring as secretary and treasurer of the company, and E. L. Hall will no doubt continue with the new corporation on his return from England.

A larger factory is under consideration, but it is too early to give definite plans. The Brantford company set a number of records for speedy manufacture of war munitions machinery.

The production of pig iron in the United Kingdom in February amounted to 645,000 tons, or 20,000 tons less than in January. When allowance is made for the shorter month, however, the rate in February was rather higher than in January, the daily rate being 22,300 tons, against 21,500 tons. The production of steel ingots and castings amounted to 798,000 tons, or 44,000 tons more than in January, and was higher by 40,000 tons than the best month in 1919—viz., March, when the production was 758,000 tons. The 645,000 tons of pig iron included 234,000 tons of hematite, 223,000 tons of basic, 170,000 tons of forge, foundry, and other qualities, and 18,000 tons of alloys.

Some Skeleton Patterns and Core Boxes; Part II

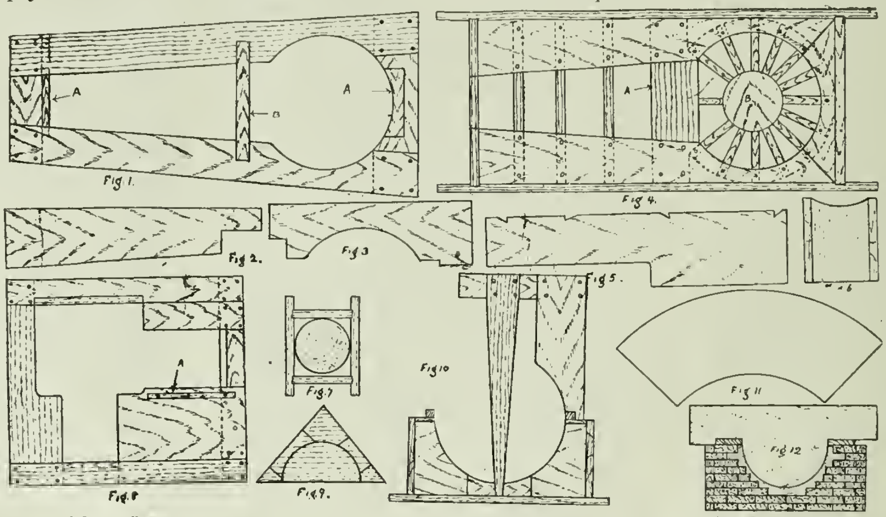
Being a Series of Jobs Encountered in British Shops Doing Mainly Work in Connection With Ship Construction

By JAMES EDGAR

SOME foundries will take skeleton patterns, but do not look on them with favor. This is especially the case with steel foundries, because of the hard ramming which is necessary, but most foundries will take skeleton coreboxes, for work that is in a great hurry. It is reasonable to infer that a solid box is an extravagance if a fragile skeleton pattern has been made. As a matter of fact, wherever it is possible to do so the cores are run up with boards or on plates or frames instead of a box of any kind being made. The timber economy is very great, if a straight board will do as well as even a skeleton box. To illustrate various ways of making cheap cores and their application to particular types of work, we shall consider what is necessary for the patterns dealt with in the last article.

Fig. 1 shows a frame on which a half core for the bollard may be made. It might be possible to supply the moulder with a board for sweeping the core on a horizontal spindle, but because of the spherical end, the frame is preferable. It ought to be about 1 in. thick and half-lapped. When it has been screwed together the shape can be drawn on it, and one piece then removed, so that the bandsaw can be utilized for cutting it out, and probably a sandpaper roller for finishing it. Two end grounds AA must be made, and as a strickle from end to end would be very long it is advisable to screw a bridge piece B on to the frame. Two strickles are then necessary, one like Fig. 2 and one like Fig. 3. Open frames are much better than plates. The latter have to be run into the stove and become distorted and probably burnt, but the moulder lays the frame on a plate and immediately he has swept the core he can lift the frame away and start making the other halfcore, thus saving the delay caused by waiting till the first made core is dry. Fig. 4 shows the construction of a corebox for such a job, if one is insisted upon. A bottom would first be made, and the sides and ends screwed to it. Unless when a big saving of timber is going to be effected by doing otherwise, it is wise to enclose skeleton work in a square or at least rectangular-shaped case, as it simplifies making the grounds. As in making the pattern it is often necessary, as at A, to insert a block where one shape is merging into the other. In order that the spherical grounds can all be drawn off the same template, it is as well to screw pieces on the bottom of the box, cut inside to a circle, and forming a shoulder for the grounds to butt against. The spherical centre B can be turned. The grounds should be kept about 1 in. below the top face so that a binding plate can be screwed on. Sometimes the patternmaker fills in the box, then draws the shape of the core on the joint or binding plate, and dismantles the box to saw and finish the grounds. This is a needlessly slow method, and if reasonable care is used in making the various pieces from the drawing board, the box will be accurate enough.

The right angle valve core might be made by means of a straight board like Fig. 5, with a separate box for the branch. The body core in this case would be made on a horizontal spindle.



CORE BOXES FOR BOLLARD PATTERNS SHOWN IN APRIL FOUNDRYMAN.

It will be noticed that the board is notched on the back edge, the distance between the notches being equal to the diameter of the core, and a gauge for the moulder when setting his calipers. The work being in a great hurry, the strictest accuracy is possibly not required, and if a square box like Figs. 6 and 7 is made with the ends shaped to the radius of the valve body the moulder can make a piece of core in a stock box and strickle off the shape as shown. In this case a straight edge will do, but a shaped strickle could be used if necessary. A more satisfactory way than the above of making the valve core is to make a half-lapped frame like Fig. 8 similar to that for the bollard. A long board should be made for the body, but a semi-circular one will have to be used for the branch. Before making the second half core the end grounds and the runner strip A, which guides the branch strickle, has to be changed to the other side of the frame because of the branch. If there are other branches on such a valve the centres of which are not on the joint line, separate cores have to be made, and they could be made in boxes similar to that shown in Figs. 7 and 8.

Fig. 9 shows a joining block which it is always well to make when cores of different different sizes meet. It is not fair to rely upon the moulder or coremaker making up so that the correct thickness of metal will be maintained, nor it is safe.

There are occasions when it is permissible to have the core made on the joint of the pattern, but it is not a good practice as it injures the pattern, because of course it has to be stoved, nor is it very convenient for the moulder. Obviously, however, a core box for a double bend pipe would be very costly if only one casting was wanted. What can be done is to make a semi-circular strickle which will be guided by the pattern plates. It is not necessary to remove the flanges but grounds should be screwed on the prints of the core diameter, so that a straightedge can be used for finishing off the ends. This is not quite as reliable, however, as removing the ends of the pattern plates with end grounds screwed on to them so that the semi-circular strickle can be used all the way from end to end.

It is not profitable as a general rule to make wholly skeleton coreboxes of plain double, triple or quadruple valve chests. The ends are the only parts that can advantageously be made skeleton and perhaps, if they are long, the branches.

The pinboard as it is very often called, is very useful for running up cores that are comparatively short, or at least not much longer than they are in diameter. A useful application of the pinboard is when making the core for a spherical valve. As will be seen from Fig. 10, the bottom half of the core is made in a box built in a similar fashion to the spherical end of the bollard core. On the top face a circular guide strip is fastened and the sweeping board itself is half-lapped. It is not always done but it is better to turn the centre pin, leaving the end square. This end should be slotted so that the top batten will slip into it. It will be found when the board is in position that it is quite steady. The pin board is very often used on a wooden plate, and by the exercise of a little ingenuity elliptical cores may be made with it Circular cores that are dome-shaped at both ends may be made by using a semi-circular strickle for the straight portion, and the pin board for the ends.

The corebox is always preferred in the foundry, and so if a few cores are wanted the moulder will frequently devise a means of making a sand corebox. This is sometimes done when boards are supplied for making a circular job in loam, where there is a core with ribs such as pistons. The moulder has a suitable board made for sweeping out a box into which he sets ribs and bosses. When a few castings were wanted from a large bend pipe like Fig. 11, instead of sweeping up cores, the moulder will sometimes build up a leam box with sand facing, which is strickled out as shown in the sketch, Fig. 12, a frame or guide being laid on the joint. The full core can be made by strickling the top half.

Foundries do not like to thickness cores if it can be avoided because of the cost and the slowness. Sometimes of course as in awkward and irregular shapes, especially if the metal is thin, moulds have to be clay or sand thicknessed, but often when work is sent from the pattern shop to the foundry without any provision for making the core in the belief that the mould will be thicknessed, the moulder himself devises some arrangement for sweeping a core.

AND NOW THE DETACHABLE BROOM HANDLE

Oxywelded Device Combats the "H. C. of L."

This is the day of H. C. L. plus—but it is also the day of new and crafty ways of sidestepping the onslaughts of the ugly ogre. The latest device to enlist on the side of the people is the detachable broom handle.

At first thought the broom handle seems inconsequential. Isolated and individually, it is. Multiply it by millions, which probably approximates the number of brooms sold yearly, and you have something quite different.

The detachable broom handle is a brand new idea, and it is "taking." At the present time there is a factory in Vermont devoted exclusively to manufacturing brooms with this type of handle. The handle is of wood fitted into an oxwelded metal holder that clamps easily on to the brush of the broom. The metal part is light but very strong, being securely welded by the oxy-acetylene process, which not only makes it rigid but allows the entire piece to be neatly finished.

This is but one of a long list of interesting new departures from man's habitual thriftlessness that have sprung out of the need for widespread economies to combat living costs. In fact the oxy-acetylene process itself is perhaps the most far-reaching of all modern economies in the metal-working industries. Owing to the superior quality of welds made by this process, its remarkable speed and almost unbelievable economy, it is now almost universally applied in manufacture, construction and repair work. All that is required for a complete portable outfit is an oxweld blowpipe for welding, cutting torch, a cylinder of Linde oxygen and a tank of Prest-O-Lite dissolved acetylene, with which practically everyone is familiar.

A HANDY CORE IRON BENDER

pipes in the core room cf any foundry
pipes in the core rcom of any founddry
handling medium heavy or heavy work is unquestioned; the tremendous transverse strength combined with lightness of old material of this description making it doubly valuable as a "backbone" or stiffener in cores of considerable length, notably in cases where cast iron arbors are neither necessary or desirable, or in combination with the latter.

Usually, however, a certain amount of bending or straightening is required be-

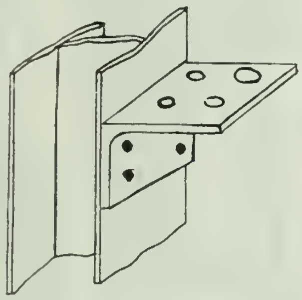


FIG. 1.

fore the pipes will fit the core box or frame correctly, much discomfort and sledge hammer work (with the accompanying stinging of hands) being entailed, where lack of facilities enforce crude working methods.

The accompanying sketches show a simple device which will lighten the coremaker's load a little and may be a handy core iron bender.

Installed at low cost, Fig. 1 illustrating a rectangular cast iron bracket, bolt-

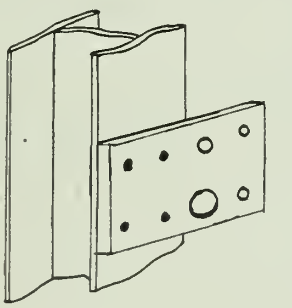


FIG. 2.

ed to a crane column, from holes of different sizes being cored out, the device in this case being placed in a horizontal position, about four feet from the floor. If placed vertically, as at Fig. 2, a flat plate only is required, both ways having their merits, and the position chosen being a matter of taste. An easy outfit for bending or straightening core rods from about five-eighths of an inch thick down to three-sixteenths, consists of a piece of angle iron 2 in. by 2 in. attached to the right-hand end of each core bench, a three-quarter inch hole drilled close to its end serving the same purpose as the holes in the above sketches.

OXY-ACETYLENE SAVED THE DAY

In a little Alabama town where the Welded Products Company, of Birmingham, was recently engaged in setting up one of its big oil storage tanks, the population witnessed the strange spectacle of a runaway tank in action. The tank, a great cylinder of the oxwelded type now superseding the riveted tanks in many places, was being lowered to its concrete foundation when the stay lines snapped, resulting in a sheer drop of a dozen feet. The empty cylinder bounced like a rubber ball from the hard base, which was several feet above the ground, hurtled to earth and started on a cross-country sprint that was not halted until it had flattened out a tool house in its path and plunged with resounding clangor a distance of two hundred yards across an adjacent field, where, its momentum spent, it rested.

The remarkable feature of the accident was that the tank, which was seemingly headed to certain destruction, was found on examination to have sustained no injury beyond a few dents in its metal plates. These were easily hammered out after the tank had been rolled back to its foundation and mounted. The oxwelded seams were intact and unimpaired at every point, no leak developing anywhere in the structure.

The staunchness of the big tank, which has a capacity of 15,000 gallons and which is 24 feet in length by 10½ feet in diameter, is attributable to the welding process used (oxy-acetylene).

DAVIS-BOURNONVILLE MOVE TO TORONTO

The Davis-Bournonville Co. announce the removal of their plant from Niagara Falls, Ont., to Toronto. After the first of June the plant and offices will be situated at 32-34 Eastern Avenue, Toronto. The office, which has been maintained at 168 King Street West, will be transferred to the above address. The new building is 50 x 110 feet of brick and steel, and is about completed now. In it will be installed a model generator installation, which will distribute by pipes through the factory. The oxygen will be manifolded and piped through the premises as well. They will manufacture oxy-acetylene welding and cutting apparatus, and make automatic equipment, oxygraphs for die cutting, barrel welding machines and other automatic equipment. Mr. J. F. Crowley, who has been the district sales manager, speaking to CANADIAN MACHINERY of the changed location, stated that they were certain that with office and factory under one roof they would be able to get much better results in the way of service and output. The change of location be-

Adventures of One James Corrigan in a Foundry

James Corrigan Ran Against Many Snags in His Adventurous Journey, But Landed Triumphantly at the Goal of His Ambition and is Now a Full-Fledged Foundryman

By Herschell L. Hatt

NECESSITY makes one think.

If it did not, the wooden Indian in front of the cigar store would resemble an excited warrior in comparison to some of us.

The mother of invention rears her children with a good clout now and then, so that they learn to stand or run without being afflicted with loose knees.

Jim Corrigan needed a job, and a certain foundry needed a man. In some way the Fates, who see to these things, linked them up together.

Jim never had anything to do with a foundry before in a practical way, but he had a liking for hot iron and the smell of burnt sand. He knew something about electric furnaces, and having worked around them there was nothing else he could be afraid of.

This foundry, which Jim took charge of, was, in a way, a poor orphan child, which had gone through two or three adoptions. For its success and happiness in life it sustained itself on cast-offs and few second helpings.

It was in an anaemic state when Jim found it, and looked as though it might collapse if a kind word were spoken.

Its assets comprised a large pile of scrap, a car of pig iron, and an empty till. There was also some coke.

Jim said: "It was like having a year's supply of hash and only one biscuit, with a hard winter in prospect."

For years the same moulders employed there had practically run the place. The work turned out had many faults, principally blow-holes, pin-holes, and every other kind of hole.

Usually if a new pattern came in they never got it the first time, but pretty nearly always the second time.

Jim had no money to buy pig iron, and he wanted to make good machinery castings without it.

The only way this could be done was to raise the silicon content. This would throw out the graphite or carbon in the uncombined state in the iron. Hard castings are hard because the carbon is in the combined state.

There are several ways of raising the silicon in iron—by sprinkling powdered ferro silicon in the spout as the metal comes from the cupola, or by putting it in the ladle; the best method is to mix it with the charge in the lump form.

Jim talked the matter over with Woods, the foreman.

Woods showed his interest by leaning against the door jam and looking furtively for a dark place to expectorate.

Well, a compromise was arrived at. It was decided to run a trial cast by putting in with each charge a few pounds of lump ferro silicon. Jim figured out the percentage required.

Wood showed his interest by leaning against the door jamb and looking furtively for a dark place to expectorate.

That trial cast would live long in history were it truthfully written.

It had more things the matter with it than Russia.

The range of complaints was everything from prickly heat to total paralysis.

Even the furnace gave symptoms of ennui.

The cold runs and short pours were something fierce.

Woods said: "The iron came out looking firm, but got discouraged and died down quick." Like 2 per cent., it was alright till it got to the mould, then lost its kick.

The furnace men said: "It took twice as long to melt the darned stuff."

The moulders intimated that they felt embarrassed about taking their seven iron men for that day.

Jim say that he had made a mistake and told the boys he was through experimenting in that mananer.

The trouble was not in what had been done to the charge. It was the state of mind generally.

It seems te be an ingrown principle that if you ever want to change anything in a foundry you have pretty nearly got to wreck the place to get it across, and build on another part of the lot, because the ground already occupied is sacred to tradition.

Jim saw this and kept his enthusiastic ideas in cold storage.

After a careful investigation he found why poor results in melting were so common.

For some unexplained reason the upper tuyeres were bricked up, curtailing the blast. He had these opened. Then he found that the fuel and iron was charged carelessly so that the coke would be on one side and the iron on the other, or just the way it had been shoveled in.

If the coke were dry it burned out before the iron was good and hot. Wetting the coke improved this.

If the men around the furnace are not closely watched they get slipshod and soon forget their early teaching. When complaints are made about the iron they never get the real reason for the cause but blame that pig, that scrap, or that coke. Then they begin to demand pressure gauges or a new blower. The real cause is usually carelessness.

Well, in this case the furnace men got peeved and naturally thought they should have more money. They made this plain by asking for it and then acting as if they did not care about the job, anyway.

Jim paid them off, and got better results from the new men because he gave them plain, careful instructions. A green man can run a cupola if he is told just what to do—and does it.

Jim worked by analysis, the only sure way in a foundry.

This is what he mapped out:

Analysis.

Charge	Lbs.	Si.	S.	P.	Mn.	C.C.	G.C.
Pig iron	100	2.70	.032	.60	.75	...	....
Scrap	1400	1.84	.08	.86	.47	...	....
Ferro Silicon	35	.50	...	...	...	...	....
Coke	225	...	...	...	...	...	....
The result from the cast—							
Castings	...	3.10	.124	.561	.41	.65	2.54

In subsequent tests the silicon ran from 2.90 to 3.25.

The castings were first-class, and Jim used up his scrap pile.

The total output of pig iron in Germany in 1919 was approximately 6.3 million tons, as compared with 11.9 million tons in 1918 (the Luxemburg and Lorraine figures for November and December being left out of consideration), a decline of about 5½ million tons. The steel output was about 8½ million tons, against nearly 15 million tons—a decrease of 6½ million tons, and that of rolling mill products 5.9 million tons, as compared with 10.13 million tons. The average daily output of pig iron fell from 32,503 tons to 17,341 tons, and that of steel from 49,113 tons to 25,469 tons.

Foundry Dialogue at Christmas Entertainment

Sunday School Children Give Demonstration of the Different Movements Required in Making and Pouring a Mould at Their Christmas Festival

By Thomas Nelson

THE FOLLOWING little sketch was presented at a Sunday-school entertainment in Toronto by a class of eight boys from nine to twelve years of age, under the direction of their teacher, who is a moulder, and who wrote up the dialogue.

They had a wooden flask 6 in. by 6 in., a little shield for a pattern, and poured the mould with plaster of Paris.

They worked on a portable bench on the platform and were lined up in a row facing the audience, with their teacher directly behind the bench. The teacher was known as the "Boss."

Beginning at the left, each boy stepped forward and performed his part, at the same time repeating the serve explaining the operation, and stepped back to his place in the line. The name of some of the boys was worked into the talk, but any name could be put in to make it of local interest

Boy No. 1

Holds up follow-board in one hand and pattern in the other and says:

"Right on this board I place this pattern,
Then I shake the partine bag,
When everybody stops their chatterin,
I'll ask the Boss to place the drag."

Here the boss steps forward and puts the drag on the board and sees that the pattern is in its proper place.

Boy No. 2

"I've got some sand that's just O.K.,
With which I fill the flask,
I ram it tight and then I say,
I'm finished with my task."

Boy No. 3 (Deviney)

Steps forward and holds up a little straight-edge and says:

"With this straight-edge in my hand
I strickle off the sand,
And the boss will place
The bottom board, oh, thanks."
(Boss puts on the board.)
Boy continues:
"It lies there good and steady,
To roll it over it is ready,
When I fasten them together
With the clamps."
(He puts on two light clamps.)

Boy No. 4 (Norman)

"All aboard, we need you all
To turn it upside doon.
Now boys, all together, Hee Haa,
And up she goes."

Here all the boys have gathered round the bench, and while rolling over the flask shout together the words in heavy type. The boy now takes off the clamps and drops the follow board on the floor at his back, when the boss hops around holding his foot and says:

"Oh, Norman, you're a terror,
A thoughtless, careless coon;
You dropped that heavy board
Right on my toes."

Boy No. 5 (Wills)

"I hope you've left some partine
In that little partine bag,
For I've got to put some on this
Joint, or the pattern's sure to clag;
I now put on this other frame,
The trade calls it the cope,
And push this pin (the gate pin) into the drag, you follow me I hope?"

Boy No. 6

"With this little pile of dope
I proceed to fill the cope
And tuck it tightly underneath the bar.
I take my little rammer, which is this case is a hammer,
And ram it good and tight, and there you are."

Boy No. 7

"Deviney, lend me your straight-edge till I do my little trick,
I clean the sand from off the cope, and I do it good and quick;
I take out the pin that Will's put in when he was on the hop,
And I'm the toff that lifts it off, I'm the giant in the shop.

(This happened to be the smallest boy in the bunch.)

Boy No. 8

"I draw the pattern good and steady,
Cut the runner gate,
Close on the cope and fix the clamp,
And cast it while you wait."

In the meantime the boss had the plaster ready and it was poured at the correct moment. Two boys now carried the bench to the end of the platform out of the way, and they finished up with the boss, saying:

"Now we move our little foundry,
To the platform's farthest boundry,
And we'll dump the flask in half an hour or so;
If we dump it any faster, as the cast is only plaster,
A mass of paste is all we'll have to show.
If it does turn out all right
We will let you see it to-night,
Then ye're going to keep it for a souvenir.
So with thanks for your attention,
We'll withdraw from this convention,
Wishing everyone a bright and glad New Year."

LEARNING A TRADE

Moulders are frequently caught expressing themselves as having learned their trade in a certain engineering establishment where high-class work was being done, and scorning the thought of working on such work as agricultural implements, even to the extent of hinting that it requires no ability whatever to do that class of work, but I want to say that these moulders should try their hand at agricultural work for a while, just to see how it goes. I know they would say the first day or so that it required some ability in the back, but that is not what I am referring to. If they stayed at it for a few months, they would find out that there was really something to it besides labor. I worked at moulding for a good many years before I ever tried it out but finally I tackled a foundry where plow work was done, and I found it to be hard work but in the half-year I remained there I learned more about real progressive moulding than I ever learned in any half-year in my life. I learned that many of the moves made by the average moulder are superfluous. Operations, which are really necessary on one job. are not necessary on another, and I learned that in order to make my wages on piece-work I had to eliminate everything which did not produce something for my own personal self. By this means, I was brought to the realization that even though a moulder is working day work and is doing a satisfactory day's work, he can do the same amount in a day with much less exertion if he uses a little judgment and leaves out all the superfluous false motions. There are jobs where it is advisable to take pains with the parting in order to facilitate repairing defects, but there are other places where this does no good and might as well not be done. This is only one class of useless work. All through the trade there are innumerable opportunities to save work or save time whichever is most to be desired.

Carelessness and Failure are twins.

—o—

The most valuable "system" is a good nervous system.

—o—

He—"The hand that rocks the cradle rules the world."

She—"Then you come here and rule the world a while. I'm tired.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

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Canada's Trade Balance

CANADA needs to get busy and produce in order that she shall have something to sell.

There is something radically wrong with a people living in such a country as this, who export very little more than they import.

It is a mighty poor tribute to the brain and muscle of the people, and a forceful commentary on their hit-and-miss habits.

Here are the figures for the past seven years:—

	Exports	Imports
1914	$ 431,583,439	$ 618,457,144
1915	409,418,826	455,446,312
1916	741,610,638	507,817,159
1917	1,151,375,768	845,356,306
1918	1,540,027,788	962,543,746
1919	1,216,443,806	916,429,335
1920	1,239,492,098	1,064,516,177

If Canada is to learn the lesson the exchange rate should have taught her, will have to be a further increase in exports.

Shorter hours and less output will never do it.

Canada's Industries

IN ANOTHER column of this issue will be seen an announcement of a series of articles appertaining to the foundry department of the Ford Motor works at Detroit. These articles we hope will be interesting and instructive, but while we have to hand it to the Americans for their ability to do things and for their politeness and courtesy in entertaining strangers we do not want to cast any reflections on our own institutions. We have in Canada some foundries which any nation might well be proud of, and all over Canada this kind of foundry has been springing into being by leaps and bounds ever since the signing of the armistice. Every month we announce a number of new foundries, but we do not always announce old foundries which are remodeling and installing new equipment. Some of our smaller foundries which for a time seemed destined to go into oblivion have been enlarged and equipped in up-to-date manner, while some of our larger plants which have always been leaders are still keeping pace and are holding their own with anything in the world.

It was our pleasure a few days ago to visit the works of the McClary Manufacturing Company, Limited of London and converse with the men in the shop, the foremen and those higher up and it augurs well for the company as well as for the employees that things are as they are. The McClary works is the largest stove works in the British Empire and the third largest in the world and is still enlarging and improving at a phenomenal rate Everything which tends to make it a pleasant place for the workmen to earn a livelihood in has been attended to not the least of which is a fully equipped lavatory and washroom containing numerous hot water shower baths and all conveniences. Every modern safety device is in use, and everything which lightens the burden of the workman is in evidence, such as light trolly system for conveying hand lades from the cupola to distant parts of the foundry floor. Moulding machines and match plates are here in abundance but they are operated by compressed air or whatever method works to best advantage. In conversation with the moulders and apprentices we learned that everything was satisfactory. One old reliable in union circles informed us that both sides had learned that by co-operation it was quite possible to have harmony, and that instead of taking advantage of the shortage of labor to make unpleasantness with the employer they were content to take advantage of the opportunity to make money for themselves at a time when steady employment was to be had and by treating the employer fair during these strenuous times the moulders would be justified in looking for fair treatment from the employer when times should change. This we are confident they will receive. Another suggestion emanating from the working man's side of the house was that, knowing the difference between winter and summer to a moulder, the employer might strain a point and have stocktaking and all such necessary shut downs take place during the summer months when the lost time would be appreciated by the moulders instead of during the winter months when he would rather stick to work. Unless there is some good reason for not doing so we trust that this suggestion will be acted upon.

Malleables Hard to Get

THE malleable iron foundries of Canada seem to be unable to cope with the demand for castings, according to parties interested in securing this class of goods. Everywhere it seems to be the same story. In conversation with M.. W. McVean of O. & W. McVean, Limited, manufacturer of wheels, hubs, spokes and bent goods, Dresden, Ont., we were informed that it was next to impossible to secure such malleables as are used on the Sarven wheels to reinforce the hub. These castings are required in car load lots but could be handled in smaller quantities, but in order to keep things moving it has been found necessary to draw on the United States for malleables. Things are not any too good over there either, but it is possible to get delivery with a certain amount of delay which is preferable to not getting them at all.

Why can't our own malleable plants get after this work.

A Commendable Idea

AN INTERESTING and novel entertainment was presented to the audience at a Christmas entertainment given by the children of a local Sunday School recently, in the form of a Dialogue in which a number of the boys were taught to do their parts in the making of a mould. The teacher of the class being a practical foundryman and somewhat of a poet found it quite in his line to compose the dialogue and instruct the performers.

The execution was well performed and well received and the audience, many of whom were not well informed in foundry practice went away much enlightened and amused. The dialogue is reproduced in another column of this issue of CANADIAN FOUNDRYMAN.

Government Control of Railways

THE people of United States had a very practical demonstration of what a mess could be made out of so complicated a utility as a railway system.

The Government controlled the roads. They raised passenger and freight rates enormously, and then lost money in millions.

Here is what happened in an average month of 30 days:

"The earnings of 17½ days of each month were paid to labor in wages.

"The earnings of 3 days were paid for fuel.

"The earnings of 5 days were paid for materials and supplies.

"The earnings of 1½ days were paid out for taxes and equipment and facility rents.

"This consumed the earnings of 27 days of each month.

"The earnings of the remaining 3 days went to net operating income and were used by the Government to pay the guaranteed standard return to the companies. The net operating income was insufficient for this purpose and in consequence there was a direct levy on the Government to meet the deficit."

It is easy for agitators who have nothing at stake to paint a great picture of the corporation gouging the public, but it is quite another matter to make the same dear general public see and realize that they have been well and properly gouged by their flier into state ownership of railways.

Daylight Saving Muddle

DAYLIGHT saving is meeting with an indifferent reception this season. Places that had it last year are staying with the clock this year, and letting the sun and the moon alone.

It suits some families, and others find that it does not work to their advantage at all. The result is that we have this year a splendid example of hit-and-miss time all over the country.

This country has had some years of experience with this sort of thing now, and those who have been benefited are a minority when compared with those who have found the new idea a nuisance and a drawback.

And so we have the spectacle of railroads running on old time through places on new time: Toronto on new time and Hamilton and places in between the two on old time.

The whole thing as it stands is a mess.

Put the hands of the clock where they properly belong and quit tinkering.

Ode to a Potato

THE grocer man is sellin' spuds at a dollar for a peck; it causes me to have a pain located in my neck. And there they set, them scabby things, them skinny-lookin' scuds, a-throwin' on all kinds of airs for common things like spuds.

Why, say, you spud, I well can mind not many years ago, I worked to keep your kin alive with sprinklin' can and hoe.

I used to pick ten thousand bugs from off your family tree, and now, you scabby faced galoot, you make a face at me, and claim to be worth six times more than was your former price when I was rescuin' your like from tater bugs and lice.

When I worked in a grocery store, way back in '65, we sold all sorts of truck and stuff to keep the folks alive; when in them times, you scabby thing, you wizzled, freckled sprout, we used to stick the like of you upon the oil can spout.

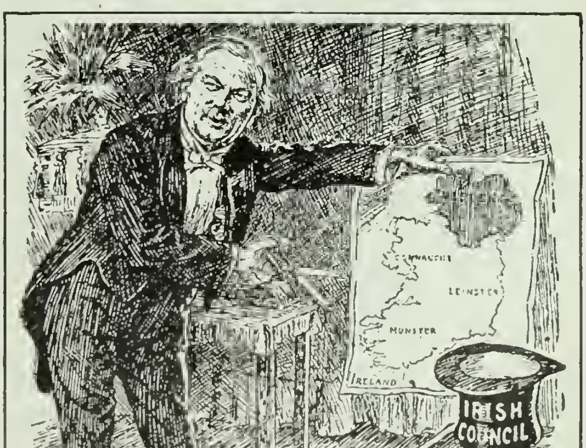
You make me sick, by heck you do, you aint no friend of mine, we used to toss the likes of you to fatten up the swine.

You think you're smart, you cross-eyed spud, you wall-eyed scaly thing, for bouncin' up the price of eats 'tween summer and the spring. I'll gorge myself with punkin pie, with turnips and with cheese, and eat enough of these here things to make me snort and wheeze, while you at 15 cents a quart are worth more than I've got, and you can sit right there, old top, until you durned well rot.—"Ark."

THE overall fad and the strike against using potatoes fell asleep at the side of the road. One reliable report has it that Old Man Hicost ran over them with his cart.

* * *

IN THE machinery, iron and steel world just now, it is one thing to buy goods, and quite another to receive them.



London "Punch."

Welsh Wizard: "I now proceed to cut this map into two parts and place them in the hat. After a suitable interval they will be found to have come together of their own accord—(aside)—at least let's hope so; I've never done this trick before."

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question.—As a subscriber to your valued publication, I take the liberty to ask the following questions:

(1) In using felt buffing wheels with emery surface for rough polishing brass, my method has been to cover the face with glue, then polish with emery.

This method is quite satisfactory on small work with wheel on stand. On work where large surface has to be covered by portable grinder this method is not at all satisfactory, the wheel being worn down to the felt in short order.

This is very noticeable on our bronze propeller blades, which have a diameter of 17 feet 6 inches. The wheel 2 in. or 2½ in. by 12 ins., running at 2,500 r.p.m.

Can you suggest any means whereby this emery face can be made more tenacious of life either by better cement or more absorbent; or perhaps new type of wheel or different procedure?

(2) The portable equipment used on this work is simply an attachment to socket of ordinary air motor; this is cumbersome, out of balance, and altogether inconvenient.

Can you suggest better portable arrangement with better balance, easier to handle, etc.?

Answer.—(1) Use canvas wheels for roughing the brass, then finish on felt with finer emery. Felt wheels are not adapted to rough polishing, a good canvas wheel properly set up with good glue and good emery will finish four times as much work as a felt wheel of same size set up in the same manner. Felt wheels are used principally for final finishing operations. In setting up the wheels, clean and true them, then dry for about three hours, glue again, and roll in emery of the required grade and hang up to dry for at least ten hours. Emery sufficiently coarse to use for roughing brass will adhere much more tenaciously to a canvas wheel than to a felt wheel. A canvas wheel or a felt wheel of 12 inch diameter would work satisfactorily on a suitable stand if the wheel revolved 2,500 r.p.m., but this speed is excessive for a wheel 12 inches in diameter rotated at the end of a flxible shaft. This excessive speed, together with the probable crude construction of apparatus has a tendency to create a very pronounced unbalanced condition, and this unbalanced condition is one of the principal direct causes of short life to your wheels. High speeds increase the effect caused by slight unbalanced condition of wheel or shaft. We would advise the use of canvas wheel not exceeding 8 or 10 inches in diameter and rotated at from 1,600 to 1,900 r.p.m. The speed of a perfectly balanced wheel rotating on a shaft in a firmly fastened polishing lathe will be limited by the melting point of the glue, which varies with different glues, also by the hardness of the emery. This, however, does not hold good in cases where wheel is rotated in the manner described by you.

(2) The principle employed is quite correct, but we would suggest a flexible shaft similar to those used with the flexible drills in machine shops. Drive from a cone pulley on counter shaft by round belt to grooved pulley at end of flexible shaft, the end of which is held in position by a rope acting over a small block and running through a ring in the floor directly beneath the cone pulley on counter-shaft. The wheel is fastened to the end of the flexible shaft in same manner as on a shaft of stationary machine, sufficient length of shaft should extend beyond wheel to permit the use of a hand hold, the latter being held on shaft by collar on shaft and a spring clip on handle. A portable device of the above kind may be constructed on small truck if desired. The flexible shaft may be made very light and easy to handle, the arbor for wheel must be of sufficient diameter to fit the wheel and naturally will require to be substantial. A device of this kind will be found very convenient. Have a hand hold on each side of polishing wheel to facilitate perfect control of the wheel while in contact with the work.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—I have recently undertaken to operate a small nickel solution for my employer and have become very much interested in the work. Will you please tell me why a nickel solution with 12 ozs. of salts per gallon will conduct more current than a solution made from 8 oz. of salts? Is it simply owing to presence of more metal in the solution?

Answer.—It is owing to the presence of greater number of nickel ions. There are two kinds of ions: The electro-positive ions are called cations and the electro-negative ions are called anions. The first mentioned appear at the cathode or article being plated while the latter appears at the anode. The current may be regarded as being carried through the solution, which is termed an electrolyte, by the ions; since an ion is capable of carrying a fixed charge only of positive or negative electricity, any increase in the current strength necessitates an increase in the number of ions. Single nickel salt solutions will conduct several times more current than double nickel salt solutions, as the former may be made much more concentrated than the latter, which is usually limited to 12 oz. of salts per gallon when used at normal temperatures. For more detailed explanation of the various ions read a chapter on electrolysis in any good text book on electricity.

Question.—Can you advise us approximately the cost of nickel plating the average stove casting per pound, also do you think it would pay us to install a nickelling plant in consideration of the small amount of stoves that we manufacture? We now turn out about 1000 stoves per year, and are intending to double this output if possible and would like to have expert advice on the advisability of installing the plating plant. We would then be able to use to advantage your articles on nickel plating and polishing.

Answer.—To estimate the cost of installing a polishing and plating outfit for your requirements, it would be necessary to have more detailed information with reference to the following:

(1). The total quantity of work required to be plated per day or per week, or the greatest quantity of work required to be plated at one time. The above has reference to the approximate square foot surface area of the work to be plated, also the shape and size of average and larger pieces. Many stove castings such as doors, panels, etc., may be suspended in the plating solution in pairs, exposing only the polished surface to the direct action of the current and increasing the capacity of a given sized tank. In case this is common practice the distance between the pieces in process and the nickel anode in the tank should be given due consideration, and to obtain this dimension we should know the dimension of the castings which are to be plated in pairs.

(2). What class of finish do you intend giving the product? Rough polishing requires heavier nickeling to facilitate even ordinary finish. High grade nickeling will require heavier deposits than cheap work. Durable deposits naturally require slower deposition or larger periods of plating than the cheaper lines. The size of the polishing and plating plant is in the main dependent (after the quantity of work required to be operated on is known) upon the quality of the plating and finish desired, which is ruled by the length of time the work has to be left in the plating solution, and by the care exercised in polishing, preparatory to plating. In deciding upon a plant it is prudent where possible, to leave room both with the dynamo and the shops for further extension of the plant at some future time. In your case we would advise the initial installation of a plant sufficiently large to process 2000 complete stoves per year or more. The extra expense with reference to electrical equipment would be small, in fact the cost of suitable equipment now would be less than the cost of replacements later on.

From the information furnished us we estimate your requirements as follows:

Tanks—1 cypress wood tank 8 in. x 30 in. x 24 in. for nickel solution. Cypress wood is specified because it is the best wood procurable for the purpose and is used for tanks for both plating solutions and rinse water. The lumber should be 2½ in. or 3 in. thick and all joints tongued and grooved, sides, ends and bottom to be clamped with ⅝ in. iron bolts, completed tank to be lined with ⅛ in. coating of asphaltum. Or tank may be made of concrete and lined with asphaltum. Tank walls should be at least 4 in. thick when concrete is used.

One wooden rinse water tank, double compartment, approximately 6 ft. x 2 ft. x 2 ft. depending on size of largest pieces to be handled. Possibly a large barrel could be used for hot water for final drying until conditions warranted better container. Barrels are often employed for this purpose in plating plants of small dimensions.

One sheet iron tank for cleaning solution, 4 ft. x 2 ft. x 2½ ft. This tank will permit soaking large quantities of work of small dimensions and if quick acting solution is employed the large pieces could be cleaned quickly enough to facilitate constant processing of the average sized work.

We assume you intend to deposit nickel directly upon the iron and will not include items relative to copper plating.

One or two small wooden tanks or stoneware crocks will be required for dips, or barrels could be substituted. Now to properly equip a tank of the size mentioned, with nickel anodes will require for one work rod, or a three bar tank equipment approximately 64 nickel anodes 2½ in. wide by 24 in. long. These anodes will weigh approximately 18 lbs. each and present an effective surface area of about 32 square feet which practically equals the maximum cathode surface area limits of the tank in question. This is the most economical method of equipping a nickel plating tank and insures you against frequent costly additions of metallic salt, if the conductivity of the bath is maintained correct and the anode corrosion is efficient and constant during the periods of deposition. We also advise 95-97% nickel anodes. This grade contains less iron than the 90-92% and is more economical and satisfactory in the end. To plate 32 square feet of surface will require from 160 to 380 amperes of electric current at low voltage. The range here given has reference to use of the two solutions now in general use. The double salt solution would permit the lower current density while the single salt solution would allow practically double the current used with the double salt to be employed. It is good business to purchase a generator of greater capacity than you are liable to actually require. To install a plant of this type would require the expenditure of approximately $1500. If you built your own iron and wood tank within your present factory the cost might be reduced to about $1200.

In view of the fact that your business is expanding and the demand for plated work increasing we would say that it would be an economical investment to install a plating plant and finish your own product. Naturally much depends upon the amount of nickel work there is on one of your complete stoves. You have given us no information relative to this important point.

Question.—When metallizing small objects such as butterflies which is the best to use, graphite or bronze powder? Also which is the best way to apply the powder to the objects without damaging them?

Answer.—Bronze powder is preferred by the majority of platers who indulge in this class of amusement. Graphite may be very successfully used for coating more substantial articles, but for frail specimens use the bronze powder. It may be applied by spraying on solution of orange shellac varnish cut with denatured alcohol, or the dry powder may be blown on while the lacquer coating is tacky. Care must be taken not to apply the powder too freely as even careful brushing with very soft brush is liable to injure the specimen. If the bronze powder is sprayed on, the powder is mixed with a good bronze medium such as gun cotton lacquer, and two coats may be necessary on some objects. Allow the coating to dry hard before attempting to plate the article. The first deposit should be of copper from an acid copper solution, use a voltage of about 1 volt. A final finish of gold, silver, oxidize, etc., may then be given the object and a finishing coat of transparent lacquer completes the operation.

Owing to lack of Hydro power all construction work at Baldwin's Canadian Steel Corporation, Ashbridge's Bay, Toronto, has been stopped. The president, Mr. A. M. Russell, is now waiting to hear from the directors of the concern in England to decide what steps to make next. The company has threatened to move to Quebec Province.

On May 5 the president wrote a letter to Sir Adam Beck calling attention to the Hydro's assurance that the plant would be able to get adequate power, and the later admission of Sir Adam that there was a shortage. "We acknowledged receipt of a letter signed by Mr. Pope, dated the 3rd instant, on the subject of the power supply for the operation of our plant," says the letter of Mr. Russell. "This letter is to the effect that the commission will supply us with 2,500 horsepower after June 1, 1920." The letter continues that a year ago, when Mr. J. C. Davies, managing director of Baldwin's, Ltd., England, was considering the purchase of the assets of the British Forgings, Ltd., the Hydro Commission assured them that there would be plenty of power, and the commission was willing to agree to 20,000 kilowatts in blocks of 1,500 kilowatts as required by the company. Negotiations as to price took place.

"The price was settled and there never was a suggestion that the power requirements would not be met," continues the letter. "Obviously a plant such as the British Forgings is useless without power to operate it, and Baldwin's Ltd. would not have purchased it if they were not assured of power."

The minimum amount of power necessary for the next 18 months would be 2,500 horsepower in June next, for the first unit of the rolling mill; 2,500 horsepower by next September for the second unit of the rolling mill, and 3,500 horsepower by 1921 for the sheet bar mill.

Mr. Russell, president of Baldwin's, stated that if the company could continue its programme as intended they would be employing between 2,000 and 2,500 men by next year at this time. At present work has stopped on several large steel buildings.

AN OPPORTUNITY WORTH WHILE

In this week's issue of CANADIAN MACHINERY is an article on "Some of the Methods of Heat Treatment." This article is one of many that we hope to present on this important subject, for as time goes on the value of proper heat treatment is becoming more and more recognized.

We suggest that readers desiring to follow up all important developments in the heat treatment field get acquainted with Toronto Chapter of the American Steel Treaters' Society.

This body of men meets once a month and prominent speakers will present papers and lectures from time to time. Experience meetings will also be held; in fact it will be a real get-together club. You need not reside in Toronto to become a member, for if you so desire reports of all meetings will be forwarded you should you be unable to attend personally.

Investigate this for it will more than repay you, the price of membership being far from prohibitive. Write Mr. Lowry, chemist of the Massey-Harris Co., Toronto, if interested.

Scraps from the Foundry Scrap Pile

Death of Mr. Roger C. Sullivan.—Mr. Roger C. Sullivan, chairman of the board of directors of the Independent Pneumatic Tool Company, died at his home in Chicago on April the fourteenth.

The Dominion Conduit Co., Montreal, P.Q., has been incorporated to manufacture iron, steel, casting, etc., with $300,000 capital, by Wm. Jehnson, Robert Mills, Richard C. Simmins and others are the promoters.

Sarria Foundry to be Enlarged.—The Holmes Foundry Company, of Sarnia, Ont., will begin at once the erection of a substantial addition to their plant, the plans for which are already drawn and the contract awarded for its erection.

Montreal Foundry Changes Hands.—The plant of the Belanger Foundry Company, 340 Amherst Street, Montreal, has been acquired by The Dominion Welding Mfg. Co., also of Montreal, who will immediately take posession of the same.

Stove Foundry Enlargement at Guelph.—The T. Eaton Company, of Toronto, who have acquired the plant and business of the Guelph Stove Company, will add a considerable extension to the foundry. Architect W. A. Mahoney, of 72 Quebec Street, Guelph, has prepared plans for the same.

Dresden, Ont., Iron Works Changes Hands.—The Dresden Foundry and Machine Shop, formerly owned and operated by Mr. Cecil Gammage, has been sold to Mr. Howard Meredith, who will run it chiefly as an automobile garage and repair shop. The foundry department has been dismantled and the space utilized as part of the garage.

Business Brisk at Kitchener. — The Forwell Foundry Co., manufacturers of soil pipe and general jobbing work, Kitchener, Ont., have made extensive improvements to their plant and have taken on a considerable number of additional hands and are very busy at the present time and contemplate a good year's business during 1920.

Addition to Wallaceburg Plant.—The Wallaceburg Brass and Iron Company, Limited, Wallaceburg, Ont., are making extensive changes and additions to their foundry An electric crane is being installed as is also a Monarch oil burning furnace. Their battery of eleven pit furnaces is being augmented by the addition of one more, and an electric furnace is being seriously contemplated.

McClary Extension Nearing Completion.—The new three-story addition to the McClary Stove Works, at London, is nearing completion and will add greatly to the output of the plant. The woodworking department, which is now occupying space in the main building, will be transferred to the new addition, making room for an enamelling department in the space vacated, which will also be enlarged by an additional extension.

Fire at Buck Stove Plant.—Damage to the extent of seventy-five thousand dollars was done to the plant of the Wm. Buck Stove Co., Brantford, Ont., on May 6. The main building and mounting department were practically destroyed, but the company will not be hampered in filling orders as their large store house was saved. The offices and the moulding shop, which were housed in separate buildings, are also intact. The company is very busy, and, needless to say, will rebuild at once.

The Courtney-Fraser Company, who were reported in our March issue as having transferred their Buffalo business, to Mr. Chas. C. Kawin, have sold their entire stock and the Akron, Ohio, Laboratory, formerly operated by this company, is now a branch of the Charles C. Kawin Company, and neither Mr. Courtney or Mr. Fraser is any longer connected with the Courtney-Fraser Company.

Electric Furnace Installations.—The Electric Furnace Construction Company, of Philadelphia, report the successful starting up of "Greaves-Etchells" Electric Furnaces at the following works; Dodge Steel Casting Co., Philadephia; American Radiator Co., Buffalo, N. Y., and the Hammond Steel Co., Syracuse, N. Y., all of which tends to show that electricity is becoming a dominant part of foundry operation.

Sandwich Foundry Changes Name.—The International Casting Company, of Sandwich, has been amalgamated with the Fischer-Wilkie Company and will hereafter be known as the Foundry Department of the Fischer-Wilkie Co. They are practically dropping out of jobbing work, and after completing some two hundred tons now on order will devote themselves to the regular run of work for the company. Some of the orders now booked include an initial order for 750 tons of tractor castings and 5,000 sets of castings for silo-fillers to be attached to tractors.

New Foundry Next Spring.—The Moncrief Furnace and Manufacturing Co., Limited, of Guelph, Ont., are now running full blast in their assembling department and will immediately begin construction on another building for similar purposes and for storage, but their new foundry will not be proceeded with until the Spring of 1921, at which time, it is hoped, that conditions will be more stabilized. In the meantime, they are securing their castings from local plants and importing some from Cleveland, Ohio, where their parent plant is located. The company has seven acres of land at Guelph and intends to have a modern and complete plant in every particular. Mr. W. J. Shibley is the manager and treasurer.

Big Foundry Addition in Hamilton.—The Brown-Boggs Company, Limited, Hamilton, Ont., are building an addition to their foundry which will more than double its capacity. When completed, it will be equipped with a 25-ton electric travelling crane, a new heating system, and all the latest improvements which go to make up a thoroughly up-to-date foundry. There will also be a washroom and lunch-room, 20 by 64 feet, finished in white tile with steel lockers, enamelled wash basins, and space for ten shower baths. In addition to this, there will be a first-aid room, large enough for three stretchers, fully equipped to give aid in any kind of accident. This equipment will be one of the most complete foundry installations in Canada.

Co-Operation in Brass Foundry.—An interesting example of co-operation is that displayed by the moulders employed at the plant of the Stratford Brass Company, Limited. The company manufactures a line of brass furniture trimmings and builders' hardware, and finding themselves handicapped from lack of equipment and for lack of space in which to install new equipment, decided to enlarge their foundry. This necessitated a lot of builders operating where the moulders should be and the company being too busy to have their men idle and also not wishing to have them out of employment with living expenses at such a high pitch, it was decided that the men should work nights instead of days with the result that the output was as usual, the men received their pay and the carpenters and bricklayers had the right of way to proceed with the extensions to the plant.

CATALOGUES

Synopsis of McLain's System **is the** title of a neat booklet published **by the** McLain System, of Milwaukee, **and is** a book which should be in the hands of every foundryman: Every phase of semi-steel and general cupola practice is thoroughly explained, together with a general synopsis of the open hearth furnace. Many examples of semi-steel castings and much valuable information for the foundryman are given.

Thor Pneumatic Motor Hoists is the title of a pamphlet just from the press, by the Independent Pneumatic Tool Company, 3334 St. James St., Montreal, and 32 Front St. W., Toronto. The pamphlet describes in detail this latest addition to the Thor line of pneumatic tools. The tool known as the Thor Pneumatic Motor Hoist is to supplant the old method of hand-driven chain hoist by that of compressed air and is of particular interest to foundrymen. The pamphlet shows all its features and is well worth asking for.

Combustion Economy Corporation. 1901-1911 South Rockwell Sts., Chicago, Ill., have just issued their bulletins Nos. 2 and 3, describing their Grindle system of melting malleable iron with powdered coal. This is a comparatively new invention in metal melting, and in view of the high cost of coal and the difficulty of securing it at any price, the descriptive articles described in these bulletins should be of particular interest to malleable men. Annealing ovens, core ovens, steam boilers, etc., successfully fired with the Grindle system are also described.

Change of Address: "On May 1st, the Independent Pneumatic Tool Company which has been located at 736 David Whitney Building, Detroit, Michigan, will move into larger quarters at No. 55 Garfield Building, Detroit, Michigan.

This change has been made necessary due to the rapidly increasing business and the desire on the part of the Company to give their customers better service. In the new offices, which will have 1500 square feet of floor space, the Independent Pneumatic Tool Company will maintain the largest stock of pneumatic tools and electric drills, repair parts, and accessories in the Detroit district."

REPORT ON TWO PLAIN CARBON TOOL STEELS.

At the University of Sheffield the following tests were made of two samples of steel, one made by the electric furnace process in a "Greaves-Etchells" furnace and the other from a crucible steel made from a Swedish base. It will be noted that the Electric Furnace shows a slight advantage.

These two steels were tested on a mild-steel bar by means of the speed increment test, in which the starting speed was 20 feet per minute, the speed increment 1 foot per minute. The depth of cut ⅛ in. and the feed per revolution 1-60 inch. Each tool was testsd three times, the following being the mean results of the tests:

Tools	Average Test Duration, in Mins. and Secs.	Average Breakdown Speed, in Feet per Minu.	Average Volume of Metal Removed Up To Breakdown in Cub. Inches.
Electric ..	18 mins. 57 secs.	59.2	18.8
Crucible .. (Cast)	18 mins. 47 secs.	58.8	18.6

There is but little difference between the two steels from the point of view of durability and cutting power, and each is a good average plain carbon tool steel.

NORTON COMPANY OF CANADA BEGIN OPERATIONS

Building operations on the Norton Company of Canada, situated at Hamilton, Ont., mention of which has appeared from time to time in these pages, have now been completed and the management of the concern is ready to ship orders to the Canadian trade by May 15.

The plant has a complete equipment for the manufacture of grinding wheels and the entire handling of the wheels from the mixing to shipping will be done at this new centre.

The main building is three stories high with a single floor space 50 x 100 feet and will be connected with a kiln building of two stories in back, the floor dimensions of which are 16 x 128 feet.

MR. R. C. DOUGLAS
Manager Norton Co. of Canada, Hamilton, Ont.

The entire plant has a modern construction built of Hamilton pressed bricks with steel sashes throughout. It was started on November 4, 1919.

A number of expert workmen and efficiency heads from the Worcester plant are in charge of the several departments under the direction of the manager, R. C. Douglas. The personnel includes Frank Ryan, head of Methods; A. J. Mouncey, time-keeper; Albert Jornson, general foreman of Mixing, Abrasive and Bond supply; Oscar Wahlberg, head of Shaving and Cutting; M. Anderson and Carl Forsman, in charge of Kiln; J. Hoglund, in charge of Balancing, Bushing and Truing; William Landquist, in charge of Grading, Inspection and Stock; S. H. Healey, in charge of Packing, Shipping and Traffic, and J. Jelicka, in charge of Silicate and Plastic Departments. W. H. McNeilly from the electric furnace plant, situated at Chippawa, Ontario, will take full charge of the office detail.

The Norton Company of Canada is a separate corporation, and has been capitalized at $500,000.

INDEPENDENT PNEUMATIC TOOL CO. HOLD ANNUAL MEETING

"The Annual Stockholders and Directors meeting of the Independent Pneumatic Tool Company was held in Chicago, Illinois, on Friday, April 23rd.

Directors were elected to serve for the ensuing year as follows: Boetius H. Sullivan, John D. Hurley, Leonard S. Florsheim, August Gatzert, James J. McCarthy, William A. Libkeman, Ralph S. Cooper, Robert T. Scott, Edward G. Gustafson, Fletcher W. Buchanan.

Officers were elected as follows:

Boetius H. Sullivan, Chairman of the Board.

John D. Hurley, President.

Ralph S. Cooper, 1st Vice-President.

Robert T. Scott, 2nd Vice-President.

Fletcher W. Buchanan, Secretary.

Edward G. Gustafson, Treasurer.

Mr. Boetius H. Sullivan is a son of the late Roger C. Sullivan, and was elected to fill the vacancy made by his father's death, which occurred April 14th. This was the only change made in the Board of Directors.

Mr. Robert T. Scott, the newly elected 2nd Vice-President has been connected with the Independent Pneumatic Tool Company for the past fifteen years. He has been Manager of the New York office, and will continue to make his headquarters in that city.

The annual report shows great progress in the Company's business. There has been not only a steady increase in Pneumatic Tool sales, but the Company is now strongly established in its Electric Drill department, and has also commenced to manufacture a complete line of Pneumatic Motor Hoists."

DAVID McLAIN

We have on several occasions received requests from our subscribers for information regarding David McLain and the McLain system of foundry practice.

We have a decidedly favorable opinion of the McLain system and we therefore unhesitatingly recommend it, although we never attempt to quote from it, for two very good reasons. In the first place we do not feel capable of delivering the goods in a proper manner, when asked to answer questions on how McLain would do things. And in the second place it would not be the proper thing to do. This course represents the result's of Mr. McLain's life's labors and is the stock in trade of his business.

A profusely illustrated catalogue descriptive of the course is now being given out and should be secured by every progressive foundryman. We have just received our copy and the receipt of this catalogue in the same mail with a communication from a foundryman seeking a foreman and a foreman seeking a position is a circumstance of coincidence worthy of interest. One want ad. reads: "Wanted—By thorough, practical moulder, position as foreman. Can handle marine, locomotive and stationary en-

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$42.40
Lake Superior charcoal, Chicago	57.00
Standard low phosphorus, Phila.	50.00
Bessemer, Pittsburgh	43.00
Canadian foundry pig—	
No. 1, Toronto	52.00
No. 2, Toronto	50.00

NEW METALS

	Mont.	Tor.
Lake copper	$25.00	$24.00
Electro copper	24.50	24.00
Casting copper	24.00	24.00
Tin	77.00	75.00
Zinc	12.50	12.25
Lead	12.00	12.00
Antimony	14.50	14.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$15.00	$14.00
Copper, crucible	18.00	18.00
Copper, heavy	18.00	18.00
Copper, wire	18.00	18.00
No. 1 mach. comp	16.00	17.00
New brass cuttings	11.00	11.75
Red brass cuttings	14.00	15.75
Yellow brass cuttings	8.50	9.50
Light brass	6.50	7.00
Medium brass	8.00	7.75
Scrap zinc	6.50	6.00
Heavy lead	7.00	7.75
Tea lead	4.50	5.00
Aluminum	19.00	20.00
	Per gross ton	
Heavy melting steel	18.00	18.00
Boiler plate	15.50	15.00
Axles (wrought iron)	22.00	20.00
Rails	18.00	18.00
Malleable scrap	25.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	12.00	12.00
Car wheels	22.00	26.00
Steel axles	22.00	20.00
Machine shop turnings	11.00	11.00
Stove plate	25.00	25.00
Cast borings	12.00	12.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.16
Iron perchloride	.62
Lead acetate	.60
Lead acetate	.30
Nickel, ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite, per cwt.	8.00
Sodium phosphate	.18
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.60
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.09
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09
Crocus composition	.12
Emery composition	.10
Rouge, silver	.60
Rouge, powder, nickel	.45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$42.50	$43.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	46.00	44.00
Copper sheet, tinned, 14x60, 14-oz.	8.00	48.00
Copper sheet, planished, 16 oz. base	46.00	45.00
Braziers', in sheets, 6x4 base	45.00	44.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.75	$14.50
Sheets, 3½ lbs. sq. ft.	10.50	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.25	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 8.50	$ 9.50
Sheets, black, No. 10	8.50	9.00
Can. plates, dull, 53 sheets	8.50	10.00
Can. plates, all bright	8.60	9.00
Queen's Head, 28 B.W.G.	11.00	....
Fleur-de-Lis, 28 B.W.G.	10.50	....
Zinc sheets	16.50	20.00

gine work. Graduate of McLain's system of semi-steel. Box 211 Canadian Foundryman." The other reads: "Wanted—Foundry foreman for foundry doing agricultural work and some jobbing. McLain system graduate preferred. Naturally methodical, orderly, tidy and economical. Box 209 Canadian Foundryman."

From these it would look as though a molder might as well not apply for a position or answer an ad. unless he is a McLain graduate, and obviously there must be a reason. We will not attempt to pass any comment on the McLain system as it is not an affair of ours, but we can not help but notice that it has become a part of the modern foundry practice which must be reckoned with.

It has been our pleasure to meet Mr. McLain personally and it is with equal pleasure that we introduce him to our readers.

David McLain is rightly regarded as one of the central figures of the foundry industry; his name and fame are now WORLD-WIDE, as the list of his students and graduates covers practically every country on the globe; his system of better foundry practice in both iron and steel plants has been accepted as STANDARD throughout the world.

Mr. McLain was one of the pioneers who blazed the trail and more than twenty years ago began teaching his methods to all foundrymen with whom he came in contact, and the secret of his success in doing this is that he applies the principles of metallurgy of both iron and steel directly to the individual.

From boyhood he dreamed of the day when he would know more about analysis of materials—the alloys and how to use them to produce the different grades of steel—he wondered if he would ever learn to operate a cupola in such a manner as to avoid the enormous waste existing in the majority of gray iron foundries, and whether it would be possible to utilize the tons of steel scrap then sold for a song.

He married at the age of eighteen and consequently had shouldered greater responsibility than the ordinary young man at twenty-three, but necessity developed the wonderful faculty of observation and as a result of this he became aware that the average foreman followed the "Lines of least resistance" and while he believed they should know every little detail of making gray iron and steel castings, still where were they to learn it?

It was while systematizing foundries that he saw more than ever the necessity of some method of instructing foundrymen along the scientific principals of their business, and this without giving up their positions. Thus he conceived the idea of teaching them by mail and discussing foundry problems in detail.

We might say a lot more but this introduction will make all our readers feel acquainted with David McLain and that you will all write and tell him that you are glad to know him, and ten chances to one he will send you one of his booktem better than we could undertake to do it.

SUPPOSING

Supposing we had every thing which we wished for, or supposing we were in a position to secure anything and everything which we might ask for, how would we proceed? Would we want what be-

longed to others and just take it? Would we forget that others had desires and should have what they want as well as we? Supposing it was in our power to make the laws, would we make them so as to benefit our own personal, individual selves or would we make them to do the most good to the most people?

We are supposing a lot of things but not getting any reply. What we want in this old world of ours, which was given to us without any effort on our part, is a knowledge that there are othin this world besides ourselves and that we must not covet that which belongs to others. Now, supposing we are having an election, why not forget that we belong to any party or set and simply aim at securing a man who is honest? If the man is honest, he can be depended upon to do that which is right. An honest man will not side with any bunch or clique and he will not be led around or influenced by any set who are inspired with personal ambitions at the public's expense. What we want is honest government and honest laws. Every class of society must have the same chance and if everybody uses his own judgment on election day, surely the successful candidates and the successful Government must be the ones which are desired by the majority of the people, and any laws made by these elected representatives of the people should be respected and obeyed. Millionaire paper mill men or millionaire manufacturers of any other kind should not be allowed to defy the law. If the law is wrong it should be righted, but until such time as the people's representatives change the law and make it right it should be obeyed.

The same thing holds good with the working man. His vote is just as big as anyone else's and he has every chance to elect his man that anyone else has. The working man says he does not want favors, but just wants fair treatment. If he comes out as a candidate, standing on this platform, he should stand a good chance of success, but if defeated he must recognize the fact that he did not have the majority with him and he and his followers should govern themselves accordingly.

Now supposing we should have an election and the working class does not get sufficient support to become the ruling power, what can they expect to accomplish by rowdyism or demonstrations? If they cannot win at the polls they cannot win in a row.

Now for the sake of supposing. Supposing the Bolshevik movement became strong enough to form a political party, if they could get themselves elected we would have to abide by their laws, but if they could not get elected, they certainly would be unable to win anything by any other means. Of course, nobody in Canada favors Bolshevism, but supposing the laboring class could convince enough electors that their theory is the right one and we should exact all the laws which labor advocates, would the laboring class be any better off, or would they enjoy living under the laws which

get a law made whereby eight hours constitutes a day with a fine attached to the man who works any longer and also a fine for the employer who allowed it. And supposing the authorities set the rate of wages which each man is entitled to draw, with a fine for both employer and employee who breaks it. And supposing the law regulates the amount of profit a business man can make but overlooks remunerating him for losses which he may suffer. And suppose we have the whole country run under this class of legislation? What satisfaction would it be for anybody to be alive? Isn't it better that each one chose his own walk in life and each one struggle to make life a success? With everybody tied down under arbitrary laws, what incentive is there for anyone to make any effort to be successful in life. These kind of laws are no improvement on those under which the Russians labored. Arbitrary laws imposed by a czar are no more unbearable than if imposed by a labor Government. What we want is freedom of thought and action, with encouragement for the poor working man who is on the bottom to work his way up. What each and every one should strive to understand is, that this world is full of opportunities, and that the man with the most ambition is the man who is the most entitled to success. Why does the working man remain a working man if the employer of labor has such an advantage over him. History proves that most of the great giants of industry are those who have risen from humble workmen. The opportunities are still as evident as ever, and the poor workman who is struggling to have the law take a hand in his affairs and compel his employer to come to his terms would do better if he would get out of the employer's clutches and launch into something for himself.

No, we don't want any more laws made to force any one to do what he does not want to do. If I start a little country shop and decide to work long hours until I get on my feet I don't want anybody else meddling with my affairs. If we have law mixed into our private affairs there is no telling where it leads to. If a man is a molder and works eight hours at his trade he must remember that he is breaking the gardener's section of the law if he works a garden after hours.

REDUCING CASTING LOSSES

(Continued from page 121)

moulding some 50 per cent. of the castings cracked where the spokes ran into the hub. A fillet at that point nicely tapered off did what neither gating or chilling could do.

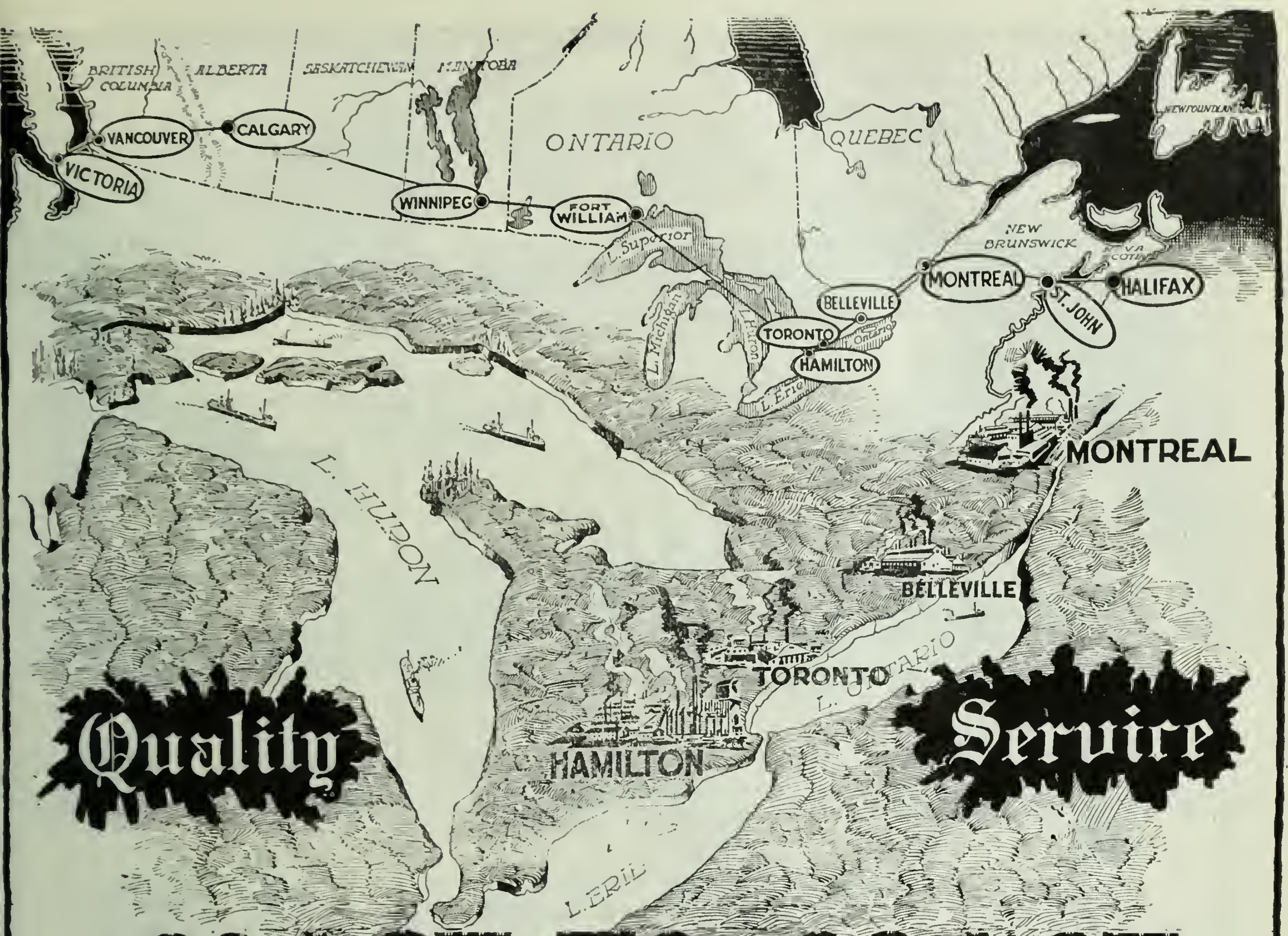
There are many other things a brass foundryman has to consider but nothing is more important than the condition of his sand. Dry sand causes washes. Wet sand and sand rammed too hard kick, and make air pockets, and spongy castings. Often the foundryman who has porous castings blames his metal when the trouble is in the mould. Venting is another thing to watch; so you can see there are many causes. If the foundryman makes up his mind to go after all the details he can get his foundry loss down to 5 per cent., he can do so and the first place to start is on the pattern plate. So therefore get your gates right first for no matter how careful you may be in other ways first class results cannot be obtained if your gating is wrong.

A VISITOR TO CANADA

Mr. H. E. Deakins of the Osborn Manufacturing Company, Cleveland, Ohio, manufacturers of moulding machines and foundry supplies, is now spending part of his time in Canada.

To those familiar with the engineering service given by the Osborn Company this will be good news. Mr. Deakins, in addition to being a foundry engineer of ability, is thoroughly experienced in pattern making. A man capable of advising you on the moulding machines best suited to your purpose and their proper rigging to produce the best results.

MR. H. E. DEAKINS
Representing Osborne Mfg. Co.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L. HURON
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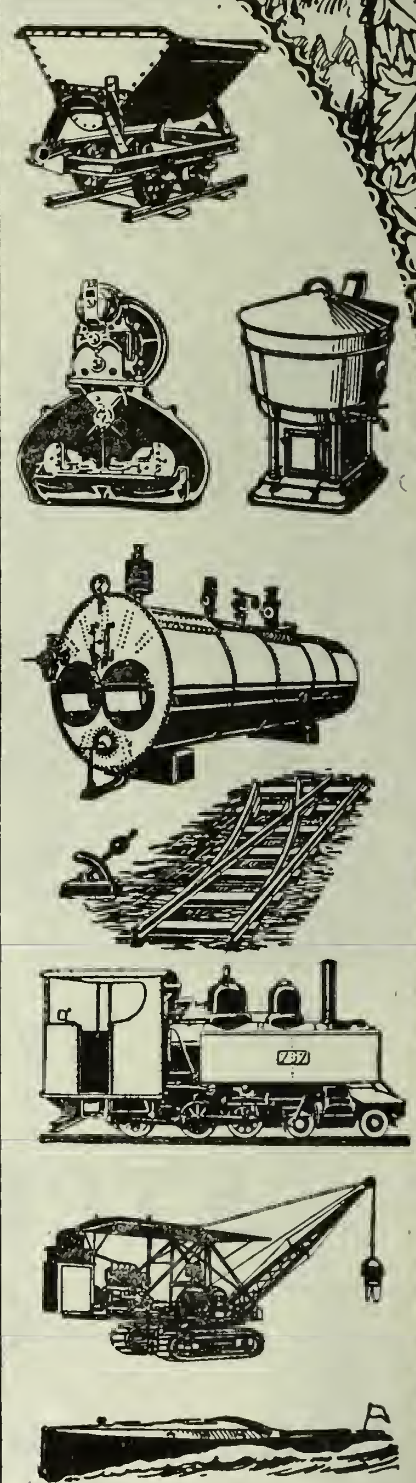

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.

ANALYSIS
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Pangborn Corporation, Hagerstown, Md.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Clark, Chas. J., Chicago.

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Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
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Ministry of Munitions, London, England.

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C. H. Watt, Amherst, N.S.
Ministry of Munitions, London, England.

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BRACKETED JIB CRANES
Curtis Pneumatic Machy. Co., St. Louis, Mo.

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American Manganese Bronze Co., Philadelphia.

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Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CABINETS, SANDBLAST
Frederic B. Stevens, Detroit, Michigan.

CARBON BLACKING
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Woodison Co., E. J., Toronto.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CASE HARDENING
General Combustion Co., Montreal.

CERAMIC KILNS
General Combustion Co., Montreal.

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Cleveland Chaplet & Mfg. Co., Cleveland.
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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Lindsay Chaplet & Mfg. Co., Philadelphia.
Obermayer Co., S., Chicago, Ill.
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CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Stevens, Frederic B., Detroit, Mich.
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CHEMICALS
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Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
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Cleveland Pneumatic Tool Co., The.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
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Frederic B. Stevens, Detroit, Michigan.
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Joseph Dixon Crucible Co., Jersey City, N.J.
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Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

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Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

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Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Davenport Mach. & Fdry. Co., Davenport, Iowa.
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Hyde & Sons, Ltd., Montreal, Que.
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Holland Core Oil Co., Chicago, Ill.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
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United Compound Co., Buffalo, N.Y.
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Cleveland Pneumatic Tool Co., The.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Northern Crane Works, Ltd., Walkerville, Ont.
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Curtis Pneumatic Machy. Co., St. Louis, Mo.

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Woodison Co., E. J., Toronto.

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Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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W. W. Sly Mfg. Co., Cleveland, Ohio.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Roots Co., P. H. & F. M., Connersville, Ind.
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Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

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Crane Ltd., Montreal.

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Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

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Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

ENAMELWARE
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ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

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Ministry of Munitions, London, England.

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Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
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Stevens, Frederic B., Detroit, Mich.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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FITTINGS, CAST IRON
Crane Ltd., Montreal.

FITTINGS, FLANGED
Crane Ltd., Montreal.

FITTINGS, MALLEABLE
Crane Ltd., Montreal.

FITTINGS, SCREWED
Crane Ltd., Montreal.

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Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FORGINGS
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FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
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Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
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McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
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Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY SUPPLIES
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National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

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Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Hyde & Sons, Montreal, Que.
Woodison Co., E. J., Toronto.

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Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Black Donald Graphite Co., Calabogie, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montrea Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEAT TREATING
General Combustion Co., Montreal.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
J. A. Spangler, Benton Harbour, Mich.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, CHAIN AND PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT ROCKOVERS
American Molding Mach. Co., Terre-Haute, Ind.

JOLT MACHINES AND SQUEEZERS
American Molding Mach. Co., Terre-Haute, Ind.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT STRIPPERS
American Molding Mach. Co., Terre-Haute, Ind.
Davenport Mach. & Fdry. Co., Davenport, Iowa.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
The Cleveland Osborn Mfg. Co., Cleveland, O.
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND
Frederic B. Stevens, Detroit, Michigan.

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

NOZZLES SAND BLAST
Frederic B. Stevens, Detroit, Michigan.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACE BLOWERS
Roots Co., P. H. & F. M., Connersville, Ind.

OIL METERS
General Combustion Co., Montreal.

OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS
General Combustion Co., Montreal.

OVENS FOR CORE BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OXYGEN
Dominion Oxygen Co.

PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.

PARTING COMPOUNDS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

PATTERNS
Frederic B. Stevens, Detroit, Michigan.
Montreal Pattern Works

PATTERN MAKERS' BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.

PATTERN MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP EQUIPMENT.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP MACHINERY
Preston Woodworking Machinery Co.

PATTERN WAX
United Compound Co., Buffalo, N.Y.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Steel Co. of Canada, Hamilton, Ont.

PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINT COMPOUNDS
Crane Ltd., Montreal.

PIPE, SOIL, AND FITTINGS
Crane Ltd., Montreal.

PHOSPHORIZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLANT AND MACHINERY
Ministry of Munitions, London, England.

PLUMBAGO
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PLATING AND POLISHING SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells Toronto.
Woodison, E. J., Co., Toronto, Ont.

PNEUMATIC TOOLS
Independent Pneumatic Tool Co., Montreal.
The Holden Co., Ltd., Montreal.

PORCELAIN WARE
Crane Ltd., Montreal.

POWER JOLT SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

POWER SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

PRODUCTION LATHES
Oliver Machinery Co., Grand Rapids, Mich.

PROTECTIVE WEARING APPAREL
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

PULLEYS, MAGNETIC

RAMMING PLATES AND MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Magnetic Mfg. Co., Milwaukee, Wis.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RETORTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES, ELECTRIC
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Woodison Co., E. J., Toronto.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Reynolds & Co., Toronto.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC HAMMER, COMPRESSION
Independent Pneumatic Tool Co., Chicago, Ill.

ROLLOVER MACHINES
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

ROTARY PUMPS
General Combustion Co., Montreal.

RIP SAWS
Preston Woodworking Machinery Co.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

SAND
United States Silica Co., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

SANDBLAST ABRASIVES
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST ACCESSORIES
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison Co., E. J., Toronto.

SANDBLAST EQUIPMENT
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
United States Silica Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST GRIT AND SHOT
Frederic B. Stevens, Detroit, Michigan.
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST HELMETS
J. A. Spangler, Benton Harbour, Mich.

SAND BLAST SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
E. J. Woodison Co., Toronto.

SANDBLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.
Frederic B. Stevens, Detroit, Michigan.

SAND CONVEYING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST MACHINERY, BARRELS.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Frost Mfg. Co., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SANDBLAST MATERIAL
Frederic B. Stevens, Detroit, Michigan.

SANDERS
Oliver Machinery Co., Grand Rapids, Mich.

SAND-MIXING MACHINERY
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.
Standard Sand & Machine Co., Cleveland, Ohio.
Woodison Co., E. J., Toronto.

SAND MILLS
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.

SAND MOLDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

SAND SIFTERS
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Preston Woodworking Machy. Co., Preston, Ont.
Woodison, E. J., Co., Toronto, Ont.

SAND RAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

SAND RIDDLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
SAND SIFTERS, HAND
Battle Creek Sand Sifter Co., Battle Creek, Mich
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
SAW SHARPENERS
Oliver Machinery Co., Grand Rapids, Mich.
SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.
SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
SEPARATORS, MAGNETIC; STANDARD AND SPECIAL
Magnetic Mfg. Co., Milwaukee, Wis.
SEPARATORS, MOISTENERS, OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.
SEA COAL
Obermayer & Co., S., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
SHAPERS
Oliver Machinery Co., Grand Rapids, Mich.
SHOT
Frederic B. Stevens, Detroit, Michigan.
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa
Woodison Co., E. J., Toronto.
SHOVELS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
SIEVES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
SILICA WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
SILICA ROCK, GROUND AND PULVERIZED
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.
SKIMMERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
SLIP JACKETS
Diamond Clamp & Flask Co., Richmond, Ind.
The S. Obermayer Co., Chicago.
SNAP FLASKS
Oliver Machinery Co., Grand Rapids, Mich.
SNAP FLASK BANDS
S. Obermayer Co., The.
SNAP FLASK BOTTOM PLATES
Diamond Clamp & Flask Co., Richmond, Ind.
The S. Obermayer Co., Chicago.
SNAP FLASH JACKETS
S. Obermayer Co., The.
SNAP FLASK TRIMMINGS
Diamond Clamp & Flask Co., Richmond, Ind.
The S. Obermayer Co., Chicago.
SNAP FLASKS, WOOD, CHERRY AND OAK
The S. Obermayer Co., Chicago.
SNAP MOLD JACKET
Diamond Clamp & Flask Co., Richmond, Ind.
The S. Obermayer Co., Chicago.
SMALL ANGLES
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
SOAPSTONE
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
SPEED LATHES
Oliver Machinery Co., Grand Rapids, Mich.
SPELTER BOWLS
Can. Hanson & Van Winkle Co., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.
SPRAYERS
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
SPRUE CUTTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
SQUEEZER MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.
SQUEEZERS, POWER AND HAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.
STEAM TURBINES
General Combustion Co., Montreal.
STEEL, CRUSHED
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
STEEL GRIT
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.
STEEL BANDS
Diamond Clamp & Flask Co., Richmond, Ind.
Woodison Co., E. J., Toronto.
STEEL BARS, ALL KINDS
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.
STEEL PLATES
Pangborn Corporation, Hagerstown, Md.
A. C. Leslie & Co., Limited, Montreal, Que.
STEEL RAILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.
STIRRERS, GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
STONES, RUBBING AND OIL
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.
SURFACE PLANERS
Oliver Machinery Co., Grand Rapids, Mich.
SWING
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
SWING GRINDERS
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Woodison Co., E. J., Toronto.
SWING SAWS
Oliver Machinery Co., Grand Rapids, Mich.
SWITCHES, I-BEAM
Curtis Pneumatic Machy. Co., St. Louis, Mo.
TANKS, OIL AND WATER
Frederic B. Stevens, Detroit, Michigan.
TALC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.
TENONERS
Oliver Machinery Co., Grand Rapids, Mich.
TESTS OF MATERIALS
Hersey Co., Ltd., Milton, Montreal, Que.
TEEMING CRUCIBLES AND FUNNELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
TOOLS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.
Keller Pneumatic Tool Co., Chicago, Ill.
TONGS, SHAKE OFF
Diamond Clamp & Flask Co., Richmond, Ind.
TRACK, OVERHEAD
TROLLEYS AND TROLLEY SYSTEMS
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.
TRIPOLI
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
TROLLEYS, SINGLE I-BEAM
Curtis Pneumatic Machy. Co., St. Louis, Mo.
TRUCKS, DRYER AND FACTORY
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
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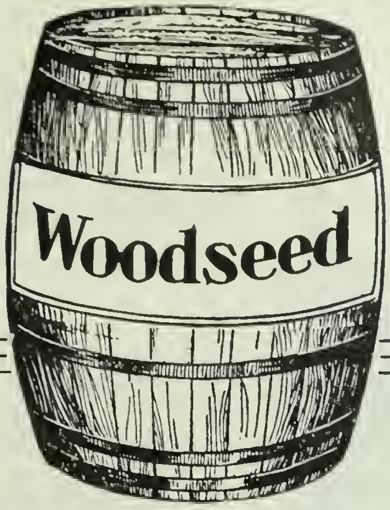

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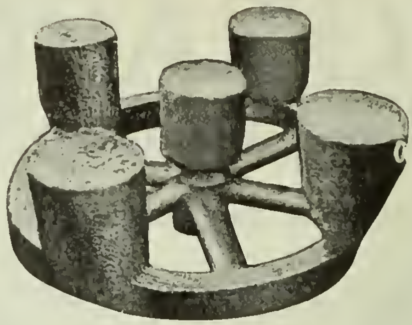

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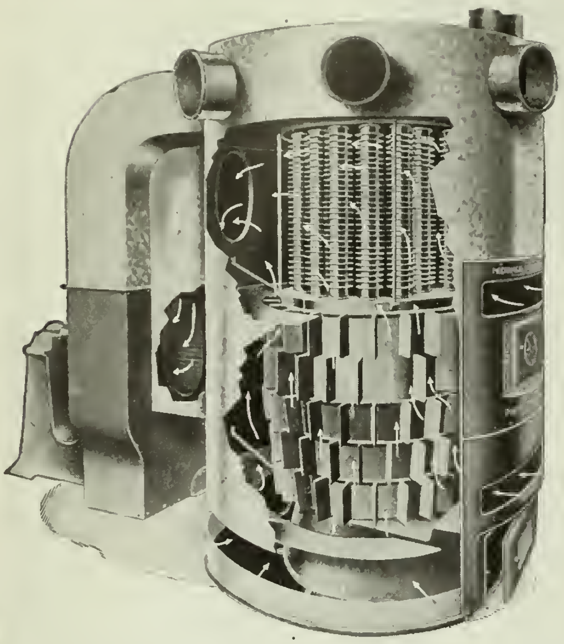

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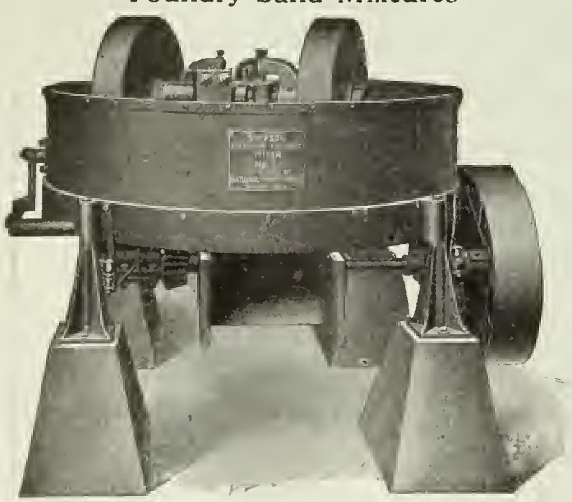

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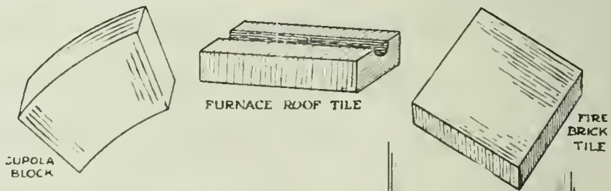

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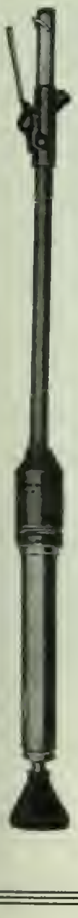

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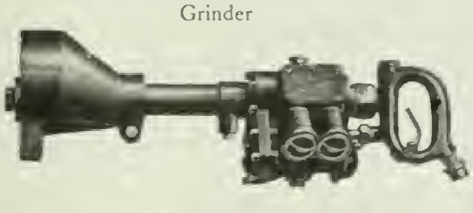

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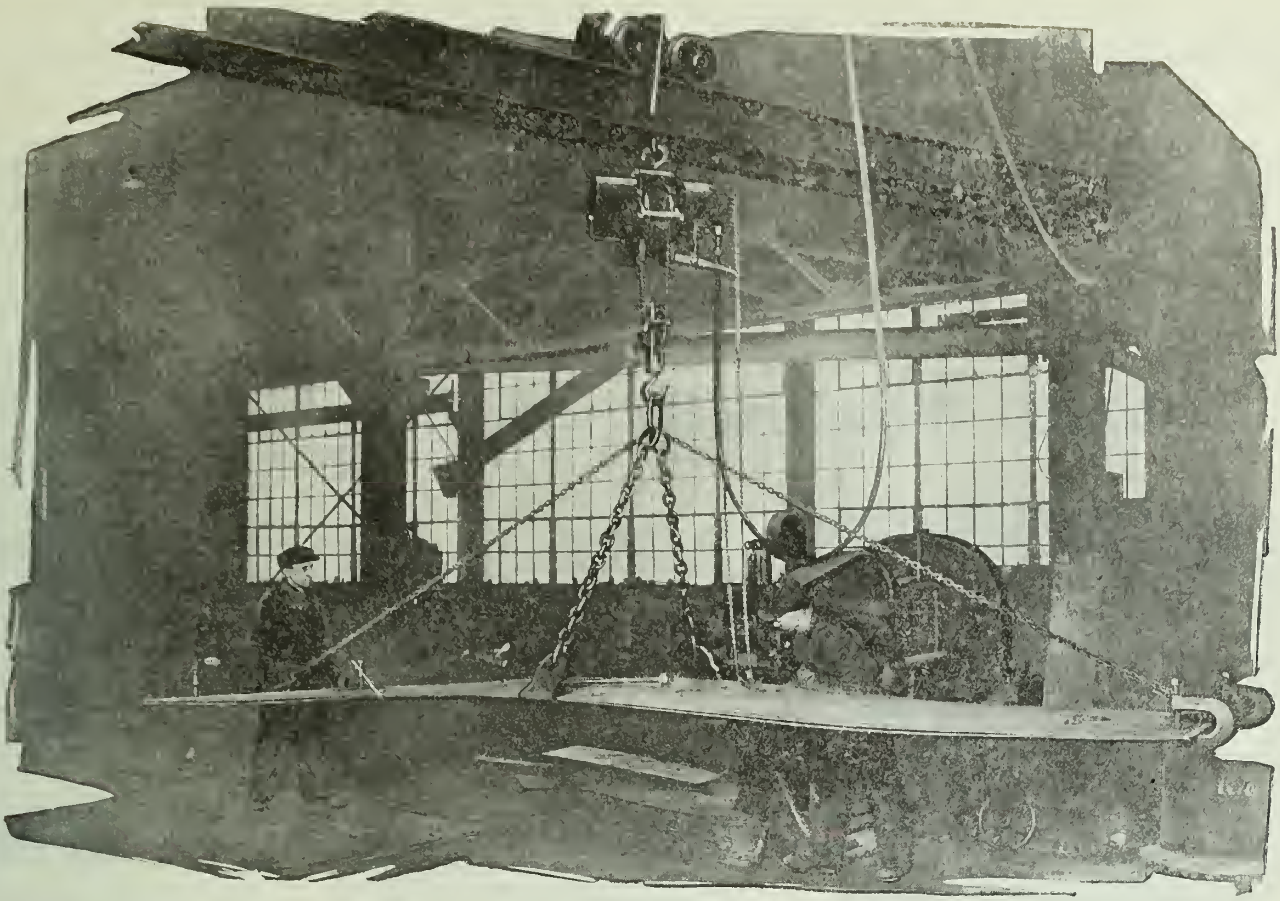

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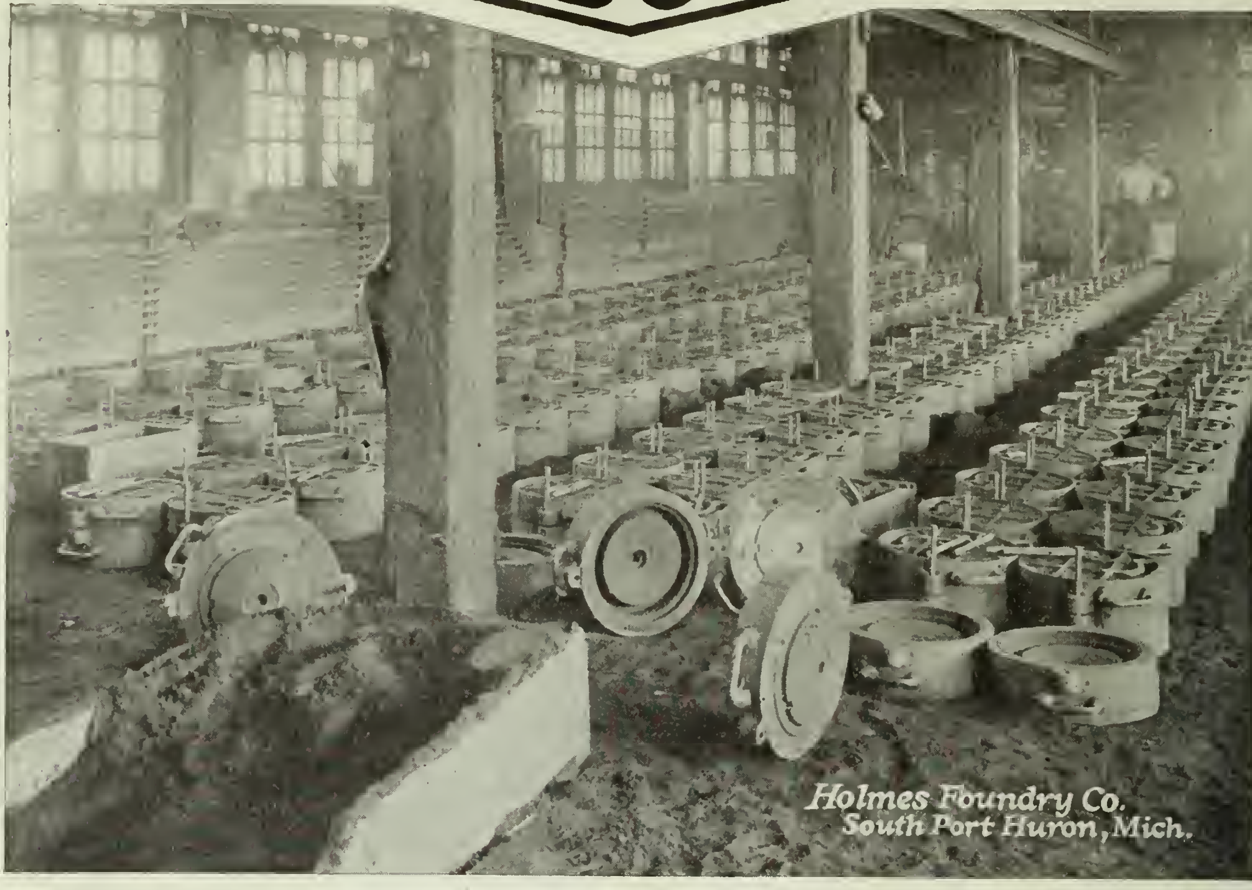
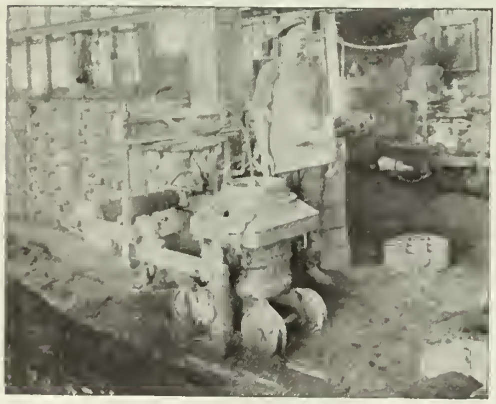


Osborn Stripping-Plate Jolt Squeezer Machines

The above floor of fly wheel moulds shows part of the daily production of fly wheels on two Osborn Stripping-Plate Jolt Squeezer Machines in the plant of the Holmes Foundry Co., South Port Huron, Mich.

These machines are operated portably on a T-Rail track and follow the sand pile.



The lower left hand picture shows the drag half of the fly wheel pattern and the lower right hand picture the cope half.

Both the cope and drag halves of the flasks are barred. The moulds are bedded on the floor — no bottom boards being used.

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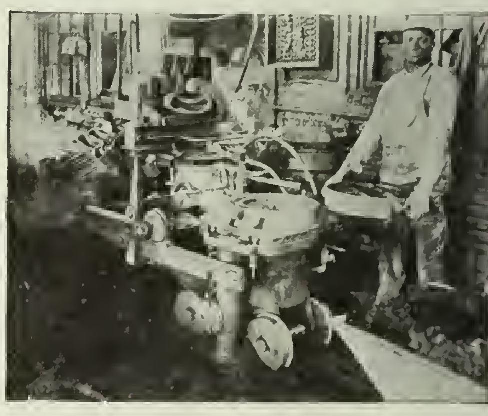

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Intelligent Foundry Practice Problems

The Writer Shows Different Ways of Doing Things and Offers Suggestions which Should Assist in Overcoming Some Annoying Difficulties.

By GEORGE O. VAIR

IS IT the fault of the mould, the metal, or the melting? is the question when a defective casting looms in sight. But how are we to know which it is unless we have some definite knowledge of the cause which brings bad luck in its wake?

If a good clean mould is made, and good, clean metal poured into it, the logical conclusion would be that a good clean casting would be the result, but unfortunately such is not the case. Improper gating will cause an otherwise successful job to be a failure. Ill-proportioned patterns will cause trouble at times. Castings which apparently cannot be cast successfully can frequently be made all right if moulded the other side up. Chills, if judiciously used, have the effect of causing a heavy section to cool before it is bled by a lighter and more rapid cooling section. Poor iron may be melted ever so carefully and yet be poor iron, while first-class iron may be ruined by bad melting.

Iron which may be first-class for one job may not be suitable for another. Ramming, venting, pouring, and innumerable other details of the moulder's and founder's arts and sciences all contribute to the worries of the moulder and founder. It therefore behoves him to study every defect and convince himself of what was really the cause.

Iron is queer stuff but is easily controlled if properly understood. Pressure from a head will take up a lot of slack if the metal cools from the bottom up, but if a midway section sets first, no amount of pressure from above will have any effect on the molten metal underneath it.

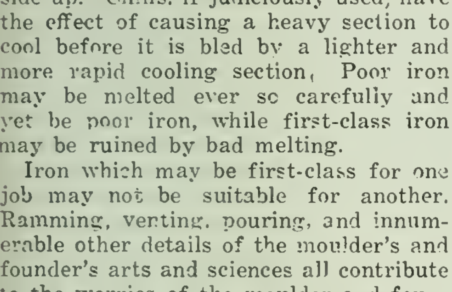


FIG. 1

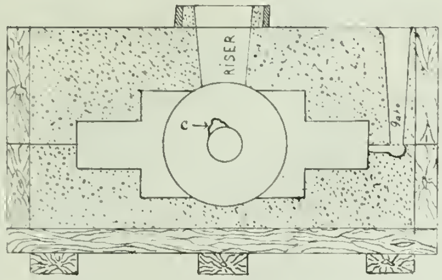


FIG. 2

Chilling a heavy section does not necessarily make it any harder than the rest of the casting. If it simply hastens the cooling so that the entire casting sets at the same time, the graphite carbon should have the same chance all through it.

All these points are worthy of study and the more they are studied the more points they will show up. The following story by a practical foundryman is full of interest along these lines.—Ed

REFERRING to the accompanying sketches, Fig. 1 shows a sectional view of a cylinder head mould and also the method of gating one foundry adopted to obviate trouble which arose from steam pressure leakage in their castings.

This leakage, when it did occur, always showed at the same section. The defect ran as indicated by broken line at A, Fig. 1.

The foundry foreman, to overcome this trouble, resorted to pressure by using a high pouring basin when casting. The 10-inch depth of pouring basin improved the castings but was not an absolute remedy.

According to the writer's experience with cylinder head castings of the same type as here shown only, much larger in diameter and heavier in section, we found the use of sectional chills as seen at B, Fig.1, to be a very simple and efficient method to overcome all trouble from secretion and leakage. The use of chills in comparison to a high pouring basin will also save moulders' time on the particular job.

If these castings as shown in Fig. 1 had been moulded and cast the reverse way, or in other words, upside down, the casting would have been perfectly solid.

However, there is no doubt but the iron mixture in use had a good deal to do with the leakage regardless of the foundry practice used.

In connection with the use of surface chills in moulds we will say a chill ⅝ in. thickness will change the density of cast iron to a greater extent than generally supposed, but still leave the casting soft enough to machine easily.

Fig. 2 illustrates a defect often found in all classes of castings, namely, shrinkage.

And, paradoxical as it may seem, the remedy as often applied increases the shrinkage instead of obtaining the desired results. The shrinkage as seen at C, Fig. 2, is often found directly below the riser, or "feeding" head, which indicates said riser did more harm than good.

Of course very often this defect as here seen is traceable to carelessness on the part of the moulder in not "churning" the casting in hand properly. In this engine crosshead casting, shown in section at Fig. 2 and plan at Fig. 3; if the riser had been located on the parting line of pattern and cut into the mould close to the round core hole, preferably on cope half, it would have given good results and also saved more or less time for the chipper when cleaning the casting. The writer therefore has always considered the intelligent use of "feeding" heads, and pouring gates are very necessary to competent foundry practice.

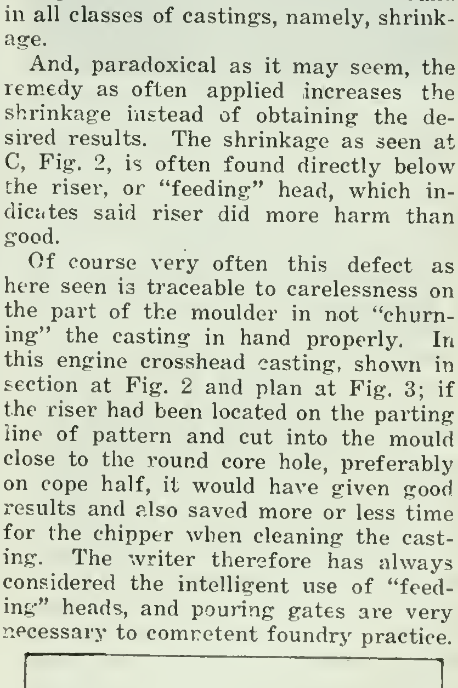


FIG. 3

Molding Propeller in Green Sand from Old One

So Long as the Moulder Has Any Guide to Go by He Can Produce Good Results—The Impression Left by the Good Blades Gave the Exact Outline for the Made-Up Ones.

By JOHN H. EASTHAM

BY the exercise of a little diplomacy, call it "soft soap" if you wish, you can get a moulder to do anything; he will, of course, say at first it is not possible, but eventually you get results, just as they got the confession from the nigger.

Haven't you heard that one? All right. He was accused of stealing fowls (all niggers in stories are accused of the standard crime), and being taken before the Cadi, was faced with the charge, that he, therefore, to wit, in a certain year of our Lord, in the nightime of the day aforesaid, the premises of one Smith, did feloniously enter with malice prepense, being caught in flagrante delicto, the goods and chattels of the aforesaid Smith, about to, burglariously, and by force of arms against the peace of the people to seize, appropriate, and in propria persona to convey thence, lifted his voice in misery and said:

Typical log boom on Lake Superior, one mile long by half mile broad, often broken up and scattered by heavy gales, becoming a menace to navigation. City of Port Arthur in background.

"Ma goodness, jedge, Ah didn't do none ob dem tings—all Ah done was take a couple of chickens!"

The flotsam and jetsam of the Great Lakes, and especially of Old Father Superior, is responsible for many accidents, the breaking of propellor blades being not the least of these in number, notably at or after the equinoctial gales. The breaking of the booms enclosing huge timber rafts, releasing thousands of cords of pole lumber to the vagaries of the winds, added to floating wreckage of many kinds, make navigation in some places a tricky proceeding, and furnish the local ship repair plants with many rush jobs, an example being hereafter described. A lumber tug lost two blades of her propeller, the broken blades being diametrically opposite each other, and on her arrival in port her owners ordered a new propeller, sending the broken one up to the foundry to be used as a pattern, thus lightening the troubles of that department considerably, because, you know, if you will just wave your index digit in the air in front of a moulder, making an imaginary sketch, and tell him what you want, you will get the goods the following morning. N'est-ce pas? So the patternmakers fastened a coreprint through the bored hub, leaving one and a half inches projecting at each end, the top end tapered in accordance with good practice, tapped the hub with two five-eighths holes, had a pair of eyebolts made to match (their function being to draw the pattern from the sand), and sent the lot into the foundry accompanied by a series of malevolent chuckles.

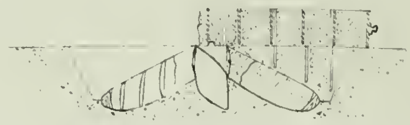
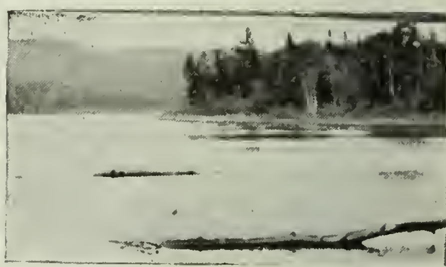


FIG. 1—CROSS-SECTION VIEW OF MOULD, SHOWING TAPERED PARTING AND BLADE THICKNESS PIECES

So a hole was opened the full depth of the casting, and the bedding in process carried out in the usual way, a parting made level with the foundry floor and the top of the hub, a sloping joint being carried down to the tips of the two sound blades, their under or driving faces being tucked in and banked up to allow a good clear lift, as shown to the left in the cross section view of Fig. I. The stumps of the two broken blades were also banked the same way, out from the hub to the fractures, the pattern being next drawn out and given a quarter turn, then lowered into the mould again, the two sound blades being now laid in the impressions left by the stumps, and the stumps placed in the contours of the perfect blades.

Those portions of the sound blades now projecting beyond the banked-up joints left by the stumps were next lined up and a layer of wet parting sand spread wherever needed, thickness pieces similar to those used when moulding propellers in loam without a pattern being then placed in the mould impressions left by the whole blades before twisting the pattern round. Using the thickness pieces as guides. The metal spaces of the broken blades were now formed in sand laid on paper, this to avoid sticking and consequent spoiling of the drag mould afterwards. Paper being next laid on the upper or "following" faces of the broken blades, the cope flask was lowered to place, and rammed up in the usual way, the four deep pockets and outside sloping joint being carried by wood chocks, wedged between the bars and reinforced when necessary by gaggers, the empty cope laid on the joint being shown in the plan view of the mould at this stage at Fig. 2, while the rammed



DERELICT TREES IN QUIET CORNER ON NORTH SHORE OF LAKE SUPERIOR, DANGEROUS TO SMALL STEAMER NAVIGATION

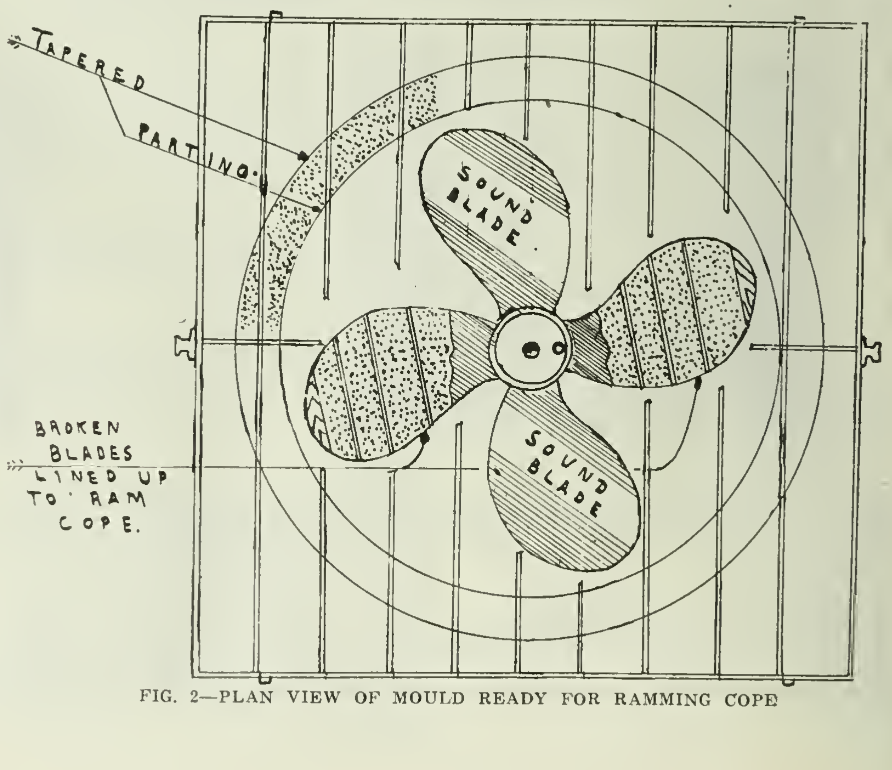


FIG. 2—PLAN VIEW OF MOULD READY FOR RAMMING COPE

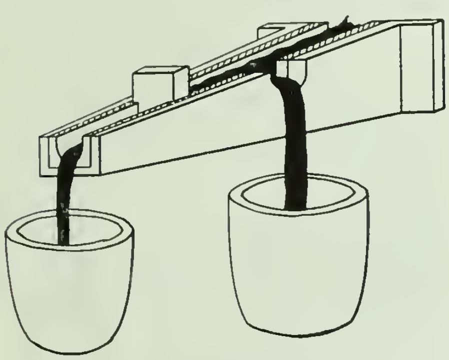
cope is indicated with runner pin in place to the right in Fig. I.

In some cases, when moulding a propeller in sand from a pattern, the overlap of the blades at their junction with the hub prevents a straight lift off, when removing the cope a circular or screwing motion being necessary under these conditions, the guide stakes being driven in to allow the cope to move in the direction controlled by the overlap above referred to, extreme care when finally closing the mould being imperative, if the fine feather-edged joint at the top of each blade is to be preserved intact. In the case under discussion, however, as may be seen from Fig. 2, no such difficulty was encountered, the cope just clearing itself by a straight-lift, being then turned over and finished, the extended mould on each broken blade end being next cleared of sand, paper and loose thickness pieces; the edges of the drag mould swabbed prior to the withdrawal of the pattern, and drag finishing and blacking, a small chambered core with liberal machining allowance at each end being put in the print before finally closing. In a green sand mould of this type, poured on the hub by means of a "pop" gate, it is good practice to place a piece of clean scrap flat on the mould, immediately under the runner, the danger of scabbing being thereby greatly decreased, as the piece receives the first shock of the metal, but melts almost as soon as a pool is formed, becoming homogeneous with the casting, and leaving no mark. Two days' moulding turned out an excellent casting by the method above outlined, the sardonic grin being consequently removed from the pattern shop boss' visage to that of the foundry superintendent, making good once again the old adage that he laughs best who laughs last. Incidentally, it was not found necessary to drydock the try, either when shipping or unshipping the screw, a pair of hundred-ton sheer legs raising her stern sufficiently high out of the water by means of a healthy wire cable slipped under the hull on each occasion.

SLAGGING THE CUPOLA FROM THE FRONT

The slag spout at the rear of the cupola is considered necessary now-a-days if the foundry is posing as being up-to-date. The old-time cupola which was big enough to take off the heat at one charge is no longer considered, for the very good reason that it was just getting nicely under way when it was done. The idea now is to have a small cupola and run it to the limit, thereby greatly economizing in fuel. But after a cupola runs just so long, then the slag begins to make trouble and must be disposed of by some means, and the slag spout at the rear was the accepted relief from the nuisance. By putting in the proper amount of limestone to make the slag liquid, it would flow freely from the slag spout, and continuous heats were easily accomplished.

It works all right and I am not going to try to pass any adverse comments on it, but there are many places where it cannot be used to advantage, and still more instances where it cannot be used at all. For instance, there are innumerable cupolas which are good melters but were built before slag spouts came into vogue. This could be overcome without much trouble as an opening could be made in the shell of the cupola, but it usually happens that the layout of the shop and the position of the cupola is such that the rear spout could not be used. The spout shown in the illustration is one which very effectively overcomes the trouble and which is always under the eye of the melter. The spout is the ordinary cupola spout with a notch cut in the side. When the lining is being built into it a brick is built into



SKIMMING SPOUT IN PLACE OF SLAG SPOUT AT REAR OF CUPOLA.

The melter has been a little bit careless in placing his brick, as it should be right up against the slag spout at the side of trough.

the lining as shown in the illustration with an opening under it of approximately the same area as that of the tap hole. The brick should be right close up to the notch in the side, and as the metal and slag come from the tap hole the metal flows under the brick, while the slag flows through the side notch.

I have seen this used in shops where the rear spout method could easily have been adopted but where the management preferred this method. The whole thing is that slag will accumulate in the cupola, and up to a certain time it does no particular harm to the melting, but always has a tendency to make inferior castings, and if long heats or clean castings are to be desired it must be got rid of, and it matters not how this is accomplished so long as the iron and the slag are separated before it gets to the mould.

MILLVILLE GRAVEL FOR LOAM MOULDING

In the May issue of CANADIAN FOUNDRYMAN we published a short story on the moulding and casting of heavy marine cylinders, and suggested that more interest be taken in the art of moulding in loam. Loam moulding is probably the oldest and at the same time most reliable branch of the moulder's art, but for some reason it does not receive the encouragement which it should, and few moulders seem to know anything about it. If moulders would study it up they would find it to be most interesting and not difficult to master.

One of the most important features is to have proper material from which to make the loam mixture, and this is of course dependent to a considerable extent on the material available in the neighborhood, and different materials may have to be mixed in order to get the right composition, this of course entails work and expense added on to the original cost of the materials.

As with all subjects published in this periodical, we requested suggestions on this one and we received the following from the United States which will probably explain why they were able to turn out a superior brand of cylinders. The letter says in part: "As we note, you invite suggestions and criticisms. May we say in our judgment the materials which you mention are not as suitable for loam moulding as a material known as Millville gravel. Probably you never heard of this of the material, and for your information, it is being used in all the large foundries doing loam work in the eastern part of the United States. Millville gravel is a natural formation of small pebbles, which gives it porosity to allow the gases to escape without the addition of sawdust, horse manure, or any other disintegrator. The clay bond in Millville gravel is a very refractory, siliceous clay. This Millville gravel may cost a little more laid down in Canada than the Canadian foundrymen think they can afford to pay, but after they have tried it once they will be convinced it is the cheapest in the long run."

The wording of this letter sounds all right and is worth looking into, and while it is not our policy to boost one company's goods over another, we only know of one company handling this material, viz.: George F. Pettinos, Real Estate Trust Building, Philadelphia, represented in Canada by R. J. Mercur & Co., Ltd., Montreal. Samples would undoubtedly be sent on request.

THE STEEL TROUGH AND MACHINE COMPANY, OF TWEED, ONT.

The above company is one of which we should be jealous but we are not. We know that oxo-acetylene welded goods are crowding into the field usually dominated over by the foundry but there is room for us all. This company manufacturers a line of goods which have to be gas, water and air tight, and are even invading the precints of the foundry itself. In their advertisement, on "Steel Foundry Equipment," they do not mean that they are only making equipment for steel foundries, but that they are making steel equipment for every kind of foundry. Gasoline tanks, unless as tight as a bottle are apt to be the direct cause of fires and explosions, and oxo-acetylene welded is the only sure-tight method. Compressed air tanks, while not so dangerous are a nuisance if they leak. This company has a nice line of steel goods which are of interest to foundrymen.

Pattern Making and Molding of Helical Gears

Being the First of a Series of Articles on Gearing in Answer to a Question Relative to Helical Gearing.

By F. H. BELL

EDITOR CANADIAN FOUNDRYMAN:—We require some information regarding the making of patterns and moulding of Helical gears, and you would oblige by giving us what information you can on the subject.

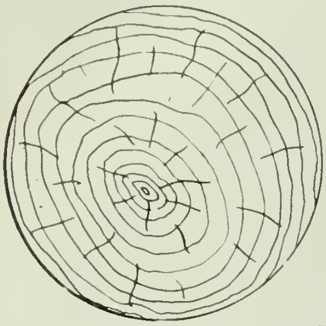


FIG. 1—PATTERN AT ROOT OF TEETH.

Answer. — Your question is rather vague, as the making of a small helical gear would be different in some respects from that of a larger one, although on general principles it would be the same.

Supposing we wish to make a gear of, say, six-inch diameter and four-inch face, it would be a comparatively easy matter to lay it out.

As good a way as any is to turn up a block of wood of proper length, the diameter of which will be that of the gear at the base or root of the teeth. See Fig. 1. Onto this slip a sleeve, Fig.

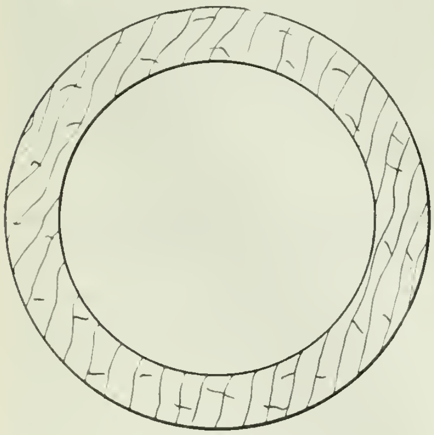


FIG. 2—SLEEVE, THE TOTAL DEPTH OF TEETH.

2, which has been turned of end-grain wood. This sleeve must be the exact size on the inside, so as to fit neatly onto Fig. 1, and the outside must be of the size that the gear is to be. The teeth will now be laid out as in the case of a spur gear, see Fig. 3, with each tooth marked so as to be sure of returning it to its proper place. The other end will now be laid out in a similar manner, but with the proper allowance to give it the correct angle of helix. This can be found by drawing a straight line from the one end to the other and measuring off the proper distance ahead. After laying out both ends it now remains to draw properly curved lines from one end of the tooth to the other. This can be done with the aid of any straight-edge which is pliable enough to be sprung down, so as to touch both ends of the teeth at the same time, as at A, Fig. 4. A steel corset spring can be utilized in the absence of anything better, but machinist's scales are to be had which are perfectly true and springy enough to fit around the

FIG. 3—SLEEVE IN PLACE WITH TEETH LAID OUT. NOTE TH EMARKS BEYOND THE ROOT LINE.

curve. After both ends and the outside are laid out the sleeve, Fig. 2, is withdrawn and the same straight-edge is used to draw the lines on the inside for the bottom of the teeth, as at B, Fig. 4. The surplus wood is now cut away and the teeth finished to a template similar to A, Fig. 6. The teeth will now be fastened to the block, Fig. 1, when it will appear as Fig. 5, and the pattern is done as regards the wood work.

If the gear is to be a large one where the loose sleeve would be out of the

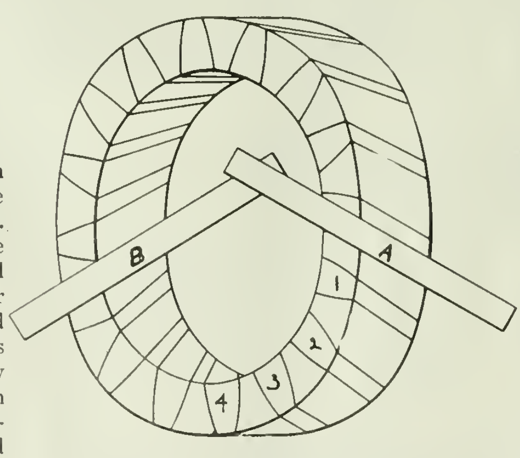


FIG. 4—MARKING TEETH ON OUTSIDE WITH FLEXIBLE STRAIGHT EDGE A, AND INSIDE WITH B.

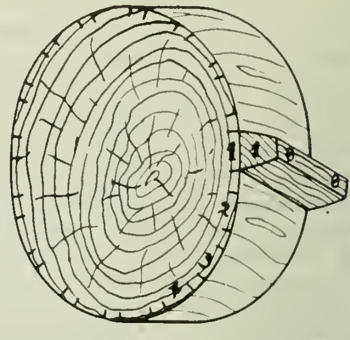


FIG. 5—SHOWS FIG. 1 WITH TOOTH TAKEN FROM FIG. 4 FASTENED IN PLACE. MARKS SHOWN ON FIG. 3 ARE GUIDES.

question, the blank will be built up the same as for a spur gear with the teeth lacking, or, in other words, a gear blank the size that it should be at the base of the teeth will be built up and finished and the teeth spaced off on both ends, and the lines drawn to the flexible straight-edge as before. Tooth blanks will now be fastened on at approximately the proper angle, or with plenty of material to work on, as the case may be. These tooth blanks will be trued up on the ends and the teeth laid out as before, using the lines at the base as a guide. The same type of templates can be used as before if the base line is strictly followed, or a template similar to B, Fig. 6, can be used, in which case

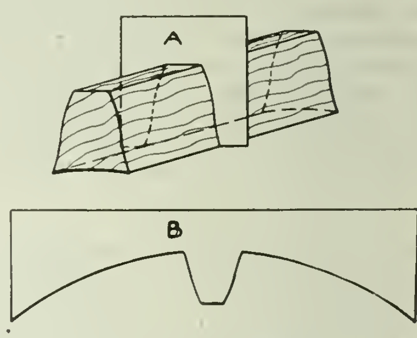


FIG. 6—SHOWS TWO TYPES OF GAUGE FOR SHAPING THE TEETH.

it would not be so necessary to have the base laid out. The moulding on a helical gear is the same as any other gear, with the exception that it has to be turned as it is being drawn.

If many helical gears are to be made, a stripping plate can be used to advantage, as it will assist the moulder in drawing the pattern. A stripping plate machine can be used if the pattern works easy on a pivot.

Machinists will say that a helical gear can not be cast successfully, and to a certain extent they are right. A helical gear has no advantages over any other gear unless it is perfect and to secure a perfect casting of any kind is a difficult proposition, but if the pattern maker is careful enough in following his curves, so that the pattern does not bind when being drawn from the sand, it is quite possible to successfully produce cast helical gears. A helical gear is simply a section of a screw and can be readily cut on a milling machine and a similar machine could be used on a wooden pattern if the demand warranted it. Helical gears have a tendency to slip endwise when doing heavy duty and to overcome this it is customary to make right and left combined, commonly known as herring bone. The pattern for this would be simply a right and left dowelled together and half would be moulded in the cope.

WHY THE SMALL FOUNDRY IS USUALLY A FAILURE

A subject frequently broached in CANADIAN FOUNDRYMAN is that of the small foundry as compared with the large one, and I can quite agree with most of the arguments advanced and can add a few points which are frequently overlooked, one of which is "flasks." The small shop which frequently is to be found in the country town is usually supplied with flasks which could easily remove all chance of making profit, no matter how well equipped it is in other respects.

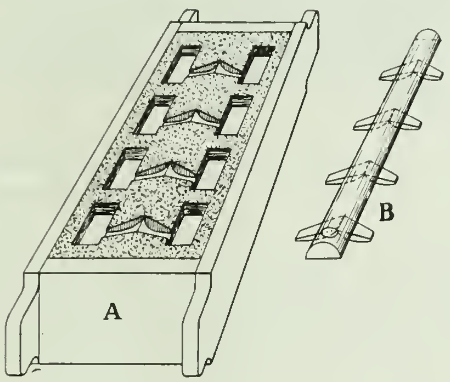
Quite a common type of flask is the one made of inch lumber, and with the cope from two to four inches deep. The 4-inch ones would be for work which projected well up above the parting. A shallow cope makes extra work in moulding taking longer to make the mould; it requires extra caution in closing the mould, lest it should fall out; it creates greater risk of coping when being poured, by which I mean the sand is likely to be forced up through the bars from the force of the inflowing metal; the cope invariably springs, causing the casting to have fins, and added to all of this it has no reservoir of metal to draw from to prevent little shrinkages in seemingly unimportant places, and it allows no head to keep full so as to prevent the dirt from getting in unless heads are built up, and this adds time and expense where it could be as well saved, and only adds to the risk of forcing the sand up through the bars. In doing job work a good deep cope made from good heavy lumber, while appearing to be clumsy, saves a lot of time and is much more satisfactory in every way. For specialty work the flask is of course made to fit the job, but specialty work is not often met with in these little shops.

Now that lumber has become so expensive it is doubtful if it pays to use wooden flasks at all. For almost any job an iron flask can be used to better advantage and at less expense. Cast iron flasks are rather heavy and are apt to break, but stamped steel flasks are becoming quite prominent of late and seem to be giving the best of satisfaction. They are becoming almost universal in the larger shops, and if it pays a wealthy corporation to have them it would pay the struggling beginner who is trying to work up. Whatever else is done, have good substantial flasks and the very best of bottom boards, and get your casting true to the pattern.

PROPER GATING IN BRASS FOUNDRY

Mr. Editor,—"In your last issue was an article on gating brass work. I am not any too well educated and could not grasp some of the points, although I know it was well written. Will you please explain to me the shape of that gate, as I understand all the rest?

Answer.—The sketch herewith shown will perhaps make it more clear to you. All melted metal has more or less dross on top of it; the dross being lighter than the metal, floats, while the good, heavy metal goes to the bottom. For this reason the runner is cut in the cope, and its area is greater than the combined area of all the branch gates. This is so that the branches cannot drain it and allow the dross to enter the mould. In order to get the best results the sprue should be of greater sectional area than the runner, and the runner should be of greater sectional area than the gates. With this method, if the sprue is kept



A SHOWS THE PART WHICH GOES IN THE DRAG. B SHOWS THE PART WHICH GOES IN THE COPE.

full, every part of the gating system must be full and all dirt and dross floating. In pouring, it sometimes happens that a lump will get past the skimmer before it is possible to flood the gate, and by having the runner to project beyond the last branch gate the lump has a chance to lodge there instead of in the gate, and by having the gates cut backward as shown, the dirt will pass them and go to the further end of the runner rather than change its course and enter the mould. By having the gates cut in the bottom and the runner travelling over the top of them, the best metal will always be where it can enter the gates into the mould.

Another feature of the article was, that if a block of wood cut to fit the top of the crucible is placed on top of the metal after it is skimmed, the burning wood will absorb the oxygen, which will otherwise permeate the melted metal. Melted copper has a strong affinity for oxygen, and unless something can be kept on the metal to act as a wick and kept burning so as to consume the oxygen, it will mix with the metal. This is the secret of using powdered charcoal, magnesium, etc.; they burn, and in doing so consume the oxygen.

CAST IRON AND SURFACE WEAR

Reverting to Mr. F. C. J. Cook's paper, we find some excellent notes on the surface wear of cast iron. Mr. Cook says that there is much room for investigation into the subject of surface disintegration and wear of cylinders and all rubbing surfaces of cast iron. He added: "When cast iron is machined by the ordinary cutting methods there is more or less tearing away of the crystals. The tearing out of the softer material produces cracks or indentations and leaves the harder constituents standing up in relief. The degree or fineness of the finish will depend upon the structure of the material and the speed at which the material was cut; generally speaking, according to Professor Poliakoff, the quality of the finish will be improved as the cutting speed decreases. The resistance to wear under working conditions depends upon how far the crystals will resist breaking off—thus forming a hard, gritty, abrasive substance which increases the wear—or will spread over and form a highly polished surface. Grinding of cylinder liners and piston rings, being less drastic and exposing less of the harder crystals, appears to be a desirable method of finishing these articles, provided every trace of emery be removed. Where this is not practicable, very slow cutting speed and fine feeds for finishing should be resorted to with the object of decreasing the wear.

WHERE SCIENCE SCORES

In the old days the ordinary man tapped the Florida pine tree and from the sap secured resin and turpentine—those two, and only those two products.

Now, the scientific man comes along and from the old stump wood gathered from the extensive areas cut over years ago secures a number of commercial products.

In the destructive distillation process the old pine wood is reduced to charcoal in modern steel retorts. The product contains no less than fifty-four definite chemical compounds.

Some of these rare compounds are extracted for use in the manufacturing industry.

In the old days when the live trees were tapped for the sap, the trees soon died and then were cut down by the lumbermen for the pine wood, and now there comes along the scientific man who takes the old stumps that were considered absolutely worthless, and from them obtains valuable products.

In the Basel consular district, Switzerland, there are 14,029 farms, and of these 9,549 are operated without the use of farm machinery of any kind.

Adventures of One James Corrigan in a Foundry

The Writer Shows How Mr. Corrigan Managed to Convert an Unprofitable Business Into a Paying One by Getting a Cost System Started

By HERSCHELL L. HATT

IT ISN'T so hard to do something as it is to know just what to do.

A man in a helpful mood might step into a family row with the best intentions in the world. Up to that it's easy. Just what he should do is reckless speculation.

Jim Corrigan, who took charge of the Atlas Foundry, hadn't been there long before he realized that something was woefully wrong.

The bank account kept sliding down in spite of healthy-looking shipments, and bills were piling up.

Jim went to Woods, the foreman, and said: "This outfit is just two jumps ahead of the sheriff. We're paying too much for the work, and the cost is too high."

Woods looked carefully, then let it go behind a box in the corner. With this preliminary he affirmed, "It was'nt no fault of the moulders."

"Perhaps not," said Jim, "and maybe Carrie in the office has nothing to do with it, but the point is this, we're not getting back what we're paying out, to say nothing of profit."

"In business a profit must be made on everything that's turned out, otherwise the casualty list will read: 'Wounded, missing, or killed by inaction.'"

Woods said: "Did'nt see why the concern was'nt making lots of money. Look at the work we're turning out."

"Let me ask you this," said Jim. "What is the average weight set up each day by the moulders?"

"Average 350 pounds per man."

"Have you any record to show it?"

"No, but we charge about 6,000 pounds each day, and have fifteen moulders."

"What about sprues, excess metal and bad castings?"

"Oh! that ain't much."

That is the great weakness. Going by impressions, foremen are not the only ones guilty of this, but business men as well. Whatever makes a good impression stays in their minds and makes them contented. Not looking beneath the surface, they are satisfied.

In the war many an innocent clump of bushes, all peaceful and quiet, with the birds hopping from limb to limb, looked so inviting, you could throw yourself down on the soft moss and enjoy perfect happiness, undisturbed. But crawl up carefully and probe some. Hidden there you find a shell spitter ready to shoot the daylights out of everything.

Appearances are not safe for business, and impressions are lopsided if based only on what appears.

Well, to get back. Jim soon found that if he were going to find the accurate cost of castings it meant some hard study and work, and the farther he dug into it the more he found he was obliged to turn his ideas to suit the conditions.

It would be simple if all castings in grey iron cost the same to make, but every pattern run is different, and the cost varies accordingly.

When a flat price of six cents per pound is quoted to a customer, the foundry takes a chance.

The customer sends his orders to meet his own requirements. He may want, and usually does, castings from the difficult patterns. Then your calculations are knocked out, for you find that the production cost on this customer's work has exceeded what you figured.

Then there is another side to the question—fairness to the customer.

Foundries have been known to quote a flat price lower than they should just to fill in for tonnage. In other words, charge a good paying customer for the loss on the work of another customer.

Fairness to the customer and fairness to the foundry must be considered when finding a cost upon which to base a price.

The fairest, all-round way, is to consider each pattern individually.

This might, at first thought, mean a lot of clerical work to the foundry and be a nuisance to the customer through having so many different prices.

It is not nearly as bad as it looks, and has this one strong argument—it is absolutely fair and honest. The work is handled on its merits.

The Atlas Foundry for years had quoted a flat price to its customers. Some of the prices were graded by weight, so much for casting from 1 to 10 pounds, so much from 10 to 25 pounds, and so on up to a ton. Cores were not considered any more than the average price would cover.

It meant loss on some work, but the foundry did not like to holler when it got stuck under an arrangement of this kind, and figured it could make up the loss later, which happens about as often as a rich legacy.

Jim considered all these matters and knew that any change in pricing would be thought radical, but his duty was to

ATLAS FOUNDRY COMPANY

Sold to ....

....

Ship via ....

Order No. .... Customers Order No. .... Date of Order .... Date entered ....

Quantity	Pattern Number and Description	Price.

DATE.																
NO. OF PIECES MADE.																
WEIGHT.																
HOURS MOULDING.																
SHIPPING DATE.																
PIECES SHIPPED.																
WEIGHT SHIPPED.																
REJECTS.																

Fig. 1—In weight and pieces, the last amount set down indicates total made to that date. The shipper who is also the time keeper, records daily the progress of this order from the time cards turned in to him by the moulders. After the castings are weighed and inspected he has all the data necessary. This gives a complete and permanent record of the pattern run.

honestly administer the affairs of the foundry, so he went ahead.

The first thing he did was to issue an order form, Fig. 1.

Just one pattern number was to appear on this form with the quantity wanted. If the customer ordered from twenty different patterns, twenty different orders would be issued.

A record was kept on these orders by the shipper, who was also the timekeeper. The number of pieces produced each day showing date, weight, rejects, if any, and the moulder's time. As the only uncertain element in the cost is the moulder's time, this information gave a sure basis for future price quoting.

Something more was needed. It was essential to know how the foundry stood each week, whether it was making or losing as a whole, and if losing, where and how.

Jim had the office girl break up the payroll each week into divisions and then set the amounts down in the report as shown in Fig. 2.

You will notice the first column for figures, on the left, is for the week just completed and paid. The column for figures to the right is for the cumulative period, or all the weeks added together from the beginning of the year.

A few weeks later Carrie had just finished the report and laid it on Jim's desk, when Woods came in with his wad of stag comfortably parked. He says: "Guess you wouldn't be thinking of making an investment, would you?"

"If you're proposing to sell some rich oil land, I have a few acres now."

"No. If I had a monorail track in the foundry I could cut the time it takes to run the heat, in two, and it wouldn't cost much at that. We're melting faster now, and with the track I could shoot a ton ladle down the factory so the men wouldn't have to carry it and lose time waiting their turn, and all that."

"Well! Woods, you said a mouthful."

"Who's been talking to you now? No one, unless its them reports. The casting cost does seem high."

"You're on the right car line now Woods. Keep going: don't stop, and refuse all transfers."

PRODUCTION COST

Casting Dates .... Week ending ....

Division	For the week only			For the cumulative period		
	Wages	Weight produced	Rate per lb.	Wages	Weight produced	Rate per lb.
Foundry Bench Moulding						
Side Floor Moulding						
Machine Moulding						
Floor Moulding						
Total Moulding cost						
Bonuses						
Moulders' Helpers						
Core Makers						
Casting Cost						
Night men						
Cleaning and Chipping						
Cupola labor						
General Non-productive						
Total labor cost and rate						
Overhead .... % on labor						
Supplies						
Coke						
Scrap						
Pig Iron						
Total cost of castings and rate						
Sales or shipments of castings (Giving weight and rate per pound received.)						

Fig. 2—The pay roll is subdivided or distributed as the names appear in the column "Division." The amounts are set down in the "Wages" column. The "weight produced" means good castings only. This weight is divided up in the moulding section. Below "Total moulding cost" the total weight of casting produced is used. The "Rate per pound" is found by dividing the amount in "Weight produced" column, into the amount in the "Wages" column. This is carried out in exactly the same way for the cumulative period showing the results to date.

NOT ANXIOUS TO QUOTE PIG IRON

Dealers Place Toronto Prices Between $53 and $55, with an Indifferent Supply

Dealers in Canada are not anxious to give quotations on pig iron. Between $53 and $55 would be the price asked. As one dealer stated this week: "While we might name a price it is more or less nominal. As a matter of fact we are not all anxious to have you say anything about our business, as we find it hard to look after the business that we already have. Prospects for improvement in the future are not at all bright."

A New York report says that "a material improvement in demand has characterized the pig iron market in this district the past few days and sales which actually have been made, together with inquiries, which are on the point of being closed, aggregate a large total. Numerous large tonnages, making a total of more than 10,000 tons of foundry iron, have been sold, and there are inquiries out for 20,000 to 25,000 tons. Included in the sales were one or two large tonnages for prompt shipment, considerable for second half and a sizable portion for prompt export.

WHAT AMERICAN MOULDERS ARE ASKING FOR BUT NOT GETTING

The 380 moulders and coremakers employed at the Erie, Pa., plant of the General Electric Co., are out on strike, asking for an 8-hour day, and 90c per hour.

The moulders and coremakers of the Houston Car Wheel & Machine Co., Houston, Texas, went out on strike, May 12, demanding $7.20 for an 8-hour day.

To find the diagonal of a hexagon, Octagon or square, the diameter being given. Multiply the diameter by the following constants: For hexagon, 1.1545; for octagon, 1.0825; for square, 1.4129.

Incorporation has been granted to the Easy Washing Machine Co., Ltd., of Toronto, capitalized at $400,000, to manufacture and deal in machinery and parts and accessories.

More Buying.—This year the Canadian National Railways rolling stock will be increased by the building of 5,750 freight cars, 80 locomotives, and 70 passenger coaches. The additions to the rolling stock, contracted for in 1919, are now almost completed.

Our courts to-day resound with a babel of foreign tongues, and it is quite a common experience for our judges, through the vicarious medium of an interpreter to hear the testimony of foreign-born persons, who, though having lived among us for 15, 20, and even 25 years, are unable to speak English.—Judge Thomas H. Dowd, U.S.A.

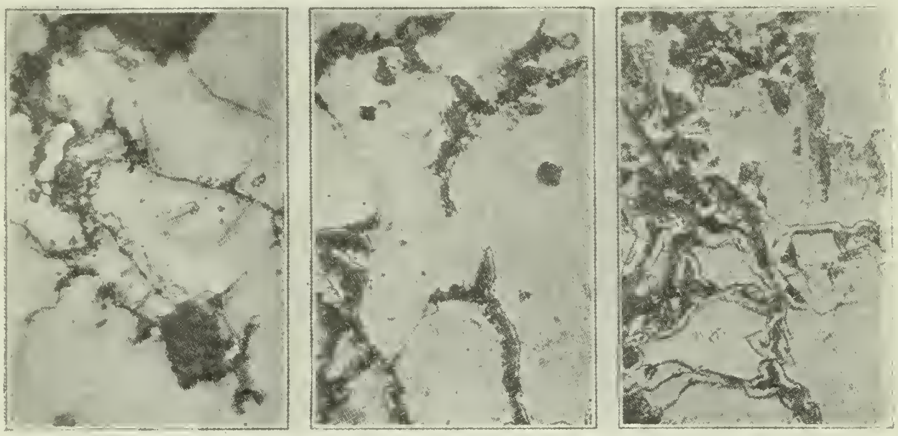
Definition of a good citizen: A good citizen is one who observes all national, state, and municipal laws and is willing to assist in their enforcement; he is honest and fearless; he is loyal to home, friends, and country, and he does what he can to assist in promoting the moral, intellectual and physical welfare of the people.

Research Work on Malleable Iron—*Continued*

Being a Continuation of the Results of Four Years of Research Work for the American Malleable Casting Association

By ENRIQUE TOUCEDA

59. In order to obtain some idea of the mechanism of what takes place, micrographs at a magnification of 750 diameters were taken of the crystalline boundaries of pieces corresponding to Figs. 25, 26 and 27, which are shown in Figs. 29, 30 and 31. It would appear that as the carbon is dissolved the solution takes place through the amorphous iron in the crystalline boundaries, a fact that the writer has not heretofore seen mentioned. This is possibly the manner in which the carbon starts to diffuse into iron during cementation. What might be written in connection with the numerous observed facts pertaining to this product would fill many pages. The writer has lacked time to even take up the matter on which he has written in the way in which he would have liked to have presented the subject, but he believes that enough has been covered to illustrate that through research and through that means only can the manufacturer make real and permanent progress.



FIGS. 29, 30 AND 31, SHOWING CRYSTALINE BOUNDARIES OF FIGS. 25, 26 AND 27

60. For the benefit of those who labor under the impression that malleable iron is a product unsuited for any but small castings, Fig. 32 is shown. One casting of which the writer has a photograph is 5 ft. long, 23 in. high and some of its sections are 3 in. thick. That the metal, when well made, can stand great abuse is illustrated in Fig. 33; while the problem in regard to disproportionate sections that confronts the manufacturer, coupled with intricacy of design, and too often the intricacy of ill design, is well illustrated in Figs. 34 and 35. Irrespective of how good the metal may be, as shown by physical tests on bars and wedges, patterns are furnished so outrageously out of proportion that the good qualities of the metal can easily be destroyed and too frequently the metal is blamed when the design is at fault. These troubles are overcome as far as possible by a thorough study of the best method of gating the casting, in order that no evidence of shrink will be present in any part. Research has made considerable advance in this direction and well-placed, well-proportioned shrink heads are now generally used. Not infrequently, in the case of such castings as the ones referred to, the sprue, runners and heads weigh about as much as the casting.

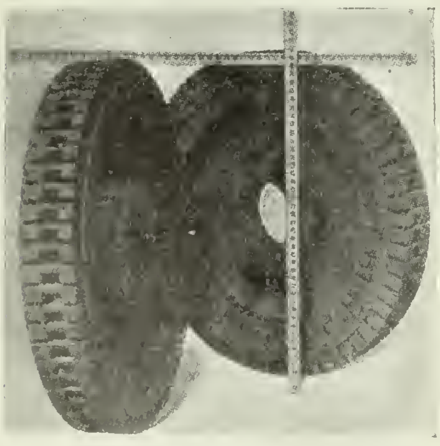


FIG. 32—EXAMPLE OF LARGE MALLEABLE IRON CASTING

Common Fallacies

61. Before taking up the matter of fallacies, which during the past few years have been pretty well exploded, although some still linger in the minds of a few of the engineers and consumers the writer would like to make some further remarks by way of explanation concerning what was stated in the first part of this paper in connection with the literature of the subject. Enough has been shown to make clear the fact that in order to make a good quality of malleable iron, it is absolutely necessary that the white-iron-casting composition be correct. Many very interesting and laborious researches have been made in connection with the precipitation of the carbon during the anneal and in numerous other directions on hard-iron samples whose physical properties would be so low as to be worthless when annealed, due to their impossible composition. Had the same work been done by the eminent men who have carried through the experiments referred to on a hard-iron composition that was normal in all particulars except in connection with the particular element they were investigating, the metallurgist in this particular field would have been greatly benefited and his path made easier.

62. The fallacies that have been handed down and accepted by many of the engineers and consumers as true, are numerous, but the following only will be touched upon as they are the most important:

a. The strength of malleable iron lies in the skin. When it has been removed the remainder of the metal is found to be very inferior and not dependable.

b. During the anneal, the elimination of the carbon is confined to the surface, and the amount removed from the rest of the section is inconsequential.

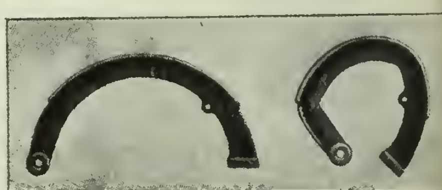


FIG. 33—EXAMPLE OF ABUSE MALLEABLE CASTINGS WILL WITHSTAND

c. When the section of a casting exceeds ⅝ in. in thickness, it cannot be annealed throughout.

Table 4 Tests of Malleable Iron Bars With Decarbonized Skin Removed

Mark	Ultimate strength, lb. per sq. in.	% elongation in 2 in.
12-2-1	52,084	17.50
12-3-1	47,182	10.00
12-3-2	51,107	17.50
12-4-1	56,732	14.00
12-5-1	46,482	7.00
12-5-2	52,246	23.00
12-6-1	47,889	19.00
12-7-1	48.080	18.00
12-7-2	49,640	18.00

63. Concerning item a, the data in Table 4 will prove of value. Nine regular test bars were machined until the decarbonized surface was removed. These bars were all from different heats and marked as indicated in the table.

64. As the writer did not have duplicates of these bars, he was unable to

make a comparison between the machined and the bars as cast and lacked time to run through a set for illustration, but the experiment should be unnecessary in any event in view of the above. It is obvious and must be acknowledged that the metal in the decarbonized skin is more ductile than the core, so when a bar fails it must be conceded that it is the core that has parted first, for the reason that the metal in the skin has not at the instant of fracture reached its maximum elongation. Aside from the foregoing we have the practical evidence that presents itself in the case of the automobile industry in which thousands of tons of machined malleable-iron castings are used annually on parts that receive in service great abuse, such as wheel spindles, etc. On the other hand, the writer not only admits that when the skin is machined off somewhat malleable-iron castings the remaining part is worthless, but admits as well that the castings would be such with the skin on. This, unfortunately, will continue to be the case until the purchasing agents cease to shop around and a contract is made on price as the basis rather than quality.

65. Taking up item b, the writer can,

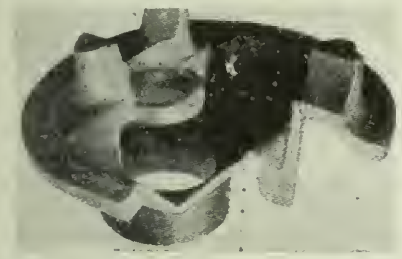


FIG. 34—EXAMPLE OF CASTING OF DISPROPORTIONATE SECTIONS

without encumbering this paper with the large amount of data he has on the subject, prove the falsity of this contention. In the figures quoted in Table 3 for bars of over 52,000 lb. ultimate strength and over 20 per cent., elongation, there will be noted two bars, one of which has a carbon content of 0.72 per cent. and the other of 0.82 per cent. Aside from this there are fourteen with a carbon content of 1.50 and under. In Par. 39 an explanation is given of the manner in which the drillings were taken for analysis. It has already been pointed out that the carbon in the hard iron must be kept up to a certain figure, failing which the castings will not only misrun, but contraction cracks will spoil them. If we assume, in the case of the first two bars referred to, that the carbon was reduced by one-half, then in the bar that had but 0.72 per cent. carbon, the carbon in the hard iron from which it was cast must have been 1.44 per cent., and we all know that it would be almost impossible to run such work, say nothing about subsequently annealing it. In a ⅝-in. diameter annealed bar such a low carbon content is unusual, but it proves the point that is being made, nevertheless. The writer has polished the section of two ⅝-in. bars and has photographed them at about seven diameters. These are shown in Figs. 36 and 37. They will furnish a fairly good idea as to how the carbon is distributed throughout the section, and indicate that

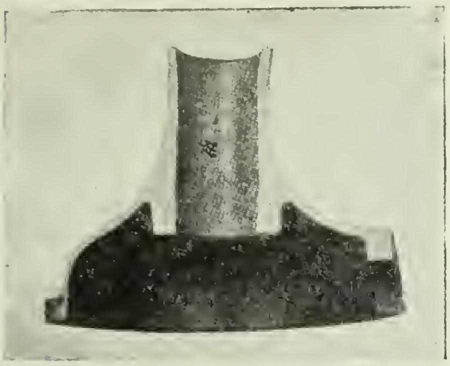


FIG. 35—EXAMPLE OF CASTING OF DISPROPORTIONATE SECTIONS

the carbon does not vary by uniform gradation from surface to centre, but in one region can vary slightly from what it may be in another. This does not signify that in the regions of highest carbon content the carbon has not been lowered through diffusion into its contiguous region, for many investigations have shown that this is just what does happen.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

This is a society with offices at 29 West Thirty-Ninth street, New York City, and their existence should be an incentive to Canadians who think they have something up their sleeves which the other fellow does not possess to forget it. The secret of success is not in having "secrets." This society selects from its membership, and, if considered advisable

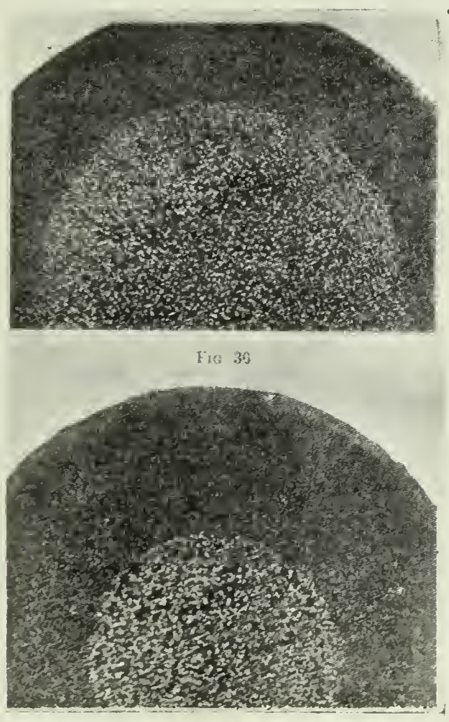


Fig 36

FIG. 36 AND 37—SHOWING CARBON DISTRIBUTION

from non-members, men who have had exceptional experience and have them prepare papers on subjects with which they are abundantly familiar. These papers are read at meetings where they are discussed and where every opportunity is offered to point out improvements which might be possible. The results of their deliberations are then for the benefit of the world.

To show that their work does not conflict with that of other equally worthy organizations, we will introduce them to our readers:

The Sub-Committee on Foundry Practice has secured for the society a set of papers on the products of the several types of foundries, believing that this information would be of greater value to the members than data as to the details of foundry practice.

Mechanical engineers are called upon to decide or advise on the selection of the proper kind of a casting for a given piece of construction and should therefore know or have available reliable information as to the present state of the art in foundry practice. The committee has accordingly endeavored to have this information presented in such a way as to not trespass on the territory of the American Foundrymen's Association as to the art or how castings are made; on that of the American Society for Testing Materials as to specifications or methods of testing castings; nor on that of the Mining Engineers and Chemists as to the production of the metals from which the castings are made.

Each paper is supposed to outline the special properties of that particular kind of casting and where it is to be preferred to other forms of cast metal. Also to outline what is actually being done so that engineers and designers may know what they ought to be able to secure from first-class commercial foundries at the present time.

No attempt has been made to secure information as to what is going on in the line of research work in the foundry, as it was thought best to present a reliable statement of what foundries are now doing in a commercial way rather than of what it may be possible for them to do in the future.

The committee has endeavored to secure the highest available authority for each of the several common types of castings and is under great obligation to these men who have written the papers and presented them to the society. This is especially true of the several authors who are not members of this society.

There will doubtless be many differences of opinion as to some of the statements made in these papers, but it is sincerely hoped that the members will freely question all points at issue so that after a full discussion the authors may be able to complete their papers in such a way that the set as a whole will be generally accepted as a thoroughly reliable report on the products of modern foundry practice.

W. W. BIRD, Chairman
Sub-Committee on Foundry Practice.

The Production of Bronze and Brass Castings

Being a Paper Read at the Spring Meeting of The American Society of Mechanical Engineers, Held at St. Louis, Mo., May 1920.

By CHRISTOPHER H. BIERBAUM

THE terms "brass" and "bronze" are not as definite in their meaning as might be desired. The term bronze was formerly applied to an alloy of copper and zinc. Usage, however, has changed and it is now generally applied to an alloy of copper and tin, while the term brass is used to denote an alloy of copper and zinc. This change of nomenclature has led to a great deal of confusion. Even today we speak of crankpin, crosshead, or engine brasses when we have bronzes in mind; that is, a copper-tin alloy with comparatively little, if any, zinc in its composition. In general, it may now be said that without a modifying adjective brass is an alloy of copper containing a large amount of zinc; and bronze is an alloy of copper containing a relatively large amount of tin. In this country no general standard of terminology for these alloys has as yet been adopted; the British Institute of Metals has adopted one but theirs does not seem entirely satisfactory for our purpose. For the present, in this discussion, these alloys will be designated according to the prevailing commercial usage in this country; and other alloys will, as far as possible, be designated in the order of their preponderant constituents. Thus, the copper-tin-lead alloy is one containing, by weight, more copper than tin, and more tin than lead.

2. It is very generally understood that in designing machine parts which are to be made of cast materials a larger factor of safety is necessary than that required for rolled or forged material, although the compositions may be very similar or even identical. This in itself is not sufficient. The fact that the strength in any given casting varies in its different parts must also be taken into consideration, since it is impossible to make a casting with varying sections of uniform strength.

3. In general, the engineer should be cautioned against specifying alloys upon which he has only such knowledge as has been derived from laboratory tests alone, since it is impossible to determine, by ordinary experiment, all of the economic conditions which enter into the founding and tooling of a casting and the requirements of a subsequent satisfactory use of an alloy for any given service. To illustrate: Years ago the favorite Government composition known as gun metal (88 per cent. copper, 10 tin and 2 zinc) was unreservedly specified for valves, steam connections and fittings. At the present time, however, no successful valve manufacturer would think of using this alloy for this purpose, although from purely laboratory results this and similar high-tin alloys may appear to meet the requirements. The safe procedure is either to investigate and follow standard practice, or determine definitely why it should not be followed; or else to leave the composition and the guarantee of results to a responsible manufacturer and hold him accountable.

4. Aluminum should never be used in an alloy which is to be tight against leakage of either a gaseous or fluid substance. Aluminum has the peculiar property of forming a characteristic skin upon the surface of its alloys, due to its great affinity for oxygen. Appreciably less than one two-hundredths of one per cent. of aluminum produces an appearance upon the surface which is very distinctly that of a brass or bronze casting. In fact, this surface film is often found in castings where the amount of aluminum present is so small that the chemist may be in doubt as to whether even a trace of it exists. In pouring a casting containing aluminum this surface film becomes entrained in the convecting currents as the molten metal fills the mold and often extends through the entire thickness of the wall of the metal and thus gives rise to porosity which causes leakage. For the foregoing reasons it is always desirable, when pouring, that the molds should fill with as little bubbling and splashing as possible. This applies to all alloys in general, but to those containing aluminum in particular. The "horn gate" or some form of gating by means of which the molten metal enters at the lowest point in the mold is very desirable.

5. In the alloying of copper and tin a low-fusing crystal forms known as the tin-copper eutectoid. This crystal is hard and brittle and in general should not be present in bronzes used for machine parts; and more particularly so if these parts are subjected to temperatures approaching that of high-pressure steam. This crystal always forms in ordinary foundry practice when tin is present in amount equal to 9 per cent. of the copper content. In slow cooling the amount of this crystal is increased and slow cooling also cause it to appear with a lower percentage of tin. High-tin bronzes should neither be used under high temperature nor where they are subjected to severe shock. Without doubt this eutectoid crystal constitutes the most valuable bearing crystal for bearing metals to be found in any of the bronzes.

6. Considerable experimental work has been done at different times and in different laboratories on the subject of heat treatment of foundry bronzes and brasses which are to be used without subsequent forging or tooling. These experiments have been applied particularly to the copper-aluminum alloys and to the copper-tin alloy known as gun metal. Nothing, however, has as yet developed to bring this process of heat treatment into general commercial importance.

Deoxidizers

7. **Magnesium** has a strong affinity for oxygen. It corrodes quite readily when exposed to moist air. It is the most natural deoxidizer for zinc. It is also very useful for deoxidizing copper in the making of pure copper castings requiring a high electrical conductivity. Unlike many other deoxidizing agents, a slight excess of magnesium will not materially reduce the electrical conductivity.

8. **Aluminum** also has a very strong affinity for oxygen, ranking next to magnesium in this respect. It is an excellent deoxidizing agent in all alloys where it is intended that it should be present. It produces a characteristic surface which is not adapted for soldering.

9. **Manganese** has a high affinity for oxygen, ranking next to aluminum in this regard. It is supplied commercially as manganese copper, which contains about 30 per cent. of manganese. It is not only a deoxidizing agent when alloyed with copper but it is also a desulphurizer. When used in copper castings a mere trace greatly increases their electrical resistance.

10. **Zinc** is very generally used for alloying with copper. In its affinity for oxygen it ranks next to maganese but, owing to its high affinity for copper and its tendency to form a solid solution, it is not as good a deoxidizing agent as might be expected.

11. **Silicon** has considerable affinity for oxygen when present in the molten state of an alloy. It is supplied to the trade in the form of silicon copper, a product of the electric furnace containing from 10 to 50 per cent. of silicon. It became very popular as a deoxidizing agent in the brass foundry some fifteen years ago, but has largely been replaced by phosphorus for this purpose owing to the convenient form in which the latter is supplied. Silicon has the disadvantage that it cannot be used in any alloy containing lead, owing to its tendency to unite with lead and cause porous and spongy castings.

12. **Phosphorus** is now most universally used in the brass foundry as a deoxidizing agent for copper. New copper can be melted in a crucible and complete deoxidization effected with one-tenth of one per cent. of phosphorus. It has the

disadvantage, however, of reducing the electrical conductivity wherever it is used. The phosphorus-copper crystal (PCu_3) is very hard and a very small percentage of phosphorus tends to harden any of the alloys in which it is present. If bronze containing more than a trace of phosphorus is to be used as a bearing metal, it should also contain an appreciable amount of lead in order to minimize the abrasive character of the prosphorus-copper crystal.

13. **Boron Suboxide.** When this compound was first introduced it was the most successful deoxidizing agent for copper, in that not a trace of boron remains in the deoxidized copper, and the effect is exceedingly good, making a pure deoxidized copper with high electrical conductivity. It has recently been superseded, however, by boron carbide, which is even more active as a deoxidizing agent. Both require skill and expert knowledge to handle successfully in the foundry.

Fluxes

14. The use of fluxes in the brass foundry is of considerable importance. If pure metals could be melted without coming in contact with air, fluxes would not be required and therefore it is essential that proper fluxing be resorted to. Covering the surfaces of the molten metal with charcoal is always beneficial, that is with metals and alloys whose melting temperature is above that of the ignition point of the charcoal.

15. The function of a flux is twofold: first, it should dissolve in itself all the metallic oxides; and secondly, when in a molten state it should completely cover the surfaces of the molten metal and thus exclude all air. A good flux should not be too destructive on the walls of the furnace or crucible. Satisfactory castings may be made by melting pure metals in a crucible and covering with charcoal. In the remelting of gates, risers and skimmers which have been more or less oxidized, it is necessary to use both a deoxidizing agent and a flux. The best two fluxes known are probably borax and fluor-spar. The first of these is too expensive for ordinary foundry use. The second, when pure, is too severe upon the walls of crucible and furnace. Various fluxes are now on the market containing, in part, fluor-spar and an admixture of other materials which tend to reduce the destructive action of the fluor-spar upon the furnace and crucible walls. Broken glass is often used and is quite satisfactory, especially if of a low fusing temperature. Glass, however, has also a destructive action upon the crucible and furnace walls, so that the fluor-spar mixture fluxes upon the market are the best for the purpose.

16. Brass-foundry products do not compete directly with cast iron, cast steel or steel forgings in machine construction. They are specified by the designer only when certain properties are necessary, such as appearance, bearing value, chemical composition, and the like. These non-ferrous products never can compete directly in cost with the ferrous products for the reasons that copper is always higher-priced than iron and the price of tin is always subject to foreign speculation; while few of the minor constituents compare favorably in price with iron.

Bronzes

17. **Manganese Bronze** is the term generally applied to a composition which, properly speaking, is a brass instead of a bronze. It is an alloy of copper containing a high percentage of zinc, aluminum and iron, in which a small amount of manganese has been used. The beneficial effects in this alloy, due to the deoxidizing and iron-carrying properties of the manganese, are very striking. Beneficial results are obtained even though no more than a mere trace of manganese finally remains in the resulting product. In none of the brass-foundry products are the high merits of an alloy so much due to the results of skilful and intelligent foundry practice as in the case of this particular alloy. The composition is relatively cheap when the cost of the constituents is considered. The cost of the final product, however, is much higher than its composition would indicate, due to the following requirements necessary for the production of satisfactory castings: The introduction of a small percentage of iron is necessary for proper results, and care and skill with proper equipment are indispensible for this operation; secondly, the amount of metal required for gates, heads and risers necessary for this alloy is unusually large, so much so that in the production of ordinary automobile castings only from 17 to 39 per cent. of the entire metal melted finally appears in the form of finished castings; and lastly, the loss in melting is unusually large. For machine construction this alloy, of all brass-foundry products, is of first importance. In strength it successfully competes with steel castings and steel drop forgings although the price is from three to five times that of malleable castings. This, and its non-corroding properties make it a most desirable material in automobile and marine construction. As a foundry product it is a very desirable material as it has a very smooth surface. The labor for finishing it is in many cases so light compared with that required for finishing steel castings that it can often compete with steel castings. This is especially true in automobile construction. It has the necessary strength for brackets, standards and fixtures, so that it can replace both steel castings and forgings for these purposes. Manganese bronze has a field of usefulness in experimental work in that it can be produced with less delay than steel forgings, stampings or malleable castings, requiring as it does so little finishing. By varying the two principal constituents of manganese bronze the desired physical characteristics can be obtained. An increase of the percentage of copper increases its elongation, whereas an increase in zinc increases its ultimate tensile strength but decreases its elongation. When this material is made up with the necessary precautions as to purity and foundry methods, very excellent commercial results can be obtained. For example, a tensile strength of 90,000 lb. per sq. in. with 30 per cent. elongation can be secured in a standard test coupon, whereas many producers consider 65,000 lb. tensile strength with 15 per cent. elongation as fair.

18. **Aluminum Bronze** is an alloy of copper and aluminum containing from 4 to 11 per cent. of aluminum and the remainder copper. In recent years, however, this alloy has been made up with an addition of from 1 to 6 per cent. of iron. The introduction of iron produces twofold results: First, it causes the alloy to solidify with smaller crystals, that is, it produces a finer grain; and secondly, it adds a third hard crystal formed by the union of aluminum and iron which is much harder than the other two crystals. This is the only brass-foundry product which can compete commercially with manganese bronze. With care it can be so made up as to have a somewhat higher ultimate strength than manganese bronzes, although it does not possess a higher yield point or elastic limit. The drawback to this alloy is the inherent difficulty of making solid castings. The tendency to have blowholes is very characteristic and even extreme skill will overcome this difficulty only in a degree. Aluminum bronze may be used for bearing purposes, and recently, when containing iron, has had a limited use for motor-truck worm drives. The only advantage of this latter alloy over a copper-tin-bronze composition is its cheapness; for bearing purposes, however, it cannot compare with a copper-tin alloy.

19. **Acid-Resisting Bronzes.** These are some of the brass foundry products which formerly were of more importance than they are to-day, owing to the fact that stoneware and specially modified cast iron are now largely replacing these uses. There are, however, some uses for bronzes to resist sulphuric and sulphurous acids in mine service, pulp mills, and other industries. For these purposes two alloys are most serviceable; a copper-tin-lead alloy containing substantially 86 per cent. copper, 12 per cent. tin and 2 per cent. lead; and aluminum bronzes containing a small iron percentage.

20. **Copper-Tin Alloys.** First among these alloys highest in its tin content may be mentioned bell metal, a composition containing from 16 to 25 per cent. of tin. As the name implies, it is used for the manufacture of bells, gongs, steam whistles and the like. It is a resonant metal. For industrial purposes the compositions used are those having the lower percentages of tin, say from 16 to 18 per cent. The higher percentages of tin, especially between 20 and 25 per cent., are used for bells in which high tone quality is required. The production of these bells requires considerable skill and constitutes a special industry.

In general, however, it may be said that for all purposes the constituents for these alloys should be extremely pure and every precaution against oxidation should be taken during melting and pouring, since the quality of the product is altogether dependent upon the purity of the alloy.

21. The next alloy of this type to be considered is a bronze used in turntables and movable bridges. This composition is given in the tentative A.S.T.M. specification as "Class A, Bronze Bearing Metals for Turntables and Moveable Bridges." It is also given as "Grade A" in the American Railway Engineering Association specification bulletin of July, 1918. It contains 20 per cent. of tin, and phosphorus not to exceed 1 per cent. It is very hard, due both to its tin and its phosphorus contents. For best service conditions it should not be used except when placed between hardened steel plates. It is intended for pressures over 1500 lb. per sq. in., and slow-moving bearings.

22. A composition similar to the foregoing is one given as "Class B Bronze," under both of the immediately foregoing specifications and containing 17 per cent. of tin with a permissible phosphorus content of 1 per cent. It does not seem wise to permit this amount of phosphorus in a bearing metal of this kind, however, if to be used as specified between "soft steel plates." Better service conditions can be obtained by the production of the necessary hardness through increase of tin content and reduction of phosphorus. An alloy containing 19 to 20 per cent. tin and only a trace of phosphorus would give better service when used on soft steel. In a case of this kind where a copper-tin bronze is used between unhardened steel surfaces the amount of phosphorus present should be very limited owing to the exceeding hardness of the copper phosphide crystals.

23. The next alloy of importance as to its tin content is a bronze containing 11 per cent. of tin and a maximum of 0.2 per cent. of phosphorus. This alloy is the standard composition now in very general use for worm wheels in motor-truck drives and in the motor-car reduction worm gears. A feature of considerable importance in the making of this alloy seems to be that of producing the proper amount of chilling effect in the cooling of the castings. In some cases zinc has been added to an amount of 2¼ per cent.; results show, however, that the addition of zinc is undesirable although it produces an additional hardness of the alloy as indicated by the Brinell and scleroscope tests. This additional hardness rather detracts from its bearing value, and, at the same time, makes it more difficult for tooling. It seems self-evident that the above alloy, as it now stands, could be improved by the addition of a small amount of lead, —not sufficient to produce undue weakening,—and that this would result in a threefold benefit; easier tooling, increased accuracy of tooled surfaces, and a higher bearing value.

24. **Copper-Tin-Zinc Alloy.** The most popular alloy of this class is the one known as ordnance bronze or gun metal. Its composition is 88 copper, 10 tin, and 2 zinc. This alloy has come to be a very generally known composition in that it is a general-average bronze. However, with a more complete metallurgical knowledge of the relative values of different compositions, it becomes of less importance, in that it is specifically neither a bearing bronze of high merit nor a bronze especially adapted for machine parts when maximum economy of alloy is considered. The high tin content produces in this alloy a high percentage of the tin-copper eutectoid, with the resulting disadvantages when the alloy is used for other than bearing purposes. The use of ordnance bronze for the construction of machine parts is, for two reasons, a wasteful one: It contains an unnecessary amount of tin, a high-priced constituent, and more serviceable alloys can be produced by the use of a lower percentage of tin. For machine parts, steam connections and valves, a composition having, say, 90 per cent. copper, 6½ tin, 2 zinc, and 1½ lead, is a superior alloy for the reasons that it can be produced as a more economic foundry product, its price is less, its physical properties are superior, and lastly, its machining qualities are superior. On the other hand, the zinc in ordnance bronze distinctly detracts from its bearing value.

25. **Copper-Tin-Lead Alloys.** These alloys are strictly bearing compositions containing not in excess of 82 per cent. of copper, and a tin maximum of 11 per cent. with a lead maximum also of 11 per cent. This range of alloy corresponds to "Class C" of the A.S.T.M. tentative specifications for Bronze Bearing Metals for Turntable and Movable Railway Bridges. These alloys are usually deoxidized with phosphorus which has a tendency to suspend or diffuse the lead, since in all these alloys the lead is held in mechanical suspension without any chemical union. The most generally used of this series contains 80 per cent. copper, 10 tin, and 10 lead.

26. To enumerate all of the copper-tin-lead alloys given by various authorities as bearing bronzes would constitute an almost infinite series. The whole matter, however, can be summed up in a few words: Lead is a desirable constituent in a bearing alloy but has the drawback of weakening the bronzes, therefore, for light service, or under conditions where a supporting oil film cannot always be maintained, as in car or truck bearings, the compositions containing the higher proportions of lead should be used. Where the punishment is severe the alloys should have a lower percentage of lead. As a rule it is economy to use as much lead as possible, since lead is a cheaper metal and it also adds materially to the bearing value of the alloy.

27. **Copper-Lead-Tin-Zinc Alloys** are those containing from 3 to 12 per cent. of lead, from 4 to 6 per cent. of tin and from 1 to 10 per cent. of zinc. This series of compositions includes several used for bearing purposes, especially those having the high lead limits. The addition of zinc in this alloy is for the purpose of reducing the cost; it does not add to the value of the alloy except in its physical strength and it detracts from its bearing value. The series includes the popular red-brass composition; 85 per cent. copper, 5 tin, and 5 zinc; and also a cheaper composition containing 77 per cent. copper, 10 lead, 3 tin and 10 zinc, used for low-pressure valves and plumbers' supplies.

STRIKES AND ORGANIZED LABOR

THERE are two separate and distinct subjects which seem to have become confused together and classed as one; the word "strike" seeming to savor of organized labor and the expression "organized labor" appearing to portend or suggest the likelihood of a strike, but from my own personal viewpoint they have no connection whatever. However, in view of my position with CANADIAN FOUNDRYMAN, I am continually being confronted with this combination or duel subject and asked to pass an opinion on it and state our platform, meaning the stand which this publication takes on the subject.

To this I can only say that it takes no stand and has no platform on either of these subjects, but is strictly a technical or mechanical paper treating on the foundry and allied trades, and aiming to keep its readers posted on what is doing in the way of improved methods of production. In its news columns the aim is to deliver the information as it is, and not as we would have it.

As regards my own personal opinion, it is of no more consequence on these subjects than on those of politics or religion or any other subject, but if I must answer a question which has been repeatedly asked me, it is this—"If we will take, first the subject of strikes, I would say that it is simply a form of "force." If a body of men cannot prevail upon their employer to see things as they do, they endeavor to "force" him to come to their terms.

Now if we will take the history of England for the last thousand years it will be a fair example of the foundation of which modern civilization stands, not only English civilization, but that of the civilized world. Practically everything, good bad or indifferent which has come to pass during this period, had its origin in England and later on accepted by other nations, but if we look it over carefully we will observe that very little has transpired, in the way of improvements or reforms except through the influence of "force."

Now if we forget about English history for the time-being and go to the far east and look back about nineteen hundred years, there was one who used such expressions as "Come," and who endeavored to interest mankind in such subjects as "Peace and goodwill to man," "Love one another," "Love thy neighbor," "Love thine enemies," "Do unto others as you would have others do unto you," etc., but the people were not interested in that kind of talk and they said "Away with Him." So it is in our own day, we have many who profess to be His followers but few who follow His example. Force is the predominating factor, and pleadings such as "Come" do not count.

If we return to our English history and come down to the year 1066 when William of Normandy invaded England we will see that he did not meet with a hearty welcome from the populace, but he stayed there just the same and he divided up the land among his followers, creating a nobility or gentry or aristocracy or whatever we may call it and forced the people to submit to his authority and to recognize the nobility as their superiors. This they did so long as they were forced to, but never missing an opportunity to wield this same weapon "force" against those over them.

If we come on down to June 19th, 1215 when King John signed the Magna Charta, he didn't do it with any degree of cheerfulness, not he. The proverbial club was over his head when he was reluctantly signing that piece of parchment.

Now if we come on still further down to May 26th, 1679, when King Charles the second signed the Habeas Corpus Act, he was not particularly anxious about making any changes in the existing laws, but he yielded on this point on account of the some old influence—"force." Or, we might revert back to his father, King Charles the First. When he laid his head on that block to have it chopped off with an axe. He did not do so because he wanted to, but because he had been trying to force his subjects to do what they did not want to do, and they got the best of him and forced him to do what he did not want to do. So it is when we come on down to our own generation. When the landlords were requested to pay taxes on unearned increment, they did not look upon it as a patriotic duty and say "certainly." No, they waited for the same old remedy, force, to decide the question, but they are paying their taxes now.

This same influence is working in every walk of life and in every land, neither the working man nor the employer misses many opportunities to try it on his opponent. Everybody knows what the lot of the working man has always been when left to the mercy of the employer, and the present time shows the extent to which the working man will go when he has the opportunity. When times were quiet and men plentiful the employer invariably argued against arbitration, on the grounds that there was nothing to arbitrate. He reserved the right to name his terms and conditions and the man could accept them or do the other thing. Now-a-days the man has the upper hand and he seems to delight in being on strike most of the time, even though he is missing the chance of a lifetime to lay up some money. Walking around the street all the year around and drawing a sort of half living out of the fellow who happens to have a job does not look like a very high degree of good judgment, but then he is getting back at the boss.

The whole thing is so ridiculous that it is positively disgusting, and surely there is a remedy to be found in this twentieth century.

Arbitration would look like the proper solution, and this should not require to be put on the statute books. Common sense should dictate to both parties that a strike is a losing game for all ides, and a terrible annoyance to the public at large. One strike just fades away when another looms up, so that we are always pestered with a coal miners' strike or a railroad strike, or some kind of strike to keep the country in an uproar. These strikes have been going on as long back as I can remember and I have not seen any great wonders which they have wrought. Wages are higher than they used to be, but so is everything else, and the working man has less to play on than he ever had. One certain, sure thing, is that a day wasted can never be made up. Every day that we waste, the world makes a revolution and registers a day lost, and it will never go back and do it over again. If we take a day for pleasure it is not wasted, as we must have pleaure, but if we take a day for spite, we are spiting ourself as much as we are spiting the employer, and we will always be out of pocket what we might have earned on that day. Arbitration if honestly administered has all the good points which are required, but to be of any service it must be an all-year-round understanding and not be suggested after the rupture has taken place. The idea of an employer ignoring every appeal from the men until after they have gone out on strike, and then refusing to treat with them unless they come back is a course which the men may justly resent. But, as I have tried to point out, it has always been thus and if it is ever to be changed it may be necessary to bring force to bear on both parties and compel them to submit their differences to arbitration.

Organized Labor

As regards organized labor, it is about the most ancient of any of our institutions and is a pretty touchy subject to touch upon. It has weathered some pretty rough storms, but is still a powerful force, so I don't think we had better interfere with it. If we go back into ancient history, say as far as the building of King Solomon's Temple, we will find it there. It will be remembered that the King of Tyre furnished several thousand men to assist the thousands which King Solomon furnished, but these were what might be termed conscripts. They worked because they were told to do so, but in addition to them, there were certain carpenters and masons (all known as masons in those days) who were of the expert class and whose services were sought after, wherever any high-class work was being done. These were free and independent of the conscript class and were organized into a regular society known as the Free and Independent Masons. They took as their emblem a couple of the builders' tools, the square and compass, similarly as the moulders' union has taken the shovel and rammer. They also had secret signs which each member had to understand in order to prove that he was not an impostor who had never served an apprenticeship and proved his worth. This, as I understand it, is the origin of Trade Unionism and incidentally of Free Masonry. Whether it is accepted as history, tradition or mythology is optional, but it should be as acceptable as any other history. In the reign of King Henry VI., Free Masonry was declared illegal but the law was never enforced. In the early part of the last century organized labor was considered a crime, punishable by imprisonment on account of the harm it "might" do.

A Mistaken View

In conclusion I would say that I am not in favor of strikes, and I do not know of anyone who is, but each side always blames it onto the other when a strike is declared, but where the employer gets himself on the wrong track, if he is really anxious to have an agreeable settlement, is in opposing the representative who is sent from headquarters.

The moulders union is an international affair, with headquarters at Cincinnati Ohio., and before a local union can go out on strike it is necessary that they present a very forcible argument to headquarters in order to get a sanction If a strike is declared, headquarters has to provide the funds, and it is quite reasonable to believe that they would do their utmost to prevent a strike, and if the employer would treat with their representative he would get the best possible results.

Now, these are my sentiments, and as the old saying goes, "If they are not satisfactory I suppose I can alter them." —Editor.

He has achieved success who has lived well, laughed often, and loved much. Who has gained the respect of intelligent men and the love of little children. Who has filled his niche and accomplished his task. Who has left the world better than he found it, whether by an improved poppy, a perfect poem, or a rescued soul. Who did not lack appreciation of earth's beauties nor fail to express it. Who looked for the best that was in others and gave the best he had. Whose life was an inspiration and whose memory is a benediction.—(Stanley).

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

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Our Special Moulding Machine Number

THE next issue of CANADIAN FOUNDRYMAN will be especially devoted to the subject of moulding machines, from the inception of the crude stripping plate and squeezer machine up through all the stages of development to the present state of perfection to which moulding by machinery has arrived.

It is not the intention to consider it in the light of a strike breaker, because that is not its mission in this world. It may be hailed as such by one class and spurned as such by another, but its real mission, like that of all machinery, is to save the labors of man, to increase production, and to save expense. The world will always provide an abundance of drudgery for those who prefer to do hand work and machines will not stand in their way. The moulder's trade may be fascinating, and the man who can do jobbing work may not want to give it up, but he need have no fear, the demand will always be greater than the supply of men to fill it. The real value of the moulding machine is that it makes possible many things which would be impossible without it. Take for instance the thousands of automobiles which are built and sold every day. Would it be possible for men working by hand to produce them at a price which would allow of them being sold? It certainly would not. If automobile work had to be done by hand it would not be done at all, excepting in isolated cases. None but the wealthy could have them, and the thousands upon thousands of workmen who are employed in automobile works would have to seek other employment.

What holds good in the automobile business holds good in every line of business. The moulding machine is a positive necessity, and no matter what we think or what the working man or any other man thinks, the fact remains that the moulding machine has come to stay. It is a thing of the present and of the future, and every foundry in Canada must be fitted out with its quota of machines or be crowded off the field, and the question before the foundryman now is what type of machine to purchase With this in view, it is our intention to go into detail and describe every type of machine which is made, and also point out the class of work for which each is most adapted.

The number will be profusely illustrated, and nothing will be included in the matter but the most authentic and reliable of material, and we trust and believe that it will be a valuable book of reference for future use as well as for the present.

Conservative and Bluff

HERE are two words which have meanings, far from being in common, and both are used to convey ideas for which they are not adapted. Canadians take a pride in being known as a very conservative people while the Americans, perhaps, do not take so much pride in being noted for their bluff and yet to a certain extent they do. Now what do these two words mean? Through courtesy to our neighbors we will first describe "bluff." Bluff, in the English language, means, "Too abrupt and plain in speech." In slang dialect it means "to impose on or frighten by boasting." Now, neither of these definitions conforms to the methods of the American. The American idea is to take an optimistic view of every projected venture, and even though the prospects of success are not any too rosy, he makes a try at it anyway. That is what is known as American bluff, but it does not require any abrupt talk, neither does it impose on anyone or frighten him.

In Canada we seem to have a pride in being considered conservative. Now, this word practically means stagnation, or to quote the dictionary, "Desiring to preserve existing institutions." This name was adopted by one of the political parties in Great Britain in the early part of the last century on account of their staunch belief that the existing form of Government, and British institutions in general were so near perfect that they would not tolerate any alterations. This might be all right in politics, but it is of doubtful value in business.

The mode of procedure in the early part of the last century in the foundry business, for instance, is surely not adapted to present-day conditions, although it is still adhered to by too many foundrymen. If American practice is bluff, what we want in Canada is a brand of Canadian bluff similar to the American brand.

Of course, Canadians are not as conservative as they would like to picture themselves. They have loosened up on the century-old methods of operation, but still stick to the idea of reserve, keep all their business to themselves, have nothing to say if questions are asked, etc., etc.

What we want over here is more hot air. Stick to the truth, but boost the truth for all it is worth and let the world know that Canadians are Canadians.

One of Columbus' Attractions

ONE point which the people of Columbus, Ohio, are putting forward as an attraction which should encourage foundrymen to the convention in their city in October is that they have the best drinking water on the continent This may be taken up by some as a joke, inasmuch as drinking water has become the national beverage, but it is no joke. There are times when nothing satisfies like a good drink of good drinking water, and if Columbus, Ohio, has good drinking water to offer to her guests, she has a real drawing card which will be appreciated.

This Year's Foundrymen's Convention

IT is perhaps a little early yet to go into details regarding the fifteenth Annual Exhibit of Foundry and Machine Shop Equipment and Supplies to be held in conjunction with the twenty-fifth annual convention of the American Foundrymen's Association, Inc., at Columbus, Ohio, during the week of October 8th. It is however, drawing toward the time when intending visitors should bestir themselves and make preparations.

The association is fortunate this year in having a group of buildings in which can be provided ample accommodation for all association activities, including meetings of the Technical Department, Registration Headquarters and Exhibits.

It is also planned to have all entertainment at the Fair Grounds, except such features as are scheduled for evenings.

For the benefit of those who have not already been informed, we would say that the buildings and grounds to be used on this occasion are those of the Ohio State Exposition, which are located within the limits of the city of Columbus which is the capital city of the State.

The buildings are of concrete, brick and steel, and have concrete floors. Street car lines run from all parts of the city and loop at the grounds, from where there is a covered passageway leading to the first building, and all the buildings which will be used are connected by covered passage ways.

From this it will be understood that the buildings were designed and constructed for exhibition purposes, and, everything in the way of Coliseum, Auditorium, etc., is right on the grounds. In fact there are two lecture halls in the No. 1 building where two conventions can be held simultaneously.

CANADIAN FOUNDRYMAN will assume the responsibility of enlightening its readers on all points as the time draws near and will describe and illustrate the exhibition as well as interesting features in connection with the City of Columbus and its surroundings in the September issue.

Subscription Price $2.00 Per Year

OWING to the enormously increased cost of production it has been found absolutely impracticable to continue the publication of CANADIAN FOUNDRYMAN at the nominal subscription price of one dollar per year. Not only have wages increased in accordance with the times, but everything which goes to make up a publication has risen in price to an unprecedented height. Print paper, which, for a long time, has been on a steady climb, is continuing to soar, making the present move imperative.

CANADIAN FOUNDRYMAN will, as heretofore, continue to be the recognized medium through which all foundry matters will be transmitted from one foundryman to another throughout Canada, and nothing which tends to make it a welcome messenger will be overlooked.

The specially prepared articles for the moulders, written by moulders in moulders' language, will continue to be a leading feature.

The patternmakers' section, which has been gaining in popularity, will continue to improve in many respects; many exceptionally instructive articles on this subject by expert patternmakers, British, American and Canadian, being in preparation.

The cupola practice articles, which will continue to receive proper attention, are considered by many to be of the greatest value.

The non-ferrous metal section, the plating and polishing section, the general information features, together with the questions and answers facilities, all combine to make it a book which scores of foundrymen have cheerfully informed us would, at ten times the price, be the biggest and best value of anything which comes into their possession.

Speaking of Brave Men

WHEN this here season rolls around between the spring and summer, when one day's wet and dreary, the next a six-foot hummer—'tis then I like to watch the crowds and see the changing style, they cause a chuckle for to come and stop with me a while.

'Tis then I see one miss go by, with fur wrapped round her neck—another one stripped off, by gum, as passin' through a wreck.

Some men have coats wrapped 'round their chest to cover up their hide, while others go a-sailin' past, their vests and jackets wide.

Here comes a chap with old felt hat, its vintage we can't trace—it rests upon his ears, it does, and sprawls upon his face. It is a mean and tacky thing, it has not style nor class; in fact, my boy, it soundeth like a shapeless, time-worn mass.

But here there comes the man I love, the folks turn round to squint—he savors of the new mown hay and hunks of savory mint. There beameth from his jaw a grin, another loops his ear, he's walkin' 'round, by gum, he is, to radiate good cheer.

And on his dome there sitteth now a brand new hat of straw—it is a new and nifty thing, and built without a flaw. He cares not for the chap who stops and stares to beat the band, at the man who's brave enough to wear the first straw in the land.

So let us toast this first straw hat, and sing to it a verse, it took five plunks, by heck it did, from out his skinny purse. He is a brave and fearless soul, he is a valiant kid, the man who leadeth from the store the first new straw-made lid.—Ark.

Why don't they learn molding?

On the Move in the Ford Motor Co. Foundry

Being the First Instalment of a Series of Short Articles on the Production of Castings for Automobiles, with Everything in Perpetual Motion.

By F. H. BELL

EVERYTHING is on the move in the foundry where the castings are made for the Ford Automobiles. Not only the workmen, but everything about the place keeps on the move—not a flying pace or a gallop—but just a nice reasonable, all-day gait, and all that each operative has to do is to keep pace with the motion of the machinery, just like dancing to music or marching to the beat of a drum.

Experience has taught most of us that to march with a body of men to the regular beats of the drum, it is quite possible to take long steps and lots of them, thereby covering a lot of ground in a day with very little apparent fatigue, whereas if walking haphazardly alone without anything to regulate our gait we soon tire. So it is in the Ford foundry, each man has his part, but his gait is regulated by that of the man next to him, and incidentally by the continuously moving conveyors which have their gait, and which either take a load every time they pass or else they must go by light, which would be similar to leaving a link out of a chain.

Take for instance the moulding of some of the smaller parts of the engine, such as could be moulded in a flask, say, a foot square. These jobs are not made in snap flasks, but are made in regular moulding boxes, all exactly alike, which is to say all flasks of a certain size are exact duplicates of each other so as to avoid confusion which might arise in getting them mixed. The moulding is done on moulding machines—not special machines got up for the purpose, but just the regular moulding machines, which grace the advertising pages of the CANADIAN FOUNDRYMAN regularly every month.

These machines are, as in most every case, made in pairs—one for the nowel and one for the cope—but the two do not stand side by side. A number of nowel machines stand at the beginning of the row, then a number of core tables and then the cope machines.

These nowel machines are not necessarily all making nowels for the same job, but all in one set will be making jobs calling for about the same amount of work. Two rows of machines constitute a set, and between these rows, which are just a nice working distance apart, is the conveyor, which, for these small moulds consists of what is known as the pendulum conveyor.

These conveyors are simply little power-driven cars travelling on an overhead track. Suspended from each of these cars is a pendulum-like arm on the lower end of which is a shelf, much resembling a chair suspended by the back. These cars keep up a continuous movement forward at the rate of twelve feet per minute. The conveyors occupy the space between the two rows of moulds, with the exception of reasonable working space for the workmen. When the moulder makes a drag he simply lifts it away from the machine and places it on a shelf beside him and proceeds with another one. Another man lifts the drag away and places it on the travelling shelf or chair, as I have pictured, and in a minute it is twelve feet further along the line.

The reader will understand the rest without much explaining. As the conveyor moves the nowel along, another man sets the cores and further along another man sets on the cope and the weight which holds it together, after which it passes the men with the melted iron. These men have a trolley ladle holding perhaps a ton of iron, which, for this class of work, is transferred into hand ladles, from which it is poured into the moulds.

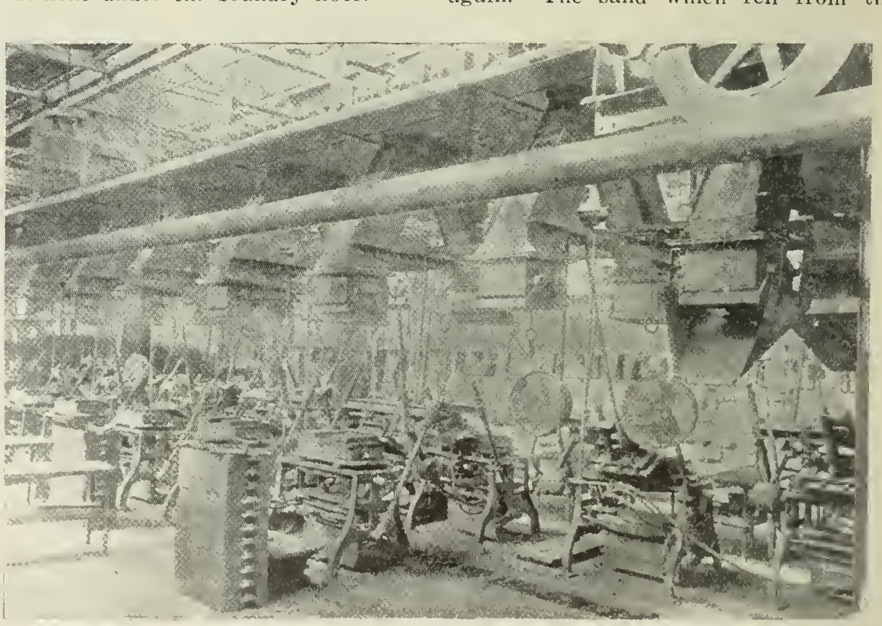
After the casting is poured it continues on its journey long enough to become set, and when passing a certain point, which, incidentally, is at the curve where the conveyor turns preparatory to its return trip and the weight is lifted and hung on the back of the chair. A power-driven rake reaches over and, seizing hold of the mould, draws it off the board and onto the floor, which floor consists of iron grates, covering underground pits, which in reality make a basement under the foundry floor.

As the mould strikes this grate after falling from the shelf it is automatically "shook out," the steaming sand falling through the grate, leaving the casting free from the flask.

The two parts of the flask are now hung on separate hooks on the back of the chair, only to be lifted off as they are passing the proper place and piled up alongside of the moulder to be used over again and again, week in and week out.

Eighteen of these pendulum mould carriers, and, of course, thirty-six rows of moulding machines, such as are shown in the illustration, are required for this class of work alone, in addition to other types of carrier for other work, which will be described later on.

A glimpse at the illustration of the machines will probably tell a practical foundryman more than a detailed description would do. As will be seen, there are no sand heaps in connection with the machines. The sand which is used to make the moulds is handled much the same as the grain in a mill. All moulding sand, new and old, is mixed and tempered by machines in a department equipped for this purpose. This sand is carried by conveyors shown overhead and deposited in the chutes shown over the machines. When the moulder requires sand he pulls on the lever to the side of the chute, which discharges the required amount of sand for the mould. All surplus sand is allowed to fall through the grating shown in the floor to be conveyed and elevated to the chutes again. The sand which fell from the



MOULDING MACHINES AND OVERHEAD SAND HOPPERS. NOTE ABSENCE OF SAND HEAPS, ALSO FLOOR GRATES THROUGH WHICH ALL LOOSE SAND IS SWEPT casting which we have spoken of would be in a steaming condition when released from the hot casting, but would not be baked to a very great extent. It would, however, be dried out a certain amount and would also be slightly burned. Before being conveyed to the chutes to be re-used it is wet down sufficient to replenish the amount of water which was evaporated and also has enough new sand added to keep it in proper shape.

Moulding the Pistons

The machines, as we have stated, are of standard pattern, but for special jobs, special "Ford" attachments are added. For instance, in the moulding of a piston it would be out of the question to mould it like anything else. The outside of a piston is of simple enough design and can be made on a very simple stripping plate machine, but the inside, being ribbed and stayed, as well as having two big bosses in it, makes it a complicated job to do in a green sand mould. Ordinarily this would be done by making a separate core, but not so in the Ford works.

The nowel, with the inside of the piston, is made on a roll-over machine from what would appear to be an ordinary pattern, and is treated as such until after the mould is rolled over and the pattern has to be taken from the mould. At this juncture a lever on the Ford attachment is pulled and the pattern spreads in four directions, allowing the mould with the perfectly formed inside of the piston to be lowered down and taken away. The pattern is again closed together and rolled back, ready for the next one.

With proper equipment, such as this, a piston is a simple thing to mould, and nice castings, with no uneven metal to be machined, is produced, whereas with ordinary foundry practice this inside would be made with a separate core, causing uneven thickness, as well as fins, and, incidentally, a lot of extra expense. If the visitor will take into consideration the number of automobiles which are turned out of this establishment in a day and that each one requires quite a number of pistons, it will be easy to understand that several machines will be required on this job alone. In fact, this particular job has a department set aside on purpose for it, with a trolley system of its own, and iron, suitable for pistons, delivered to it. The peculiar inside design of a piston is such that unless good judgment had been exercised in every detail, it would be quite easy to have an enormous discount sheet on account of blow holes from the green core. The bosses for the connecting rod and the uneven thickness cut the core up so badly that it is a difficult core to vent, but to overcome this, special open-grained sand is used in this department.

Cleaning the Castings

In our last article we gave a few details regarding the shop, but just in a general way. To be explicit, we might explain that this room alone is twelve hundred feet in length, and if this should be multiplied by four, it would figure up pretty close to a mile, so it will be seen that this foundry is about a quarter of a mile long, and with machines in rows, such as have been described, and extending down through a room approximately a quarter of a mile long, it will be readily understood that a lot of castings would have to be gathered together and a lot of rehandling done if these are to be trucked to a fettling room and cleaned, only to be rehandled again and trucked to the machine shop. This, however, is not the course of procedure here. Rumblers suited to each class of casting are arranged in a row close to the grates, onto which the moulds fell when they were "raked" off the conveyors. The castings, instead of being trucked about, are put directly into the rumblers and cleaned, after which they are trucked into the machine shop.

These rumblers are, of course, dust proof (being connected to exhaust fans), and being of proper dimensions to suit the work, are comparatively noiseless.

The Trucks

The trucks used for conveying the casting to the machine shop are made up in trains drawn by an auto tractor built for the purpose, and handled by one man.

The Cupolas and Ovens

The idea of having a separate building for each branch of the work appears nice in theory, but in actual practice it is not profitable. The practice of handling the same casting several times before it is in shape to go to the machine shop, and then landing it in a bin or on a shelf for someone else to come and get it, has nothing in its favor. So, likewise, the handling of the melted metal and the cores must be considered in the same light. In a shop of this size it would not be practicable to have the cupolas bunched together in a room by themselves, as was at one time common practice, and it would not be profitable to have the cores all made in one place and conveyed around the shop. The cupolas, fifteen in number, are right in the foundry, and close up to the moulding machines, with just a gangway separating them. These cupolas are distributed along the shop, for practically the length of it, and the charging floor for the different cupolas is one continuous floor and on this floor the core ovens and core benches are situated, being distributed along it the same as the cupolas.

The melting and mixing of the metal, the making and baking of the cores, the moulding and core setting of the cylinders, together with many other features of interest, will be continued in succeeding issues of CANADIAN FOUNDRYMAN.

Because of cheap pasturage, oxen are the usual draught animals used in farming in Cuba. They are being rapidly supplanted, however, by small farm tractors, of which there are said to be over a thousand.

THE PIG IRON AND COKE SITUATION

Pittsburgh Dispatch to CANADIAN FOUNDRYMAN

Even the most sanguine of the pig iron producers now report that they are doing practically no business. The forward market practically stopped some time ago, but there remained some activity in prompt lots, the demand growing chiefly out of consumers being shut off from their usual sources of supply by the rail strike. Now there is fairly free communication, the merchant furnaces being able to ship to practically all their customers. In the circumstances, market prices are nominal. They are not tested to any extent by actual transactions and lower quotations are not made, for as a rule the furnaces do not offer iron at cut prices when there is no inquiry. The market remains quotable as follows: Bessemer, $43; basic, $43.50; foundry, $45, f.o.b. valley furnaces, freight to Pittsburgh being $1.40.

Production of coke in the Connellsville region is now running at about 185,000 tons a week, against an average of 245,000 tons a week before the rail strike. The present rates represent a fair gain from the low point. Nearly all the coke is going out on contracts, but even with the limited offerings in the open market foundry coke has weakened a trifle, being now at $15 to $15.50 per net ton, Connellsville ovens, while furnace coke remains at $15, both for spot shipment. Some brokers think that as foundries receive better pig iron deliveries the demand for spot foundry coke will increase somewhat in the next fortnight. Generally speaking, of course, the market is marked for a decline.

SCRAP RECOVERING AROUND CHICAGO

But It May Be Some Time Yet Before Buying Will Be Done in Any Quantity

Chicago.—Efforts to clean up congestion in railroad terminals and to speed up the movement of freight all along the line are begining to produce results. Scrap is moving a little more freely and trade is hopeful that the transportation problem will soon cease to be the deterrent factor in business that it has been for several weeks past. At the same time it is understand that much work is yet to be done before the jam is loosened at every point and a prompt and orderly freight service restored. The important thing, however, is that progress to that end is being made under definite plans and co-operative effort, which, barring further arbitrary action on the part of the railroad brotherhoods, can be counted on to set the traffic system in motion again.

Every man's life lies within the present, for the past is spent and done with, and the future is uncertain.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—I am informed that a new kind of cyanide is now obtainable which is much cheaper and equally as efficient as the sodium cyanide now used for electro-plating purposes. Will you kindly furnish me with any reliable information relative to this matter that may assist me in procuring the product?

Answer.—We assume your informant had reference to an American product known as "Aero" brand cyanide, of which X is the standard grade, and contains between 36 and 37 per cent. equivalent sodium cyanide. It is marketed in the form of small, thin scales of a grayish black to shiny black appearaance. The above method of expressing its composition is used because it is sold on the basis per pound of sodium cyanide equivalent. A constitutional analysis of the material has so far proven impossible of executien, but evidence points to the fact that it consists of a mixture of calcium cyanide, sodium cyanide and free lime with fractions of a per cent, each of calcium carbide, calcium cyanamid and other minor impurities obtained from the ash of the coke used in cyanamid manufacture. Grade XX aero brand cyanide contains approximately 45 per cent. equivalent sodium cyanide, the cyanogen being actually present as calcium cyanide. The mining industry has acacepted this product very quickly and we are informed by reliable authorities that it has proven very satisfactory. Being made from cyanamid, one of the cheapest forms of combined nitrogen and common salt, its cost of manufacture and its selling price are materially less than the purer forms of cyanide hitherto on the market. In every case, either in the laboratory or in the mills, the cyanogen content of the "Aero" brand cyanide has proven itself equally as efficient in the extraction of precious metals as that of the 98 per cent. sodium cyanide pound for pound of contained cyanogen. In its present state of development "Aero" brand cyanide is not adapted to use in the case-hardening industry or in electro-plating. It is very unlikely that it will be of any special value to the case-hardening industry in the future, but efforts are now being made to perfect a method to simply convert it into forms such as the electroplater can conveniently use, and we may expect to hear of its use in commercial electroplating at no great distant date. In the meantime we must continue to use the ordinary product as in the past.

Question.—Will you kindly give me your opinion of the experience I have had recently in operating a cleaning solution such as is employed in plating plants. It has been common practice with me to add the prepared cleaning compound to the solution in the tank without weighing the compound. I have usually had good results by using a small pailful of compound each week. A few days ago I received a batch of very oily steel parts, and as the quantity to be cleaned was quite large I decided to strengthen the cleaning solution. One extra pailful improved conditions a little but did not give me clean work, so I added two more pailsful. The result was no better, in fact the steel is not clean after two hours constant immersion in the boiling solution. As the solution was recently cleaned I am at a loss to know what to do.

Answer.—Evidently you have the solution too dense. If the makers advise 4 to 6 ounces of the compound per gallon of water and you have increased the quantity to possibly 8 or 10 ounces, the result would naturally be as you have stated. It is easily possible to get a cleaning solution composed of modern alkaline compounds too heavy or dense for successful rapid cleaning, naturally much depends on the material to be removed from the steel, if the oil is a heavy mineral oil its removal will require a stronger solution than would be necessary for the removal of vegetable or animal oils. Again, if the oil is burnt on, the strong solution found successful in the case of applied mineral oil might not have sufficient power to remove it. In such cases it is sometimes necessary to employ coal oil in small quantities in the alkaline cleaning solution. Certain soap compounds may also be used in combination with a good cleaning compound and produce results not obtainable in any bath except one composed mainly of strong caustics. Reduce the density of your cleaning solution and test the idea. Then make the usual replenishments with due regard to volume of bath, amount of work processed, character of cleaning compound and the nature of oil or grease to be removed from the steel.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1919-1920.

President—Mr. John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—Mr. T. G. O'Keefe, 147 Dupont St., Toronto.

Secretary-Treasurer—Mr. O. Holtham, 328 Carlton Street, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—We intend installing equipment in our plating department to handle 3,000 steel tubes ¾ inch diameter by 30 inches long per day. The plating operation will be coppering in a cyanide copper solution. The tank we have will accommodate about thirty tubes per load. What amperage should we use on the load to obtain a copper deposit, which will permit buffing and finishing for lacquer. Our plant is operated nine hours daily.

Answer.—If you intend to copperplate 3,000 steel tubes of the dimensions you give in a tank having a total capacity of only thirty tubes per batch it will mean 100 batches per day, each batch being given approximately five minutes in the plating bath. Each tube presents one-half square foot area for copper-plating and may easily be allowed 10 amperes, or a total of 300 amperes per load of thirty tubes. The loading will necessarily have to be almost continuous and we would suggest that if the width of the tank will permit two rows of tubes to be plated, using three rows of copper anodes, the tank be equipped in this manner and thus facilitate a slower deposit which would be more satisfactory. A distance of 5 inches between cathode and anode will be sufficient for practical purposes if the tubes are straight. Keep solution rich in cyanide and the metal content should not be allowed to become low. Daily inspection of bath will be advisable.

Question.—I installed an oblique tumbling barrel in the plating room some few months ago, and use it for producing a smooth finish on a variety of small steel parts which are subsequently nickel-plated. A boy attends the loading and unloading of the tumbler, and until recently we have experienced no difficulty in getting very satisfactory results from the operation. Several lots of work have been found very badly pitted, small, deep holes which ruin the usefulness of the piece form in a few hours. One load was actually honeycombed; this particular batch was in the tumbler during a week-end and the water in which the work was tumbled was very dirty. Do you consider the dirty water has a direct bearing on the trouble? Less pronounced pitting has taken place when water was comparatively clean; a small amount of soda ash is used to soften the water, but increased quantities of soda do not appear to improve results. Any information relating to the cause and remedy will be appreciated.

Answer.—The pitting of which you complain is the result of discontinuing the operation of wet tumbling, and the pitting will usually be more noticeable on those pieces which are allowed to remain exposed to the action of the air during a period of thirty-six hours. If it is not possible to operate the tumbler continuously we would advise loading in such a manner as to facilitate unloading at the close of each working day. Soda ash is not the best lubricant to use for tumbling. A solution made from a very mild grade of Wyandotte cleaner. Oakite or mineral cleaner, or any other material of similar nature, and small amounts of good soluble oil will give better results with less liability of trouble from pitting. Small additions of sodium cyanide sometimes prove beneficial, especially over short periods. The safest method is to operate the machine continuously when loaded. Some plants operate wet tumblers continuously on one load for seven days without experiencing the trouble with pitting. If operation must be interrupted, cover all the work with solution.

Question.—I am in charge of a small, but very busy job plating shop; we receive many automobile head lamps, motor-boat lamps, and other articles which include glass in some form in their construction. I have had considerable difficulty in plating these articles successfully without cracking the glass. Some of the repairs have an old nickel coating on them which I get them. It is not always practical to remove all of this old plating, and such pieces are copper-plated previous to being nickeled. This coppering operation is usually the cause of most serious cracking as we use a hot copper solution. Can you suggest a method of handling articles of this kind during cleaning and plating processes which will assist me in avoiding the breakages I have described? Please note that in a job shop we often have to complete an order in a very limited time and possibly the haste required may have something to do with the results.

Answer.—The lamps or other articles may be cleaned and coppered in hot solutions without cracking the glass if the glass is slowly heated to at least 80 deg. Fahr. by sprinkling warm water or solution on each side of the glass. This preliminary operation need not occupy over one minute and will save ninety-nine glasses out of one hundred. Never immerse dry glass in a hot solution, and the degree of heat which will be advisable to attain in any case will depend largely upon the thickness of the glass and the manner in which it is held in position. Do not plunge the article into cold water after removal from the hot solutions. Use a warm or hot water rinse and allow the glass to cool in the air before proceeding with cold dips or plating solutions. A cleaning operation by use of swab or brush will frequently suffice, and if the surface of metal parts become tarnished or oxidized during cooling period, cyanide or muriatic acid may be applied with swab and the subsequent operations effected successfully. By cleaning the metal with a brush charged with warm cleaning solution and then rinsing in clean water and following with an immersion in a 25 per cent. muriatic dip, the old nickel plate may be successfully coated with nickel direct if the electric current is controlled, so that a slow soft deposit is obtained. As you are in charge of the plating it is your privilege to extend the time necessary to perform any operation if practical common-sense demands it. Your success with lamps of this kind may be the means of drawing more business; continued failures may result in severe loss of customers. Final drying may be effected by sprinkling hot water on metal portions only.

Question.—Lead coated soft sheet steel is now being used in the manufacture of a pressed novelty by one of my customers. Until recently ordinary cold-rolled steel was utilized, and I tumbled it and plated it without any difficulty. These lead-coated samples have a discoloration or stain on them which no combination of acids and water, used with the electric current or without the current will remove. I have tried both direct and indirect current on these acid dips but all have failed. I now tumble them in sand and water but this makes extra labor and produces a matte surface which is not desirable. What method can I use which will reduce the time required to clean these pieces?

Answer. — Lead coated sheet steel which is now playing an important role in various manufacturing plants which we have visited, has a very thin covering of lead, and some samples we have seen were very badly coated with a reddish scale. If this scale is the "stain" which you have reference to you may remove it quite easily and quickly by using a moderately strong solution of almost any good general purpose cleaning compound operated with an indirect electric current at from 8 to 10 volts. With a solution of good composition operated at a temperature of approximately 175 degrees Fahr. you will find that 1 minute or less will suffice to complete the task. Do not allow the pieces to remain under the action of the current longer than actually necessary to remove the scale. We would also advise you to prepare a special tank for this operation and use the solution for the removal of the scale only. It will be advisable to renew the solution occasionally if you process a large quantity of the lead-coated steel articles.

Question.—I am anxious to obtain information relative to practical physical tests for the durability of black baked enamel such as is employed in the finishing of automobile fenders, etc., some methods of which will permit me to gain some idea of the wearing quality of the coating, with reference to scaling, chipping, etc. A brief reply in the columns of your valued journal will oblige an old subscriber.

Answer.—One of the most expert enamelers in this country tests his coatings in the following manner. A test piece of 18-gauge sheet steel is run through the dips with a given batch of work, the test piece is also baked with the batch. When removed from the final baking the test-piece is allowed to cool, and it is then subjected to a rolling test, a twisting test, and a denting test.

To roll.—Take a pair of pliers, turn one corner of the sheet over in a cylindrical form approximately 1 inch in diameter—note results.

Twisting test.—Twist one corner or end with pliers to corkscrew form—note results.

Denting test.—Strike the portion previously rolled, with a round iron bar about ⅝ inch diameter; strike hard enough to make a deep indentation; several strokes should be given. Now scratch the indented spots with a smooth-edged piece of soft iron or a stiff, hard thumb-nail will suffice. If the base metal is exposed in any of these tests the coating is considered of inferior quality. If scaling is very pronounced the treatment given is considered too faulty for continued use. A first-class black enamel coating should withstand the three tests without exposing the base metal or without cracking sufficiently to be detected with the finger nail.

Question.—I have taken a position as foreman plater and we nickel-plate small bolts in a revolving plating machine. The drum, which contains the bolts revolves four times per minute. The bolts get a very good coating of nickel, but they are not as bright as some samples I have seen. What can I do to improve the appearance of the plate on these bolts?

Answer.—Your machine rotates too slowly to impart a good finish to the plated pieces, bolts are particularly difficult to burnish at slow speed on account of the threads. Possibly four revolutions per minute would suffice to produce a lustre on nails, tacks, rivets, etc. For bolts we would advise increasing the speed of the cylinder to about 13 r.p.m. and test the solution. If the metal content is low, add nicked sulphate and boric acid, about four to six ounces of the former and two ounces of the latter per gallon of solution required to correctly submerge the cylinder. See that all the connections leading to the machine are tight and clean. Be sure the contacts, both anode and cathode, are perfect and plate the work at least three hours if you want a good finish and satisfactory coating.

SQUIBS

The lawyer was cross-examining a witness to a robbery. "When did the robbery take place?" he asked.

"I think—" began the witness.

"We don't care what you think, sir. We want to known what you know."

"Then if you don't want to know what I think, I may as well leave the stand. I can't talk without thinking. I'm no lawyer."

The U.S produces 85 per cent. of the world's automobiles.

Scraps from the Foundry Scrap Pile

New Foundry for Montreal.—M. Cote, 7 Richmond Street, Montreal, is having plans prepared for a new gray iron foundry to be built during the coming summer.

The Acme Malleable, Engineering and Boiler Works Company, Limoilou, Que., have let the contract for the erection of a new foundry which will be proceeded with at once.

The Callander Foundry Co., Guelph, Ont., is having plans prepared for an addition which will be built to their foundry in that city. Mr. H. B. Callander is the manager.

The Ontario Foundry Co., Limited has been incorporated at Toronto by Peter Kirkwood, 33 Indian Road, William W. Parry, Horace B. Proudlove and others, with a capitalizatioin of $40,000.

Booth-Coulter Copper & Brass Co., 115 Sumach Street, Toronto, will build a considerable addition to their plant. The plans being already drawn and the contract let, ground will be broken at once.

The Vivian Gas Engine Company, of 1086 Sixth Avenue West, Vancouver, B.C., are erecting a building to cost $8,000. H. A. Wiles is the architect and has the contract for erecting the building as well.

The Toronto Castings Ltd., Toronto, Ont., has been incorporated with a capital stock of $50,000 by Frederick A. Dewey, 7 Aberdeen Avenue; Henri G. Smith, Room 44, 2 Toronto Street; John F. Boland, and others.

Bastian-Morley Ltd., Toronto, has been incorporated with a capital stock of $300,000 by James P. Morley, Oliver A. Ludlow, both of Laporte, Ind.; John M. Godfrey. Toronto, and others, to manufacture stoves, heaters, furnaces, lighting and heating systems, etc.

The Springer Lock Manufacturing Co., 180 Coleman Street, Belleville, Ont., are having plans prepared for a new factory to replace their present one which they have outgrown. Beaumont Jarvis, 8 Campbell Street, is the architect.

Iroquois Falls to Have a Foundry.—The Abitibi Paper and Pulp Co., Iroquois Falls, Ont., have plans prepared, and some of the equipment bought for a new foundry which they will construct for their own use. Owing to the unsettled state of the markets it is doubtful if they will complete it until next spring.

Five Hundred Hands Laid Off.—The Canadian Vickers, Limited, shipbuilders, engineers and boilermakers, Montreal, P.Q., have been forced to lay off five hundred men indefinitely, on account of their inability to secure castings. There must be a reason, if the foundries cannot fill their orders. Is it the railroad strike? or the coal miners' strike? or what strike is it?

ARE IN THE MARKET FOR MOLDING MACHINES

The Robert Mitchell Co., Limited, of Montreal, are in the market and in urgent need of hand or air squeezer molding machines, new or second-hand, and have asked for information regarding where they can be secured without delay.

The Steel Trough and Machine Co., Ltd., Tweed, Ont., are issuing a neat illustrated pamphlet descriptive of their line of steel goods which include oil waste cans, steel shop boxes, steel shop stools, drums, shop barrels, oil tanks, shipping cans, welded air-pressure tanks, welded underground gasoline tanks, and numerous other sheet steel products. The pamphlet is well worth asking for as that is all it costs to get it.

Norton Company, of Worcester, Mass., U.S.A., announces the establishment of the Norton Company of Canada, Ltd., at Hamilton, Ont., for the manufacture of grinding wheels for the Canadian market. Robert C. Douglas is the manager. Norton standards of excellence and service will be maintained. The Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto, with branches in most Canadian cities; Simonds Canada Saw Co., Ltd., Vancouver, B.C., and F. H. Andrews & Son, Quebec City, are agents.

The Northern Aluminum Co., with offices in the Bank of Hamilton Building, Toronto, have taken over the sales business of the Shawinigan Electro-Metals Co., of Montreal, and are disposing of their stock of magnesium which was left over after the signing of the armistice. The company is making big improvements in methods of manufacture which time did not allow during the war, and contemplate supplying the market with commercial magnesium along with their aluminum and other products.

Vice-president George E. Long, of the Joseph Dickson Crucible Company, retires after forty-three years of service with the company. Mr. Long had just celebrated his seventieth birthday and concluded to enjoy the remainder of his days out of the harness. During his long career with the Dixon Company he contributed a great deal toward the wonderful growth of the company's business and was recognized as the "father" of graphite lubrication and of silica-graphite paint. CANADIAN FOUNDRYMAN wishes him a long term of continued health in which to enjoy his well-earned vacation.

The Dominion Engineering Works, Ltd., Montreal, Que., has been organized with a capital of $10,000,000 to take over the Dominion Engineering and Machinery Company, Ltd., which was organized some time ago to assume operation of the paper machinery department of the Dominion Bridge Co., Ltd. The company manufactures paper-making machinery, hydraulic turbines, etc., and has arranged to manufacture, in Canada, hydraulic machinery of the Wm. Cramp & Sons Co., of Philadelphia. G. H. Duggan is the president, and R. Montague Davy is the secretary.

The twenty-seven moulders employed by the John Bertram & Sons Co., Ltd., Dundas, Ont., are on strike for higher wages. The original demand of the men, which was presented on the first of May, was for a minimum wage of 90 cents an hour, and a 44-hour week. Later the men dropped the 44-hour clause, but hung tenaciously to the 90 cents per hour, which the company considered to be fifteen cents per hour above their idea of right, with the result that the men are out.

Returning to Work.—Men at the Keating's foundry, Toronto, who have been on strike for several weeks, have returned to work. They have been granted a five cent increase upon the wages they were receiving a few weeks ago, the increase to be retroactive to May 1, and a further increase of five cents to be granted on August 1. Agreements have also been signed with the brass workers at the Monarch and Standard Sanitary Foundries. Other firms are still negotiating with the Machinists' Union respecting increases.

Dominion Steel Products Company, Ltd., Brantford, Ont., are building a large steel and brick pattern shop to take care of the additional demand for patterns brought on by the recent completion of their grey iron and brass foundry. Their new foundry is equipped with a 20-ton air-furnace used especially for the manufacture of all classes of chilled cast iron rolls and other high-grades of close grained iron castings. In addition to the air-furnace the foundry is equipped with two cupolas of an hourly capacity of 12 tons. and an electric brass-furnace of 1000 lbs. capacity.

Buck Stove Works Changes Hands.—The plant and business of the Wm. Buck Stove Co., of Brantford, which for the last fifty years has been one of Brantford's leading industries, has changed hands and is now in the hands of the McClary Manufacturing Co. of London, Ont., who will however continue to operate it at Brantford. About three hundred hands are employed at the Buck plant, and while it has always enjoyed an enormous share of the trade, it will certainly not lose any of its prestige under the new management. The McClary Mfg. Co. is one of Canada's most progressive institutions and is operating one of the largest stove foundries in the world in London. The price paid for the Buck addition was approximately one million dollars.

CATALOGUES

Foundry Equipment Manufacturing Association, 12th and Chestnut Streets, Cleveland, Ohio, have presented us with their bulletin on how to take care of foundry equipment. The contents are right to the point. Equipment seldom gives the satisfaction which it should in a foundry because it is seldom given any attention with a view to keeping it in good condition. Anyone who wants to run a foundry as it should be run, and keep his machinery in proper working order would do well to abide by the information contained in these bulletins.

The S. Obermayer Co., Chicago, Ill., with branches in different parts of the United States and Canada, have just issued their special catalogue No. 50, of Equipment and Supplies for Brass, Bronze and Aluminum Foundries. The book contains 108 pages 6 by 9 inches, and for handy reference the contents are grouped into five sections, viz.: Melting room, pages 3 to 25; molding room, 26 to 71; core room, 72 to 90; pattern, 91; cleaning and finishing room, 92 to 108. It is an interesting volume, fully illustrated and descriptive of everything which goes to make up a non-ferrous metal foundry. It is a book which should be in the hands of everyone interested in brass, bronze, or aluminum founding.

Symposium on Castings is the title of an interesting set of papers presented to us by the American Society of Mechanical Engineers, 29 West Thirty-ninth street, New York. The contents consist of the following papers: "Malleable Castings," by Enrique Toucedas; "Die Castings," by Charles Park; "Aluminum Castings," by Zay Jeffries; "Steel Castings," by John H. Hall; "Gray Iron Castings," by Richard Moldinke; "Brass and Bronze Castings," by C. H. Bierbaum. This is another example of what the American Foundrymen are doing to advance the science of foundry work, not from a personal, selfish motive but to make the business as perfect as possible for everyone concerned. These papers were prepared for and read at the Spring meeting of the American Society of Mechanical Engineers, St. Louis, Mo., May 24-27, 1920.

Bolshevism or Trades Unionism, Which? is the title of a neat booklet, published by the Montreal "Labor World," the contents of which show conclusively that the aims and aspirations of organized labor are not in any way analogous with those of Bolshevism. While they, like many others, had hoped for something from a freed Russia, they were equally disappointed. The book is a credit to the publishers, and at the price of ten cents, is well worth being read by anyone interested in the cause of labor.

We could all be happy and prosperous if the weak were helped by the strong.

CHUMS

Money may not bring happiness, but many people believe that the two travel in company.—"Boston Transcript."

RULE FOR FINDING LENGTH OF CROSSED BELTS

First find the length for the straight belt. Square each the diameter of the large pulley and distance between centres. Add together and extract square root of sum. Subtract from this the distance between centres Multiply the remainder by two and add to length of straight belt as previously found. The result will be the length of crossed belt

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$42.40
Lake Superior charcoal, Chicago	57.00
Standard low phosphorus, Phila.	50.00
Basic, Valley furnace	42.90

Canadian Foundry Pig—

	Mont.	Tor.
No. 1	55.50	53.50
No. 2	54.50	52.50

NEW METALS

	Mont.	Tor.
Lake copper	$25.00	$24.00
Electro copper	24.50	24.00
Casting copper	24.00	24.00
Tin	72.00	65.00
Zinc	12.00	12.00
Lead	11.50	11.00
Antimony	14.50	14.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$15.00	$14.00
Copper, crucible	18.00	18.00
Copper, heavy	18.00	18.00
Copper, wire	18.00	18.00
No. 1 mach. comp.	16.00	17.00
New brass cuttings	11.00	11.75
Red brass cuttings	14.00	15.75
Yellow brass cuttings	8.50	9.50
Light brass	6.50	7.00
Medium brass	8.00	7.75
Scrap zinc	6.50	6.00
Heavy lead	7.00	7.75
Tea lead	4.50	5.00
Aluminum	19.00	20.00
	Per gross ton	
Heavy melting steel	18.00	18.00
Boiler plate	15.50	15.00
Axles (wrought iron)	22.00	20.00
Rails	18.00	18.00
Malleable scrap	25.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	12.00	12.00
Car wheels	22.00	26.00
Steel axles	22.00	20.00
Machine shop turnings	11.00	11.00
Stove Plate	26.50	25.00
Cast borings	12.00	12.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.16
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Potassium Sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite, per cwt.	8.00
Sodium phosphate	.18
Tin Chloride	1.00
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.60
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.09
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09
Crocus composition	.12
Emery composition	.10
Rouge, silver	.60
Rouge, powder, nickel	.45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$42.50	$43.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	46.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	48.00	48.00
Copper sheet, planished, 16 oz. base	46.00	45.00
Braziers', in sheets, 6x4 base	45.00	44.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.75	$14.50
Sheets, 3½ lbs. sq. ft.	10.50	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.25	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 8.50	$ 9.50
Sheets, black, No. 10	8.50	9.00
Can. plates, dull, 53 sheets	8.50	10.00
Can. plates, all bright	8.60	9.00
Queen's Head, 28 B.W.G.	11.00	....
Fleur-de-Lis, 28 B.W.G.	10.50	....
Zinc sheets	16.50	20.00

Research Problems in Electrical Engineering

An Address Delivered by Prof. Vladimir Karapetoff of Cornell University Before the Erie, Pa., Section of the A.I.E.E. on May 17, and the Cleveland Engineering Society on May 19, 1920.

THE most natural division of unsolved problems would be according to the types of apparatus, for example, into problems in the design and operation of large turbo-alternators, improvements in lamps, circuit-breakers for larger currents and higher voltages, etc. Such problems may be multiplied ad infinitum, and I should not venture to express my personal opinion upon their relative importance. For the last three years the "ElectricalWorld" has had a research page on which anyone interested in the subject will find hundreds of opinions expressed by competent men as to the specific needs for theoretical or experimental research in practically every branch of the electrical industry. I wish to offer another and somewhat unusual classification for the pending research problems which may be more helpful to those interested only in the broader aspects of research.

I.—Caliber of Investigator

One division of research problems that seems to me to be quite essential is based upon the caliber and mental equipment of the investigator himself. There are problems of great financial importance which can and will be solved by the expenditure of a sufficient amount of money and time. Thus, during the war the shortage of certain materials led to a large number of tests on substitutes, and in some cases satisfactory materials were found by men of average ability and education. A large number of such tests, sometimes dignified by the name of research, is being carried on all the time. For example, there are certain varieties of mica on the market or lubricating oils offered by the principal concerns, and comparatively simple tests permit to determine the kind best suited for a given purpose without employing men of unusually high caliber.

At the other end of the scale we have researches which require men of exceptional intellectual power and of wide erudition, researches which have baffled the most persistent efforts of many years and problems which remain unanswered in spite of the most alluring financial inducements. A reliable high-tension insulator and a simple variable speed alternating current motor may be mentioned as two such examples. In between these extremes there are innumerable gradations of mental caliber required for the solution of different kinds of research problems, and a clear realization of this fact is of the utmost importance in the cultural development of the country. The tendency is to lay too much stress on material resources, equipment, and other external factors. A few men of superior caliber and thoroughly trained will accomplish results on which thousands of less gifted and not so thoroughly trained investigators may work for many years without much progress.

The necessity for better care of persons of exceptional scientific intellect is so urgent that it is legitimate to ask ourselves what our government, leaders of industry, educational institutions, or any other agencies are doing in this direction. The answer is, next to nothing. Moreover, in this imperfect world of ours it is no one's particular business to attend to the proper development of geniuses.

I do not have in mind a somewhat Utopian scheme of breeding a race of intellectual giants by careful mating. I have in mind a perfectly feasible scheme of detecting exceptional children by suitable mental tests and then guiding them year after year to the full development of their mental powers. This is a proper function of the state and some day will become a reality.

II.—Pure and Applied Research

Another classification of research problems is in accordance with their proximity to or remoteness from the direct industrial applications. A certain physical phenomenon, a mathematical formula, a peculiar alloy, etc., may, up to a certain time possess no practical importance and be merely a subject of personal interest to a few investigators. Then one day someone discovers that that particular alloy or formula offers great practical possibilities, and it becomes the subject of extensive industrial researches.

While such a state of affairs may seem perfectly natural and unavoidable, it has certain serious drawbacks for the best development of the art. The electrical industry owes many of its triumphs to so-called pure physical research, but until recently this industry offered mighty little encouragement to such research or to its exponents. Had the leaders of the electrical industry realized earlier the tremendous possibilities of physical research in improving commercial apparatus, then, instead of sneering at "doctors" they would have used their talent long ago, and we would have been much further advanced in the applications of electricity than we are now.

But, it may be retorted, the scope of physics is infinite, and how can an industrial concern keep on sinking hundreds of thousands of dollars year after year on the mere possibility that some of the results of physical research may at some time prove to be of use to it. the real situation is this: physical chemical or mathematical research involves first of all a method of approach, a method of attack of a certain group of related problems, based on a thorough familiarity with the resources of that particular science. Promotion of research, therefore, consists primarily in the encouragement of the study and further development of such methods and not in the acquisition of a large number of unrelated facts. A scientist trained, say in alternating currents, will be prepared to approach a new problem in this field with much better chance of success than one who has had merely general practical experience and beats about the bush in an effort to discover a short cut by luck.

Thus the promotion of pure research is another national problem, and the first aim must be the training in the methods of analysis, general laboratory methods, the ability to find what is already known, the use of mathematics, the use of methods borrowed from other branches of science, general accuracy of measurements, of computations. of statements, and last though not least, that loving attitude towards nature and the intuition that comes only from a first-hand contact and observation of actual physical phenomena without any preconceived theory or utilitarian thought.

In the early development of our industry we sneered at all research, then we called plain testing research, later we grudgingly tolerated industrial research, that is, an investigation of a particular piece of apparatus in its complexity. Finally it began to dawn upon some of us that an investigation of the very physical elements which enter into that particular piece of apparatus may lead to interesting discoveries. In this way it gradually became clear that a thorough investigation of the physical laws governing this or that branch of industry may be the quickest and the surest way toward remedying the difficulties in the operation and construction of certain pieces of apparatus. I should not be surprised if in a few years we should make a fad of pure research in industrial establishments and overdo it as we overdid safety and efficiency and patriotism and many other good things.

III.—Experimental and Theoretical Research

The next division of research problems is into experimental mathematical, inventive, critical, indicative of new fields, etc. A clear understanding of this division on the part of investigators themselves and of their business managers will help scientific progress materially in that it will allow each one to apply his effort, imagination, and inspiration where it will bear the best fruit, and it will enable two or more investigators to

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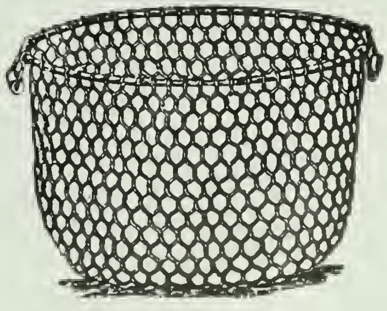

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Almost any big research problem involves some theoretical study as well as experimental skill, inventive ability, and patient search for the work of other investigators and its critical analysis. Only a very few investigators possess all these accomplishments to the same degree, and it is in the hands of a harmoniously-organized group of scientific workers of different talents that research leads to gratifying results.

A chain is as strong only as its weakest link. Many a research worker struggled in vain with a problem for which he was eminently fitted just because he failed to recognize this one weak link in himself or was too proud to ask for help on some particular point of difficulty.

The Anglo-Saxon race is individualistically inclined perhaps to a greater degree than the other civilized races. The Americans among the Anglo-Saxons are especially prone to exhibit the Western pioneer spirit in research with all its virtues and shortcomings, of which the utter disregard of the work of preceding investigators is perhaps the most characteristic one.

I do not mean to imply for an instant that an original thinker should be hampered in the flight of his fancy by laboratory assistants or by skilled mediocrities, in the name of a misapplied principle of co-operation. I mean two other things. First, to clear a big idea in his mind, he ought to know how to let go of it and hollow his assistants to play with it for a while and see how it shapes itself in detail. Secondly, if in the preliminary moulding of his ideas he should be handicapped by his lack of mathematical ability or of foreign languages (two handicaps common in this country) let him not try to solve the problem in an imperfect manner alone without first having exhausted the possibilities of associating with other gifted and congenial minds who may furnish the missing needs of the problem.

An outsider, and often a manager, thinks that research men specialize by subject, so that one knows all about direct-current machines, another all about transformers, etc. While to some extent this is true, yet there is a much more thorough-going and desirable specialization according to the nature of the man's talent. One is especially gifted in arranging ingenious methods for accurately measuring difficult quantities, whether it be in a-c. or d-c. machinery, another can skilfully present a phenomenon or a relationship in a mathematical form, a third is particularly adept in finding out quickly and accurately all the preceding contributions on the subject and in assigning the proper relative value or trustworthiness to each.

The possibilities of co-operation in research on the part of persons of different temperament and ability go far beyond the confines of one industrial organization or even one country. International co-operation in research is just as important in view of the favorable and unfavorable racial idiosyncracies. Any one who follows European scientific magazines cannot fail to notice these racial distinctions in the treatment of identical subjects.

A student of the history of science can easily recall cases in which a scientific idea is born in one country and then is taken up by someone in another country and finally brought to a fruitful development in a third country.

Perhaps the best known example in our line is that of Hertz, a German, who acted as an intermediary between Maxwell, an Englishman, and Marconi, an Italian. A biologist could easily get samples of living organisms which have to live under different conditions at the various stages of their development. Thus the rust of wheat must live on barberry before it can live on wheat. We in this country, with its polygot population, have had an exceptional opportunity to observe and to benefit by this co-operation right in our midst, even though in our Anglo-Saxon arrogance we are apt to look down upon our brothers from across the seas. There is hardly an organized institution for research in this country that cannot point to benefits derived from associates of foreign birth and training and point of view.

In conclusion I wish to point out that while first-class original investigators are born and not made, yet there is a great problem before our leaders in politics, industry, and education to facilitate the work of such men by granting favorable conditions for their creative activity. We ought to do this for our sake and for that of the coming generations. It is in the hope of contributing to the clear understanding of the conditions that promote the welfare of research workers that the preceding remarks are made.

During the address Prof. Karapetoff gave examples of electrical research done or suggested by various prominent investigators.

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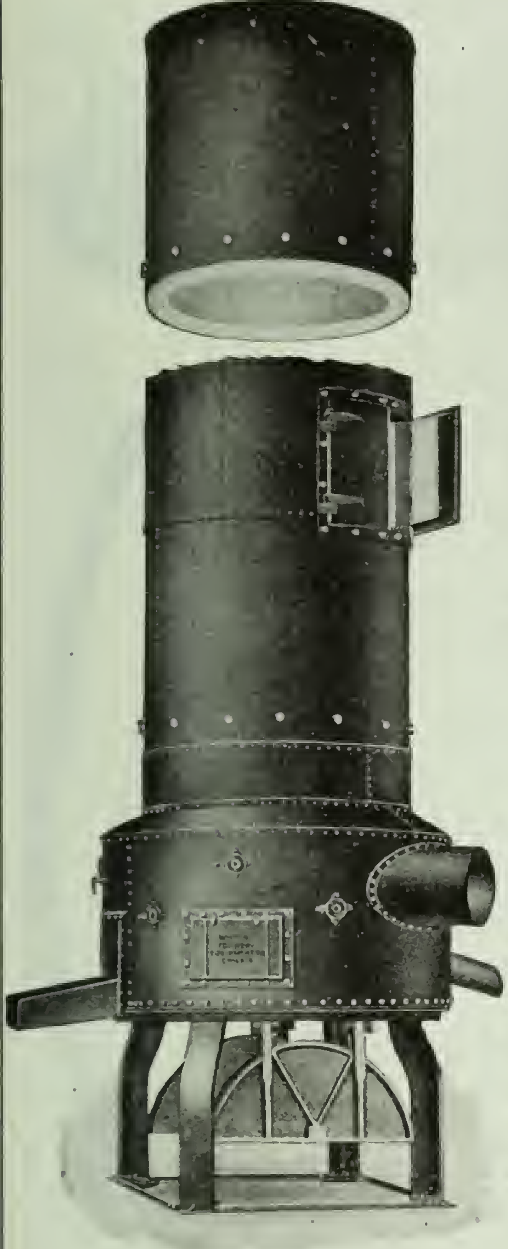

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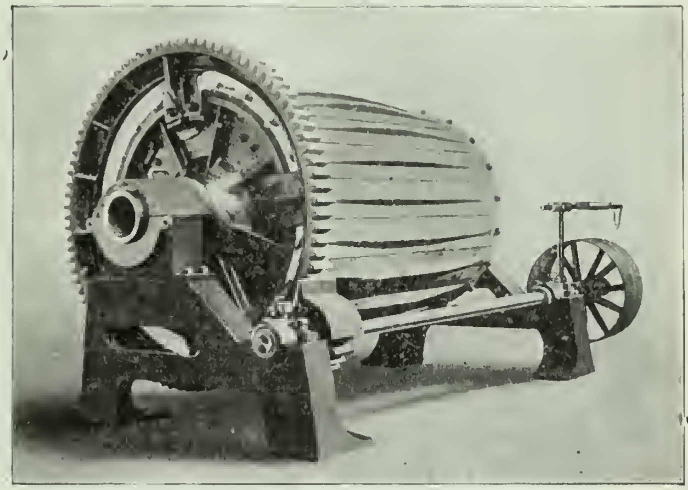

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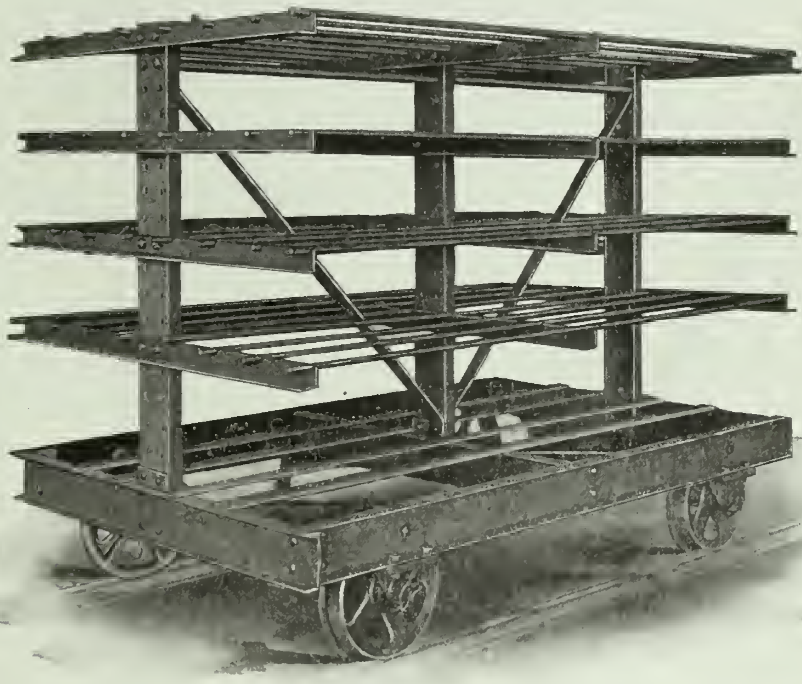

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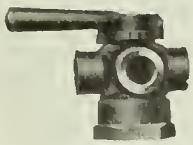

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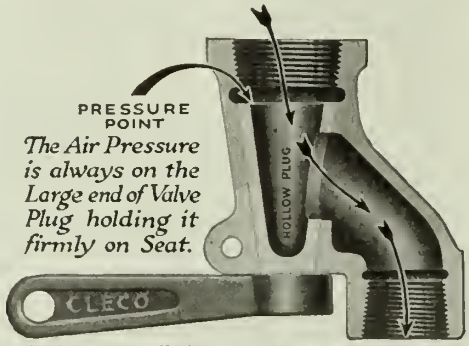

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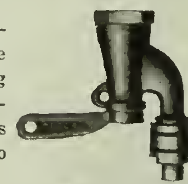

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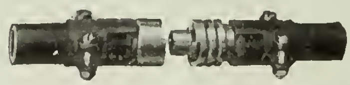

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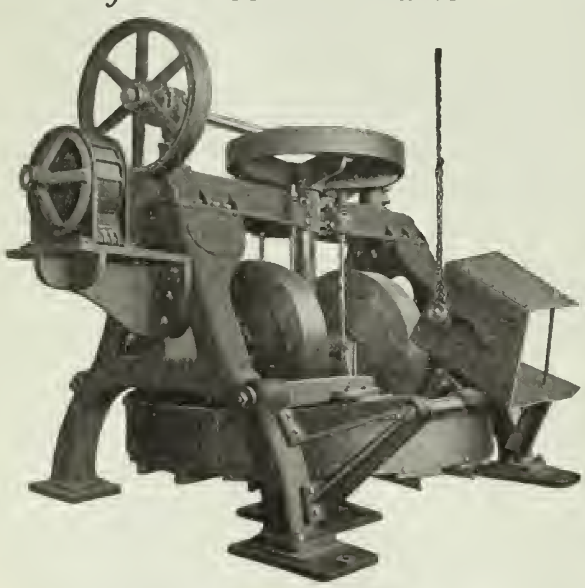

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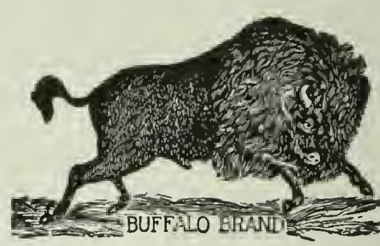

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Hyde & Sons, Montreal, Que.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRANES, HAND TRAVELLING
Curtis Pneumatic Macby. Co., St. Louis, Mo.

CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC FURNACES
Electric Furnace Construction Co.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINEERS (FOUNDRY)
H. M. Lane Co., The.

ENGINES, STEAM
Ministry of Munitions, London, England.

FACINGS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FITTINGS, CAST IRON
Crane Ltd., Montreal.

FITTINGS, FLANGED
Crane Ltd., Montreal.

FITTINGS, MALLEABLE
Crane Ltd., Montreal.

FITTINGS, SCREWED
Crane Ltd., Montreal.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Diamond Clamp & Flask Co., Richmond, Ind.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FORGINGS
General Combustion Co., Montreal.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY ENGINEERS
H. M. Lane Co., The.

FOUNDRY EQUIPMENT
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY SUPPLIES
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Hyde & Sons, Montreal, Que.
Woodison Co., E. J., Toronto.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Black Donald Graphite Co., Calabogie, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEAT TREATING
General Combustion Co., Montreal.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
J. A. Spangler, Benton Harbour, Mich.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, CHAIN AND PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT ROCKOVERS
American Molding Mach. Co., Terre-Haute, Ind.

JOLT MACHINES AND SQUEEZERS
American Molding Mach. Co., Terre-Haute, Ind.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT STRIPPERS
American Molding Mach. Co., Terre-Haute, Ind.
Davenport Mach. & Fdry. Co., Davenport, Iowa.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Berkshire Mfg. Co., The.
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
The Cleveland Osborn Mfg. Co., Cleveland, O.
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND
Frederic B. Stevens, Detroit, Michigan.

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic . Stevens, Detroit, Michigan.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

NITROGEN
Dom. Oxygen Co.

NOZZLES, SAND BLAST
Frederic B. Stevens, Detroit, Michigan.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACE BLOWERS
Roots Co., P. H. & F. M., Connersville, Ind.

OIL METERS
General Combustion Co., Montreal.

OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS
General Combustion Co., Montreal.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OXYGEN
Dominion Oxygen Co.

PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.

PARTING COMPOUNDS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

PATTERNS
Frederic B. Stevens, Detroit, Michigan.
Montreal Pattern Works

PATTERN MAKERS' BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.

PATTERN MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP EQUIPMENT.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP MACHINERY
Preston Woodworking Machinery Co., The.

PATTERN WAX
United Compound Co., Buffalo, N.Y.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Steel Co. of Canada, Hamilton, Ont.

PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINT COMPOUNDS
Crane Ltd., Montreal.

PIPE, SOIL, AND FITTINGS
Crane Ltd., Montreal.

PHOSPHORIZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLANT AND MACHINERY
Ministry of Munitions, London, England.

PLUMBAGO
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PLATING AND POLISHING SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

PNEUMATIC TOOLS
Independent Pneumatic Tool Co., Montreal.
The Holden Co., Ltd., Montreal.

PORCELAIN WARE
Crane Ltd., Montreal.

POWER JOLT SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

POWER SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

PRODUCTION LATHES
Oliver Machinery Co., Grand Rapids, Mich.

PROTECTIVE WEARING APPAREL
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

PULLEYS, MAGNETIC

RAMMING PLATES AND MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Magnetic Mfg. Co., Milwaukee, Wis.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RETORTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES, ELECTRIC
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Woodison Co., E. J., Toronto.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Reynolds & Co., Toronto.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC HAMMER, COMPRESSION
Independent Pneumatic Tool Co., Chicago, Ill.

ROLLOVER MACHINES
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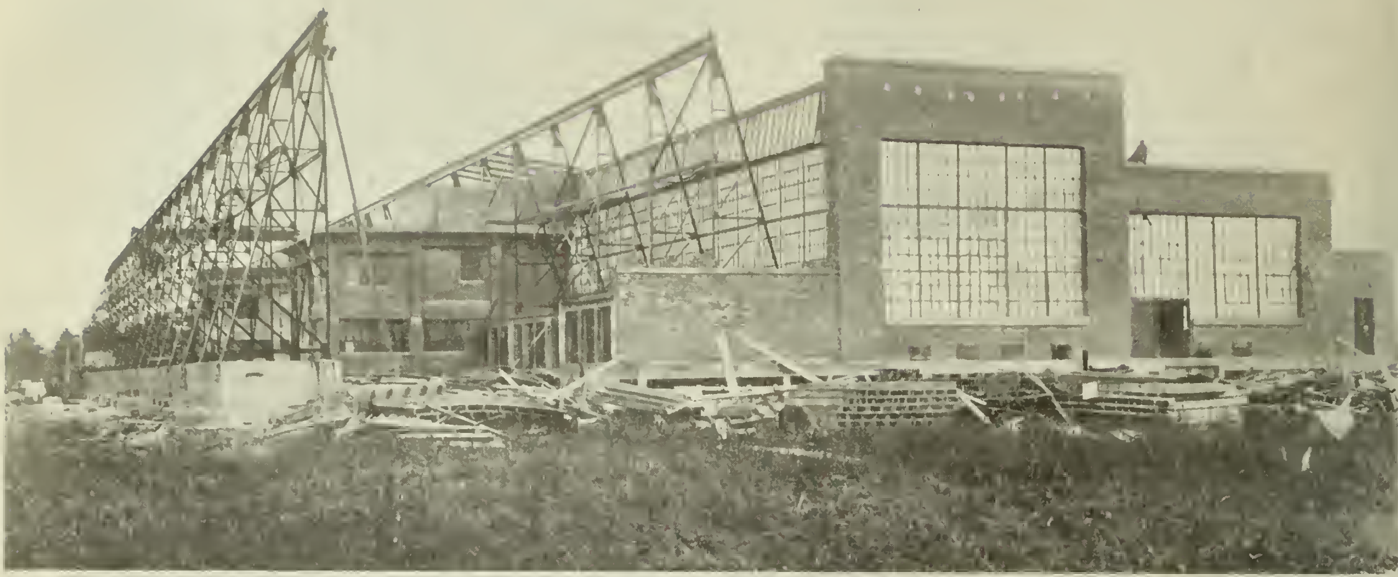

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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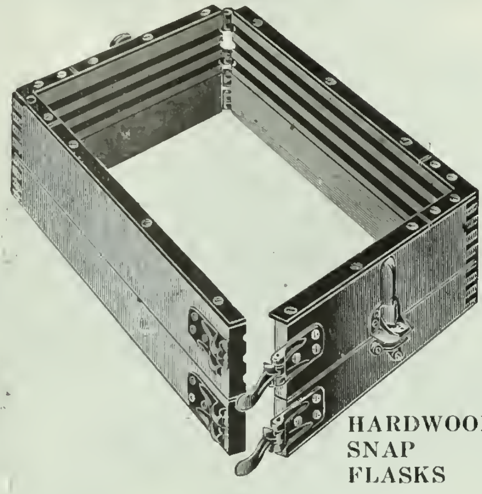

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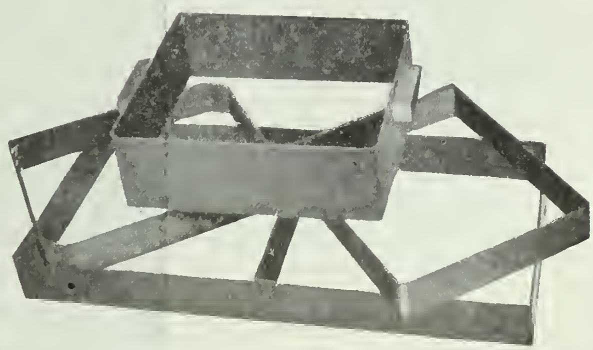

STEEL BANDS

Steel Bands

The steel bands shown in illustration are rammed up in the mold. In ordering give size of flask at parting, and our standard is to make the outside of the band $\frac{1}{8}$th smaller. This allows it to drop easily and will ram out tight against the flask and hold it.

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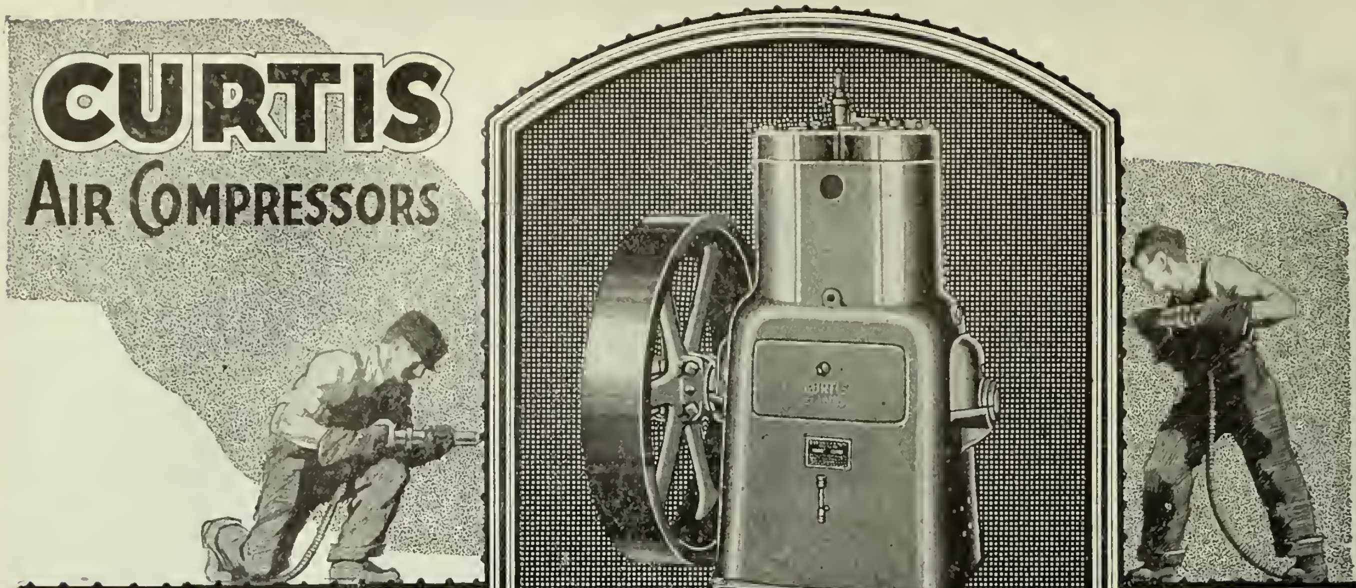
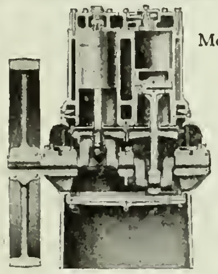
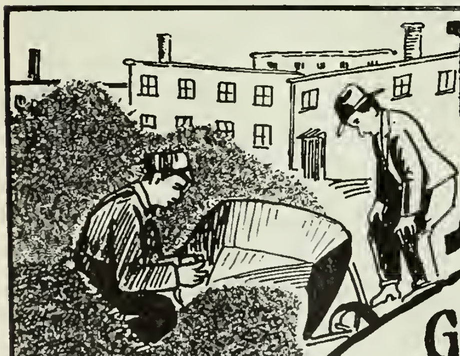
TORONTO ONTARIO

CANADIAN FOUNDRYMAN, July, 1920. Vol. XI., No. 7. Published monthly, at 143-153 University Ave., Toronto, Can. Subscription price in Canada, $2.00; in the United States, $2.50. Entered as second-class matter July 1st, 1912, at the Post Office at Buffalo, under Act of March 3rd, 1879, and at the Post Office Department, Ottawa, Canada.





Sectional View
Model "A" Compressor



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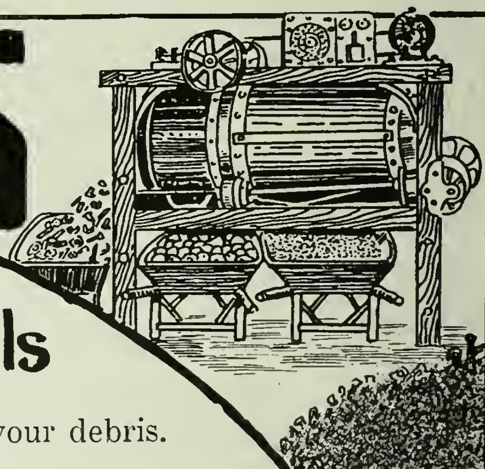

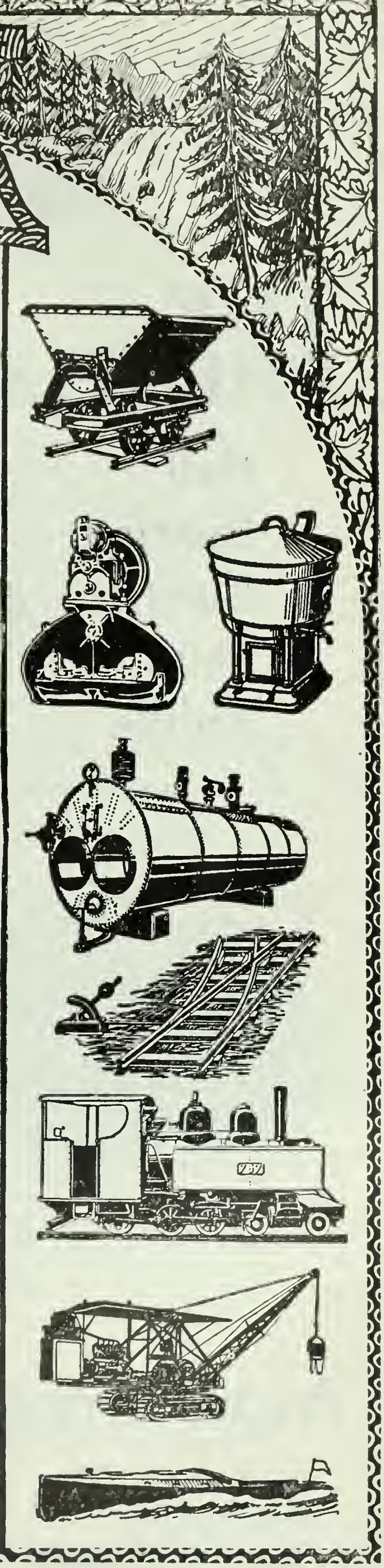

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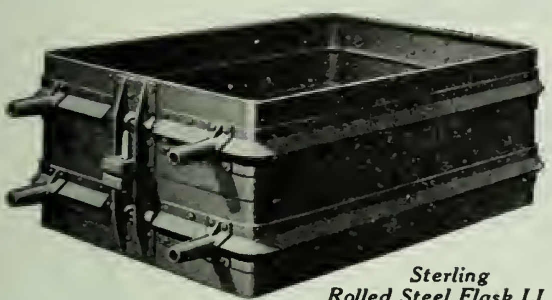

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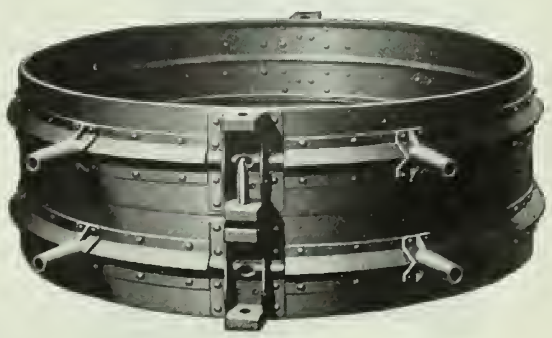

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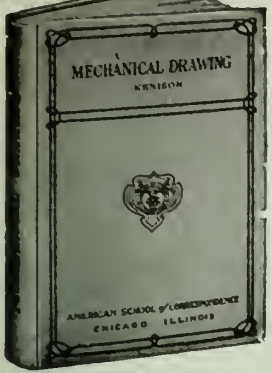

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The Molding Machine—Its Uses and Abuses

Showing the Advantages of Machinery to the Employer and Employee Alike, Providing the Proper Machines Have Been Selected, and the Same Are Properly Taken Care of.

IN introducing the subject of the molding machine to the reader it is not really essential that we should make any special effort to secure all the data in connection with its early history and development, as this has already been gone into in a very thorough manner in previous numbers, and at its best is not of any real value to the foundryman. What is wanted are facts regarding the present, and what the manufacturer of the present time has to offer in the way of labor-saving, time-saving and money-saving machines for doing the work which has so far been done by hand. For us to attempt to enumerate all the different types of machines on the market and then explain to each prospective buyer, which one to buy, would be out of the question. They are undoubtedly all good, but some are better suited than others for certain classes of work, and it is for the individual buyer to see that he gets what is most suitable to his particular requirements.

The size of the foundry and the variety of jobs is a big consideration in selecting machines. Certain machines are adapted for special jobs but not for variety work, while other machines might not be so well suited to any special job but more suited for general purpose work.

To go into history we might go back as far as 1860 in which year, and during the decade which followed, various patents were taken out for squeezers, strippers, and jarring machines, but very little was accomplished. However, the mechanism which must be employed on a molding machine is the same as that which must be employed on all machines and only requires to be properly applied.

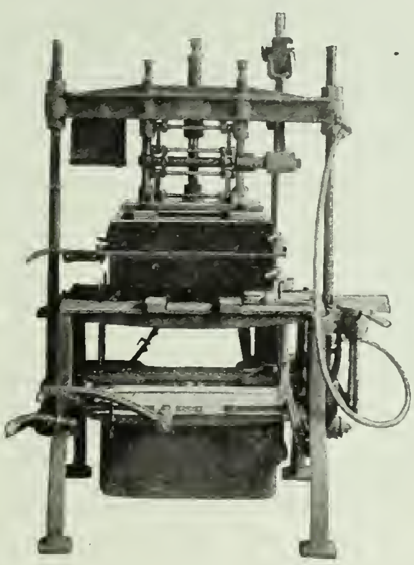
The Molding Machine

To properly comprehend the molding machine, we should first define the true meaning of the term "machine"—the family to which machines for all purposes belong.

A machine is an instrument of a lower grade than an engine, its motor being distinct from the operating part, whereas the engine is automatic as to both. It is also distinct from a tool, as it contains within itself its own guide for operation. It is a contrivance by means of which a moving power is made to act upon any body and communicate motion to it. Machines are simple and compound, complex or complicated. The simple machines are the six mechanical powers, viz:—the lever, the wheel and axle, the pulley. the inclined plane, the wedge and the screw.

In compound machines two or more of these powers are combined for the production of motion, or the application or transmission of force.

Machines employed in the manufacturing arts are named according to their products, as brick-machines, etc.; or to the processes they perform as printing machines, etc.; while other machines are classed according to the forces by which they are put in motion, as hydraulic machines, pneumatic machines, electric machines, etc.


PNEUMATIC SQUEEZER SQUEEZING A MOLD.

The powers employed to transmit or apply force through the machines are various, as the muscular strength of men or animals, wind, water, air, gas, electric, steam, etc.

From this it will be seen that the molding machine, no matter how simple or how few its features, is rightfully a member of the family of machines.

It will also be seen that a molding machine, like any other machine, must be one of, or a combination of two or more of the six mechanical powers mentioned above, as these six powers are the entire stock from which to draw, in devising any machine, no matter how complex or complicated.

The first attempt at getting away from the hand process of molding, with the eye as the only guide and years of practice as the only means of accomplishing results was the stripping plate. This in its original form could not be considered as a machine, even of the simplest type, although it was the forerunner of the modern stripping plate. These original stripping plates were simply placed on the joint of the mold and the patterns drawn through them. On such work as spur gearing they were a guide to the molder and allowed a less skilled workman to do the work. They did not add greatly to the output of the foundry but were steps in the right direction.

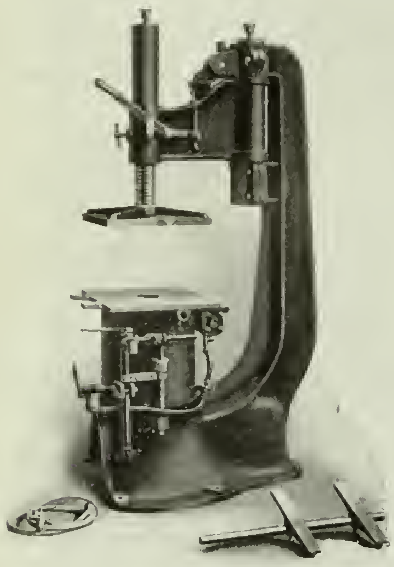
The real credit for producing a successful molding machine is undoubtedly due to Henry E. Pridmore, of Chicago, who, while in the employ of the McCormick Harvester Company, as an inventor in the experimental department, incorporated the stripping plate into a machine which was such a success that it was immediately adopted by other firms and in fact became in general use almost at once. So complete was this original effort of Mr. Pridmore's that some of the first machines are still in use.

When we say that the stripping plate was the first break away from the long-established method of floor molding we are of course remembering that squeezers and jolters were being tried out but little was being accomplished, unless it would be experience which would be of assistance in future experiments with these methods of molding, which have to-day reached so great a degree of perfection as that of the stripping plate machine.

Pages might be written on the early history of the molding machine, but enough has been portrayed to show that enthusiasm was not at a high pitch for quite a number of years, as it remained until comparatively recent years for any great strides to be taken along the line of perfecting molding machines so as to conform to the various requirements of molding.

The last decade has probably developed more than all the previous years since the first machine was invented, and we now have squeezer machines, stripping plate machines, power rammer type of machine, split pattern machine, power ram and power draw, blow ramming machines, hinged roll-over up or down draw, power roll-over up draw, gravity molding machines, plain jarring machines, combination jarring machines with roll-over and draw attachments, combination jolt, squeeze, stripping plate with roll-over attachment, in fact about everything which can be accomplished with the aid of the six mechanical powers previously spoken of has been accomplished.

In molding by hand it must be remembered that the mold usually consists of two parts, and in machine molding the same conditions prevail, making it necessary to have two machines for the average mold, unless the design of pattern is such that both halves are the same.



Universal oJlt and Plain Squeezer

The machine shown in this illustration is known as the Universal Jolt and Plain Squeezer, and covers a miscellaneous range of work. The column is a plain, one-piece casting. The arm is supported by a three-inch steel shaft that revolves on ball bearings in hardened ball races, which will last for years. The piston is bolted to the base, and the cylinder passes down over it, making it impossible for any sand to get underneath. The piston is fitted with rings, the same as in steam engine construction. The rise of the cylinder is controlled by stops, so that a mold can be squeezed to any density. These stops are quickly adjusted and are positive. The arm swings out of the way of the operator. The pressure plate is quickly adjusted by a screw in the arm, to suit the height of the flask. It will take a flask 16 inches deep, 22 inches wide and any length. They are made either plain or jolt squeeze. The jolt can be used or not, as desired. Manufactured by the Berkshire Manufacturing Co., Cleveland,

The Stripping-Plate Machine

As the stripping plate is what might be termed the foundation on which the molding machine is built we will give a few details of this type of machine. As we have seen, a stripping plate is simply a plate with an opening in it, through which the pattern can be drawn. In ordinary hand molding this would be rolled over with the nowel and the pattern drawn up through it, but with the stripping-plate machine it remains under the mold, and the pattern is drawn down through it, thus giving it the name, so frequently heard, of "drop pattern" machine.

The stripping-plate machine consists of a strong stiff frame, having two or more sets of adjustable guide ways in and near the top of the frame and at a comparatively great distance from the upper guide ways there is a single, centrally located, brass bushed guide way. This construction gives in effect a long rigid guide way, in which the yoke carrying the pattern or patterns is raised and lowered by means of a depending connection, crank shaft and lever, or by a single lever. The crank shaft is journaled in a long brass bushed box, either cast with or firmly secured to the bottom of the upper frame.

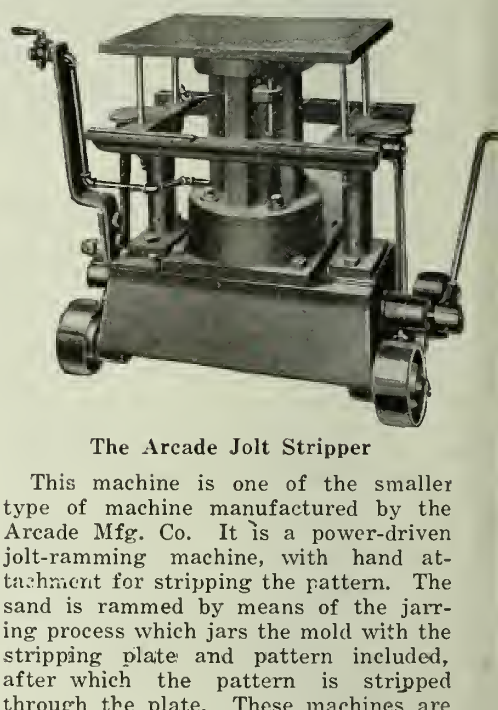
The yoke is held in its highest position, in which the sand is rammed in the flasks, by a crank-pin passing slightly beyond the centre and striking a stop, or by some similar locking method.

The simplicity of the machine is one of its greatest points for to-day there is no type of machine which requires less care than, and that costs less to maintain than the striping plate machine. When once the patterns are properly made, mounted and matched, the stripping plate machine is always ready for operations. The stripping plate can, of course, only to be used for the pattern to which it is fitted, but by removing the plate and pattern, the machine can be used for any pattern within its capacity. Stripping-plate machines are built with open end frames so that the pattern can be extended over the machine for a reasonable distance and all that is required is to ave the plate long enough. Round machines for molding fly wheels, pulleys, gear wheels, etc., must, of necessity have the frame extend all the way around. and the diameter of the machine is the largest diameter of pattern that can be accommodated. For molding pulleys and fly-wheels one machine is sufficient as both halves of the mold will be alike, and by having the arms of the pattern properly spaced, the one part, on being reversed will fit neatly onto the other. Pulley molding machines are simply stripping plate machines, so arranged that the rim pattern is loose from the arms and can be set for any width of face. Straight arms are necessary if one machine is to do both halves, else it can not be reversed.

The plain stripping plate machine performs only one operation in the making of a mold, that is, to draw the pattern from the sand. This, however. is done accurately and there are no broken edges to patch and no tool work should be permitted. If the mold does not come perfect, the machine and pattern should be fixed so that it will.

The Squeezer Machine

The squeezer as we have seen was among the earliest attempts at molding by machinery but as we have also seen it was not developed to any extent until quite recently. The plain squeezer has a large field to cover where no other machine can equal it. For two-faced match plate work the sand is put in the nowel and struck off level and the board put on and rolled over, the cope is put on, the gate pin placed, and the sand put in and struck off before any squeezing is done. The squeeze board with opening in it to receive the gate pin is now put in place and both cope and nowel squeezed at the same time. Machines of this class are made to run by hand or by compressed air, and are undoubtedly the most rapid machine for such work as is usually done on the snap bench, with a match plate.



The Arcade Jolt Stripper

This machine is one of the smaller type of machine manufactured by the Arcade Mfg. Co. It is a power-driven jolt-ramming machine, with hand attachment for stripping the pattern. The sand is rammed by means of the jarring process which jars the mold with the stripping plate and pattern included, after which the pattern is stripped through the plate. These machines are made with roll-over device for drags, also with squeezer attachment, pattern drawing arrangement, etc. They are made in all sizes and are suitable for small gearing and ferrules, stone plate or work up to several tons. On work such as boiler fronts, engine beds, etc., the Norcross type of jolter is adopted.

Squeezers are also used on split pattern work. Machines for this class of work are particularly adapted to making moulds from symmetrical patterns that can be split through the centre or for flat back work. Patterns adapted to this type of machine are not, however, limited to the two classes mentioned above as any pattern that can be split on a true plane may be moulded on it.

With symmetrical patterns but a single plate of patterns is necessary, as the cope and drag are moulded from a double set of half patterns, the impression of the right hand set in the drag matching those of the left hand set in the cope and vice-versa.

Where "flat-back" patterns are used the pattern is mounted on the pattern plate for the drag half of the mould and a blank plate may be put on the machine for the cope half.

Where patterns of this character are used it is the custom to make a "floor" of drags and then change the plate on the machine to make copes and close the molds, any necessary cores having previously been set. The squeezing, as we have already stated, may be done by hand or by pneumatic pressure, depending on the class of work being done. For light work, where no great pressure is required, a good man might make better headway with the hand lever than he would with the power, but for work of any size the advantages of the power squeezer over the hand operated machine are many. The power squeezer relieves the operator of the heavy work and allows him to bend his energy toward greater production.

Absolute uniformity in the density of the sand is obtained with the power squeezing split pattern machine and consequently the loss of castings due to swellings or blowing of the molds is reduced to a minimum.

Vibrators

The use of a vibrator not only assists in the drawing of the pattern, but assures uniformity in the size of the castings produced. The vibrator does not appreciably enlarge the mold, but simply overcomes the friction of the pattern against the sand, and consequently, while a pattern without any draft can be drawn perfectly, care should be taken that there is no back draft.

Plain Jarring Machines

The jarring machine is essentially a sand packing machine and is applicable to any work on which the ramming time is worth saving. This applies to cores or molds within the capacity of the various sizes of the machines.

Like the stripping plate, the jarring machine performs only one operation, that of jarring or ramming the sand into the mold, and while the stripping plate is only useful in drawing the pattern, the jarring machine is only useful in ramming the sand, but if we combine the two into one machine, we have a machine which will both ram the mold and draw the pattern. In addition to this there are lines of work which can be jarred first and squeezed afterwards to make a hard bottom, and by having these two combined in one machine we have what is known as a jar-squeeze machine. There are also lines of work where it is an advantage to have the stripping plate in conjunction with the jar-squeeze features, making a three feature machine. There are also lines of work where the stripping plate can be dispensed with and other pattern drawing devices utilized. Machines which will roll the mold over are also on the market and giving the highest degree of efficiency.

The Jarring, Roll-Over and Pattern Drawing Machines

The Jarring, Roll-Over and Pattern Drawing machine, while it embodies neither the stripping plate nor the squeezer features, it nevertheless covers a field which could not well be covered by any other combination. These machines are now made shockless, the jarring operation being accomplished independently of the rest of the machine, the pattern board simply resting on the jarring table, and being held in place by means of two dowel pins.

After the mold has been jar-rammed, the bottom board rubbed on and clamped in place, the roll-over frame rises, picks up the entire load from the jarring table and rolls it over, automatically locking the pattern plate to the roll-over frame at the beginning of the turning movement.

When the mold is rolled over, it is deposited on a cantilever on the pattern drawing side of the machine, after which the wedges of the leveling device are thrown into place, by means of their levers, thus bedding the flask perfectly, preparatory to drawing the pattern.

The clamps are now removed and the pattern drawn up from the mold by means of an air cylinder provided for the purpose.

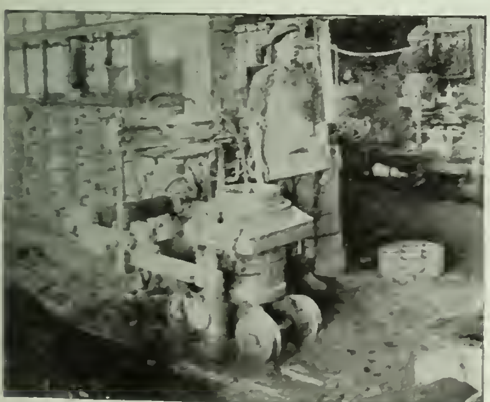
After the pattern is drawn the roll-over frame returns to its initial position leaving the pattern board on the jarring table ready to receive the next flask.

It will be seen from the foregoing articles that while the stripping plate and squeezer were the pioneers in moulding machine equipment, and are still indispensible in a large volume of the work which comes to a foundry, it is evident that the jar-rammer is becoming popular as a labor-saver and as a superior method of ramming. Pattern-drawing devices for drawing patterns which cannot well be stripped are also prominent features in the modern machine. That each and every machine has its particular advantage is self-evident.

In conclusion we will quote a few extracts from the bulletins of the Foundry Equipment Manufacturers' Association, to which we trust they will not have any objection. The members of the association realize that their machines and appliances, at times, do not give the returns to the foundrymen which they should. This is largely due to the fact that the appliances are not understood, or do not receive the necessary care and attention. The members of this association, with their comprehensive knowledge and experience of conditions and problems in all classes of foundries, have been in a favorable position to accumulate facts and data which would be valuable and helpful in the installation operation and care of foundry equipment. As an example—a piece of foundry equipment is compared to the human body in order that it may be the more forcibly brought to the attention of the man who has invested his good money in it.

YOUR BODY IS A MACHINE

In the complex life of to-day, man's available total energy which is many times in excess of the physical energy of mankind alone, is largely being drawn from external sources, that is, sources

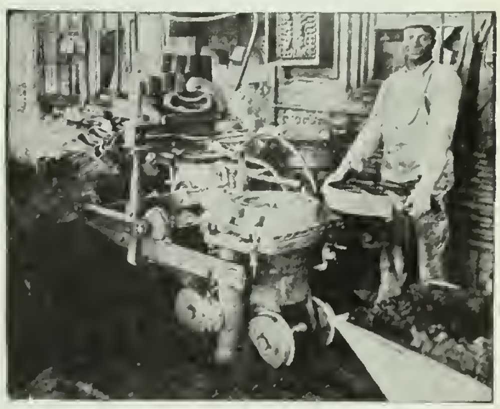


DRAG MACHINE AND PATTERN

THE OSBORNE PULLEY AND WHEEL MACHINE

The illustration to the left shows the drag, while that shows the cope. Both the cope and drag halves of the flask are barred. The molds are bedded on the floor—no bottom boards being used.

For wheels, this type of machine is in a class by itself.



COPE MACHINE AND PATTERN.

other than the human body. This extra energy is used to meet our rapidly increasing needs and desires; rapid transportation, instant communication with distant points, the transfer of commodities quickly and in quantities over long distances; all of these things are coming to be regarded as commonplace. More leisure time, more ample facilities for amusement of various sorts are demanded and all of these factors increase the amount of energy which must be drawn from sources other than the human body.

It is by means of machinery that man obtains this extra energy which enables him to move forward in the evolution of civilization, consequently machinery is of vital importance to all of us. The term machinery is a broad one, covering not only prime movers which utilize Nature's source of the sun's stored energy. changing it to energy in a mechanical form, but also, of the appliances by the use of which this mechanical energy is made to directly serve man's needs. What then is a machine? It is more than grouping together of castings, shafts, belts, cams, bolts, and nuts. Something in addition is needed, something not of the same classification as these previously mentioned component parts. The Romans used the word machine as meaning device and, as our word is taken directly from the Latin, so is its meaning introduced unchanged. In some brain there must exist the desire to do a certain thing. This desire growing strong enough becomes the motive which causes the man to assemble together the various component parts of a machine, each part co-ordinating with each other part and all functioning harmoniously together for the accomplishment of a predetermined end. Under this definition man's body is a machine; the most common machine, since each person possesses one and yet in spite of its commonness it is the most highly developed tool we have. Since each of us possess one and is familar with this machine, it is by comparison that we may best speak of other classes of machines which are not quite so common and which are not so intimately known to us. Certain facts are universally known in regard to our bodies. One of these is that food must be supplied to it. This food serves the same purpose as power to a motor and as coal to a boiler. Another fact universally recognized is

(Continued on next page)

TABOR MACHINES

The illustration here shown are of two of the many types of machine manufactured by the Tabor Mfg. Co. The lower one is that of the plain jarring machine used for jarring medium-small work, either molding or core making. It is made in sizes ranging from 12 in. table up to 36 in., and is self-contained. The jarring feature is also included in many of the combinations of machines such as the stationary and portable shockless jarring roll-over and pattern drawing molding machine, etc.

The upper illustration is portable power squeezer, which is also made of stataionary type. It is so simple in construction that very little explanation is required. As will be seen the squeezing is done from below. The mold being on the table and forced up against the platen above.

The Tabor 8 inch Power Squeezer has been designed to take care of light work requiring a quick acting machine of comparatively small size.

All of the best features of our 10 in. Squeezer have been incorporated in this machine and in addition other features adapting it specially to a particular class of work that heretofore has been made on machines too large to obtain the best economy in air consumption and output.

There are two designs of the 8 in. Squeezer, one mounted on legs to permit the operator to get closer to the work and to permit of keeping the base of the machine clear of sand; and the other mounted on wheels spread well apart so that the machine can straddle the sand heap.

The wheel-base machine is provided with a shelf at the left to carry bottom boards and for use in closing the molds so that the machine follows the sand heap and the molds are left behind as the machine is moved forward.

The valve on both machines is the well-known Tabor Pop Throttle which eliminates leakage and excess air consumption due to its quick operation, and can be operated for years without repairs.

These machines are 30 ins. between uprights have tables 12 in. x 16 in. and are regularly provided with pressure gage and blow valve.

Vibrators, vibrator frames and snap flasks extra at the usual prices.

TABOR PORTABLE POWER SQUEEZING MOLDING MACHINE.

PLAIN JARRING MACHINE.

that our body requires more than mere food. We must give it care and attention, varying in amount with the suitability or unsuitability of the conditions under which it is operating.

The same truth with regard to ot' machines is almost universally recognized. In making a machine, provision for oil is made, repairing is considered and details of schedule of inspection are frequently worked out and furnished with the machine. Each engine room has its oiler who carries a wad of cotton waste in one hand and on oil can in the other. Some foundries have a millright or some man to care for its equipment, but it is among the foundries that the most frequent exceptions to this rule are found. It is human nature for dirt and carelessness to be associated with each other. Dirtiness reflects itself in the attitude of our minds toward our work and it is unfortunate that in foundries dirt is impossible to escape. For this reason more precaution should be taken in the foundry than in any other industry to guard against neglect. At first thought it is strange to see a foundry superintendent who regularly inspects his automobile and yet allows the machinery located in his foundry, for lack of inspection, to undergo many times its normal rate of depreciation, but after all this line of action is the most natural one for him.

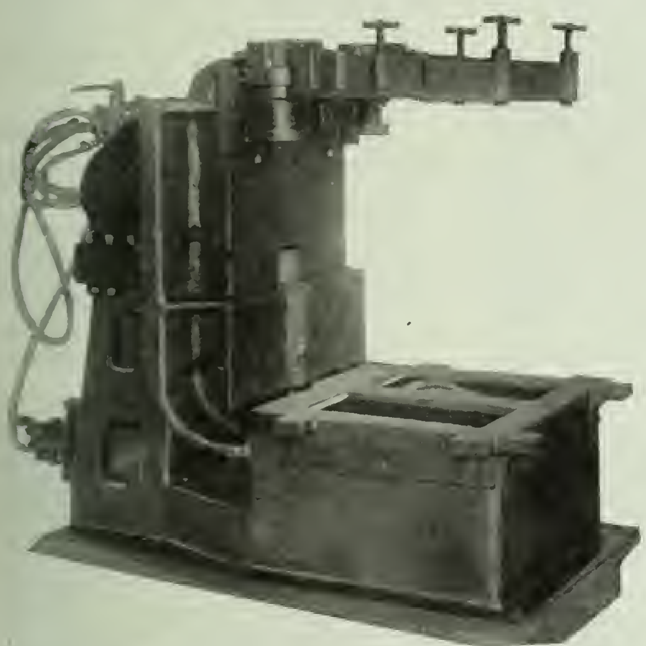
Sermons are commonly believed to be aimed at the man in the next pew rather than at ourselves. Do not let us fall into the same error concerning the care of foundry equipment. You may be doing something in this direction but are you certain that you are giving each machine its due amount of attention? Neglect of the body means impairment of faculties and eventual death, neglect of foundry machines means decreased output and eventual breakdown and finally the scrap pile.

Carrying out the analogy between the human body and a machine, the argument may be advanced that when the body is sick or diseased it is possible to call in a doctor who will prescribe a course of treatment calculated to restore the patient to the full enjoyment of his mental and physical faculties. While this is quite true, and may be necessary on some occasions, still the fact cannot be successfully contravened that a much more commendable course of action is one which aims to keep the body in such a state of mental and physical perfection that it is not susceptible to sickness and disease. This is one of the instances which exemplify in a striking manner the truth of the old saying that an ounce of prevention is better than a pound of cure.

and with the shafts and bearings cut all to pieces and working out of line.

After a machne has deteriorated on account of neglect and carelessness a cure is sometimes possible, but no style or system of cure has yet been discovered which will compensate for the valuable time lost and the lack of production occasioned by the machine being out of commission or working at a low rate of efficiency. Furthermore it must also be borne in mind that there are occasions in both the life of a human body and a machine where the disease has progressed so far that no system of treatment, however skilful, will succeed in effecting a cure.

A full day's work cannot be expected from a man who is under fed and under clothed or who is suffering from an incurable organic trouble; neither can a full day's work be expected from a machine which is never lubricated, where bearings are filled with sand and grit,



1,000 POUND CAPACITY JAR-RAMMING MACHINE.

THE GRIMES JAR—RAMMED ROLL-OVER MACHINE

The engraving here shown is the Grimes Jar—ramming machine, with roll-over attachment. This machine has a capacity up to 1,000 lbs., but other sizes have capacities up to 5,000 lbs. The Grimes machines are made in a wide variety of types and are used in the production of motor car parts, tractor parts, gears, crank cases, locomotive, car, switch boxes and other railway work in brass, iron and steel. The machines are hand and power driven.

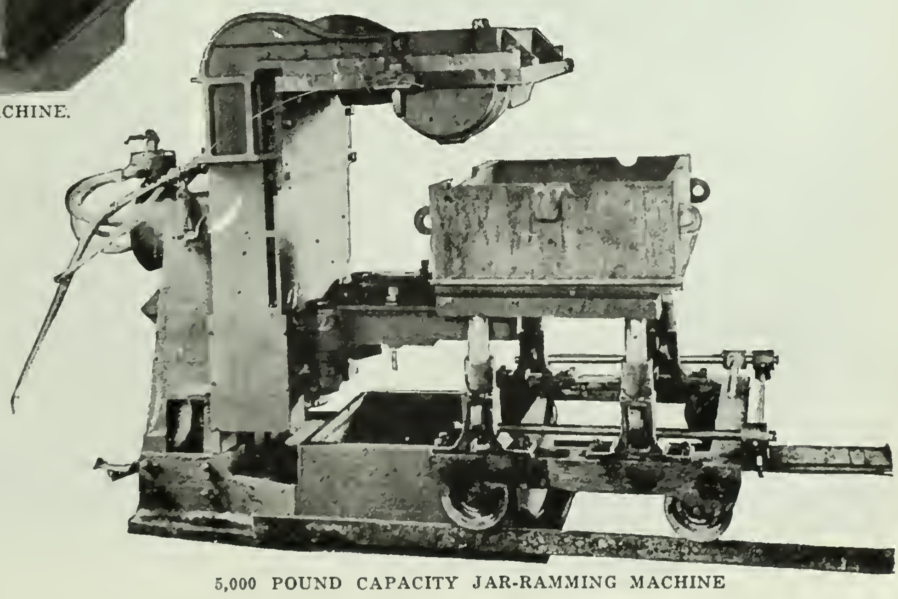
These machines are designed to begin where the squeezer leaves off. They are used on large bench and side floor work—in core-rooms as well as in molding-room. They have even been used in the production of cement laundry tubs.

Five-ton truck wheels, mammoth cylinder heads, stone crushing machine parts, etc., are right in their line. Some of the main features are that it is entirely above the floor, making it easy to instal, to operate, to keep clean, to maintain or to move in case of re-arrangement of floors, as there are no pits.

The larger size of machines are finished with a car for taking the molds away from the machine.

In making a mold on the Grimes machine the nowel is jolted until the sand is sufficiently packed; it is struck off and the board bedded on, when it is clamped with an attachment which is part of the machine, and rolled over by the machine. After the mold is rolled over on an air-driven machine, the air is turned into the lower end of the cylinder and the pattern is drawn. After the pattern is drawn the car raises the mold from the aims and takes it away from the machine.

Some types of the machine are arranged to be used as jolt stripping machines.



5,000 POUND CAPACITY JAR-RAMMING MACHINE

Making Large Work on the Jarring Machine

Work Formerly Done in Brick and Loam is Now Done Successfully on the Shockless Jarring Machine.

THE foundry scene shown in the four views herewith illustrated, is that of the Jarr Independent Roll-over and Pattern Drawing Machine, manufactured by the Herman Pneumatic Machine Co., of Pittsburgh, Pa., and is known as their Independent type on account of jarring machine and the roll-over and pattern drawing attachment being separate units. The two, however, working in conjunction, jar the mold, turn it over, and after it is lowered from the pattern on the levelling device, the pattern is turned back on to the table plate of the jarring machine.

The mold being made is for the end of a low pressure marine cylinder, and is such a job as is usually done in brick and loam, but as seen, can be done on a machine where proper equipment is installed.

Fig. 1 shows the mold being jarred; Fig. 2 shows the mold being rolled over; Fig. 3 shows the mold resting on the levelling device after being lowered from the pattern. Fig. 4 shows the pattern being turned back on the table plate of the jarring machine.

By looking at the illustrations it will be seen that it is a cope that is being made. Some foundries use the jarring machine on the nowel while ramming the cope with a rammer, but here are views photographed from the actual operations in the foundry, and the job is one which has an abundance of hanging sand, showing conclusively that the jarring machine will do any job where deep ramming was formerly done by hand.

As has already been stated the jarring machine is a separate unit from the roll-over and pattern drawing device, and it may be of interest to know that the roll-over and pattern drawing device is now sold to be installed to work in conjunction with jarring machines which have been used as plain jarring machines for the past ten or 12 years. It is possible to instal this attachment without disturbing the original jarring machine or its foundation, and thereby convert the installation from a plain jarring machine to a jar roll-over and pattern drawing machine. This roll-over attachment is worked out by a system of valves, etc., that makes the machine what is termed in slang phraseology, fool-proof. Inasmuch as the roll-over cylinder and the pattern drawing cylinder in being connected up with air line is connected through a tank filled with oil, the speed of the machine rolling over and rolling back and also the pattern draw is governed by the flow of the oil from the tank to the cylinder and vice versa.

Some of the exclusive features on this machine are the resilient jarring surfaces in the base and the guide plates placed in the corners in which the guides of the table plate move up and down relieving the balancing function at plunger and preventing wear at that point.

While the various types of jarring machines manufactured by this company are of such design as to accommodate themselves to every size of work, their design makes them particularly adapted to work of a larger nature, and the special features mentioned above make the machine a very economical one to operate, as on account of the way the drop of the table plate is absorbed it is possible to use a table plate of very light construction. Where the jarring is to be done at the plunger or central point, it is necessary on such types of machines to use very heavy table plates to eliminate vibration at the outer points of the table plate, and this not only reduces the net capacity of the machine but makes the machine expensive to operate as this extra dead load has continually to be lifted. These machines are made in sizes ranging from fifteen inch square table and three inch cylinder, and having a capacity of approximately 350 lbs. up to machines with tables eight feet by twelve feet, and 40-inch bore of cylinder and a capacity of approximately 75,000 lbs. The independent type of roll-over devices are built to work with all sizes from 30″ x 45″ up, and incidentally these devices will work in conjunction with any make of jarring machine.

Jar-squeezer machines and jar-stripping plate machines with side cylinders are also made by this company.

MILLVILLE GRAVEL ANNOUNCEMENT

The Dominion Foundry Supply Co., Ltd., Montreal, Toronto and Winnipeg, announce that they have for some years back-handled the celebrated Millville gravel for loam and dry sand moulding, and at the present time have forty car loads on order.

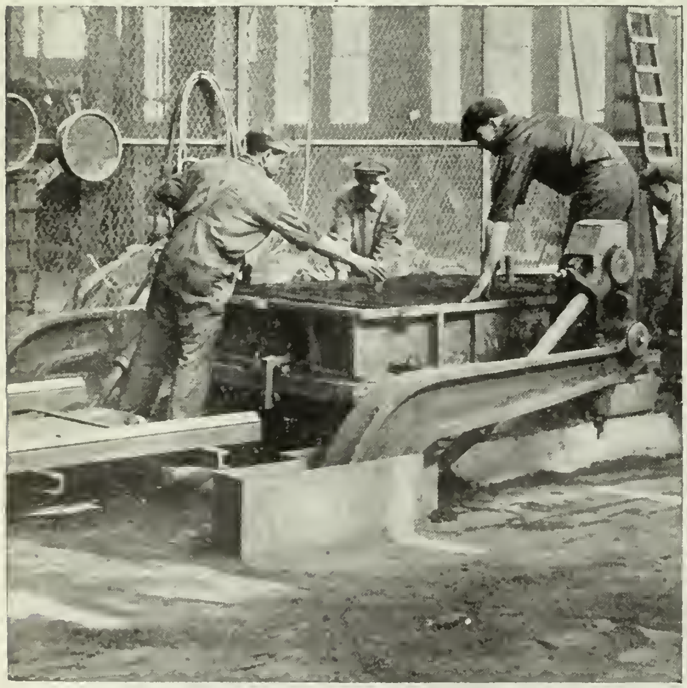


FIG. 1 COPE BEING JARRED ON HERMAN PNEUMATIC MACHINE.

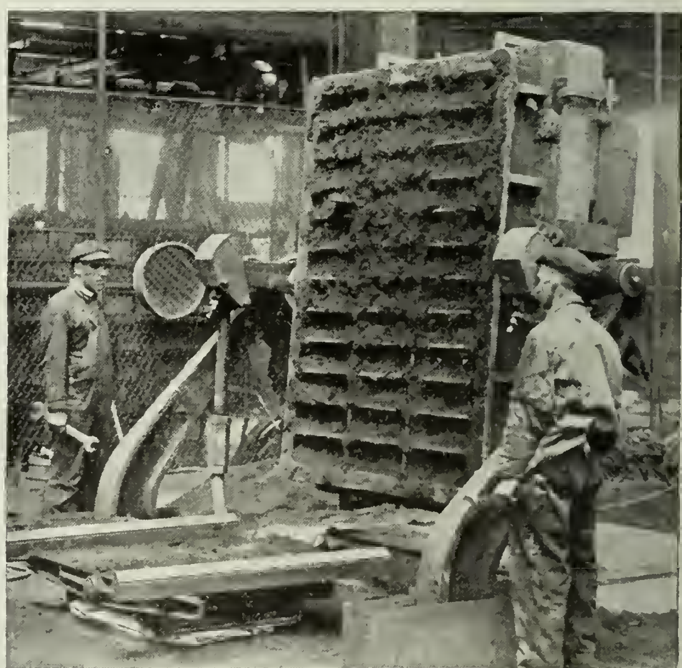


FIG. 2 MOLD BEING ROLLED OVER, ENTIRELY AUTOMATIC

HORSE SENSE IN THE FOUNDRY

By Herschell L. Hatt

A horse will work if he's looked after. He will draw the load, and although the load may be of the most useless stuff imaginable, a waste of time to handle, or it may be the most precious stuff there is, it makes no difference to him.

His one job is to draw, and he don't give a horse darn whether the load is worth while drawing or not. That is decided by the hand that holds the reins.

His requirements are oats and hay for power, harness for transmission, and shoes to traction. With these things he will accomplish the job.

It's the same with a foundry. Sometimes it is thought that anything is good enough, and that a foundry will produce, even if the equipment and conditions are rotten.

You must feed it with coke and iron. You can't fool it, either, by feeding steel borings, and get good castings, any more than you can feed shavings instead of oats and get horse power.

Did you ever see a harness on a horse like a boy's suspender? You wondered just how long the boy could go before they would have to put him in a barrel. Things are like that in a foundry. Sometimes there are poor fitting boxes, unreliable cranes, man power where mechanical power should be used.

The ill-fitting collar that galls the horse is the bull labor which galls the men in a foundry.

Horses fall, slip and slide when their shoes are not good. Grip the ground and move! That is what is wanted. If the gang don't pull together, but is up in the air more or less, things slip and slide, with poor progress. Get on the ground and traction, is the proper idea in a factory. That is the human factor.

The Atlas Foundry was one where anything was good enough, and the minute anyone suggested spending money for improvements the owners held up their hands, and talking fast, said they could have more fun buying oil wells or Russian bonds.

"Make money first, then we'll see about improvements." In other words, do a good day's work old horse, and maybe at night if you look as if you need it, we will give you a quart of oats and fix up your harness.

This was the state of things when Jim Corrigan took charge as general manager. Under the condition a profit was impossible, unless some God-sent genius produced the castings, like bricks without straw.

Woods was the foremen, but he was no God-sent genius, just an ordinary foreman, merged into the thing, and fastened to it because years had established habits and customs hard to break.

Jim watched them run a cast one night. The iron was tapped into a 1,200 pound ladle. From this the iron was poured into small 100 pound bull ladles, and carried to the molds by two men.

After two or three trips of carrying these ladles the length of the foundry, the men were tired. Then on account of so much carrying of metal, two men were required as "hold up," making four men to pour.

To prevent the metal being melted faster than these men could handle it the furnace was checked off and on. This would dull down the metal and cause bad castings.

The metal for the bench work was handled in the same manner, with this addition, that the metal was transferred from the small bull ladle to the hand ladles, the metal being passed into three successive vessels before it finally reached the mold.

As a rule, about 75 per cent. of the bench work was finally poured, because the metal wasn't hot enough, and about 50 per cent. of what was poured happened by some chance to be good.

Woods blamed the furnace, then the coke, and lots of times the iron. He always wanted "one of them pressure gauges" on the blast.

A pressure gauge is no help, because the melting is done by the amount of wind passing through the charge. Now, if this wind is blocked in some way by the charge, it increases the pressure but not the melting, so what good is it?

It took from four o'clock until five to run the cast, and all hands on the job. Fifteen minutes would do each floor, but everybody stayed to the finish and they were all needed.

Woods came over to Jim, wiping the tribute to his exertion from his brow.

"Well! what luck to-night?" asked Jim.

"There's something the matter with that furnace. The iron don't come hot enough, and we should have an electric crane so we can handle the iron faster. Then we wouldn't have to keep the moulders to pour off."

"Well an electric crane would cost a lot of money. We haven't got any and can't get it," said Jim.

Bill Morgan, the shipper, was standing near. Bill had a single track mind, and said: "Seems to me a trolley belt line around this foundry would do some good."

That night Jim thought it over, and the next morning got in touch with the makers of overhead trolley carriers.

It took three weeks to get it installed, at a cost of $500.00.

Now the metal is tapped into a half ton ladle, when this is full it is pushed along and metal is taken as fast as wanted. Three of these ladles are in constant use, and circulating around the foundry so that the men don't have to leave their floors, but stay right there and the metal comes to them good and hot.

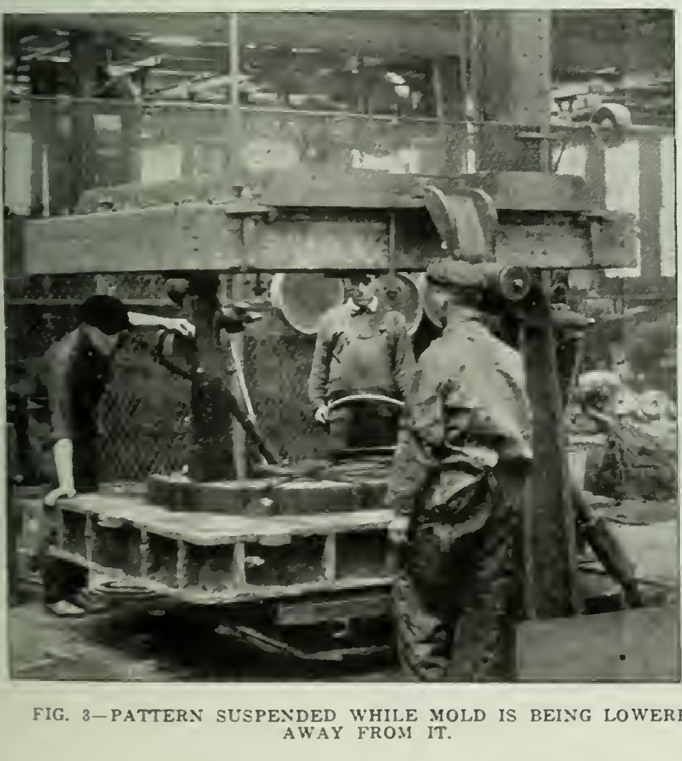


FIG. 3—PATTERN SUSPENDED WHILE MOLD IS BEING LOWERED AWAY FROM IT.

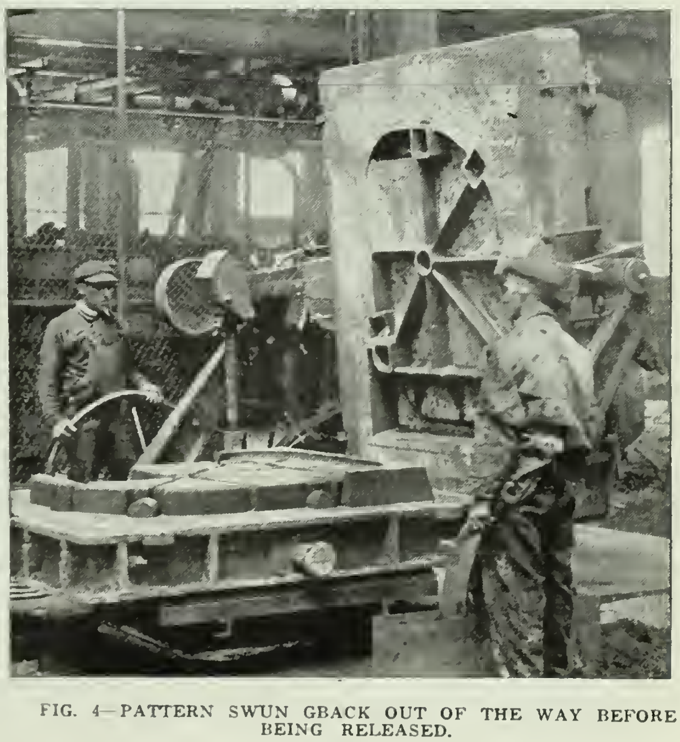


FIG. 4—PATTERN SWUN GBACK OUT OF THE WAY BEFORE BEING RELEASED.

The Automatic Molding Machine

Showing How Automatic Machinery Can Be Made to Do Molding from Beginning to End.

THE BERKSHIRE AUTOMATIC MOLDING MACHINE

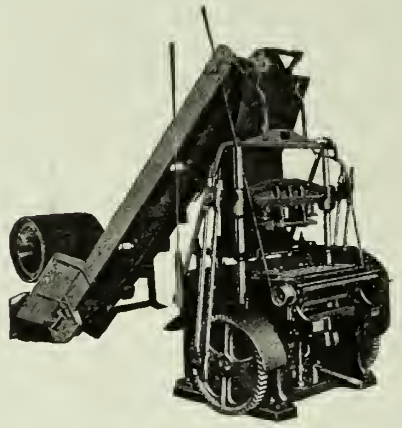
To show the extent to which molding machinery can be perfected we will describe and illustrate the Berkshire Automatic machine which is equally as perfect a machine as would be constructed for any other line of business.

Heretofore molding machines have been only partly automatic—the machine performing but two or three operations, depending upon the attendant to complete the work.

The Berkshire Molding Machine is completely automatic—it does all the work. Every step in the entire process, even the screening of the sand, is performed by the machine accurately and with no attention whatsoever on the part of the operator. The operator merely places the flask and bottom board in position and presses his foot on the starting lever, and in eight seconds one-half of the mold is finished. Automatically the machine puts the sand in the flask, rams it, vibrates the patterns, and finally removes it finished from the pattern. The entire operation is made with no assistance from the operator beyond the initial pressing of the starting lever. In detail, the machine operation is as follows:

The flask and bottom board having been put into position and the lever pressed, the sand having been sifted in the riddle at the rear of the machine, and then conveyed in a bucket-elevator to the hopper above the machine. The flask is next automatically carried to the rear, where it is filled with sand. It then travels forward and is met in its course by the bottom board, supported upon the ram, which is forced down, thereby ramming the sand.

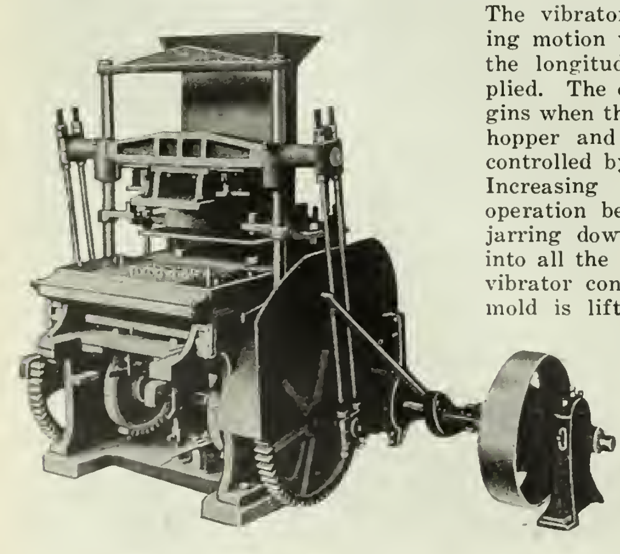
At the instant of ramming, the vibrator is automatically thrown into action, which makes impossible the formation of any vacuum, and also prevents the sand from adhering to the pattern. The lifting pins then raise the flask off the pattern. While the flask returns to receive its supply of sand, the bottom board is supported by suitable hooks, but as the ram comes down, these hooks are drawn back so that the board remains upon the mold. All the operator has to do is to lift off the flask and set it to one side, blow the sand from the table with the air hose, and all is ready for placing the other half of the mold.



SIDE VIEW OF AUTOMATIC MACHINE SHOWING ELEVATING CONVEYOR.

The pressure of the ram upon the sand can be quickly adjusted, and as the flasks are filled automatically, every flask will be rammed alike. It is also possible to adjust the boards in such a way that the drag will be rammed harder than the cope. When making the cope, the machine is so arranged that it cuts the sprue.

The vibrator is connected to the pattern support plate by an arm and is located in the machine away from the gas jets used for heating the pattern plates. The vibrator also is given an oscillating motion which is more effective than the longitudinal movement usually applied. The operation of the vibrator begins when the flask starts under the sand hopper and its period of operation is controlled by a cam on the main shaft. Increasing the time of the vibrator operation before compression results in jarring down the sand more effectively into all the pockets of the patterns. The vibrator continues to operate until the mold is lifted from the pattern plate. The height of the lift can be varied up to three inches. The speed of raising the flask is controlled by a valve so that it can be lifted rapidly or slowly, according to the nature of the work. The air cylinder can also be used for drawing the patterns down through a stripping plate if necessary.



FRONT VIEW OF AUTOMATIC MOLDING MACHINE.

Another feature is the positive stop which centers the flask under the ramming head. This effectively prevents the ramming of the sprue out of place. The clutch pulley on the shaft is merely intended as an emergency device to stop the machine.

The pattern plates are placed in an ordinary table, or platen, at the front of the machine, and can be changed easily and quickly by removing four screws which hold the plate in position, and slipping in the new plate. This machine uses split patterns plated on one side of a cast iron plate, or stripping plate patterns.

One of the "Berkshire" features is the heating of the pattern plates by gas jets from beneath, so that the molds draw readily, without the use of any parting material whatever. By this method, with the proper grade of molding sands, very fine work is made possible without any facing.

Being compound geared, it requires but three horse-power to drive both machine and elevator.

MELTING STEEL FOR WIRE MILL

The McLain-Carter Furnace Company, of Milwaukee, Wis., announce that on June 7 they melted steel in one of their new 10 ton furnaces for the Black Steel & Wire Co., Kansas City, Mo.

This furnace is a specially designed McLain-Carter furnace and while rated as a 10 ton, the maximum capacity is 30,000 lbs,, and it is guaranteed to melt five heats per twenty-four hours.

This company will produce high grade wire of every description—wire rope, etc., and the steel melted in the McLain-Carter furnace will be poured into 4, 6 and 8 inch. ingots. It is expected that the 4 inch. ingots, after being cast, will be rolled into wire rods with only one heating and as this has been considered an impossibility heretofore, if they are successful, it is quite a step in advance in wire mill practice.

Recently they secured an order from the Aetna Steel Castings Company, Lorain, Ohio, for a second furnace. They have been operating one 5 ton McLain-Carter furnaces for several months and have made numerous record heats, melting 5 tons in two hours, fifteen minutes.

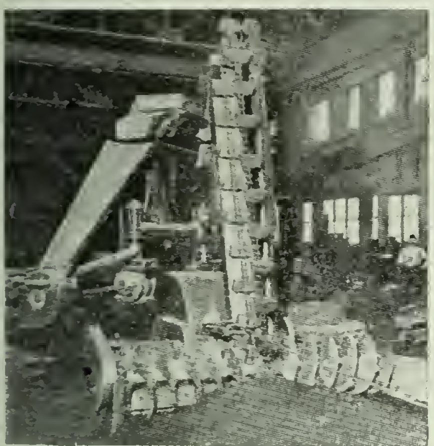
WOULD PLACE LARGE ORDER FOR CASTINGS

A large concern in the Montreal district is in the market and prepared to place an order for grey iron castings to the extent of from $2,500 to $3,000 a month. We would be pleased to hear from anyone who is prepared to take the work.

New Power-Driven Sand-Throwing Machine

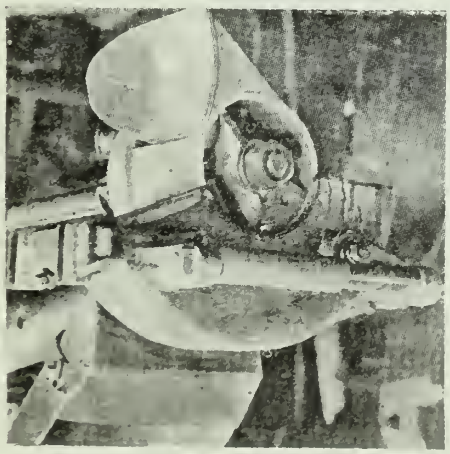
This Machine Accompanies the Stripping Plate Machine and is Limited in Capacity Only by the Ability of the Crew to Provide It with Work.

The machine shown in this illustration is perhaps the latest innovation in molding machine practice. Experiments leading up to the present development may have been proceeding for some little time back, but it has been within the last three years that Messrs. Beardsley & Piper, of Chicago, have brought it to its present state of perfection. As has already been pointed out, the stripping plate machine only performs one operation, that of drawing the pattern. The other operations must either be done by hand or by means of some other combination or attachment. For small work it is quite a common practice to



SAND THROWING HEAD WITH PORTION OF HOOD REMOVED.

combine the stripping plate with some other device, such as a squeezer or jarring machine, but there are places where this has not been found practicable, and gravity has been found to work to good advantage. With the gravity type the sand is conveyed to a considerable height by means of elevating conveyors similar to those used in a grain elevator. As the buckets of the conveyor pass over the top the sand is liberated and falls into the mold, the weight of the sand being considered sufficient to make it abundantly compact. This system, however, had its drawbacks, as gravity would draw the sand in one direction only, — straight down. It was also a difficult matter to distribute the sand so as to have the different depths of sand properly provided for, and incidentally there are times when it is desirable to force the sand in different directions, and at different degrees of density, and the rotary sand thrower shown in the illustrations has been found eminently satisfactory. A rear view of the rotary machine will show that in some respects it resembles the gravity machine. These machines are made stationary or of the tractor type, as desired. If of the stationary type, it requires to have the moveable arm, which delivers the sand to the proper place, so arranged that it may be swung around in an entire circle as the sand is delivered to the hopper by independent conveyors, but with the tractor type, as shown in Fig. 1, the arm only swings part way around on account of the conveyor obstructing the way. As will be seen in Fig. 1, the sand is cut up into a heap in the usual way and the machine backed up to it. The cable shown in the illustration is no longer a part of the equipment, but in its place a tractor arrangement is built onto the machine and connected by gear wheel to a rackway on the floor. When the machine starts in motion the elevating conveyors lift the sand from the heap, and the conveying screw conveyors deliver the sand from the sides to the center. While this is in progress the machine is continuously backing up against the sand heap. As the sand is conveyed to the top it falls into the riddle from which it passes into the arm which delivers it to the revolving head on the lower end of the arm. This revolving head, shown in Fig. 2, is encased in a jacket with an opening in the bottom. The head revolves at a speed of from 1,200 to 1,800 revolutions per minute, according to the class of work to be done, and as the sand passes through the head it is thrown with sufficient violence to leave the mold properly rammed. The arm is movable at the top, on roller bearings, as well as free to be swung, thereby permitting the molder to deliver the sand to any part of the mold and playing on one spot as long as it is required. The capacity of the machine is limited only by the ability of the crew to provide it with work. Space will not permit of a proper description of this machine, but a more detailed description will be given at a future date. The Hugh Park Foundry Company, of Oshawa, have the Canadian patent rights, and have all the latest improvements embodied in their patterns.



REAR VIEW OF MACHINE SHOWING CONVEYORS AND CONVEYING DISCS.

MIRACLES IN THE FOUNDRY

Some months ago an article appeared in Canadian Foundryman on the subject of miracle it was never settled, and I consider it worth reviving. In all hot liquids the upper part is hotter than the lower. This can be proved by plunging the hand into a vessel of moderately heated water which is placed directly over a fire. As the water heats it goes at once to the top, and while the top is so hot that it is almost unbearable, the bottom will still be quite cool. The same holds good in melted metal. If a large mass of melted iron is held in a ladle it will be at a higher temperature near the top than lower down. All this is simple enough, but we must get back to the miracle.

The hotter the iron is the more it is expanded, and as the specific gravity of heat is less than that of air, the heat in the metal will weigh less than nothing and consequently a cubic inch of iron which is partially composed of heat will weigh less than a cubic inch of solid iron, yet why is it that cold iron introduced into a ladle of melted iron will float, and if it should go to the bottom it would come up again?

HERE IS ANOTHER MIRACLE

Copper is a red metal and if mixed with tin or zinc it imparts color to them according to the proportion in which it is mixed. For instance two pounds of copper and one pound of zinc makes yellow brass, while copper and tin mixtures make a red bronze of a lighter color than pure copper. But if one pound of manganese is mixed with five pounds of copper the alloy is pure white. Where did the red go? And equally as strange, if the manganese is removed the red comes back, where did it come from? One pound of nickel mixed with four pounds of copper will bleach it to a pure white, being, not quite so powerful as bleaching agent as the manganese.

The Norwalk Iron Works Company of South Norwalk, Conn., manufacturers of air and gas compressors, have now a Canadian sales agency with offices in Toronto. This is in the hands of the A. S. Leitch Company, Kent Building, Toronto.

Prospective Centrifugal Casting Machines

While the Centrifugal Machine May Be in a More-or-Less Experimental State, Its Possibilities Have Been Demonstrated.

While there are only a limited number of mechanical powers which can be applied to a machine, and other powers which are employed to transmit or apply force through these machines, there is one force or power which receives its energy from the machine, viz: centrifugal force, which Professor Airy, the noted astronomer claims is neither a force nor a power, saying that there is no force in operation. He proposes to substitute the expression "centrifugal tendency."

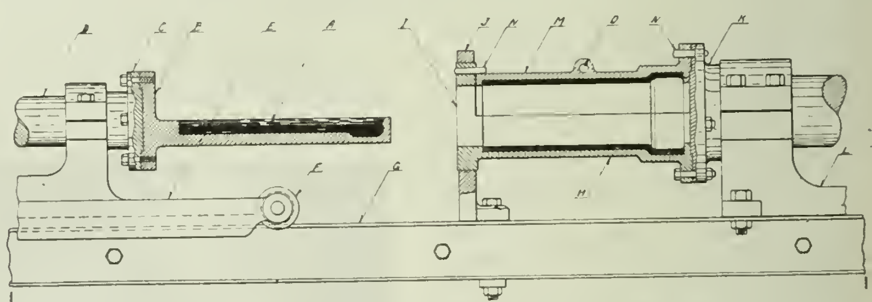
However, as it is familiarly known as centrifugal force we will refer to it thus.

Centrifugal, according to natural philosophy, is the force which impels a revolving body from the centre to the circumference of its orbit. A few experiments which every school boy has tried, are quite interesting. If a marble is placed in the bottom of a tapered pail and the pail is revolved, the marble will run to the side of the pail and travel around the largest circle which the pail will allow it to. If the pail is revolved with sufficient velocity the marble will worm itself up the side in order to get where the circle is larger, and if it were possible to revolve the pail at a high speed the marble would travel right to the top and over the side. If the pail is straight up and down on the sides the marble will remain at the bottom because the centrifugal motion or tendency does not force it anywhere excepting where it can get further from the center. If water is put in a tapered pail and revolved, even at a moderate speed it will be seen to recede in the center and bank up at the sides. If the pail is the same diameter all the way up, this action will not be so perceptible, but it will nevertheless take place, and if revolved at a sufficiently high speed it will, (unlike the marble) go right out of the top. This is because each atom of the water is striving to get as far as possible from the centre and in doing so forces the water which is there to make room, and the force of gravity pulling down on it being not as great as the centrifugal force the water is forced out of the top. If a parallel pail with a flange on the inside such as is used in fruit canning, etc., is substituted for the plain pail the water will be forced from the top, with the exception of that which is held back by the flange, and if the flange projects inward to the extent of one inch, there will be a wall of water an inch thick the entire depth of the pail.

This is all simple enough to see through, but if doubted can be tried out by fastening the pail in fast-running lathe, as it matters not whether the pail is upright, horizontal or on an angle. The centrifugal force brings the entire mass to a level at right angle to the force.

Now these are the principles on which the centrifugal casting machines work. Melted metal being a liquid acts in a similar manner to water, with the exception that melted metal does not remain in a liquid state for any great space of time, and by pouring it at exactly the right temperature it is quite possible to control the metal to better advantage than could be done with water. Of course there are certain patent rights hanging over the centrifugal casting machine, although Socrates or Galilio might have taken out patents on them as these forces were well known in their days, so likewise were the six mechanical powers spoken of, but it is upon the manner of application of these forces and powers that individual effort is expended, and the successes of achievements of which we must pay respect.

In the sketch will be seen a crude machine which is not an exact likeness of anything in the heavens or on the earth, and could perhaps be worshipped on that account, but still it shows the fundamental principles involved in the centrifugal machine. If melted iron should be poured into one end of a long mold such as would be required for a water pipe, it would of course tend to spread the entire length, but it is doubtful if it would travel that distance before becoming set, but if first put into a trough shaped ladle the length of the mold it would be distributed the entire length of the pipe at the same time. By shoving the trough into the revolving mold and tipping the said trough over sidewise the centrifugal force will distribute the metal around the mold. By having the metal at the proper temperature so that it will be set before it all runs to the bill it might be possible to cast a waste pipe with a bell mouth. To make a plain straight pipe by this process would be quite simple. In making piston rings for automobiles it has been found quite practicable. If an iron mold is made of proper diameter for the rings and of sufficient length to make a number of rings, it can be made to revolve horizontally or in a upright position or at any angle and the castings will be true on the inside as well as the outside, and the clean iron being the heavest will be thrown to the outside of the casting while the lighter impurities will be on the inside. By this means perfect rings are insured. The thickness of the casting is governed by the flange on the end. If the outside diameter of casting is, say 4 inches, and we wish half inch thickness, we put a flange on the end with a three-inch hole in it. If we want more thickness we use a flange with a smaller hole in the center. This flange is pivoted so that it can be opened like a door, to allow the casting to be removed. Iron molds may require water cooling arrangement and may be on trunnions to allow of being tipped up endwise so as to admit of dumping the casting out. There is certainly an opening for the centrifugal mold as well as for permanent molds of different kinds.



PRINCIPALS OF CENTRIFUGAL CASTING MACHINE.

The trough ladle that carries the molten metal A, has a flange B, at one end that is bolted to the flange C, of the shaft D, this shaft being of ample length to support the overhanging weight of the trough and the metal. The carriage E is supported on four wheels F, the front two fitted to an extension that equalizes the downward pressure. This carriage, or saddle, is free to move latterly along the channel iron support G. The mold is made in two sections, the lower portion H, having a cylindrical flange I, at the open end for rotating in the steady head J. The rear end of the mold is flanged and bolted to the end of the spindle K, which is supported in the head L, provided with two bearings and driven with suitable gearing. The "cope" or cap M, when in position, is locked by means of taper keys N, N, and is likewise provided with a ring O, for facilitating removal of cap when "shaking out" the finished pipe.

Molding Auto Cylinders at the Ford Foundry

Describing the Method of Core Setting, Pouring, Shaking Out, Conveying, Etc., Without the Annoyance of Core Smoke

By F. H. BELL

IN our last article we described the pendulum conveyor for handling small molds such as one man could lift alone. With the heavier work such as cylinders where two men are required to lift a half mold, this process is not used. The conveyor used for cylinder work is of the type commonly used in foundry work, and consists of an endless cable travelling around an endless track. This track is constructed of two long parallel sections connected at the ends. The cars go along the front in one direction and return on the back track.

The molding is done on stripping plate machines as shown in the illustration. The overhead sand conveyor system is used but not in the same manner as on the small machines. With the cylinder work the sand is allowed to fall on the floor; from there it is shovelled into the mold and rammed by hand. When the drag is completed it is placed on the conveyor, which is in continuous motion, and like the small molds described before, it passes on to the next man and the next until completed.

The core setting is a big item on a cylinder, but the cores, unlike other parts of programme, are not in continuous motion. The cores are dried in continuous ovens which are kept at uniform temperature, and the conveyors are kept travelling at a uniform speed, so that when taken from the oven it is a known fact that they are dried exactly right, and that they are all ready for the mold, with the one exception, that they are hot, and hot cores cannot be used. For this reason it is necessary that they be taken from the oven and placed where they will cool off before going any further. When the cores, which are made on the second floor, are sufficiently cooled to use they are dropped down to the first floor at such locations as they will be required.

A cylinder block as it is known consists of four cylinders in one piece, together with value chambers, water jackets, exhaust openings, etc., besides various cores which are used to save the labors of the molder. Some of these cores have to be set in halves, while some are completed before being placed in the mold. As the cores are brought to the molding floor they are distributed along in the exact locations where they will be required.

When the nowel is made and placed on the conveyor it passes numerous piles of cores before it arrives at the part of the shop where the cope is made. In setting the cores, one core is sometimes required to hold another in place, and chaplets are required between them to allow for thickness of metal. When the bottom half of the water jacket core and such other cores as go in the nowel is set, the cores which form the bore of the four cylinders are set. These are in pairs, two cylinders being in each core. The balance of the jacket core is now put in place.

While all of these operations are being performed with the mold in continuous motion, each one is tested to insure that it is right. The cores are all made with the greatest of care and with the most perfect of equipment, which should guarantee accurate cores, but no chances are taken, and as each core is set, a thickness piece is drawn through to show that the proper thickness of metal is there. If the instrument is pinched between the cores it is known that they fit too close and not enough metal is allowed. This seldom happens, but it must be guarded against just the same.

Before setting on the cope, a gauge is used for the final thickness and the core prints are pasted to prevent the metal from running out.

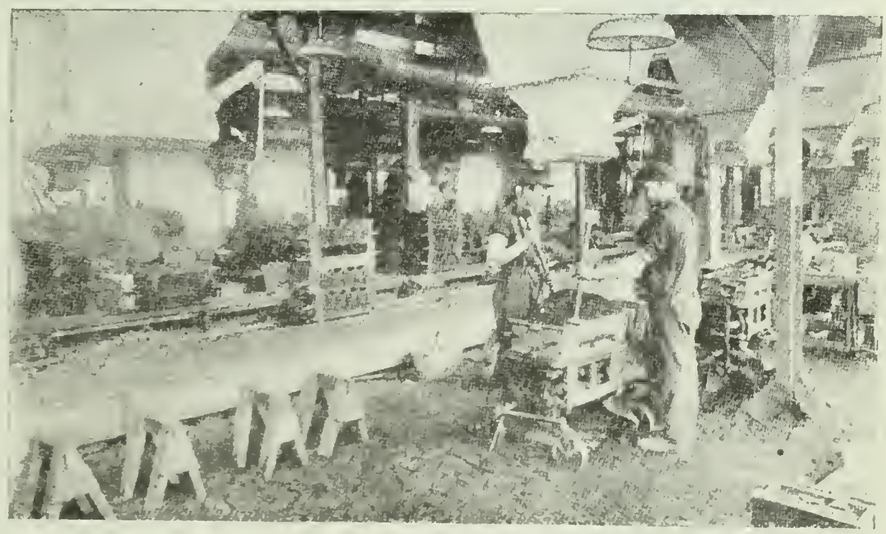
After closing up and clamping the mold it is poured, by which time it has completed the first half of its trip. On the return trip on the back track it travels under a hood which extends the entire length of the track and which is connected with an opening in the roof, carrying away every particle of smoke. By the time it has arrived at the end of this track it is sufficiently cooled to shake out, and the flasks returned to the molders to be used over again. The sand from the mold is allowed to fall through the grated floor where it is conveyed to the upper story and re-mixed.

The cores used in the cylinders are of various compositions. Silicia sand and an oil binder are used in the water jacket cores, while dry black compound is used in the mixture for the bore cores.

The making of the cores is interesting to equally as great an extent as the molding and pouring. The benches are circular in shape and the core makers work around the outside of them. These benches stand beside the ovens, which are of the continuous, oil burning type. Several duplicate core boxes are required for a core, such as a cylinder bore core. While the first core-maker might go ahead and finish the core, it has been found expedient to divide the work, so that the first man only does one operation on it and shoves it along to the next one, who does a little bit more to it, and so on until it finally lands back to the man next to the one who began it. This man takes off the core box and shoves it over to the man who makes the first move on the core, while another man lifts the completed core into the oven. The ovens, like the rest of the plant, have a continuously moving system on the inside, and a gauge to keep the temperature at the exact point. By this means the cores are baked to exactly the extent desired by the time they reach their destination.

The great drawback to the black binder in the average foundry is that it is seldom sufficiently baked. Black tar binders have no adhesive qualities unless heated to a temperature high enough to melt the tar and allow it to run through the sand. With the oil burning ovens in use here it is quite easy to regulate the temperature to any degree required. By this means, just sufficient binder is used to make the core right, when sufficiently baked, and the additional heat from the melted metal burns the core, so that it falls out of the casting without difficulty when the casting is being cleaned.

In our next issue we will endeavor to describe how the 15 continuous cupolas are operated so as to keep the shop supplied with melted iron for 16 hours out of every 24 in the day.



SECTION OF MOLDING FLOOR, FORD FOUNDRY, SHOWING HOOD FOR CARRYING AWAY THE SMOKE.

The Marine Engine Cylinder Question in Canada

Demonstrating That Canada, as Usual, Leads All Others, But Has to be Dragged to the Front With a Confession

By JOHN H. EASTHAM

A SUDDDEN shock must have been administered to many readers of Canadian Foundryman, when the allegation that marine engine cylinders cannot be made in this country," was made public in the May issue. Mr. Bell is quite justfiied in paving the way for correspondence on the subject, in order that such an absurb canard may be refuted.

As undeniably many failures in the attempt to turn out these castings have occurred during the war, and since the armistice, a little probe into the underlying causes and a few hints at possible remedies, for such a state of affairs as now exists, may be in order.

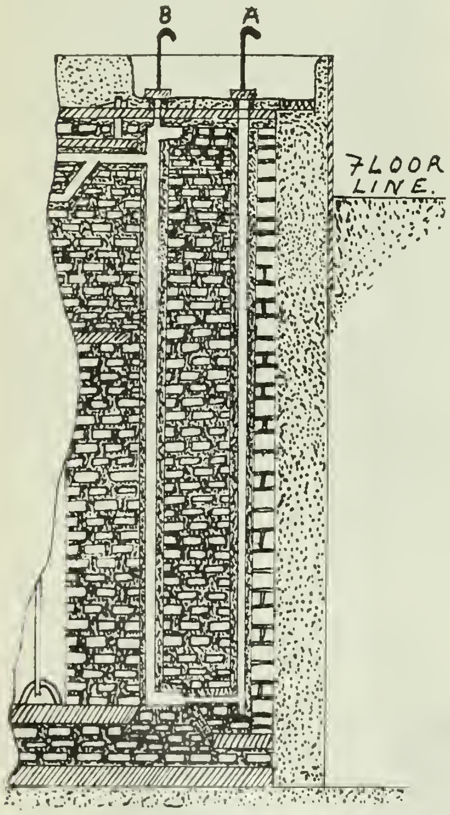


FIG. 1—CROSS-SECTION VIEW OF CYLINDER, SHOWING GATES.

We may first safely assume that this country suffers from a sad shortage of loam moulders, that is beyond question, but what steps are we taking to secure them? I venture to say, hardly any.

The average foundry management, handling a line of work which ought to be made in loam, and desiring the services of a moulder with a knowledge of drawing and ability to work from a spindle, as well as mark out his own rigging on an open sand bed, generally advertises for one in the usual way, and on offering sufficient inducement in the way of wages and cost of transportation, get one to leave another shop where he is probably just as badly needed.

One company's gain is thus another company's loss, and so on, ad infinitum, little effort being made to train men for this branch of the business, notwithstanding that two winter's courses at a good night school or collegiate evening classes, added to two years' of his apprenticeship devoted to loam work; (say, the last two years of his time), will make a finished artist of him in this, the highest branch of our handicraft.

If apprentices are not available, there is a proportion of our sand moulders with sufficient ambition and technical knowledge to qualify as loam moulders by going to that end of the shop and working as assistants to, and under the instruction of, broad-minded men who have served their time to the business.

Horizontal Pouring

Undoubtedly many open-ended cylinders cast horizontally have been scrapped for that very reason, they were made in first-class well-fitted boxes, oven dried, and if poured vertically would in very many cases have successfully passed all tests, the waste of good moulding for this simple reason alone having been criminal, the object usually being to effect a slight saving of the time and labor germane to the operations of turning the closed mould on end and bedding into a pit prior to casting. Penny wise, pound foolish, eh? and when you have carefully made, dried, cored, and closed a mold of this description, gentlemen, do you always pour it properly, or with the correct mixture? You do not, even when cast vertically.

There are a lot of foundry executives and high grade moulders who have never seen or heard of a plugged runner, to their infinite loss, and a good many others, who, having heard and seen, will not go to the trouble of using them.

Fig. 1, is a cross sectional view of a low pressure marine cylinder, made in loam and gated to get the best results, all gates being kept closed by means of the flat disc plugs marked "a", "b", respectively. Plugs "a," "a," are placed over the bottom pour gates, whose inlets may either be attached to the cylinder flange, or that at the steam chest opening, as your fancy or circumstances direct, plugs "b" "b", being placed on those "pop" gates serving the mould by direct drop between the main core and outside cheek.

Alternative ways of building up the runner box are shown to left and right of the plan view at Fig. 2, the straight system to the left being extended for two ladle pour, and the circular way, shown at the right, for a single large ladle.

Plugs may be of any of the various designs shown at Figure 3, the ball type

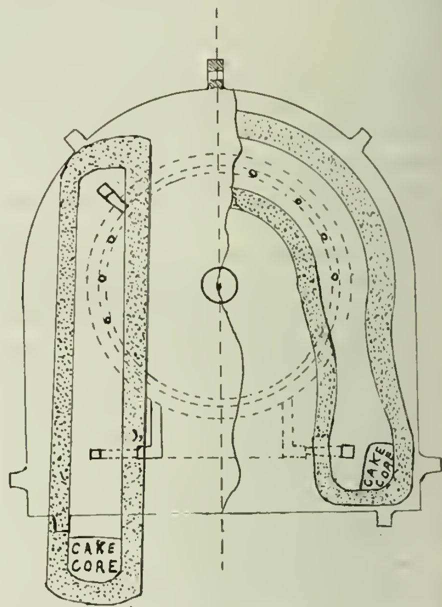


FIG. 2—DIFFERENT TYPES OF RUNNER BASIN.

being perhaps, least liable to disturb the sand in the runner box through careless handling when placing in position, and should be dipped overhead in good blackwash, then thoroughly dried, and the mould poured while they are still hot, as under these circumstances no metal will stick to them, whilst their existence will be greatly prolonged. When pouring, certain men should be told off to stand by with rammers, or long, light rods for the purpose of lifting the plugs at the proper moment; "a" "a", or those serving the bottom gates being removed as soon as the runner box is full of metal, and "b" "b", taken out one at a time to gradually increase the pouring speed as soon as a pool is forme in the bottom of the casting, the tendency to splash and scab being thus eliminated.

And what of your mixture, gentlemen? are you giving that end of the problem the attention it deserves?

If you melt by analysis, as you ought in justice to yourself and to the class of work under discussion, the following is approximately what you need:

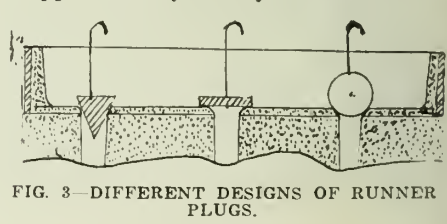


FIG. 3—DIFFERENT DESIGNS OF RUNNER PLUGS.

Silicon, Per cent.	Sulphur, per cent.
1 to 1.30	less than 0.10
Phosphorus, per cent.	Manganese per cent.
0.20 to 0.45	0.80 to 1.

This for your heavier work, for you medium and lighter cylinder castings a slight increase in the silicon content is permissable, with a corresponding decrease in the manganese per centage, according to your calibre and tonnage. The judicious use of steel scraps and close inspection of your analysis cards forwarded with each shipment of pig you get, will give you the above mixture, or any variation of it that you deem adivsable, or, if you do not care to use steel, charcoal pig may be utilized in its place at increased cost.

In conclusion, and by way of vindication of our Canadian institutions, the average man reading this article will be perhaps, surprised to learn that what is probably the best record on marine cylinder work for the past five years, on this continent, is held by an Ontario foundry.

I admit, gentlemen, that the foregoing is a sweeping statement, but here are th figures. Three per cent. loss from all causes on nearly fifty sets of triple expansion engines, or close to one hundred and fifty cylinders, ranging from two to ten tons each.

Anyone doubting and wishing to be convinced may have the name of the firm by communicating with the writer or with the editor, Mr. F. H. Bell, at thi office, and if you have a better record to show, produce it, and if ever the days of reasonable enjoyment return, we will celebrate the occasion in due and ancient form at my expense.

CAN CANADA PRODUCE GOOD MARINE CYLINDERS?

By F. H. BELL

Under the above caption I submitted for the benefit of our readers an article in the May issue of this publication, and in this article I pointed out that a prominent marine man had made the remark that it was impossible to secure a successfully cast cylinder for a marine engine in Canada. Of course I did not agree with the statement, but had to admit that we had a grand opening for improvements. I suggested a few things in order to start the ball a-rolling and invited criticism, which incidentaly I might say I received in abundance.

Among the suggestions advanced I pointed out that green sand was not the material from which to make the mold. I pointed out that the mold should not be poured while lying on its side; I also gave a recipe for making loam. In fact I about went the limit in giving advice. and I confidently believe that much good will result from the same.

However, in response to my invitation, I received a communication which gave Millville gravel as the proper material from which to make loam molds, and incidently hinting that it had my receipt skinned in a thousand different ways, which presumably it had. I was endeavoring in receipt book fashion to describe in a general way how to mix loam from material which most foundrymen would be in a position to locate, while Millville gravel is a natural formation containing all the ingredients required and is undoubtedly the cheapest and best in the long run as it is ready to use without the labor and expense of preparing it. It is equally as valuable in making dry sand work.

I was also informed that very successful work can be done by ramming the mold on its side in a flask, and after finishing it, stand it on end in a pit and ram it in. I have made many cylinders that way for small work but cannot see the advisability on heavy castings like a cylinder of four or five feet in the bore. The flask as well as the mold and cores would require to be exceptionally rigid to stand the handling, and a powerful crane would be required.

I was also told by a core maker that it is not always the mold or the metal which count.

The following letter from one of our readers on the Pacific Coast should be convincing that good work can be done by making the mold on end in dry sand, providing that proper care is taken.

"With reference to the article on the casting of cylinders, which appeared in your issue of May, Vol. XI., pages 122 and 123, you said you liked a good kicker. Well, here goes:

In this article, you take the stand that marine cylinders cannot be made in sand, but ought to be cast in loam. Well, I am going to say right here that you are all wrong.

Being a core-maker and in the employ of Mr. John Hedley of the Western Foundry, San Francisco, Calif., I wish to state that a large number of cylinders have been cast at this place in sand molds during the last four years, which is the time I have been employed here.

The cylinders have weighed from one to ten tons, and not one has ever been rejected, and all have stood the test required of them.

The core prints are rammed up in the drag, then the pattern is set on those prints. The patterns are usually made to mold up on end, with bosses and ribs loose, so that it may be drawn up out of sand. Sometimes, they are cheeked off but not always. These molds are rammed up strong with plenty of rods and vented well, with great care taken at all stages of the game not to let any old thing go by. In ramming up the mold, cast iron chills are used extensively in corners or wherever the molds are unusually thick, to prevent shrinkages and sponginess. The use of these chills will prevent leakages in the castings.

Mr. Hedley always gates his cylinders not far from the bottom of the mold if second ladle is used, that gate would be placed higher but never gated on bore. At this time of writing, we have just cast a cylinder weighing eight tons and have pursued the above methods.

Ramming up a cylinder is not the only requisite, but a good solid set of cores are very essential, with vents all clear. This, with a good mold, will come out all right. The mold will be well dried with a slow fire for two or three days, then setting the cores and pouring the mold.

For further information on this subject, you could call on Mr. Hedley, champion cylinder maker of the Pacific Coast.

William G. Leishman

This letter is certainly interesting, and the record of making cylinders for four years without losing one is still certainly the most interesting part of it. However, I always endeavor to have a loophole or avenue of escape, and I will try and wriggle out of this. In the first place it must not be overlooked that Mr. Hedley is a champion cylinder man, which fact I can vouch for, and secondly I don't think I should have been understood to say that cylinders could not be made in sand. What I said was: "Don't try to do this kind of work in a green sand mold, because the risk is too great. You might get a casting, but you might not. If you don't understand loam moulding, learn it; it is the simplest kind of moulding and the least likely to make trouble." Further on I said, "In molding a marine cylinder there is only one kind of a mold which is worthy of consideration, even though a complete pattern is provided, and this is a loam mold." Now, I don't know as I was so very far astray in this. A loam mold and a dry sand mold is practically the same thing. Whether we use Millville gravel or mix up some dope, the material used in either case is practically the same. With dry sand work a flask is used and the sand is tempered similar to molding sand, or a little more moist. The mold is made as with green sand, and when completed is blackwashed and baked for two or three days, when it is in reality a solid core.

With loam work the flask is omitted and a brick wall, following the design of the job is substituted. The loam mixture is wet to the constituency of mud because the brick wall absorbs the dampness and for the reason that it requires to be muddy in order to stick to the brick wall. When completed it is also blackwashed and baked. In baking a loam mold it is quite common to heat it to a high temperature in order to destroy what animal or vegetable matter was used as an opener, thus leaving it similar to a sponge, allowing easy escape of vent. With dry sand work this is not so essential as the mold is easily vented.

Although there are a lot of things to look after in getting a good cylinder, and as Mr. Leisham points out not the least of them is the core making. The condition of the metal and the manner of pouring also contribute to the success or failure of the casting. The article by Mr. Eastham on cylinder work, shows once again that Canadians have capabilities in this direction which have shown results equally as satisfactory as those achieved in shell production during the war.

Some Things to Be Remembered About Melting

Showing Old Fads Which Are Adhered to While Things Worth Studying Are Treated Lightly

By F. H. BELL

THE lessons which I will endeavor to present and which I have combined in one illustration are all old to the average foundryman, but perhaps not thoroughly understood or appreciated, and in the case of juniors perhaps not understood at all.

Anybody who knows anything about a foundry knows the lay-out of a cupola, so we will not spend much time describing its ordinary features but will confine our thoughts to a few experiments which foundrymen are unknowingly or unwittingly performing every day.

We will not require to go deep into mathematics to prove our points, so long as we bring out the ideas. Supposing instead of having a bricked-up cupola we take a heavy wrought iron pipe without any lining and use it for a cupola. Now, supposing we take 2,300 degrees Fahr. as the proper heat at which to melt cast iron, and we will assume that a wrought iron shell will stand up under this heat. If we build a coke fire in this shell and let it burn under natural draught, we may be able to heat the shell to a cherry red, but not to a white heat unless we have a very powerful draught.

Now, suppose we turn on the blast from the blower, the increase amount of oxygen which comes in contact with the carbon in the fuel will do a whole lot of things with chemical definitions, but which translated into foundry talk means that it will make a hotter fire. But it does not make a hotter fire as soon as it enters or comes in contact with the fuel, on the contrary, it has a cooling effect the same as all blast has, and does not do its best until it has a chance to combine with the carbon, by which time it is well up into the fuel. The distance which that will be above the tuyeres where it entered will depend on the amount of pressure which it had back of it, but in good practice this will be found to be about 18 or 20 inches above the tuyeres.

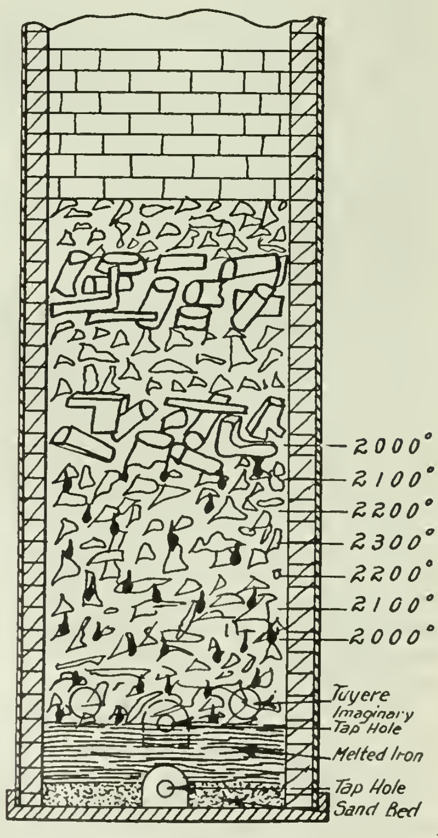
On the sketch will be seen a point marked 2,300 degrees. This point will be the very hottest spot of any and will only be of infinitesimal depth; immediately above and below it being at a lower temperature. This will show on the shell which we have imagined without any lining. One streak will be at a white heat and from this streak, both upward and downward, the color will grow redder until it becomes black.

In a properly bricked-up cupola this point might be at a much greater temperature so that the iron would be melted rapidly while passing, but whatever its temperature it is just at that point. Now this is the point at which we should aim to hold our coke bed, but obviously it will not remain long at this point with the fire burning at an incandescent heat, so we have to allow a little to play on, but the farther we get from this point the farther we get from the best melting. This should be positive proof that, no matter what proportion of fuel to iron we are using in our charges, the smaller they are the better, providing we can keep them level and not let any spots on the coke bed get below this point. Six or seven inches would be the greatest depth which could be recommended, and any greater depth would be a positive waste and would show in the uneven melting of the iron and the uneven stream at the spout. The large coke charges would not be so serious a matter if it is only meant the waste of fuel, but if we are figuring close on our fuel and trying to melt ten tons of iron with one ton of coke and we burn some of our coke to waste, we still have our ten tons of iron to melt but do not have the ton of coke to melt it with.

Conditions vary in different shops and a little experimenting will be required to find where the proper melting zone is, but when found, it should be maintained. Going below it does NOT save fuel, and going above it does NOT improve the melting.

The Sand Bottom

Another lesson to be studied is the sand bottom. In the sketch will be seen



DUMMY CUPOLA.

the sand bottom with the melted iron between it and the tuyeres. As the metal melts, it runs down through the fuel and fills up this space. Now, supposing the space between the sand bottom or the tap hole which is on the same level, and the tuyeres is eight inches, and this is allowed to fill before tapping out, we have eight inches depth of iron at a quarter of a pound to the cubic inch, or two pounds' pressure to the square inch all over the bottom of the cupola, and according to the rules of hydrostatics we have the same pressure in every direction, which is to say that if we tap it out we have a pressure of two lbs. to the square inch which would force it up hill if necessary. Now then if our tap hole has an area of one square inch, we have two pounds' pressure back of it, and unless we put additional weight onto it we can not increase this pressure by any known means, yet practically every book and paper which was ever written or published on cupola practice contained the warning against having too much slant to the bed because it caused the iron to flow with such force that it was dangerous, and hard to stop in, etc., when as a matter of fact it would have less metal and would consequently drain itself in less time and would be easier to stop in. Now think this over, Mr. Melter, and see if you think there would be any difference in the pressure on a hydrant if the reservoir had a flat bottom or a slanting one.

Next Lesson

Another question which is worth considering is with regard to having a depth of iron between the bed and the tuyeres. In order to properly handle the slag and get clean iron, it is advisable to always have the iron above the tap hole, and in order to facilitate changing ladles it is advisable to have room to hold the iron while making the change, but the idea of holding a large volume of iron with which to pour a heavy piece, has little in its favor. Supposing we abandon the tap hole and use the imaginary one which is shown in the sketch, but leave the sand bed where it is; this is to say, supposing we have our tap hole, say six inches above the sand bed; as the iron melts, it will have to fill up this six inches of depth before any metal flows from the tap hole, and if we proceed with the heat the six inches of metal in the bottom will set solid because there is nothing to keep it melted. There is no combustion down there, and no circulation of air to cause combustion, but on the contrary there is a cold blast from the tuyeres which prevents the burning fuel from even reflecting its heat onto the melted iron.

Of course nobody would have a cupola

(Continued on page 177)

Making Man-Holes for Drains and Sewers

Showing How a Great Saving Can be Effected by Adopting Curves in Place of Angles

By JAS. F. MULLAN

THE making of a manhole or any other style of hole, out of iron, might seem odd, but this is just a name. The sketches shown are of castings which are familiar to most molders, and I am not aware of any molder ever having to admit that he could not make them, but I have seen molders working like slaves trying to make three in a day, and I have seen other molders make six in a day without any trouble, but not in the same shop. The fault was not with the molder but with the equipment which he had at his disposal.

In Fig. 1. will be seen a typical pair of castings such as are used to cover up the sewage basins on the streets. These castings are usually known as man-hole castings, the one being known as the man-hole, and the other as the man-hole cover. The cover of course, is nothing worth considering, but the man-hole casting, while being a simple, rough casting, could be made to show much greater profits for the foundryman if the pattern was made with a little more consideration for the molder.

In Fig. 2 will be seen a sectional view of this casting. On the left will be seen the design as it appeared on one that I molded a good many hundred off of, while on the right is the design of how it would have looked if I had been ordering the pattern. Fig 2, as will be seen is bottom up, in the position in which it would be when poured, and it will be seen that we lifted the inside with an anchor. In beginning to mold this we used to put down a flat board on which we placed a wooden affair which filled up the inside of the pattern as far as the ring A. When this piece was placed on the flat board it formed a sort of follow board. The idea of having it loose was so that the flat board could be used for other purposes. —Joke No. 1. We now proceeded with it as with any other job until we got the drag rolled over and the follow board removed. At this point, instead of putting on the parting sand as would be expected, we had to stop and cut a parting outside and inside, and then put on the parting sand, and put the anchor C, in place. We then put in a little facing sand and placed nails side by side, all the way around over the ring A, or more properly speaking in the corner marked B. We then rammed up the inside and made a parting on the top of it and covered it with parting sand. We then removed the screw D, and after placing a piece of tin over the opening left by the screw, we proceeded to ram up the cope. In doing this we rammed in a couple of plugs EE, to leave holes for the rapping bar, as well as two gate pins and a risor at the outside edge. Before lifting off the cope we would insert a rapping bar in the two places prepared for it, and rap it with a sledge. We then called up a gang of four and lifted it off. I cannot recall ever getting a good lift. The flasks were just ordinary wooden ones, and worked as well as the average flasks do, but the pattern was so straight up the side of the ring, H, at F, that it used to tear, sometimes only a little, but oftener a good lot. After we got done patching and fixing at the cope we brushed off the parting, swabbed the pattern, re-

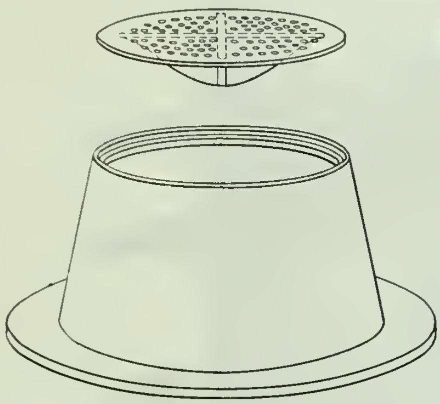


FIG. 1—MAN-HOLE CASTINGS FOR SEWER.

placed the draw screw, D, and lifted out the inside with the crane. Here again was trouble, the corner at B would never lift clean and a lot of patching was required there. After we finished with this we had the pattern to draw, and right down at G was another place which gave a lot of trouble. This place had to be right, as it was here that the cover had to fit. This place was out of sight so that it could not be seen when drawing the pattern, and being a square, sharp corner it, too, made unnecessary trouble.

If the pattern had been made like the right side, and the cover made to fit into it, all this trouble would have been avoided.

I have seen these poured in some foundries without any cope, by weighing down the inside to keep it from floating. This made as good castings as

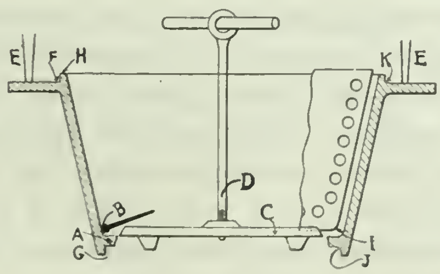


FIG. 2—CROSS-SECTION VIEW OF PATTERN MOLDED IN DIFFERENT WAYS.

anybody could want. Of course the ring H. would be lacking, but the roughness caused by pouring open would serve to hold the casting to the cement equally as well as the ring.

With a good pattern and an iron flask properly made, I will take a chance on making a complete mold with the ring H included, and have it done as rapidly as though it had been made in the open mold. By having draft where it should be and by avoiding sharp angles, there would be no excuse for tearing, and by having a properly barred cope to fit right down into the pattern as at I, there would be no trouble in getting a good lift without the anchor C being used, and if lifted with the crane could be left hanging while the pattern was being drawn.

Man-holes are sometimes made straight inside, and have a projection on the outside for the cover to fit into. This requires a three-parted flask with the usual programme of rolling over and over, or else using a lot of cores. This is a waste of time and has no advantages.

The design shown in Fig. 1 has no superiors, either in strength or ease in molding, if judgment is used in making the pattern.

Be sure and have curves instead of angles.

This job would be a cinch for a molding machine. The jolter could be used to exceptionally good advantage, or if large contracts are to be filled, the sand throwing device used in conjunction with the stripping plate would be a great saving.

SOME THINGS TO BE REMEMBERED

(Continued from page 176)

like that, but with the tap hole where it belongs and a bed of metal below the tuyeres, it is just lying there the same as it would be in the bottom of the ladle, and it might as well be in the ladle.

The three lessons to be learned are: First. The melting zone is in an exact place and the smaller the charges of coke and iron are, the nearer we can keep the melting zone to the proper place. Second. The shape of the bottom counts for very little in melting, Third. There is nothing gained by holding iron in the cupola with a view to keeping it hot for a big casting.

WANTS ALUMINUM CASTINGS

A Toronto subscriber wants to secure half a dozen thin curved sided boxes about five feet long and one foot wide, and would like to get in touch with a foundry where these can be secured as the electric installations are com- aluminum

TRUSCON F

128 lbs.
— 88 "

40 lbs.

A Chicago foundry had been using Cast Iron Flasks on a certain production job. The Cast Iron Flasks weighed 128 pounds each. The TRUSCON Pressed Steel Flasks, designed for the same job, weighed only 88 pounds each. In other words, the Cast Iron Flasks exceeded the TRUSCON Flasks by nearly 50 per cent. in weight. Would your men prefer to handle the relatively heavy Cast Iron Flasks or relatively light Truscon Flasks?

18" x 18" TRUSCON FLASK
4" x 7" Sections used as copes, drags or cheeks interchangeably.

TRU
Diameter 35
Used

Strength is Not Dependent on Weight

Strength is not dependent on weight, but rather on the nature of the material. The brittleness of Cast Iron is its natural weakness. Pressed Steel, on the other hand, is tough. Hammering, dropping, abusing Pressed Steel Flasks has little effect, while the same treatment would send a Cast Iron Flask back to the scrap heap. TRUSCON Pressed Steel Flasks are designed to have strength without excess weight. They can be made as heavy as Cast Iron Flasks, but it is a waste of material, for the lighter Pressed Steel Flasks will outlive several Cast Iron Flasks and be on the job every day.

TRUSC
Youngs

Practical Hints for the Brass Founder

MAGNESIUM: ITS PECULIARITIES AND USEFULNESS

A metal which is coming into considerable prominence and which is not yet very well known, is magnesium. This metal, next to silicon, aluminum, iron and calcium, is the most common of metals, and Canada has been favored with its presence to probably a greater extent than any other nation in the world. Magnesium is found in a great variety of forms and in many of the common minerals. Its production and cost is, therefore, dependent upon its use.

Prior to 1914 most of the magnesium used in Canada was imported from Germany, and its production in this country was a direct result of the war. As a matter of fact the electro-chemical method of reduction from the ore developed here, results in a much purer metal than any of the imported products.

As a metal, magnesium is used to a considerable extent as a deoxidizing agent, particularly in non-ferrous foundry work. For this purpose it is very effective and comparatively cheap.

The use of magnesium as a component in alloys may hardly be said to have been touched. One of its propeities, i.e., that of increasing the fineness of grain of metal, suggests a wide field of application and very promising results from metallurgical investigations.

The physical characteristics of magnesium are such that it will undoubtedly find a wide field of usefulness. While it takes time to overcome inertia and conservatism, the future will find this metal playing an important part in industry.

Magnesium is a strong deoxidizing agent, and is exceptionally valuable in aluminum foundries. Introduced into casting aluminum, pure magnesium not only reduces to some extent the oxide of the metals, but also the absorbed gases, so that its use will result in a better, stronger, and more dense casting. Aluminum itself is known to be a good deoxidizing agent if introduced into other metals, so that in melting it by itself there is considerable loss of metal because of its oxidation. In addition to this, molten aluminum sometimes absorbs gases from the furnace such as carbon-monoxide or carbon-dioxide. The result of these properties of aluminum is that frequent difficulty is encountered in foundry work, due, not only to the oxidized aluminum but especialy to the absorbed gases which are given off in cooling and result in blow-holes or porous castings.

Magnesium is used with aluminum in ordinary foundry practice in the proportion of about 0.5 per cent., that is, 1 pound of magnesium to 200 pounds of aluminum alloys of aluminum and copper or aluminum and zinc.

In aluminum, a part of the magnesium introduced will remain in the casting as an alloy, but it does not produce any objectionable qualities. On the contrary it will make the metal flow better and will materially increase the tensile strength of the casting.

Care should be taken, however, to use none but the purest magnesium, as impurities introduced in the aluminum in this manner also remain and may be the cause of serious trouble and unjust condemnation of magnesium.

Adding Magnesium to Aluminum

The pure stick metal should be held in a pair of iron tongs (there is no violent action or danger at all if the magnesium and tongs are dry), and pushed not too quickly to the bottom of the crucible after it has been removed from the fire, or in the ladle just before pouring. It must be stirred slowly until it is felt that the magnesium has melted from the tongs. Not more than a quarter of a pound should be added at a time, the reason being that a long stick of magnesium pushed into the crucible may break when it gets up to a certain temperature. The broken off pieces will float to the surface and catch fire before they are melted, taking oxygen from the air instead of the aluminum or dissolved gases. After all the magnesium is added more vigorous stirring should be continued for a short time in order to give the oxide of magnesium an opportunity to float to the surface. Then skim and pour in the usual way, no other flux is necessary.

It is not necessary to heat the aluminum above the usual pouring temperature because the heat generated by the combustion (burning) of the magnesium in the aluminum is sufficient to offset the cooling effect of plunging the cold metal. It is frequently possible to pour at a lower temperature on account of the increased fluidity, due to the presence of magnesium. Aluminum, to insure the best results, should always be poured at as low a temperature as possible, consistent with the type of casting.

Not only does magnesium deoxidize aluminum giving a more dense casting, but better profiles or greater detail are obtained. In addition to this, magnesium improves the machining qualities of aluminum and is said to give more acid and alkali-resisting qualities, making it possible to obtain a better and more lasting polish.

There are then four distinct advantages in using magnesium with aluminum.

(1) It increases the tensile strength.

(2) It improves the machining qualities.

(3) It improves the finish and quality of the polish obtainable.

(4) It increases the density.

Use none but the purest magnesium obtainable. Run a test for a week and compare your percentage of lost castings with and without the use of magnesium.

Question: I am told that it is quite possible to solder and weld aluminum, but I have never had any success, will you kindly give me any information which is available on the subject

Answer.—Aluminum can be readily welded by electricity and also by the oxy-acetylene torch, but soldering is not altogether satisfactory. The high heat conductivity of the aluminum withdraws the heat of the molten solder so rapidly that it freezes before it can flow sufficiently. A German solder said to give good results is made of 80 per cent. tin to 20 per cent. zinc, using a flux composed of 80 parts stearic acid, ten parts chloride of zinc, and ten parts chloride of tin. Pure tin, fusing at 250°c. has also been used as a solder. The use of chloride of silver as a flux has been patented, and used with ordinary soft solder, has given some success. A pure nickel soldering-bit should be used, as it does not discolor aluminum as copper bits do.

GIVE HARD WORK ITS REWARD

Foundries, machine shops, toolmakers, in fact users of iron and steel all over the country have been affected by labor unrest. Strikes have and still are costing both workers and owners enormous sums and yet no general corrective movement is being made. Each owner or plant manager as the problem comes to his door handles his own case as best he can.

As one manager said recently: "It is not the exorbitant price which I have to pay my men, nor the short hours demanded, which is my worst trouble; it is the fact that a man will no longer work faithfully under any conditions." The danger is not so much in the cost of an hour's work as it is in the attitude of the worker during that hour. Arrogance and laziness are creeping over the country. All stable prosperity—all healthy and normal business—in the last analysis, is founded on hard work. If we are going to work half as effectively as we used to and at the same time are going to demand twice our former comforts, then sooner or later we must starve, for regardless of money, food and comfort cost hard work.

What then is the solution? Many reforms are continually being suggested but these are nearly all theoretical and contain little of practical value. The labor unions are powerful organizations and if rightly directed could correct the very faults they have brought about. Why not ask organized labor to adopt a system which will reward, instead of discourage hard work? Could any faction afford to overlook such a request if it were intelligently presented?—*"Iron Trade Review."*

HOW TO MAKE A PATTERN FOR A FURNACE DOOR

By M. E. DUGGAN

WHILE employed in the pattern shop of a large foundry making a general and special line of casting for boiler fronts, doors, door frames, grates, wall anchor plates and similar castings used in the construction of steam boilers, muffles and furnaces, I had an excellent opportunity to see and study the various ways and methods followed by patternmakers in making patterns for such castings.

The brick-lined furnace door shown in the accompanying illustration is a good example of some of the methods followed by patternmakers in making a pattern for such parts. To simplify the illustration I have shown three methods used by three different patternmakers.

Molding Difficulties

The design is of the box door type having on its inner edges projecting lips which form pockets into which the brick lining is anchored in place. These lips are the cause of much guesswork and worry for the patternmaker who does not understand the best molding practice.

The slab core method C is not impractical because this method calls for material, labor and time in making the cores, fitting, setting and anchoring the cores in the mold and a possibility of the core being forced into the mold space by the metal working in between the green sand and the core. This method is contrary to good molding practise and patterns made in this way are often rejected by the foundry.

With the loose lip method B, the strips are cut in short sections, intended by the patternmaker to be drawn up and out of the mold through the narrow vertical pockets left in the sand after the pattern is removed. This idea of molding is common among patternmakers. If they will follow the pattern to the foundry and observe the work of the molder, they will see that instead of lifting the loose pieces up through the spaces of pockets, the molder will proceed to fill in the sand up to the top of the pattern after which he will pick out the loose pieces and place a slab core over the spaces left after the removal of the loose pieces. Next, the sand is filled in and the drag half of the mold is completed and ready to be rolled over to receive the cope.

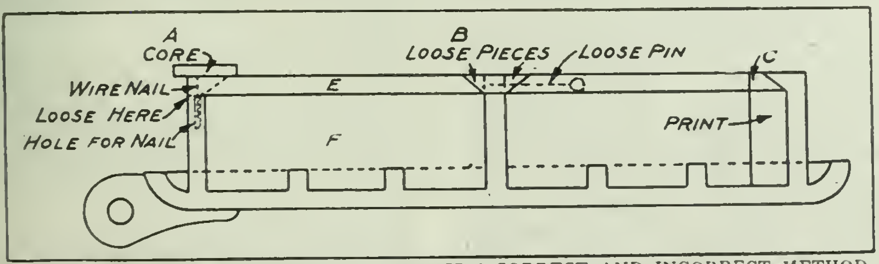
The molder has had all of these loose pieces to contend with in placing them in their correct positions in the body of the pattern. A possibility also exists of the loose pieces shifting in the mold after the pins are withdrawn. Again, the loose parts or the wire pins that hold them in place are often lost, either in the foundry or in the pattern storage loft.

While a casting can be produced from a pattern made in this way, the method is not best adapted to meet the needs of the molder.

My experience with this class of patterns, and with the molding of such castings, lead me to conclude that a large number of patternmakers do not understand the purpose of the cover core and how and where it can be used. Method A is a good example.

Pattern in Two Pieces

The pattern is in two pieces, frame E and body F. Frame E is a solid piece and is loosely fitted with wire dowel pine to the body F. No core prints are used. Sand is first filled in up to the top of the frame, then the filling-in is stopped, the sand is struck off even with the top of the pattern and the frame E is lifted. Next the slab or cover cores are set over the openings in the mold as shown at A. The filling-in of the sand is now continued and the mold is finished and rolled over to receive the cope.



SECTION THROUGH FURNACE DOOR PATTERN CORRECT AND INCORRECT METHOD OF CONSTRUCTION.

FOREMAN IN THE PLANT IS THE KEYMAN IN ACCIDENT PREVENTION

R. M. Little, of the National Safety Council, gave several addresses last week to various sections of the Steel Co. of Canada staff at Hamilton. He went fully into the history of the movement, and gave many facts and figures.

The safety measures, he declared, must be looked at from a human point of view, in order that the men might be preserved in good health and free from injury and impairment, to their wives and children. The worker, unless he was protected, was subjected to all kinds of dangers, due to the amount of machinery used in the modern plants now, and many of which dangers he did not formerly have to contend with. At this point the speaker gave a number of actual figures of accidents in plants in the States and these were very interesting. He said that 2,000,000 lost time accidents had been reported during one year, of which 75,000 would be off work for two weeks or more, and 22,500 would never return to their jobs, while from 15,000 to 18,000 suffered impairment for life, thus reducing their economic efficiency 50 per cent. This was the human toll taken by accidents. A tremendous need for the safety movement had sprung from these incredible losses, and it was necessary to form practical methods of combatting the menace.

"Everyone should be interested in the safety movement," he said. "It is a mutual benefit movement. It bears close semblance to a crusade." Its object was definite improvement, and in the States alone some $77,000,000 had been expended in various ways by the National Council which had been the means of saving 25,863 men from injury and death. He then told of the safety system as it has been adopted by plants in the States, and laid particular emphasis upon the remarkable decrease in accidents following their adoption. Mr. Little advocated the adoption of a supervisor, the distribution of safety literature, the spreading of careful instruction and the holding of safety meetings. He emphasized the value of team play and co-operation, and spoke of the success of the movement in Akron, Ohio.

"These accidents can and will be prevented, and I feel confident that this plant will make a reduction of from 30 to 35 per cent. in the number of its accidents in the next year. The movement will bring further harmony in the plant."

He stated that the foreman in a plant is the keyman and that it is his duty to take a personal interest in each employee, and his concluding statement was to the effect that the time has come for us to recognize the value of safety, especially following the great loss of life in the war.

WHAT IS EDUCATION

A favorite subject with some is "education" and presumably it is a favorite with most people, but at the same time we frequently have people tell us that some of the most successful men had no education at all, while some of the best educated fellows in the country were the least use as citizens or as business men.

This kind of talk may sound all right to a man who is, himself, uneducated, but it is not all right. The man who talks in that manner has not properly gasped the true meaning of education.

A farmer might be well versed in Latin and still be an unsuccessful farmer. School learning is a nice asset, but if he is going to farm he must be educated in the art and science of farming.

The same holds good in mechanical

occupations. If a man is going to work in a foundry, he, of course wants a good schooling so that he can hold his head up amongst his fellow men, but that is not the main thing in foundry work. If he had a college education it is not likely that he would work in a foundry. If a man is going to make a success of foundry work he should be thoroughly educated on foundry practice. If he does not like the trade and does not intend to follow it up he should drop out of it to-day, but if he intends to stay with it he is a foolish fellow to continue r premanding himself for learning it in the first place. His proper course is to think quick and remember that life is short and that he has no time to fool away talking about what he should have done. If he knows of anything better which he is sure he could have made a success of, he should go right at it at once, but if he remains in the foundry he should proceed at once to educate himself. I have had an exceptionally large experience in dealing with molders and I know that there is no better lot of fellows under the sun, and I know that when they speak their opinion they speak what they consider to be the honest truth in every detail, but unfortunately there are so many subjects on which they are in total darkness that it is really a difficult matter to engage them in intelligent conversation. I have worked beside molders who could talk of nothing but the down-trodden workingman, and what he should do, and what he would do some day, and that the day was coming soon when the working man would show the capitalist where he was getting off at, etc. I was always a good listener, but never said much. However, I used to sometimes see opportunities to give them a tip. For instance, I have seen molders taking plumbago out of a barrel and spilling it all over the floor, and I would say, "did it ever occur to you that the man who is financing this place paid about thirty dollars for that barrel of dope?" and they would look at me in amazement. It had never occurred to them that it cost him anything. I have seen molders take a new fire brick and break it in two, and use it for blocking, and I have asked, "did you know that brick cost ten cents"? and they would say, "yes, ten cents a dozen." Now that is as far as their education goes, they think they are right and they take it for granted, and base their arguments accordingly.

When I say that knowledge of foundry practice is the main point in being a successful foundryman, I have not overlooked the fact that public school education forms a leading part of this very subject. A good foundryman should be a thorough mathematician; he should know arithmetic from bottom to top. He should be able to do decimals and percentage off hand; in fact he can use all the education he can get, and he should never cease to study. Study exercises the brain, and the brain requires exercise just as much as the body. A man who never exercised his body would be of little use doing the physical work required in a foundry, and a man who does not exercise his brain is not a fit man to hold a responsible position in a foundry or anywhere else.

There are other kinds of education which are of equal importance and which call for an equal amount of brain development and this is what might be termed a business education. If a man is not in a position to go into business or has not the inclination, he should at least know how to run a business in case an opportunity should ever arise, and the education thus gained would be a valuable asset in settling disputes between the employer and the employees. Many times when the men have right on their side, their lack of education puts them in such an awkward position that they become laughable on account of some of their sayings, and loose the support of their best friends. On other occasions when they might, to a certain extent, be right but conditions being such that they haven't the ghost of a chance of success they will plunge themselves into a strike, which is really a godsend to the employer, simply because they had not the education or the good judgment to do the necessary calculating. It is all right to cartoon the college professor tryin to sell or trade off his education, but there is nothing to it. He can turn his hand to labor if necessary, but the man without education has few alternatives. Just now the working man is the dictator and can defy everybody, but this state of affairs will not last for ever, and when times get back to normal it will be a different kind of normal than formerly prevailed. Improved methods of production will continue to play a prominent part in industry, and the man who refuses to keep up to date will have to take such positions as are left over after the good ones are picked up by the up-to-date men.

I have had scores of molders tell me that they never read anything, and I have known scores of them who are content to work on the simplest class of work for a lifetime, yet those same boys are the foremost in demanding legislation to force the energetic man to divide up with them.

No one should deny the working man a good living and an opportunity to properly provide for and educate his family, but at the same time the working man instead of being jealous of the successful man, should endeavor to emulate him, and education is the channel through which to reach success.

It is a simple matter for any working men to so educate hmself that he can tell exactly what it costs his employer to produce his goods. Take for instance the foundry business. It is a simple matter to take a pad of paper and a pencil and figure from the market quotations what it will cost to build and equip a foundry; also the overhead expenses, such as taxes, insurance, light, heat, power, etc.; wages and running expenses, burning out of fire bricks, wastage in molding sand, core binders, facings, as well as fuel and iron.

These are only some of the items, but if a man is a good foundryman he will know every item, and with proper education he can figure exactly what it costs to produce the castings. Then he must remember that in normal times castings do not sell themselves, and some figuring must be done on that score, so it will be seen that there is a big opening for education before a man is capable of speaking with authority on foundry costs and what a foundryman can afford to do.

WHY DO YOU ADVERTISE WHEN YOU ARE BEHIND IN DELIVERIES

From May Issue of "Graphite"

This seems to be a very natural question, and the answer involves the discussion of a vital policy of this business —a policy that is fundamental.

If we were building a business for today our policy would vary from day to day with the temporary changes with which every business has to contend.

But we are building for the time to come and we hope that this business will become many times greater than it is to-day. Without the proper foundation it would undergo violent chahges dependent upon temporary national, local or even imaginary coditions.

If we should permit ourselves to become inflated with self-confidence when business conditions are favorable, restricting our selling and advertising activities, and go down in the dumps when conditions are not so favorable, this business would not amount to any more than the existing conditions would make of it.

We say right now, without reservations, that we hope, regardless of how aggressive and efficient our manufacturing department may be, that it will never be able to catch up with our selling organization.

If our efforts should be halted in the middle of the road in time of liberal buying to wait on the manufacturing department; there might come a time when the manufacturing department would have to suspend operations while waiting on the sales organization.

With such a policy we would be running around in a circle, disorganizing one day and reorganizing the next.

The greater the demand for our product, the quicker the turnover for merchants; and the more frequent the turnovers, the larger is the volume of profit.

In this business advertising is a sales policy—the same as our policy maintaining a sales organization—and we might as well consider the elimination of one as the other. Neither will be eliminated, as this business needs both if we are building for the future.

We hope the idea will never creep into this organization that there will be any let-up in aggressive methods, which might suggest that when business is good there is not occasion for work, and when business is poor it is too hard to get.

We constantly have in mind that the American people are much more concerned in their own affairs than in ours, and if we should restrict our selling and advertising activities they will begin to forget us—and this would be our fault.

We are going ahead with the idea of increasing the present momentum in favor of our goods; and if conditions should turn face about, our dealers and ourselves will be in a better position to hurdle obstacles than if we originated a policy for each condition as it arose.

SAND AS A LUBRICANT

A complete list of lubricants contains many strange things, among them water and soap, things which we do not usually associate in our minds with lubrication; but far queerer than any of these is a lubricant which is freely used in foundries and which foundrymen seem to be attempting to add to the list. This strange substance is none other than ordinary sand. Unavoidable sand and dirt are deposited in everything located in a foundry, and then only too often a foundryman places his stamp of approval upon this lubricant by allowing it to accumulate all over his machines, working its way into the bearings; also, sand frequently is flushed into the bearings with oil. The accompanying sketches show clearly the steps which bearings undergo after they enter the foundry. They have been thoughtfully designed, carefully constructed and as well as possible protected from the intrusion of sand. The second illustration shows how sand accumulates over the bearings before they have been in the foundry many days. This is an unavoidable condition, but it will be noticed that no actual harm has been done. The sand is all outside of the bearings and it is yet possible to keep it in its proper place, but now carelessness, fostered by dirty surroundings, begins its work. When the bearing is oiled a quantity of dirt is carried down into the very place where it will do the most harm. The third sketch illustrates the cause and the effect; careless oiling is carrying dirt into the bearing which already resembles a stripped thread rather than a finished shaft.

In most of our efforts we regard as axiomatic the fact that when conditions are not favorable more care is essential. Under conditions markedly adverse to our personal health we take an unusual amount of precaution to maintain the efficiency of our body. Should we not apply this same rule to our machines? When your tool chest at home is accidently left in the rain you go through it, oiling each of your tools as a preventive against rust. Is there any valid reason why the machines in a foundry operating constantly under the most adverse conditions should not be periodically cleaned, inspected and put in A-1 shape? The high morale of the British army has been in part attributed to the fact that no matter how mud-covered they were, or under what adverse circumstances they were operating, once every week they had an inspection. Every bit of equipment was cleaned, polished and shined as though it were to be laid away rather than become mud crusted again within the next few hours.

Surely a reasonable amount of inspection of foundry machinery is not too high a goal for each of us to set for ourselves. A definite schedule of cleaning and inspecting regularly will pay dividends in the form of prolonged life of the machine, fewer breakdowns, fewer accidents, a better production due to the good condition of the machine and also due to the spirit of the workman, who will have a better spirit toward his work when conditions are right. A reasonable amount of inspection and cleaning will appreciably reduce the cost of castings per pound and will increase the tonnage of your foundry. Are not these goals worth striving for?

The busy foundry executive with a hundred and one jobs for every hour of the day; who has to watch the markets for his supplies; see that production is kept up and an adequate number of orders on hand to keep his plant operating to capacity; to say nothing of discounting his bills and collecting his accounts, has no time to given individual attention to the proper manipulation and care of every piece of equipment in his plant.

It is needless to say that he is vitally interested in the matter, for every broken or damaged piece of machinery means one more item added to the burden he is carrying. The adoption of a system whereby every operator is held personally responsible to a reasonable extent for the condition of the machine in his charge will go a long way to lighten his load in this respect. A printed list of instructions and rules for the guidance of each machine operator could be placed in a conspicuous position. A regular inspection by a competent person who would bestow words of commendation or blame as the occasion warranted would result in developing an esprit de corps among the employes, which in turn would be reflected in the amount and quality of the work and an extended lease of life in the machines they were operating.

POWER PROBLEM GROWS SERIOUS

Plants Have to Pay for Time and They Get No Production to Balance It

At a recent meeting of Canadian manufacturers the question of power was discussed, and it was found that real difficulty was being experienced by firms which were being cut off.

Mr. F. G. Perrin of the Willys-Overland Co., in stating the case for his plant, gave the experience of a number of other firms in the district. Mr. Perrin said:

"When our plant shuts down we have the choice of paying the men off, or keeping them on and paying them. When it is shut down, it is always difficult to know when it will be on. Consequently we lay men off for a certain length of time and pay them, so we are paying them for producing nothing, thus doubling our loss. It is a condition that we are all up against. It is not only our own plant that is shut down, but all the plants that supply us with materials. Along the Windsor border our representatives telephoned us that all three plants upon which we were depending for our raw material for our plant, were closed down through lack of power. In our own case we have kept a record of all shut-downs. Our graphic watt meter, which registers all current coming into the factory, shows stoppages aggregating 38¼ hours' duration from December 2 to April 27, which is a very serious matter."

LABOR DISPUTES IN CANADA IN THE METAL-WORKING FIELD

THE current issue of the "Labor Gazette" gives the following re the strikes in the metal-working field:

Under this classification there were 21 strikes, involving 4,860 employees, with an approximate time loss of 64,597 working days. One of the largest strikes in this group was that of 675 machinists and toolmakers at Peterborough, which commenced on May 6 and which was followed by a strike of 130 electrical workers in the same plant on May 18. The machinists and toolmakers demanded an 80 cents per hour minimum and a 48-hour week. The schedule prevailing prior to the strike ranged from 55 cents to 75 cents per hour for machinists, while some toolmakers were getting 80 cents per hour for a 50-hour week. An officer of the Department visited Peterborough and endeavored to effect a settlement but without success. Eventually the municipality, acting under Sec. 63a of the Industrial Dispute Investigation Act, made and Investigation, and a board was, at the close of the month, in course of establishment. As a result of refusal of their demand for increases in wages averaging about 30 per cent. and an 8-hour day, 1,000 shipyard employees went on strike at Port Arthur on May 15. Before striking, the employees signified their willingness to have the matter referred to a conciliation board. A board could be, however, established only in joint consent, the industry not being a public utility. The company declined, claiming that it would be unable to operate and to make further increases. A representative of the department visited the scene of this dispute and succeeded in postponing action. A strike finally resulted and was unterminated at the end of the month. Other strikes of machinists and metal workers occurred at Toronto, Hamilton, Montreal, Dundas, Welland and Owen Sound. The strike of shipbuilders at Three Rivers terminated on May 17.

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THE PRINCIPAL CONTENTS

The Moulding Machine Section

IN this issue we have made a special effort to interest our readers in what can be accomplished with the aid of the moulding machine. A short history of its inception and development is included, more to interest the reader than to benefit him, but at the same time leading up to the present time, when machines are built to do practically every line of work. In advocating the use of molding machines we do not attempt to disparage the practical molder or his profession. Far from it. While we give preference of space in this issue to molding machines, we do not neglect the other departments. Every department of the foundry business is represented in this issue the same as in all others.

The advertising pages are without a doubt most interesting, and we trust that our readers will not neglect to read them through and ponder over them, and we can assure them that great gain will be his for the trouble.

Vocational Training for Foundry Occupations

AT the Foundrymen's convention held in Philadelphia in September last an interesting paper was read by Mr. J. C. Wright, of Washington, D.C., after which an equally interesting discussion took place and many valuable points brought out. The main points of the paper and the discussions being, "How to infuse knowledge of foundry work into the apprentices and such molders as were not up to much from the standpoint of knowledge." But after all is said and done, how many foundrymen are there who want intelligent workmen? This is unfortunately the worst drawback to high-class workmen. Opportunities never were so great as to-day, yet good men never were so scarce and interest in the trade at so low an ebb. If foundrymen really wanted their employees to be educated it would not be a hard proposition to master. Trade and technical papers are about as cheap a medium as could be conceived, and if properly taken advantage of, could be made to cover an enormous amount of ground. If foundrymen would ask questions and also watch the questions which others ask, and then, in addition to absorbing the answers which are tendered they would tender some of their own experiences, it would be helping the other fellow and doing themselves no harm, but, unfortunately, so many foundrymen seem to think that they have some store of knowledge which the others do not possess, and they don't even want to let their men onto the secret, let alone publishing them in the papers. The foundrymen's conventions could be made into great educational mediums if foundrymen cared to use them for that purpose. The manager usually takes in the convention, and quite frequently the foreman, but the men are seldom there, where as if the employer would let his men elect a representative each year it would give them a chance to see what is to be seen in the way of improvements in foundry equipment and would tend to remove the prejudice which men have for machines.

Foundrymen's Associations

FOUNDRYMEN'S associations are entirely a benefit to everyone who avails himself of the privilege of affiliating with one, but are they as beneficial as they could be? The American Foundrymen's Association is, without a doubt, a long step in the right direction, but, unfortunately, there are those who attend their conventions with no other object in view than to absorb all the benefits which are to be derived, but who do not intend to dviide up the knowledge which they already have with anyone else. However, there are an abundance of foundrymen who are not of that kind, and the conventions invariably have sufficient right up-to-date material from this class of men to make it worth while to forsake all other engagements for this one week out of each year.

Reading a Technical Paper

IT is the easiest thing in the world to read a paper, but it is another thing to understand it; still it is just as easy to understand it as it is to read it if we go about it properly. It is quite a common practice to sit down of an evening and read a story book, but how many can absorb the story sufficiently to repeat it, even in a crude way to another? Ten chances to one it will be confused with a story read a week before. This may be all right if we are just reading for the sake of exercising our eyes, but if we read anything from which we intend to reap benefit and which we intend to use in the pursuit of our daily vocations, we must read it in a difficult way from this. In the first place, we must make up our mind that we want to understand it, and then we must proceed to weigh each point as we come to it, and picture it as though we were doing it. A good plan is to take a pencil and paper and see if we can put it in our own words. If the reader is a molder with sufficient ability to mold and pour a washer and understands English, he should be able to read a molder's story on how to make any job, no matter how difficulty it may be and follow it through. He should imagine himself in the foundry doing the job. He should, in the course of his imaginations, remember that he has never made this piece before and that he is making it according to the instructions which he is reading. If the writer has taken certain things for granted and never bothered to mention them the reader must fill in all the gaps from his own store of ideas. In fact, he must, in his mind, make every move which has to be made in order to complete the job, and if he comes to a gap which he can not fill, or to an expression which he does not understand, he should write at once to the editor of the paper and demand an explanation, even though he is not intending to do the job at the time. Remember, Mr. Reader, that you are paying for every article which is in the paper, and it is your privilege to get the good which is to be derived from it. Remember also that technical papers are not for the benefit of those who know it all, but are for those who wish to know as much as possible, so don't hesitate to ask as many questions as you like, no matter how simple they may appear.

Couldn't Earn $2.80 a Day

HOW things hop! Could you go out to-day and hire a moulder for $2.80 a day? You might not be able to hire one at any price, but certainly $2.80 would never get a hearing.

A moulder had answered an ad. of a firm in an Eastern Ontario town. He was making $2.50 a day, and was willing to leave for $2.80. He so informed the wise man from the East, and here is what he received in return.

The letter is dated June 3, 1909:—

Dear Sir,—

Your favor of the 1st to hand. The two places are already filled in my moulding shop for which I was advertising.

The applications which I have received are rather amusing. Moulders now-a-days do not know what to ask in wages. I do not believe it is possible for you to earn $2.80 a day. If any one could I would pay it, but I know that no moulder under me has ever done that yet. Nor come near it. Our moulders have steady work, every day the year round.

The sequel to the whole thing is that only a few weeks ago the same shop was advertising for moulders again, the wording this time reading "Highest Wages Paid."

That last paragraph was certainly interesting. He says the applications are amusing. His answer would appear to be equally as amusing. In those days ten hours constituted a day, and no moulder could earn (near) that amount of money in ten hours. How things have changed!

Thirty Years Ago and Now

THERE is something sad and pathetic about looking back over thirty years into the past and calling back to mind the things we did in those days and the means we had at our disposal for doing them, and comparing the methods of those bygone days with those of to-day, but sadder still are some of the other thoughts which will creep into our minds if we allow ourselves to ponder over recollections of younger days. Memory recalls the beautiful poem in the old school reader, the first verse of which ran something like this: "Oft' in the stilly night, e'er slumber's chain hath bound me, fond memory brings the light of other days around me. The smiles, the tears of boyhood years, the words of love then spoken, the eyes that shone, now dimmed and gone, the cheerful heart now broken. Thus in the stilly night e'er slumber's chain hath bound me, sad memories bring the light of other days around me."

But why dwell upon the pathetic side of life? Life has a bright side to it, and has more for us to live for to-day than it had in the years that are gone.

But to get back to our story: It was our pleasure a few days ago to hand a copy of Canadian Foundryman to an old-timer who abandoned the foundry in 1888, and instead of him becoming fascinated with our editorial efforts, as we had intended him to, he became spellbound over the advertisements, and could hardly believe his eyes as he beheld the innovations which had taken place in the equipment of a foundry since his time. The gradual introductions of improvements was hardly noticeable to the regular attendant, but if we shut our eyes and look back over that length of time we will see most of the foundries equipped with a shovel, a rammer and a riddle for each workman, and, incidentally, a little mill with iron balls in it for grinding blacksmith's coal into facing.

Now, look into a good foundry and what do we see? The facing mill has disappeared, and the rammer, shovel and riddle have almost decided to go with it, and in their place is equipment which will compare favorably with that of any line of manufacture. In fact, the revolution which has taken place in the foundry during the last thirty years is, undoubtedly, greater than in any other line, and the next few years bids fair to remove from the foundry the odium which has hung over it for so many years, of being the last place under the sun for any man to work in.

British Steel Tonnage

THE way in which Great Britain is coming back into the iron and steel markets of the world is a matter of surprise. There have been all sorts of obstacles thrown in the way. There have been strikes of all sorts, lock-outs and transportation troubles, but against all this there has been steady and determined progress, until now her production is greater than the record-breaking months of 1918.

For the first five months of this year the British steel output has been at a greater yearly rate than the total for any calendar year, or at a rate of 9,672,000 tons as against 9,591,000 in 1918 when the pressure of war necessity was driving production figures to new levels.

Before the war Britain's production of iron was greater than that of steel, but now the figures have been reversed.

A fairly large tonnage of British high speed steel is again going into the American market, from which the British makers had to withdraw during the war.

Britain's recovery is well shown in the steel tonnage records she is hanging up through all her troublesome days.

The closing of the finishing departments of the Steel Company of Canada is an unfortunate occurrence for Canadian industry, as well as for the company. A steel mill, all through, is of necessity a continuous operation, and a break is a hard thing to overcome. Going back to first causes it is quite true to say that the Steel Co. of Canada is closed to-day because a gang of outlaw switchmen decided to paralyze traffic on United States lines, and succeeded to a degree that the authorities do not care to recognize or admit. The coal supply from U. S. mines was cut off from the Hamilton plant, and a steel mill can no more run without coal than a blast furnace can operate without ore. The strikes of United States, outlaw or recognized, are to all intents and purposes strikes against Canadian industry if they touch lines for which we depend on United States for our supply.

* * *

The fact that the steel companies and some of the other large melters are not buying scrap now may cause the prices to drop on such lines as heavy melting steel, machinery scrap, etc. If you can afford to do so, it might be better to hold material, for a recovery is almost certain to come in one way or another. An improvement in the coal and coke situation will carry with it a call for several lines of scrap material, especially of the iron and steel kinds, and prices will be stronger.

* * *

Writing to this paper from Glasgow, Scotland, James Johnstone & Son, iron and steel merchants, 212A St. Vincent St., remark on the low prices quoted in Canadian scrap metal trade. A comparison shows the following:

	Canada	Scotland
Heavy melting	$18.00	£11/10
Rails	18.00	£11
Malleable scrap	25.00	£12
No. 1 machine cast iron	33.00	£13
Steel axles	20.00	£15

Scraps from the Foundry Scrap Pile

Toronto, Ont. — The Toronto Iron Works will build an addition to its plant at an estimated cost of $12,000.

Montreal, Que.—Corundo Steel Co., Ltd., has been incorporated with a capital of $50,000, by Gilbert S. Stairs, Pierre F. Casgrain and Leslie G. Belt.

Welland, Ont.—The Ontario Smelters & Refiners, Ltd., plans enlarging its plant here, making additions to the smelter.

Montreal, Que.—The Providence Electric Heating Co., Ltd., has been incorporated to manufacture electric stoves, etc., with $500,000 capital, by Joseph W. Guimont, Louis P. Methe, Henri Bernard and others.

Montreal, Que. — Millard's Canada, Ltd., has been incorporated to manufacture machinery, etc., with $125,000 capital, by Alexandre P. Mathieu, Frank P. Richardson, Joseph H. M. Lippe and others.

Montreal, Que.—The Copper Products, Ltd., has been incorporated to manufacture copper, brass, etc., with $3,000,000 capital, by Gordon W. MacDougall, William B. Scott, James A. Mathewson and others.

Montreal, Que.—The C. P. H. Gas Engine Co., of Canada, Ltd., has been incorporated to manufacture engines, motors, machinery, tools, etc., with $100,000 capital, by Joseph Cepeda, Jean Van der Ghote, Louis Chalvin and others.

New Foundry for Milton.—The United Iron Works & Machine Co., Toronto, has purchased the buildings formerly used by the Textile Co., of Milton, Ont., near the C.P.R. tracks in that town, and will remodel them and instal equipment for the manufacture of the Orr patent double piston cylinder engine, and various lines of machinery.

Bruce Stewart & Co., Charlottetown, P.E.I., manufacturers of gasoline engines, have started work on the erection of a new building, 60 x 120 ft. of brick and concrete, which, when completed, will double the capacity of the plant. In addition to manufacturing gasoline engines, a general machine shop and foundry business will be conducted.

The Bird Archer Co., New York, recently incorporated, has taken over the ammunition plant at Cobourg, Ont., formerly operated by the Cohoes Steel Co., and is transferring its boiler chemical department to the new plant. It also proposes to add the manufacture of high-speed cast-steel tools and foundry chemicals. About 75 men will be employed.

C. W. Ripley, 519 Sandwich Street, Sandwich, Ont., is making preparations and will start work at an early date on the erection of a foundry at Windsor, Ont., to cost $25,000.

The Record Foundry & Machine Company, Lutz Street, Moncton, N.B., has let the general contract to Ambrose Wheeler, 13 Railway Avenue, for a foundry to cost $50,000.

Oshawa, Ont.—The Hugh Park Foundry Co., Ltd., has been incorporated to carry on a general foundry and machine shop business with $200,000 capital, by Frank A. Park, Oshawa, Ont.; James Parket, 157 Bay Street, Toronto, Ont., and others.

The Moffat Stove Company, Limited, Weston, Ont., is remodelling its plant and adding considerably to its buildings. New moulding machines and other new equipments are being installed. Electric power will replace steam power as soon as the electric installations are completed.

The National Engineering Company, manufacturers of the Simpson Intensive Foundry Mixer, announce that the address of their permanent Eastern office, located in New York, is at 1760 Woolworth Bldg., this office being in charge of their Eastern sales manager, Mr. S. H. Cleland.

The Peterson Core Oil and Manufacturing Co. of Canada, Ltd., is a new industry which has just opened out at the corner of Harmony Avenue and the G.T.R. tracks, Hamilton, Ont., to manufacture core oil, parting compound, facings and other foundry supplies, being an offspring of the parent plant of the company at Chicago. Mr. D. D. Roberts is the general manager of the Canadian plant and Mr. W. M. Brown is the sales manager. Mr. Brown is well acquainted with the Canadian field, having supplied the Canadian trade from the Chicago plant for the past two years.

Large Modern Foundry to be Built in Toronto.—The Grinnell Co., of Canada, Ltd., manufacturers of automatic sprinklers and other fire-extinguishing equipment, 1200 Dundas Street W., Toronto, have purchased land at 2440 Dundas Street W., and will begin at once the erection of a foundry 100 by 220 feet and costing $500,000. The H. M. Lane Co., industrial engineers, Owen Building, Detroit, Mich., designed the buildings and prepared the plans The Anglin-Norcross Company, Ltd., Toronto, have been awarded the contract.

Auto Specialties Mfg. Co., Windsor, Ont., will open their new and thoroughly modern malleable iron foundry on Monday, July 12, and will be open to engage foundry help of all kinds.

Mr. George P. Mills, formerly electrical sales engineer of the General Electric Company, Philadelphia, has joined the staff of the Electric Furnace Construction Co., Philadelphia, to take charge of and specially develop electrical industrial heating furnaces.

George O. Vair, who has for eight years held the position of foundry foreman with the R. McDougall Co., Ltd., of Galt, Ont., has severed his connection with that company and has accepted a position as foundry superintendent with the Fort Dearborn Manufacturing Company of Sterling, Illinois, who are now erecting a new foundry. George is the type of man who will make good wherever he goes and we congratulate the Fort Dearborn Mfg. Co., on having secured his services.

THIS IS AN AMERICAN ARGUMENT BUT IS EQUALLY AS APPROPRIATE IN CANADA

"The way to keep the foreign born from getting a wrong idea of America, of her industries and her institutions, is by giving them the right idea. Part of this is Industry's responsibility. * * *"

The responsibility of the plant director does not always end at the plant, but often calls for the expending of time and money for Americanization service of various kinds in the community.

NEW INDUSTRY FOR WESTON, ONT.

It is rumored that the Moline Plow Company, an American concern, will establish a Canadian branch at Weston, in the premises formerly occupied by the Roman Stone Company. The site is 4½ acres in extent, and the buildings contain about 40,000 square feet of floor space. Other buildings will be added to bring the plant up to the requirements of a business of this kind.

CATALOGUE

In response to our article in last month's Foundryman about making patterns for helical gears, in which we expressed the belief that they could be made on a wood-working milling machine, we have received a catalogue from the Oliver Machinery Corporation of Grand Rapids, Michigan, showing gear patterns of every description, including plain spur gears, bevel gears, worm, herringbone and helical gears being made on machines, with illustrations of the work accomplished. It is an interesting book and well worthy of a place in every pattern-maker's library.

Stellite, Festel Metal and Stainless Steel

The Composition of Stellite, Together with the History and Properties of Stainless Steel, Are Presented in a Very Able Manner in This Article—Discussion of the Paper is Also Given.

STELLITE and stainless steel were the subjects of an interesting paper recently presented before the Engineers' Society of Western Pennsylvania, Union Arcade Building, Pittsburgh, by Elwood Haynes, president Haynes Stellite Co., Kokomo, Ind. The paper is given largely in full below:

The three metals, iron, nickel, and cobalt, are termed by chemists the "metals of the iron group." The reason for classifying them thus is the fact that their respective properties are all quite similar.

1. They are all distinctly malleable.
2. They are all distinctly magnetic.
3. They possess high tensile strength and high modulus of elasticity.
4. When pure they take a high polish and show a distinct metallic lustre.

They also resemble one another in their chemical properties.

1. Each is readily soluble in nitric acid.
2. Each form a monoxide with oxygen, as FeO, NiO, and CoO. Each also forms a sesquioxide, Fe_2O_3, Ni_2O_6, and Co_2O_3.
3. Aqueous solutions of their chlorides, when evaporated to dryness, are transformed into oxides.
4. Their oxides are all readily reduced by either carbon monoxide or hydrogen.
5. Their melting points coincide quite closely.
6. Their atomic weights are quite close together, that of iron being 56, and those of cobalt and nickel approximating 59.

When solutions of cobalt and nickel are mixed, it is difficult to separate the metals one from the other, owing to the fact that their behavior under most precipitants is practically the same.

Composition of Stellite

In 1899 the writer produced an alloy consisting of practically pure nickel and pure chromium by heating their mixed oxides with aluminum. This alloy, when polished, retained its lustre, even in the atmosphere of a chemical laboratory, and proved to be practically insoluble in nitric acid, even when boiling. It is also malleable when cold, and under proper annealing can be worked into sheets and wire.

Shortly afterward an alloy of cobalt and chromium was produced, which not only showed the same untarnishable properties as the nickel-chrome alloy, but possessed much greater hardness. The alloy could not be worked to any extent cold, but was found to be malleable at a bright orange heat.

It was not until 1906 that the alloy was produced in sufficient quantity to determine its properties fully. In 1909 a cutting blade was made of the alloy, which took an edge comparable to that of tempered steel. Later, tungsten or molybdenum was added, and the alloy thus produced was sufficiently hard to turn iron and steel on the lathe. Later experiments demonstrated that such alloys, when properly formed, would scratch any steel, and would stand up under much higher speeds on the lathe than the best high-speed steel tools. This fact gave the cobalt-chromium-tungsten alloy termed stellite (from the Latin word, stella—a star) a field of its own, and placed it in a class by itself as a material for high-speed tools.

Generally speaking, the cobalt-chromium alloys possess three distinctive properties, namely:

1.—They are untarnishable under all atmospheric conditions, and immune to nearly all chemical reagents.

2.—They possess great hardness.

3.—They retain their hardness up to visible redness.

Festel Metal

Some of the stellite articles for ordinary use are formed from alloys of cobalt and chromium only. This alloy answers well for table knives, spoons, etc. The harder edged tools, such as pocket knives, surgical instruments, etc., contain in addition to cobalt and chromium a certain amount of tungsten to give them greater hardness, while in other instances a certain amount of iron is introduced into the alloy to soften it so that it may be more readily worked. Such articles include table-knife blades, pocket-knife handles, certain dental instruments, etc. When iron is added to the alloy, the resulting mixture is termed "Festel metal," being made up from the chemical symbol for iron (Fe) and the first syllable of stellite.

This beautiful and easily workable alloy is well adapted to the manufacture of fine door latches, door-knobs, and high class sanitary fittings for bathrooms, lavatories, etc. It is not malleable except at a bright red heat, but when a certain portion of nickel is added it may be worked cold on the lathe or under the file. By suitable means it can be given a beautiful stippled surface, resembling that of frosted silver, and it is needless to add that under all conditions it retains its lustre in the most satisfactory manner.

Some of the later stellite alloys have shown most remarkable resistance to chemical reagents. One of these, possessing quite high chromium, takes a magnificent polish, resembling that of burnished silver. This alloy retains its lustre perfectly in boiling aqua regia, and is not affected in the slightest degree after immersion in that liquid for a period of 14 days. It is slowly attacked by cold hydrochloric acid, but is practically immune to cold, strong sulphuric acid, and nearly immune to the same acid in the diluted form. It is strictly immune to nitric acid of all strengths.

Balance weights made of this material retain their lustre under the most trying conditions. They present a beautiful appearance, owing to their superb lustre, and are so hard that their loss from ordinary wear will be perhaps unweighable for several years.

History of Stainless Steel

In the year 1911, I made some experiments on alloys of iron and chromium with a view to ascertaining definitely their properties. I quote from my notes as follows. [Mr. Haynes gives memoranda from his notebook, made in 1911 and 1912, of tests of alloys of varying quantities of iron and chromium.]

The experiments recorded above distinctly show that the non-corrosive qualities of chrome-iron and chrome-steel alloys were not only discovered by the writer at the time specified, but that their physical properties were also fully demonstrated. The discovery rests not on the possibility of adding to the steel other elements which may render it more or less immune to corrosion, more or less easily workable, but upon the fact that immune chrome-steels must contain more than 8 per cent. chromium, though for certain purposes they may contain much more than that amount, even up to 60 per cent.; that such steels are distinctly workable and useful, whether subjected to heat treatment or not; furthermore, that the proportion of carbon may be raised as high as 2 per cent. without materially interfering with the untarnishable qualities of the alloy, though such alloys are, generally speaking, more easily worked if the carbon is below 1 per cent.

Numerous metals may be added to stainless or rustless steel, and some of these may contribute slight benefit, while others may be slightly detrimental. Among these are nickel, cobalt, vanadium, silicon, boron, tungsten, molybdenum, titanium and tantalum. It is evident that an indefinite number of alloys could be thus formed, some with and some without the above elements, but none would be stainless unless it contained the proper amount of chromium, which is the essential element to be added to nickel, cobalt, or iron to produce a stainless alloy.

About two or three years after the discoveries recorded above, Harry Brearley, of Sheffield, England, discovered practically the same properties in chrome-steel, and I am practically certain that the melting point, even in the presence of any discoveries made by me.

Immediately after making the discoveries recorded above, I applied for a patent, but my application was not at first granted, on the ground that chrome-

Continued on page 192

Measuring the Temperature of Molten Steel

A Paper Read Before the American Foundrymen's Association on the Comparison of the Different Methods Existent. The Pyrometer, Rod Test and Other Methods Are Discussed

By F. W. BROOKS

A LARGE number of trials and experiments have been carried out by steel makers, along with the very commendable support of the makers of pyrometers, to try and put the measurement of molten steel upon a scientific and fairly reliable basis. Most of the practical investigators have known all along that the measurement of actual temperatures, to any degree of accuracy, is at present too much to aim for, and have contented themselves with the effort of finding some indication, such as a reading on an instrument, which tells them when the steel is at the best temperature to produce either a certain type of casting or a first-class ingot with the particular composition of steel they are handling, and that each time this reading is obtained the steel is at its best pouring temperature. In other words, comparative tests have been their chief aim.

Use of Pyrometers

Of the scientific instrument methods, we may consider thermo-couples, radiation pyrometers, and optical pyrometers. The thermo-couple for temperatures of heat treatment has proved valuable. In the measurement of molten steel, however, only the rare metal couples can be considered, and even these do not withstand the very severe conditions of a bath of molten steel. Protective tubes, such as quartz tubes, have been tried, but have certain disadvantages. The mechanical strength of a long tube at the high temperature is inadequate; the chemical reaction of the slag, in the case of basic operation, is undesirable; and the varying thickness of the coating of slag to the tube, as it is pushed through the slag, causes a varying lag of temperature from the steel to the couple.

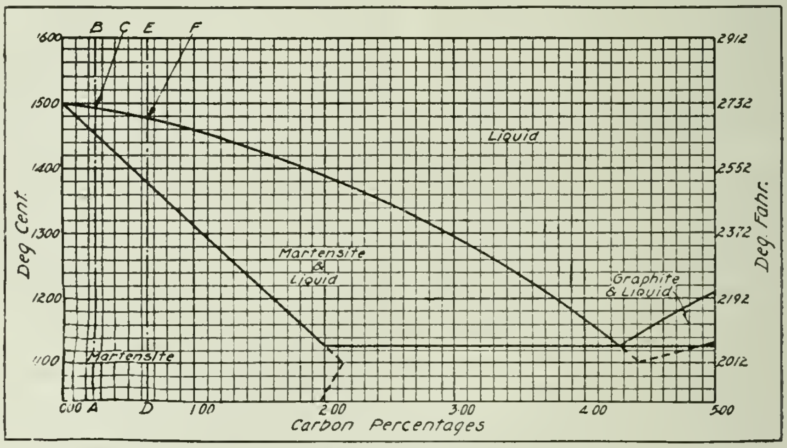
The radiation pyrometers, of which the Thwing or the Foster type of fixed focus pyrometer appear to be most satisfactory, require no focussing, and the method of handling them is simple. Both of these instruments also have an attachment for taking care of the change in black body conditions from true black body conditions when steel is poured from a furnace or from a ladle. The accuracies of these attachments are not so important, as they are the same for each heat, as long as the steel is in a completely molten state. The first obvious objection is that, owing to the slag covering in the furnace, and the difficulty and objection of maintaining an uncovered patch, the temperature cannot be read until the steel is being poured into the ladle. While this only allows for correction of temperature in one direction, it still has several valuable advantages. If the temperature of the steel is too low, preference can be given to the heavy castings of large section, and the pouring operation carried out as rapidly as possible. If the temperature is on the high side, the steel can be left in the ladle, or preference given to all the small castings requiring a relatively higher temperature; but perhaps the greatest value is a check and guidance for the melter and the foundry superintendent on the now existing more or less crude practical methods to be explained later. In the open-hearth furnace, when consecutive heats are being run to the same analysis and same conditions, a certain difference of temperature between the steel and the slag may be assumed; but this is not very reliable.

The principal objection, however, in the use of radiation pyrometers is the difficulty of always being able to focus through a clear atmosphere and onto a clean stream of steel. In actual practice, it is found that smoky atmospheres and incandescent gases are constantly interfering, while in many furnaces the slag comes out of the teeming spout along with the steel, and it is very difficult to know which of the readings recorded represent true conditions, or the same conditions as on the previous heat. There is also a tendency on the part of the observer to record the highest reading on the instrument, and interference of a small amount of incandescent gas can escape notice. The following readings are typical of many tests made of a stream of steel leaving the nozzle of a ladle when pouring castings of easy section of about 30 to 100 pounds in weight and 0.25 to 0.35 per cent. carbon, by the same instrument and the same observer, the resulting castings being of first-class quality.

Heat No. 7			Heat No. 23.		
Mold	Degrees Cent.	Degrees Fahr.	Mold	Degrees Cent.	Degrees Fahr.
1	1510	2750	1	1530	2790
2	1560	2840	2	1540	2800
3	1515	2760	3	1210	2210
4	1740	3170	4	1560	2840
5	1530	2790	5	1490	2710
6	1580	2870			

It is obvious that the readings on the fourth mold of heat, No. 7, and the third of heat, No. 23, were decidedly off, although every care was taken on both these heats to get uniform conditions, and the error is undoubtedly due to incandescent gases and smoky atmosphere. Results, both better and worse, were obtained, and these are given as typical when every care was taken.

Practically the same limitations are noticed with optical pyrometers as with the fixed focus radiation type, the added disadvantage being that with every type of optical instrument there is more of the personal element brought in by the matching of intensities or the matching of colors. On the other hand, they are not so liable to damage by the too close proximity to the molten metal, as an observer has less fear of sticking a long tube up to the stream than of bringing his face too near.



STANDARD CARBON-IRON CURVE.

Of the practical methods known, the film, rod and pouring tests are in constant use at various electric furnace plants, and they are all depending upon uniform conditions existing when each test is made. The use of the film test originated from the crucible steel practice, it being the best practice in making tool steels to first close all the melting shop doors; then to pull the pots after the required stewing and remove the lid and slag; make any additions and then carefully watch the bright surface of the steel for the first sign of an oxide film forming, this being the sign to commence pouring operations. In the absence of drafts, this served as a fairly reliable temperature indicator, as the crucibles and the mass of steel were usually the same, while the varying composition of the steel could be allowed for by pouring as soon as the first speck appeared, or so many seconds later. In electric furnace practice, this consists of using a steel spoon of uniform capacity, dried out thoroughly over the bath, and giving this a total covering of slag in the furnace. A sample of steel should then be taken, which fairly represents the whole bath, remembering that when a door has been left open for some time the steel near the door has become chilled, and with steel made in an electric furnace where all the heat is applied at the top only, the temperature of the steel directly under the slag is higher than the temperature of the steel near the bottom. Where this is the case, the bath must be thoroughly rabbled before any sample is withdrawn, and even then the sample should be taken at a place equidistant between the electrodes and half way down the bath, so as to arrive at an average temperature. The measurement of the temperature is then indicated by the length of time it takes for an oxide film to completely cover the sample after the sample is taken from the bath. This method is also influenced by the composition and physical condition of the bath, as for molten steels of the same temperature this time varies, principally with the carbon contents, the silicon contents, other alloy contents and the state of deoxidization. Therefore, final comparisons must only be made between steels of approximately the same composition and when the furnace is ready to pour. Care must be taken to keep the sample away from drafts and to have about the same amount of steel in the spoon each time. To show the range of this test it has been noted that first-class high-speed steel ingots of a composition approximating carbon, 0.65; tungsten, 17.5; chromium, 3.75, and vanadium, 1 per cent., were produced when the film (with a later characteristic wrinkling of the surface) was formed directly the sample spoon came through the door, while good castings of about 0.25 carbon and weighing from 30 to 200 pounds were produced when the film took 60 seconds to form after the furnace door.

Factors Affecting Use of Rod Test

The rod test has been used for many years as a rough indication of the temperature of many molten metals. The first publication noted by the author of this test being made a standard practice under uniform conditions was from a large Italian steel works. This test requires the use of rods of steel of both uniform diameter and fairly uniform composition and consists of plunging the rod into the bath of steel and gently moving it through the bath for a uniform length of time. If the steel is cold there is a deposit of the bath on the rod, if the steel is hot the bath melts away or bites into some of the rod, with all intermediate conditions indicating varying temperatures. The skin of the bar, it will be noted, has an effect on this test; a newly rolled bar with a bright scaly surface tends to show a colder bath than is actually the case. The bar before being plunged into the bath should be of uniform temperature and in some steel works this is taken care of by bending about 12 inches or more of the end of the bar at right angles; holding the bar with the bend in a horizontal plane over the bath until it shows the first sign of sagging and then turning the end of the bar into the bath. This test again depends on the physical condition and the composition of the bath. This test is also very useful for testing the difference in temperature between the top of the bath and the bottom of the bath and is one of the best indications of the value in electric furnaces of the bottom heating type.

Temperature is Indicated by Fluidity of Metal

The pouring test consists of using a spherical spoon of above 5 inches diameter and carefully slagging up this spoon over the bath. Dip the spoon quickly into the metal so as to get a sample of the steel from about the centre of the bath. Withdraw the sample and carefully pour out the steel over the lip of the spoon at a slow, even rate. The temperature of the steel is noted by its fluidity, and by the amount of steel skull that is left on the spoon. This test is the one most commonly used in steel foundries. It is simple and the very nature of the test gives confidence to the man who is responsible for pouring the heat. If he sees every drop of the steel pouring nicely over the lip he feels that in pouring from the ladle itself the castings of small section will fill up and there will be no skulls left in the ladle. This test is subject to the spoon being properly slagged up, the rate of pouring the sample, and absence of drafts.

For all these practical methods too much emphasis cannot be placed upon the fact that they are all comparative tests only, and that they depend entirely upon uniform conditions, and attention to details. In all cases at least two of these methods should be employed. They do not, of course, indicate to the melter the temperature of the steel in degrees, Cent. or Fahr., but they do give him a very good indication of the degrees of temperature that the steel is either above or below the temperatures which will give him the best results for the composition of the steel he is handling, for the weight and for the type of casting he is making. In making steel castings it is important that the foundry foreman or superintendent be present when the final temperature tests are being made. He is in a much better position to know how hot the steel must be to suit the castings on the floor. To tell the melter that the castings are averaging 30 pounds and then to leave the decision regarding the temperature up to him, is not sufficient.

The question most frequently asked while trying out the above tests was: "How accurately can you measure the temperature of the steel and what temperature should the steel be when it leaves the furnace to give the best results?" The first part of the questions refers to the use of the pyrometers. On steel works, where the best conditions for the pyrometer can be obtained, there is still the limitations of the pyrometers themselves. As already explained, only the optical and the radiation type offer a good field for these high temperatures and conditions, and there is little doubt that an error of plus and minus 50 degrees Fahr. in the instrument itself is all that we can ever expect. To an investigator first starting in with a new instrument he has just bought, this may not sound very encouraging, as he naturally feels that if the steel proves to be 50 to 100 degrees Fahr. less than what he is aiming for he will spoil some of his castings. The other limitations of focusing and atmosphere have already been described and values given.

Probably the best reply to the second part of the question is that the temperature in question is that at which the particular steel begins to solidify, plus the loss of temperature from when the reading is taken to when the steel gets to the farthest end of the thinnest section in the casting. A further query to this second part of the question invariably was: "But how are we to know what these two values are?" The first value depends on the composition of the steel, the carbon contents being the principal factor. This can be obtained by reference to a standard carbon-iron curve, such as shown in the accompanying illustration. For a steel containing 0.25 per cent. carbon, trace the line A B till it intersects at C, giving a value on this curve of 1492 degrees Cent. (2720 degrees Fahr.); for a steel containing 0.65 per cent. carbon, trace the line D E till it intersects at F, giving a value 1476 degrees Cent. (2690 degrees Fahr.), and so on. For other elements in the steel commonly used in castings the variation is not of importance and does not compare with the many other sources of error that crop up in reading the temperatures of molten steel in a foundry. The second value depends upon such variables as the heat of the ladle, the thickness of ladle lining, time of reading to pouring, whether molds are of dry or green sand, and thickness and lengths of the thinnest sections. All of these factors depend very much upon local conditions, and it is regarding this problem that constant consultation between the man responsible for the steel in furnace and the man responsible for making up the molds is so valuable. Final results are only obtained by the constant comparison of the quality of the final castings with the results obtained by their methods of reading the temperatures of the steel.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question.—I am operating a nickel solution which was made by my predecessor and which is supposed to be a single nickel salt solution. No serious difficulty has been experienced with this solution until quite recently. The nickel deposits which form on lower ends of the pieces being plated cracks and chips off very badly. I notice this more particularly where the work is of such a nature as to allow only a comparatively small amount of work to comprise a load. In addition to this cracking, I occasionally have a run of work which blisters in patches, these patches are usually at or near the lower portion of the piece as it is suspended in the solution, blisters are very fine but sufficient numbers to ruin the finish and necessitate replating the piece. Our work is all electro-cleaned, swabbed and copper-plated previous to nickeling and same methods are now used as formerly when these difficulties were unknown.

Answer.—Evidently your predecessor left the solutions in a very good condition and you have probably kept them going nicely by adhering to common sense practice, but, now the time has come when you must act for yourself if you hope to succeed. The nickel solution is composed largely of single nickel salts, there is little doubt about that, as the description you give of the results obtained strongly indicates such a solution. To stop the chipping, you may proceed as follows: Heat the solution to about 150 degrees fahr. or even to boiling point and neutralize the acidity by use of plastic carbonate of nickel, place a quantity in a cheese-cloth bag and move the bag with a jerky motion vigorously through the solution. The excess acid in the solution will take up the carbonate, forming nickel sulphate and increase the metal strength of the solution. When the solution is neutralized, test with a hydrometer if the solution density is less than 12 degrees Be; dissolve single nickel salts sufficient to increase the density to the above-mentioned density. Neutralize again and replace in tank. The solution will be ready for use as soon as settled. Straining the solution as it is replaced in tank is advisable. Excess current is often used in single nickel salt solution when not intended as the deposit shows little indication of the danger limit unless the solution is quite acid, in which case the extreme lower portion of the cathode is unusually smooth and bright on polished surfaces. Do not force the deposit, possibly the current density which you employ on lighter loads is a little in excess of the actual safe limits of the solution at normal temperature. If the anodes in this solution are not disintegrating in a satisfactory manner add 2 ounces of magnesium sulphate, or same amount of sodium chloride per gallon of solution in the tank. Keep anode surface clean and equal in area to the maximum cathode surface area which is processed in the tank. The small blisters which you mention are not in the nickel, they are due to a non-adherent condition of the copper deposit. There may be one or more of several reasons for this condition, the more probable reasons will be given here. An electric cleaner operated with direct current will cause a film to form over steel surfaces if the current is allowed to pass too long or the solution is old or contaminated with chemicals foreign to the composition, or by excess animal or vegetable matter introduced by means of polishing or buffing compounds on work being cleaned. This film is often very difficult to remove, and if the work is processed in usual manner following too long treatment in electric cleaner it is easily possible to unconciously copper plate a film-coated surface which will blister; usually these blisters may be detected by mere casual inspection after rinsing from copper solution. Careless swabbing or scouring will result in blistered copper plate if the work really requires swabbing. Cyanide copper solutions deficient in cyanide will often yield blistered deposits, especially when current is not carefully adjusted. The same solution may yield blistered deposits if the pre-cyanide content is too great and an excess current causing violent liberation of hydrogen is used. Clean the work quickly, 5-minute immersions in electric cleaners is poor practice, swab or scour in systematic manner; use cyanide dips at least 5 degs. Be. Maintain uniform balance in copper solution; watch the anodes, do not allow them to become heavily coated with black scale, nor too bright, a clean dull pink copper color is desirous. Solution should be light straw color and never allowed to become pale green. Allow at least one hour to pass after any appreciable addition to the copper solution before operating the bath for plating. Keep the solution as simple as possible and avoid conditions which have a tendency to gradually increase the density of the solution, a cyanide copper solution standing from 4 deg. Be to 5 deg. Be will prove more satisfactory for general purposes than a solution which registers 10 deg. Be or higher. Many apparently hopeless cases of cyanide copper plating troubles have been quickly and permanently remedied by simply reducing the density of the solution to a small fraction of the density employed. A dense cyanide copper solution has no advantages worth mentioning.

* * *

Question.—During my plating experience of ten years I have always used a cyanide dip after cyanide copper-plating previous to nickeling. About two months ago I was induced to try the muriatic acid dip as a substitute for cyanide dip. The muriatic dip is used rather strong and has given perfect satisfaction except in one respect. An objectionable film forms on the surface of the solution and if work is immersed through this film the subsequent nickel deposit proves non-adherent. It is quite a task to keep the surface of the dip free of film by constantly skimming with paper, and I have tried to prevent the formation of the film by using the dip at various densities, but with no success. The film forms even worse when sheet steel stampings which are not coppered are dipped. Kindly pass this on to your correspondent for some suggestion which may prove helpful to me.

Answer.—The effectiveness of diluted muriatic acid when employed as a final dip for any metal previous to nickel-plating is undoubtedly much greater and the results more satisfactory than when cyanide is used for some purpose. There is, however, one objection to the acid dip when used for commercial plating, and that objection is the film formation which you mention. Hundreds of platers use the acid dip carelessly and totally unmindful of the presence of a dangerous film and wonder at the frequency of failures in spite of their intended attention to details. In one large plant where the muriatic dip is employed daily on a great variety of steel, copper and brass, the problem has been solved by a very simple method. Instead of using a combination of muriatic acid and water, sulphuric acid is added as follows: To prepare a 30-gallon dip, measure out 15 gallons of lake, river, or rain water and add 8 gallons of commercial muriatic acid, mix well and then add slowly 4 gallons of commercial sulphuric acid; mix well and test with hydrometer. If a stronger dip is required, add acids in above proportions, if weaker dip will suffice, add water to make up full quantity. In replenishing it is usually advisable to add muriatic frequently in small

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. O. Holtham, 245 University Avenue, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

quantities and make additions of sulphuric acid only occasionally; water is never added after dip is prepared as the solution density gradually diminishes by loss in drip and absorption of moisture from the air. A dip of this composition will not become covered by an objectionable film if the work immersed is reasonably clean. It can be made strong enough for any ordinary final dipping or as weak as any simple 5 per cent. muriatic acid dip. It acts quickly, cleanly and is productive of no injurious effects to work or plating bath as a result of hasty rinsing. Possibly you might prefer a 10 per cent. solution of hydrofluoric acid. This is used by many very particular platers with splendid results.

* * *

Question.—Kindly inform me at what density Beaume scale should a single nickel salt solution be operated at to obtain best results. Our work is sheet brass stampings of plain design with a few circular-shaped perforations; work is hung on brass wire holders and is cleaned in electro-cleaning bath. We deside a deposit which will resist ordinary wear such as met by usual automobile accessories, for at least one year. What would you consider a reasonable time for such work to remain in the nickel bath?

Answer.—A reply to your query might easily include a rather lengthy article as there are many varieties of single nickel salt solutions. A strictly nickel sulphate plating solution made from two pounds of the sulphate crystals and the necessary chemicals usually employed is often operated at 16 degrees Beaume. The deposit from such a solution may be quite white, silvery and fine grained, yet brittle if allowed to become thick enough to endure buffing operation and reasonable wear for one year. If this solution be operated hot or even warm the deposits will be less brittle, the color darker and the grain coarser unless the current density is increased as the temperature increased, in which case the plate will be brittle, color dark and the grain coarse. Much depends upon the nature of the corroding salt employed and the quantity of same. Boric acid is almost indispensible in solutions ofthis type and the quantity required per gallon of plating solution will depend largely upon the class of work to be plated and the finish desired. We would not advise a bath of this type for your class of work unless the acidity was reduced to a very weak point. A bath containing two-thirds single nickel salt and one-third double nickel salt, together with either magnesium sulphate, sodium chloride or ammonium chloride and boric acid would be preferable for your purpose, and in case your solution is of this type we may say, construct your holders in a manner which will facilitate placing maximum surface area of work in bath per load, keep corners, edges, etc., equally remote from anodes and aim to plate with at least 10 amperes per square foot. To do this may require a denser solution than would suffice for other work hung in different manner. By proper management you can build the solution to at least 18 degrees Beaume, or even 22 degrees Beaume, and operate with high current density at moderate temperature, obtaining a very rapid deposit which will be white, tough, firm and adherent if the duration of plating treatment is not prolonged beyond 30 minutes. A 15-minute plate should be amply sufficient. Possibly you may have some difficulty with the buffing at the outset, but train the buffing lathe operator to use less pressure than would be permissible on strictly plain work. Half of the failures attributed to the nickel plate by the public may be traced directly to unskilled buffers. Thousands of gallons of single nickel salt solutions are being operated every day at a density not exceeding 10 degrees Beaume, such practice is not economical, a few pounds more of the single salts would strengthen up the baths to a point where time and material could easily be saved by increased efficiency of the bath and greater speed of deposition. Operate your single salt solutions at the highest density possible to obtain best deposits in reasonable time. Electrode distance, current available, temperature of solution and manner of suspending cathodes in bath will all have an important bearing of how concentrated your solution may be operated most economically. If deposit chips, flakes off, or is otherwise non-adherent, neutralize the acidity and increase the temperature or reduce the current. Single salt nickel solutions have been heralded as being self-sustaining. If you work them beyond very easily overstepped limits they will prove to be very expensive to sustain. Go slow until you get acquainted with their characteristics.

* * *

Question.—In the plating room where I am employed there are two small dynamos, one is connected to the nickel tanks, two in number, and the other dynamo a rather old type, is connected to the copper tanks and the electric cleaning tanks. There is no instrument of any kind to measure current, etc. The manager says he will buy an ammeter if I can use it on both circuits. I have tried to figure out how this could be worked with practical results but am of the opinion that it would not be successful. Will you kindly tell me what you think of the idea?

Answer.—You can instal an ammeter so that readings may be taken from both circuits, but we believe such an installation would prove to be more expensive than the installation of two separate ammeters. Judging from your letter we assume that a 400-amphere ammeter would be large enough for your requirements and these may be obtained in small sizes calibrated in 10-amphere divisions or less and are very satisfactory instruments if used with ordinary care. To use one ammeter on two circuits would require four single-pole double-throw switches of sufficient size to carry maximum current used on either circuit. These switches operate on two dummy sections of the circuits, the ammeter being placed centrally between the two negative lines from the machines. The cost of four switches will easily exceed the cost of small ammeter, therefore we would advise the purchase of the two ammeters for your purpose.

* * *

Question.—We have been manufacturing a wrench of the spanner type and finishing it in white nickel, that is, we merely tumble the wrench after hardening and nickel-plate about thirty minutes. This produces a dead-white surface which becomes badly soiled by handling and does not present a very pleasing appearance when offered for sale. We have decided to change the finish on this line and have under consideration a black coating or finish. We have experimented with oil dips, etc., to no purpose, and our plater suggests a dip made from copper and ammonia, but he cannot furnish the formula. May we ask you to assist us by publishing a suitable formula for our requirements?

Answer.—The copper-ammonia dip suggested by your plater would not answer unless you copper-plate the wrench, and in case you did this the process would be more expensive than the sulphurette dip, and the result would not be any better for your purpose. If you obtain a smooth clean surface upon the wrench by tumbling we would suggest that you try dipping in a molten bath of potassium nitrate containing about 2 per cent. of black manganese dioxide. This bath is used at temperatures ranging from 700 to 800 degrees Fahr. according to the size of the wrench. Black nickel is the most successful finish for steel surfaces in use to-day. It cannot be regarded as rust-proof but is a very pleasing finish for articles such as you produce. Possibly the Parker process would serve you satisfactorily. We would advise you to discard the idea of using the ammonia method and try black nickel. The ammonium sulpho-cyanate and zinc sulphate black nickel solution is the one usually employed.

* * *

Question.—During the past few years a large quantity of scrap nicked holders have accumulated in our storehouse. We are desirous of disposing of the material and have been informed that it is worth considerable more than scrap steel. We have been unable to get a buyer for this nickel scrap and would appreciate any information which you may be able to furnish us relative to its market value or where to find a buyer.

Answer.—We regret to have to tell you that the market value of the scrap nickel holders is practically the same as for scrap steel. A few years ago large plating plants found a ready market for the scrap among scrap metal buyers and obtained a price which made it worth saving, but times have changed and there is no demand for it. The average scrap holder will show the following proportions of metal by analysis: Nickel, 57 per cent.; iron, 38 per cent; copper, 5 per cent. If you have a very large tonnage of the scrap it may pay you to make an extra effort to get a purchaser for the scrap as nickel dross, otherwise we would advise selling with scrap steel and obtain the use of storage space it now occupies.

STELLITE AND FESTEL METAL

Continued from page 187

steels were not new. Without going into details, I will say that I later made a second application, and that about fifteen days later. Mr. Brearley filed an application for practically the same thing. The United States Patent Office granted a patent to Mr. Brearley on the ground that his application contained a provision that it was necessary to polish and harden the steel in order to render it immune. This, however, was later found not to be correct, and in May of this year practically all of the claims in the application of the writer were granted by the Patent Office.

A personal service corporation was formed in this city, to which both the Haynes and Brearley patents were assigned, and licenses have now been granted to the principal steel makers for the manufacture of stainless steel under these patents. This corporation is the American Stainless Steel Co., with offices at present in the Oliver Building, Pittsburgh.

Stainless or rustless steel consists essentially of an alloy of iron and chromium, containing usually from 0.1 to 1 per cent. of carbon, though the latter element may be present up to nearly 2 per cent. without interfering seriously with the working qualities of the steel.

Owing to the high percentage of chromium and its tendency to oxidize at the melting point, even in the presence of carbon, it has been found advisable to melt the steel either in crucibles or in the electric furnace. After melting, the metal may be poured into ingot molds in the usual manner, and the ingots thus obtained may be forged or rolled into bars or sheets. If the ingots are of comparatively small size, they will be found to be very hard after casting, especially if they have been stripped hot and allowed to cool rather rapidly in the air. Indeed, small bars thus produced are likely to be almost file hard.

Production of Pig Iron and Steel in 1919

THE total production of pig iron in Canada in 1919 excluding the production of ferro-alloys was 917,346 short tons (819,059 gross tons), having a value of $24,536,432 as compared with a total production in 1918 of 1,195,551 short tons (1,06,456 gross tons) valued at $33,495,171 showing a failing off of 278,205 tons, or 23 per cent. Of the 1919 total 910,080 tons were made in blast furnaces and 7,266 tons (subject to revision) were made in electric furnaces from scrap metal, chiefly shell turnings. In 1918 the blast furnace production was 1,163,510 tons and the electric furnace production from scrap steel was 32,031 tons.

The production of blast furnace pig iron in Nova Scotia in 1919 was 285,087 tons as against 415,870 tons in 1919 and with the exception of 1914 was the smallest production in that province since 1905. In Ontario the production of blast furnace pig iron was 624,993 tons, as against 747,650 tons in 1918. Although less by 16 per cent. than in the previous year, the 1919 production in Ontario was exceeded in only four previous years.

Less than one quarter as much pig iron was made from electric furnaces from scrap steel as in the previous year the output being derived from six furnace plants in 1919 as compared with ten plants operated in 1918.

By grades the 1919 production included: Basic, 580,426 tons; Bessemer, 7,637 tons; foundry and malleable, etc., 322,017 tons; low phosphorous iron (electric furnace), 7,266 tons. The 1918 production included: Basic, 966,409 tons; Bessemer, 15,415 tons; foundry and malleable, etc., 181,696 tons; low phosphorous iron (electric furnace), 32,031, tons.

The blast furnace plants operated included those of the Dominion Iron and Steel Company at Sydney, N.S.; The Nova Scotia Steel and Coal Company at North Sydney; The Standard Iron Company at Deseronto, Ont.; The Steel Company of Canada at Hamilton, Ont.; The Canadian Furnace Company at Port Colborne, Ont.; The Algoma Steel Corporation, Ltd., at Sault Ste. Marie, Ont.; The Midland Iron and Steel Company at Midland, Ont., and the Parry Sound Iron Company, Ltd., at Parry Sound, Ont.

Electric furnaces were operated for the production of pig iron from scrap at Hull and Shawinigan Falls in Quebec, at Belleville and Welland in Ontario, and at Vancouver, British Columbia.

The production of ferro-alloys in Canada in 1919 including ferro-silicon, silico spiegel, spiegeleisen and ferro-phosphorus, all with the exception of the speigeleisen being made in electric furnaces, was about 48,579 tons valued at $1,998,779. In 1918 the production was 44,704 tons valued at $4,731,521. Over one-half the tonnage made in 1919 was speigeleisen made by Algoma Steel Corporation for the company's own use.

The exports of pig iron during 1919 were 63,605 tons valued at $1,820,260, or an average of $28.62 per ton and of ferro-alloys 22,449 tons valued at $1,229,341, or an average of $54.76 per ton. The exports of pig iron included 57,845 tons to the United States; 783 tons to Chili; 7 tons to Japan, and 4,970 tons to other countries. The ferro-alloy exports included 2,564 tons to United Kingdom; 15,371 tons to United States; 4,514 tons to other countries.

The imports during 1919 included 35,800 tons of pig iron valued at $1,022,871, or an average of $28.80 per ton, and 16,221 tons of ferro-alloys, valued at $901,678, or an average of $55.58 per ton, making a total import of pig iron and ferro-alloys of 52,021 tons valued at $1,924,549. The United States trade records show exports to Canada during 1919 of pig iron and ferro-alloys amounting to 33,751 gross tons (37,801 short tons), valued at $1,052,103.

Steel

The total production of steel ingots and direct steel castings in 1919 subject to possible slight revision, was 1,031,329 short tons (920,844 long tons), of which 904,349 tons were ingots and 39,980 tons direct steel castings.

The total production in 1918 was 1,873,708 short tons (1,672,946 long tons), of which 1,800,171 tons weer ingots and 73,537 tons were castings.

The 1919 production included: Open-hearth steel, 1,008,540 tons; electric steel, 15,467 tons; crucible and converter steels, 7,322 tons. The 1918 production included: Open-hearth steel, 1,746,334 tons; electric steel, 119,130 tons; crucible and converter steels, 8,244 tons.

The total production of electric furof which 1,800,171 tons were ingots and in 1916, 19,639 tons.

The total production of pig iron, ferroalloy and steel in electric furnaces was about 43,540 tons in 1919 as compared with 191,869 tons in 1918 and 101,031 tons in 1917.

The exports of steel during 1919, as per Customs Department records included billets, blooms and ingots 28,087 tons valued at $1,731,529, or an average of $61.65 per ton; bars and rods, 52,191 tons valued at $3,394,894, or an average of $65.05 per ton; steel rails, 30,737 tons valued at $1,297,836, or an average of $42.22 per ton; wire and wire nails valued at $5,745,773; structural steel, 5,515 tons valued at $465,989, or an average of $84.49 per ton; scrap iron and steel, 245,214 tons valued at $3,779,179, or an average of $15.41 per ton, together with a large quantity of manufactured iron and steel goods.

The production of rolled iron and steel products in 1919 included: Steel rails, 316,304 short tons; plates and sheets, 25,408 short tons; wire rods, 153,723 short tons and structural shapes, 29,295 short tons, and a large tonnage of iron and steel bars, rods, etc., for which returns are not yet complete. The total production in 1919 of finished rolled products was 1,146,610 short tons, which included steel rails, 162,747 tons; wire rods, 154,789 tons; merchant bars and rods and structural shapes, 415,017 tons; plates and sheets, 26,413 tons; rolled blooms and billets for forging purposes and rolled blooms, billets, or slabs sold for export, 395,644 tons.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$42.40	
Lake Superior charcoal, Chicago	57.00	
Standard low phosphorus, Phila.	50.00	
Basic, Valley furnace	42.90	
Canadian Foundry Pig—		
	Mont.	Tor.
No. 1	55.50	53.50
No. 2	54.50	52.50

NEW METALS

	Mont.	Tor.
Lake copper	$25.00	$24.00
Electro copper	24.50	24.00
Casting copper	24.00	24.00
Tin	72.00	65.00
Zinc	12.00	12.00
Lead	11.50	11.00
Antimony	14.50	14.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$15.00	$14.00
Copper, crucible	18.00	18.00
Copper, heavy	18.00	18.00
Copper, wire	18.00	18.00
No. 1 mach. comp	16.00	17.00
New brass cuttings	11.00	11.75
Red brass cuttings	14.00	15.75
Yellow brass cuttings	8.50	9.50
Light brass	6.50	7.00
Medium brass	8.00	7.75
Scrap zinc	6.50	6.00
Heavy lead	7.00	7.75
Tea lead	4.50	5.00
Aluminum	19.00	20.00
	Per gross ton	
Heavy melting steel	18.00	18.00
Boiler plate	15.50	15.00
Axles (wrought iron)	22.00	20.00
Rails	18.00	18.00
Malleable scrap	25.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	12.00	12.00
Car wheels	22.00	26.00
Steel axles	22.00	20.00
Machine shop turnings	11.00	11.00
Stove Plate	26.50	25.00
Cast borings	12.00	12.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¼
Acid, nitric	.10
Acid, sulphuric	.03¼
Ammonia, aqua	.15
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.16
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.08
Nickel carbonate	.32
Nickel sulphate	.19
Potassium Sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.11
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite, per cwt.	8.00
Sodium phosphate	.18
Tin Chloride	1.00
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.60
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.09
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09
Crocus composition	.12
Emery composition	.10
Rouge, silver	.60
Rouge, powder, nickel	.45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$42.50	$43.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	46.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	48.00	48.00
Copper sheet, planished, 16 oz. base	46.00	45.00
Braziers', in sheets, 6x4 base	45.00	44.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.75	$14.50
Sheets, 3½ lbs. sq. ft.	10.50	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.25	13.50
Cut sheets, ½c lb. extra.		
Cut sheets to size, 1c lb. extra.		

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 8.50	$ 9.50
Sheets, black, No. 10	8.50	9.00
Can. plates, dull, 53 sheets	8.50	10.00
Can. plates, all bright	8.60	9.00
Queen's Head, 28 B.W.G.	11.00	....
Fleur-de-Lis, 28 B.W.G.	10.50	....
Zinc sheets	16.50	20.00

FOUNDRYMEN'S EXHIBIT GROWS

In a bulletin to exhibitors just issued by C. E. Hoyt, secretary of the American Foundrymen's Association, the encouraging information is given that exhibit space in excess of 51,000 square feet has already been contracted for, with 85 of last year's exhibit yet to be heard from. This advance space reservation is within 9,000 square feet of the total space used at the Philadelphia exhibit last year, and indicates beyond all question of doubt that the Columbus convention and exhibit will be the greatest in the history of the Association.

Quite a number of new exhibitors will be on hand this year especially along the general shop equipment and machine tool lines, as there is a growing appreciation of the extraordinary purchasing power represented in the A. F. A. attendance, aside from strictly foundry requirements. This is due to the fact that a good share of the men interested in the foundry meetings also operate machine shops.

A striking feature of these annual foundrymen shows is the large per centage of operating exhibits demonstrating the equipment by duplicating actual working conditions. Last year more than 50 per cent. of the 206 exhibitors used power, 170 motors being in operation and 31 exhibitors using compressed air for demonstrating purposes. With the increased space available this year, at the Ohio State fair grounds, where both convention sessions and equipment exhibts will be held, the number and size of operating exhibits will undoubtedly far exceed any previous year.

CONVENTION DATES FAVOR CO-OPERATION

This year the annual convention and exhibit of the American Foundrymen's Association will be held in Columbus during the second week following the annual convention of the American Steel Treaters' Society in Phladelphia. This will permit attendance at both meetings on the part of many men who are interested in both organizations.

A consolidated car shipment direct from the Philadelphia exhibit to the Ohio State Fair Grounds in Columbus will also perimt exhibitors to display and demonstrate their products at both gatherings.

The convention date of the Steel Treaters' Society is September 14-18, while the Foundrymen convene the week of October 4th.

A. F. A. OUT FOR NEW MEMBERS

Plans for an aggressive campaign for new members have been formulated by the 1920 Promotion and Membership Committee of the American Foundrymen's Associaton. The campaign will be handled from the Association Headquarters Office, in Chicago, and covers three months, culminating in a special "Foundrymen's Week" during September and the annual convention in Columbus, Ohio, the week of October 4th.

Coming Back to Canada.—Building trades mechanics who crossed to England following the armistice, in considerable numbers, are coming back to Canada, according to John Cottam, secretary of the Toronto union of carpenters. "Each steamship arrival brings old members back along with a number of new faces. They all tell the same story," said Mr. Cottam. "They say that work is plentiful in the skilled trades, but that living is very high and that the housing problem is very serious."

OFFERED $20 TON FOR OCEAN RATES

Local Dealers Would Like to Sell Into the Old Country Scrap Market at High Prices

TORONTO.—A great deal depends on power, and supplies, as far as the industrial life of this district is concerned. Many of the shops are constantly in trouble with the shutting off of their power. When this takes place the shop generally has to pay the men, as it is no fault of theirs that there is no juice on hand. Expenses go on just the same but there is no output. When this takes place many times in a plant where there are some hundreds of employees it becomes a serious matter. Add to this the shortage of material, and the shortage of coal, and it makes a condition that is none too favorable to getting ahead with the work.

But in spite of all these things there are buyers in the market, and there are inquiries and prospects, which, if only a fair percentage of them turn out to be good, will mean a nice booking for the early fall.

One of the leading makers of machine tools in the United States has announced a further increase this week. It has been some days since any advances have been made, and dealers have come to regard the machine tool market as more stable, and if anything have been anticipating some marking down.

Deliveries are reported by several firms as having shown quite a decided improvement during the week, and shipments are coming in from points now that have been particularly affected by the strike on United States roads.

Old Country firms are also getting better treatment in this matter of getting their goods over here, and one firm has opened a warehouse with the assurance that it will have a good line of material to show under power.

Several sales have been made recently owing to the placing of better machinery in certain plants, and it is likely that this will account for several more sales. Where the salesman can show how a shop operation can be turned out more efficiently, and where time and expense can be saved by the placing of new machinery, he can always get an audience, and there is undoubtedly a disposition on the part of plant executives to favor the better machine that has all the new and approved ideas.

Prices More Reasonable

There is every reason to believe that any price movement that takes place in the steel market will be toward a downward revision.

That is not a guess, but the statement of one of the largest warehouse firms in this district. One bit of evidence is given in the experience of this firm in the matter of sheets from the premium mills. "A short time ago the only basis on which they would talk business to us," stated this firm, "was $8.50 base, while to-day the same people will gladly take on business at $6.50 base, and give us just as good service in the matter of delivery at the lower price as they were doing at the former price of $8. There are other lines, too, where we find that there is quite a marked tendency to give us better price treatment and a greater desire to do business than there has been for some time past." A good many sheets are selling this week around the basis of $10.50 per hundred for 28-gauge.

The matter of securing a good supply of bar mill material is becoming a question that is not easy to handle. The Canadian mills have a large tonnage on their books, much of it very urgent owing to the fact that it must be secured for certain seasons, and it is almost impossible for the mills here, owing to shortage of materials, to get the rollings through to satisfy the trade. Bars for some time were one of the best classes in the trade, but recently they have become one of the worst.

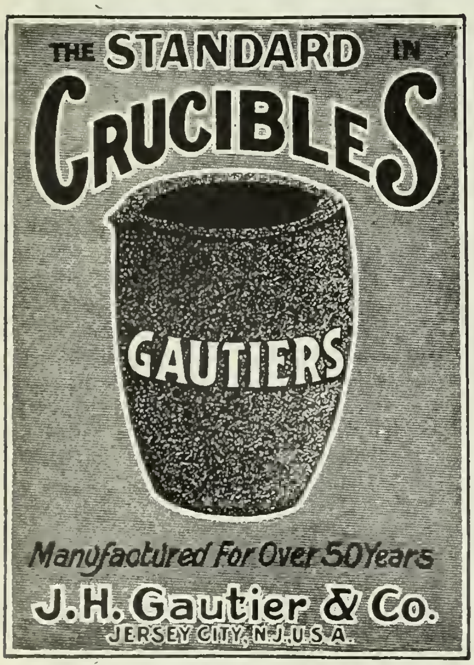
Old Country dealers are getting in shipments now that were ordered last November, and they are getting fairly good satisfaction in the matter of future deliveries, unless they go into the line of heavy duty machinery, when the time gets extended by some months. The supposition is that many of the large steel and iron plants on the continent are getting equipment ready to start operating again, and in this way there is an unusual demand for this class of equipment. Boring mills and heavy planers, for instance, are hard to secure unless the buyer is prepared to wait his turn.

Canadian dealers are experiencing a dull season in scrap metal in almost all their lines. Last week this paper published a letter from a Scottish iron and steel merchant, calling attention to the prices that were being paid by the ironmasters of that country for scrap lines, and noting the difference in price between their figures and what is offered here. Canadian Machinery took this matter up with one of the large yards here to-day, and inquired why it was that Caanadian scrap could not be sold profitably in Scotland under these circumstances.

"The explanation is simply this," was the reply, "we cannot ship to the Old Country because we cannot get bottoms to take our stuff. We have offered as high as $20 per ton to carry shipments of steel and iron scrap, but we can get no takers. So you see the price may as well be anything as far as we are concerned. It is a nice market, but we have no way to reach it now."

Coppers for a day or so seemed to show some strength, but the demand locally is weak. Any of these metals may seem to be worth more than the figures quoted at times, but the real touchstone as far as this market is concerned seems to be, "Do you want it, or don't you?" If there are no buyers wanting metals then the chances are that prices will stay down.

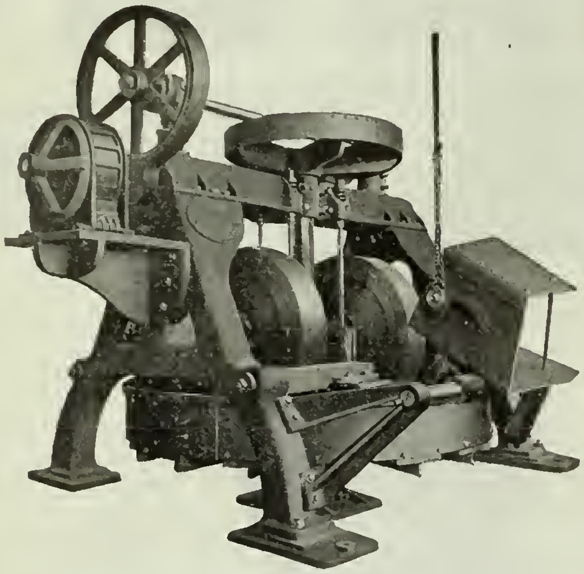
Molybdenite in Ontario.—There are several mines operating in Ontario recovering molybdenite ore. The International Molybdenum Company operated the Moran mine in Brougham Township, and also operate a concentrator at Renfrew and a smelter at Orillia. The Renfrew Molybdenum Mines have a property at Renfrew, which produced about 60,000 lbs. for the year. The Wilberforce Molybdenite Company, Ltd., has a property in the township of Cardiff. The Steel Alloys Company have a mine at Brougham.



Frost

Wet Pan Sand Mill

for Steel Foundries



The *Frost* Mfg. Co.

112 W. Adams St.
CHICAGO

MOLDERS' BOOT $6.00

— BEST IN THE WORLD

"Some" claim! But backed up with an iron-clad guarantee:
Money-back—without argument—if not satisfied.

Molders Solid Leather Boots: All Leather Heels—All Leather Inner Soles—All Leather Counters—All Leather Uppers—All strong stitching. Delivered by mail anywhere in Canada, $6 a pair.

Manufactured only by

C. H. WATT Amherst, N.S.

Do You Read These Advertisements?

Every advertisement in this magazine is worth reading. It is the product of some concern that is using a modern piece of selling machinery — technical paper advertising—to present most effectively to you the leading features of its line.

These advertisers are making it easier for you to buy intelligently with the least waste of your time and theirs. They realize that a sales force can not replace this service at equal cost. They know that advertising is good business, for the manufacturer who does not advertise cannot save the cost of advertising. Consistent advertisers are progressive merchandisers. They are saving your money and their own; and it pays to do business with them.

Don't miss your opportunities. These advertisements are interesting. Some are distinctly instructive, and a glance through them every month will keep you posted on the latest developments of Canadian Foundryman.

Speed and Ease Accomplished on a Heavy, Rigid

FORD-SMITH GRINDER

Heavy Type Floor Grinders

Our new line of floor grinders has been designed to put these machines on a really efficient basis. All types are of the strongest and most rigid construction. Even the highly skilled mechanic will find a great difference in the quality of the work and the ease and speed with which it is done.

Full specifications, prices and photographs will be mailed upon request.

The Ford-Smith Machine Co., Ltd.
HAMILTON, CANADA

Foreign Agents: W. E. Storey, London, Eng. British & Canadian Hydraulic Tube Co., Johannesburg, South Africa. Gollin & Co., Melbourne, Australia. McLeod & Co., Calcutta, India.

Quality
THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL
Service

The Publisher's Page

TORONTO JULY, 1920

Improving Our Service

THE Directors of the Canadian Press Association decided in 1919 that the MacLean Publishing Company was the largest newspaper organization in Canada and must therefore pay the highest annual fee to the Association. The Montreal "Star," with its two big weeklies, comes second, but the "Star" group had been doing business for 18 years before the MacLean Company began. While we have not the details upon which the Press Association based their decision, we understand they figured that the MacLean Company had a larger advertising revenue. This is not the case. Lord Atholstan's properties probably carry a third more business, use more paper and have a greater total circulation. The MacLean papers on the other hand get more revenue from circulation; have to pay perhaps three times as much in salaries and wages and show considerably less profit.

Good service to readers first and advertisers next has been the cardinal principle upon which the MacLean Company has been built. In doing this, every man, woman and junior apprentice on our staff has had a share. We have tried to gather about us and train the best experts in the country. Here is an example of what we are doing:

In the recent annual examinations of the Toronto Technical School, session 1919-20, in the Typography branch—that is the department where they learn how to set type—only 27 boys out of the whole city passed, of whom 10, or nearly 38 per cent., were boys of our own composing room, while in two out of the three classes, MacLean boys stood at the head.

Several of our papers are the best of their class in the world, but we are still far from satisfied with the service we are giving. As we can afford it, as the country grows, as our business grows, the service will be improved. We ask our readers to take these Technical School results as an evidence of our efforts to serve them better and better, for by giving a superior training to these boys we are laying the foundation for the still better work we hope to do in the future.

Readers can help us to give them a better service by sending in—direct to the President, Vice-President, or General Manager—criticisms and suggestions.

CANADIAN HART WHEELS

CUT FASTER LAST LONGER

than any other wheels on the market

ABRASIVE WHEELS
For
ALL PURPOSES

Our New, Modern Plant

WE SOLICIT
EXPORT
TRADE

Tell us the service you want performed and we will supply you with an abrasive wheel that will save you time, money and worry.

Send for one of our catalogues and tell us your troubles. We do the rest.

CANADIAN HART PRODUCTS, LIMITED

Successors to Canadian Hart Wheels, Limited

HAMILTON ONTARIO CANADA

CRANE FITTINGS

CRANE
LIMITED

HEAD OFFICE & WORKS
1280 ST PATRICK ST
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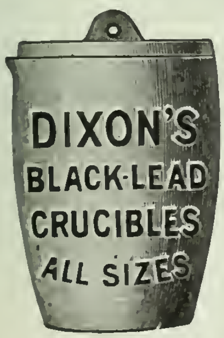
Branches: Toronto, Winnipeg, Vancouver
Sales Offices: Halifax, Quebec, Ottawa, Calgary

When you think of a crucible think of DIXON and remember that the Dixon name stands for the longest and widest experience in the crucible industry.



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Made in Jersey City, N.J., by the

JOSEPH DIXON
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Established 1827

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Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
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CORE OVENS—SEE OVENS

CORE SAND MIXER
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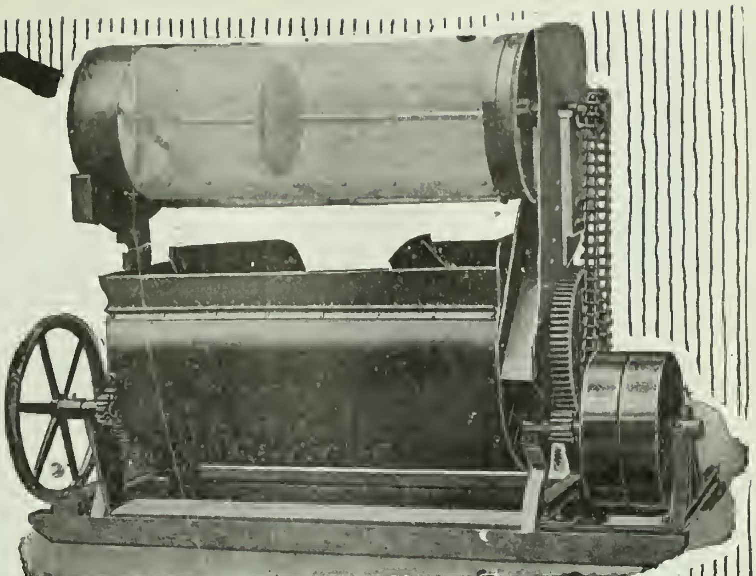
COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.



One Man With a Blystone, or Six With Shovels?

It has been proven that the Blystone Sand Mixer will do at least the work of six men mixing by the old shovel method.

Blystone—the only mixer with adjustable shovels

One man can mix core sand for 25 core makers and facing for 100 molders —*and it takes less than half his time.* Does your experience show that the six men could compete with shovels?

The demands of labour for higher wages presents the biggest problem to the foundrymen to-day. Nevertheless this problem can easily be solved in the sandmixing department. The Blystone offers the certain means.

"The Mixer That Shovels"

The Blystone shovels the sand over and over, throws it from one end of the drum to the other with each revolution of the shaft; every bit is thoroughly and evenly mixed.

Send for particulars of our 10 days' free trial offer and test a Blystone out in your own plant under your own conditions.

BLYSTONE MANUFACTURING CO.

620 Ironton St., Cambridge Spring, Pa.

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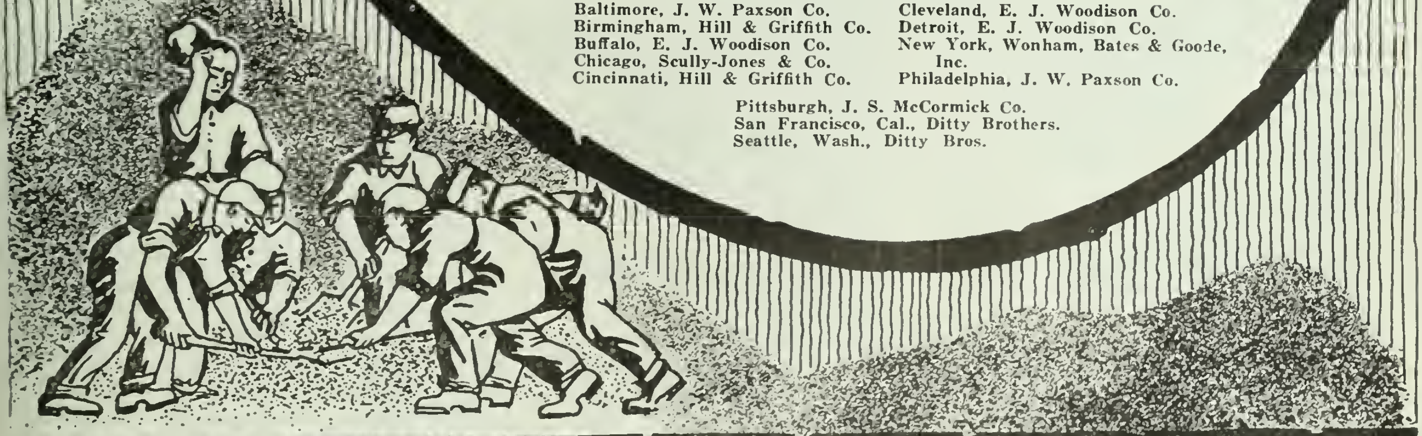
Buffalo, E. J. Woodison Co.
Chicago, Scully-Jones & Co.
Cincinnati, Hill & Griffith Co.
Cleveland, E. J. Woodison Co.
Detroit, E. J. Woodison Co.
New York, Wonham, Bates & Goode, Inc.
Philadelphia, J. W. Paxson Co.
Pittsburgh, J. S. McCormick Co.
San Francisco, Cal., Ditty Brothers.
Seattle, Wash., Ditty Bros.



A BLYSTONE Would Save the Wages of Five of These Men

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT ROCKOVERS
American Molding Mach. Co., Terre-Haute, Ind.

JOLT MACHINES AND SQUEEZERS
American Molding Mach. Co., Terre-Haute, Ind.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT STRIPPERS
American Molding Mach. Co., Terre-Haute, Ind.
Davenport Mach. & Fdry. Co., Davenport, Iowa.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Berkshire Mfg. Co., The.
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
The Cleveland Osborn Mfg. Co., Cleveland, O.
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND
Frederic B. Stevens, Detroit, Michigan.

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic . . Stevens, Detroit, Michigan.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

SAND RAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

NITROGEN
Dom. Oxygen Co., Toronto, Ont.

NOZZLES, SAND BLAST
Frederic B. Stevens, Detroit, Michigan.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACE BLOWERS
Roots Co., P. H. & F. M., Connersville, Ind.

OIL METERS
General Combustion Co., Montreal.

OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS
General Combustion Co., Montreal.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OXYGEN
Dom. Oxygen Co., Toronto, Ont.

PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.

PARTING COMPOUNDS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

PATTERNS
Frederic B. Stevens, Detroit, Michigan.
Montreal Pattern Works

PATTERN MAKERS' BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.

PATTERN MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP EQUIPMENT.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP MACHINERY
Preston Woodworking Machinery Co., The.

PATTERN WAX
United Compound Co., Buffalo, N.Y.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Steel Co. of Canada, Hamilton, Ont.

PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINT COMPOUNDS
Crane Ltd., Montreal.

PIPE, SOIL, AND FITTINGS
Crane Ltd., Montreal.

PHOSPHORIZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLANT AND MACHINERY
Ministry of Munitions, London, England.

PLUMBAGO
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphie, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PLATING AND POLISHING SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells Toronto.
Woodison, E. J., Co., Toronto, Ont.

PNEUMATIC TOOLS
Independent Pneumatic Tool Co., Montreal.
The Holden Co., Ltd., Montreal.

PNEUMATIC WINCHES
Holden Co., Ltd., The, Montreal.

PORCELAIN WARE
Crane Ltd., Montreal.

POWER JOLT SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

POWER SQUEEZERS
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.

PRODUCTION LATHES
Oliver Machinery Co., Grand Rapids, Mich.

PROTECTIVE WEARING APPAREL
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

PULLEYS, MAGNETIC

RAMMING PLATES AND MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Magnetic Mfg. Co., Milwaukee, Wis.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RETORTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES, ELECTRIC
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Woodison Co., E. J., Toronto.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Reynolds & Co., Toronto.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC HAMMER, COMPRESSION
Independent Pneumatic Tool Co., Chicago, Ill.

ROCK DRILLS
Holden Co., Ltd., The, Montreal.

ROLLOVER MACHINES
Davenport Mach. & Fdry. Co., Davenport, Iowa.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

ROTARY PUMPS
General Combustion Co., Montreal.

RIP SAWS
Preston Woodworking Machinery Co., The.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

SAND
United States Silica Co., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SAND MILLS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frost Mfg. Co., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chi cago, Ill.
Woodison Co., E. J., Toronto.

SANDBLAST ABRASIVES
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST ACCESSORIES
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison Co., E. J., Toronto.

SANDBLAST EQUIPMENT
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
United States Silica Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST GRIT AND SHOT
Frederic B. Stevens, Detroit, Michigan.
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST HELMETS
J. A. Spangler, Benton Harbour, Mich.

SAND BLAST SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
E. J. Woodison Co., Toronto.

SANDBLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.
Frederic B. Stevens, Detroit, Michigan.

SAND CONVEYING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST MACHINERY, BARRELS,
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Frost Mfg. Co., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SANDBLAST MATERIAL
Frederic B. Stevens, Detroit, Michigan.

SANDERS
Oliver Machinery Co., Grand Rapids, Mich.

SAND-MIXING MACHINERY
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.
Standard Sand & Machine Co., Cleveland, Ohio.
Woodison Co., E. J., Toronto.

SAND MILLS
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.

SAND MOLDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

SAND SIFTERS
Blystone Mfg. Co., Cambridge Springs, Pa.
Battle Creek Sand Sifter Co., Battle Creek, Mich
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton Ont
Preston Woodworking Machy. Co., Preston, Ont.
Woodison E. J. Co., Toronto, Ont.

SAND RIDDLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SAND SIFTERS, HAND
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.

SEPARATORS, MOISTENERS, OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SEA COAL
Obermayer & Co. S., Chicago, Ill.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SHAPERS
Oliver Machinery Co., Grand Rapids, Mich.

SHOT
Frederic B. Stevens, Detroit, Michigan.
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa
Woodison Co., E. J., Toronto.

SHOVELS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co. S., Chicago, Ill.
Woodison Co., E. J., Toronto.

SIEVES
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co. Ltd. Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SILICA WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SILICA ROCK, GROUND AND PULVERIZED
Can. Hanson & Van Winkle Co., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

SKIMMERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison E. J. Co., Toronto, Ont.

SLIP JACKETS
The S. Obermayer Co., Chicago.

SNAP FLASKS
Oliver Machinery Co., Grand Rapids, Mich.

SNAP FLASK BANDS
S. Obermayer Co., The.

SNAP FLASK BOTTOM PLATES
The S. Obermayer Co., Chicago.

SNAP FLASH JACKETS
S. Obermayer Co., The.

SNAP FLASK TRIMMINGS
The S. Obermayer Co., Chicago.

SNAP FLASKS, WOOD, CHERRY AND OAK
The S. Obermayer Co., Chicago.

SNAP MOLD JACKET
The S. Obermayer Co., Chicago.

SMALL ANGLES
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SPEED LATHES
Oliver Machinery Co., Grand Rapids, Mich.

SPELTER BOWLS
Can Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

SPRAYERS
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SPRUE CUTTERS
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZERS, POWER AND HAND
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison E. J. Co., Toronto, Ont.

STEAM TURBINES
General Combustion Co., Montreal.

STEEL, CRUSHED
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL GRIT
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

STEEL BANDS
Woodison Co., E. J., Toronto.

STEEL BARS, ALL KINDS
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

STEEL PLATES
Pangborn Corporation, Hagerstown, Md.
A. C. Leslie & Co., Limited, Montreal, Que.

STEEL RAILS
Can. Hanson & Van Winkle Co., Toronto, Ont
Woodison, E. J., Co., Toronto, Ont.

STIRRERS, GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

STONES, RUBBING AND OIL
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont
Can. Hart Wheels, Hamilton, Ont.

SURFACE PLANERS
Oliver Machinery Co., Grand Rapids, Mich.

SWING
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

SWING GRINDERS
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Woodison Co., E. J., Toronto.

SWING SAWS
Oliver Machinery Co., Grand Rapids, Mich.

SWITCHES, I-BEAM
Curtis Pneumatic Machy. Co., St. Louis, Mo.

TANKS, OIL AND WATER
Frederic B. Stevens, Detroit, Michigan.

TALC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

TENONERS
Oliver Machinery Co., Grand Rapids, Mich.

TESTS OF MATERIALS
Hersey Co., Ltd., Milton, Montreal, Que.

TEEMING CRUCIBLES AND FUNNELS
Can. Hanson & Van Winkle Co., Toronto, Ont

TOOLS, PNEUMATIC
Independent Pneumatic Tool Co., Chicago, Ill.
Keller Pneumatic Tool Co., Chicago, Ill.

TONGS, SHAKE OFF
Diamond Clamp & Flask Co., Richmond, Ind.

TRACK, OVERHEAD

TROLLEYS AND TROLLEY SYSTEMS
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

TRIPOLI
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

TROLLEYS, SINGLE I-BEAM
Curtis Pneumatic Machy. Co., St. Louis, Mo.

TRUCKS, DRYER AND FACTORY
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

TURNTABLES
Can. Hanson & Van Winkle Co., Toronto Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.

TURPENTINE
Reynolds & Co., Toronto.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

UNIONS
Crane Ltd., Montreal.

VALVES (IRON), STANDARD, EXTRA HEAVY
Crane Ltd., Montreal.

VALVES, PRESSURE SEATED (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

VACUUM PUMPS
Holden Co., Ltd., The, Montreal.

VENT WAX
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

VIBRATORS
Berkshire Mfg. Co., The.
Frederic B. Stevens, Detroit, Michigan.
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

WALL CHANNELS
Frederic B. Stevens, Detroit, Michigan.
Can Hanson & Van Winkle Co., Toronto, Ont
Woodison, E. J., Co., Toronto, Ont

WELDING AND CUTTING SUPPLIES
Dom. Oxygen Co., Toronto, Ont.

WHEELBARROWS
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

WHEELS, GRINDING
Can. Hanson & Van Winkle Co., Toronto Ont
Can Hart Wheels, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont
Woodison, E. J., Co., Toronto, Ont.

WHEELS, POLISHING, ABRASIVE
Can Hanson & Van Winkle Co., Toronto, Ont
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison E. J., Co., Toronto, Ont.

WIND GATES
Roots Co., P. H. & F. M., Connersville, Ind.

WIRE WHEELS
Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd. Toronto Ont
Hamilton Facing Mill Co., Hamilton, Ont.
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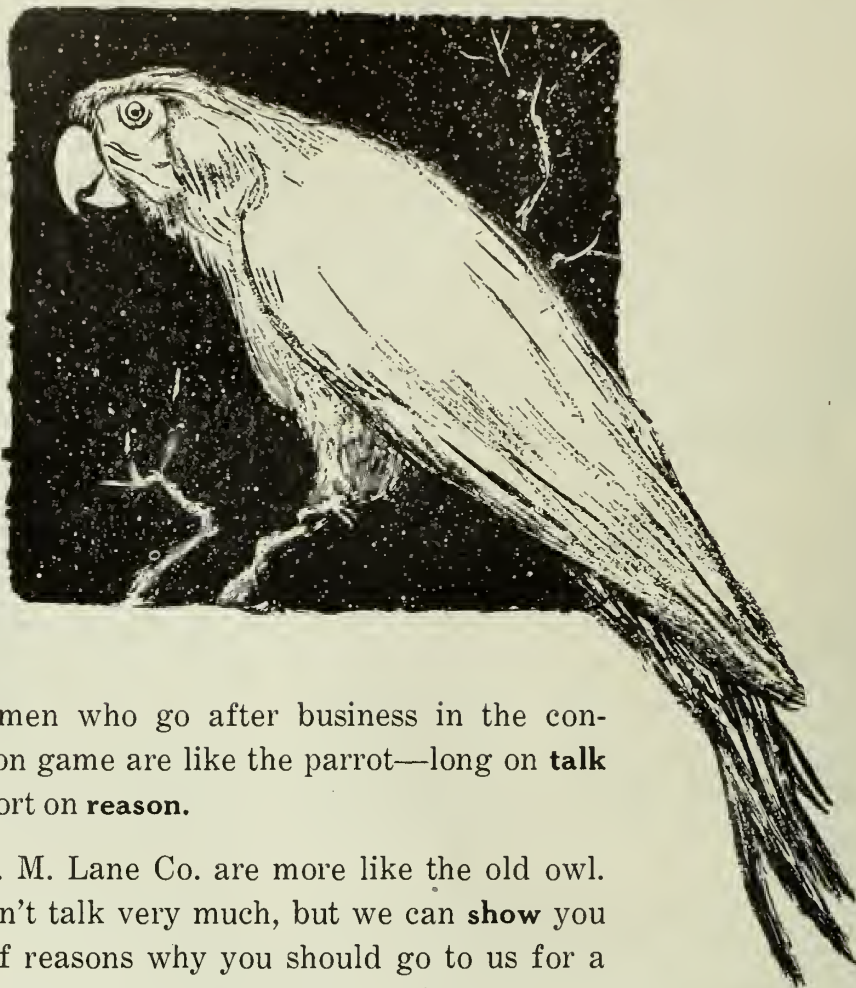

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XI. No. 8 PUBLICATION OFFICE, TORONTO, AUGUST, 1920 Subscription Price Two Dollars

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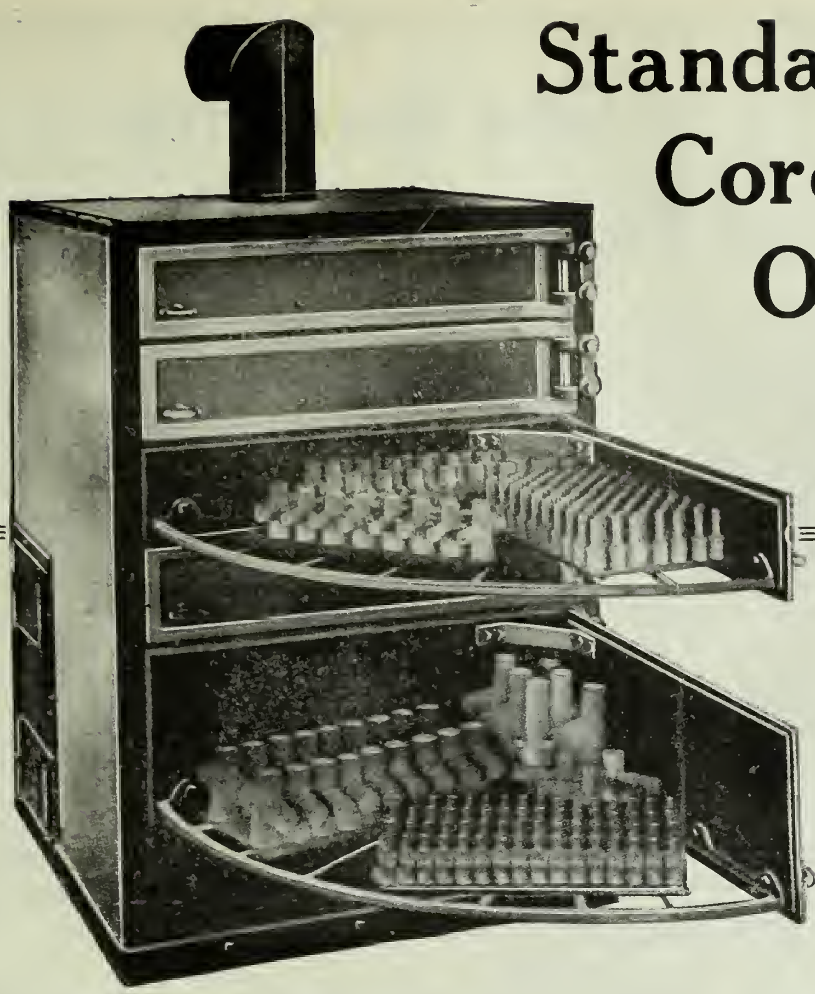

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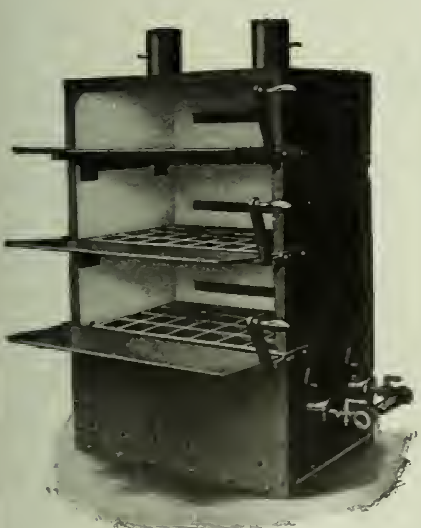

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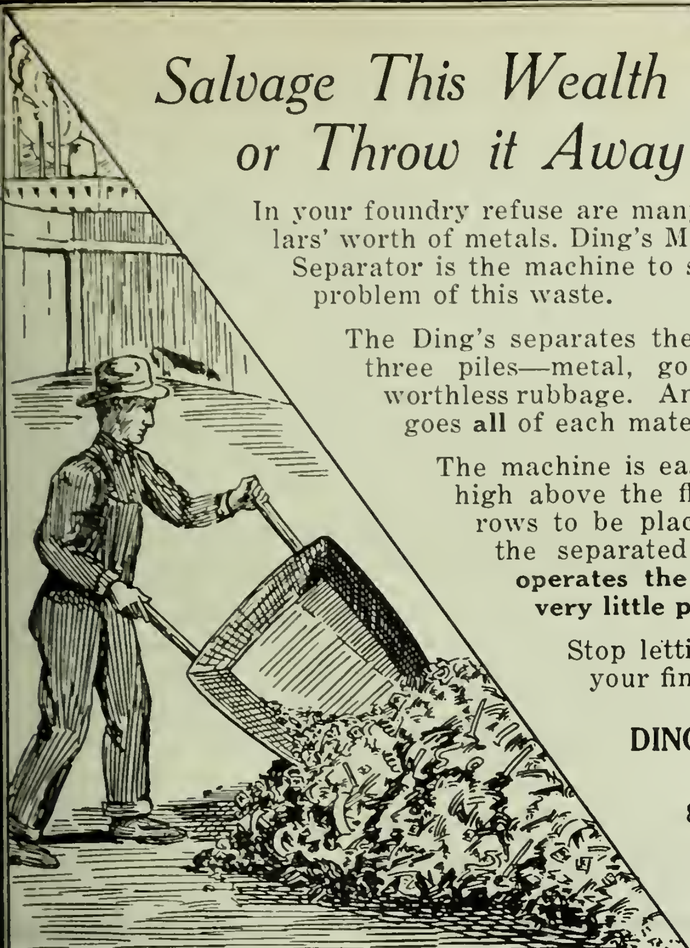
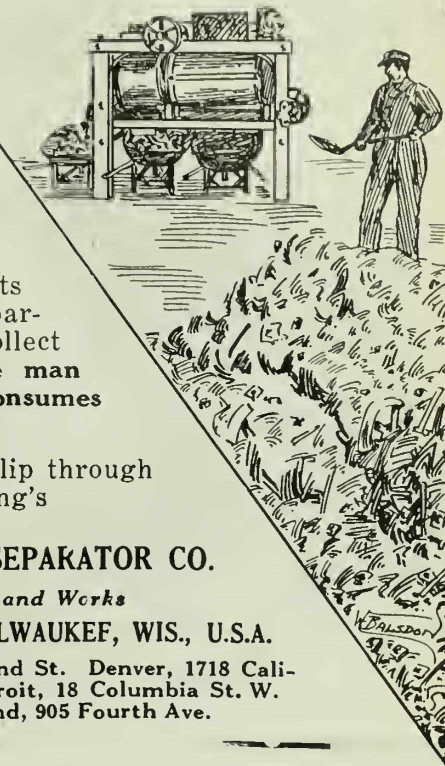

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Some Molding Problems Often Overlooked

Showing Some Points About Molding and Founding which Most Foundrymen Understand but Usually Overlook.

IN THE last two issues of this periodical were some articles on the comparative merits and demerits of loam and dry sand moulding, with explanations relative to their value in the construction of heavy steam cylinder work, and the arguments which were elicited would indicate that the engine cylinder was about the only difficult casting which a moulder has to make. Admittedly it is a job which gives about the most trouble of any on account of the high quality of metal which must be contained in it. The moulding and core making are important on a cylinder the same as they are on any other casting, but after making a perfect mould the most important part is still undone, viz., pouring it with proper metal. If cylinders are properly poured with iron which is hot enough to force the dirt to float there is no real good reason why a good casting should not be the result. But in the moulding of a cylinder there are a lot of things to be considered which are exactly the same as on all jobs, and it will be on these that I will concentrate my thoughts while writing this article.

The article in another part of this issue, entitled: "The Value of a Scrap Pile," suggests the whole thing in a nut shell, even though we do not read any more than the heading. The scrap pile, if properly studied, will teach lessons which cannot be taught by any other instructor. When I say "scrap pile" I am thinking of the foundries where they make their own scrap. When we buy our scrap we buy honorable scrap which has done its duty and gone to its reward, but when we make our own scrap we commit a crime.

In looking over home-made scrap piles I have seen where many expensive jobs have been lost because the cope raised or a core moved, or a bar sprung or some simple little thing of this kind happened and all the good work which had been bestowed upon it was lost just because of a simple oversight or through lack of knowledge as to how to prevent it.

While on the subject of cylinders, and while being opposed to the idea of pouring them while lying on their sides, I remember having seen a large cylinder which had been made this way and which would have passed inspection if it had not been that the core raised a little bit at one end and left a spot which would not bore out. This mould had been made with the greatest of care and had been poured with nice metal, but at the blind end where the core print was only a few inches in diameter, the print had very little bearing and was of very little assistance in holding the core in the centre. This should have been overcome by the use of chaplets, had the moulder understood what the chaplets had to contend with and how to secure them so as to accomplish what they were intended to do.

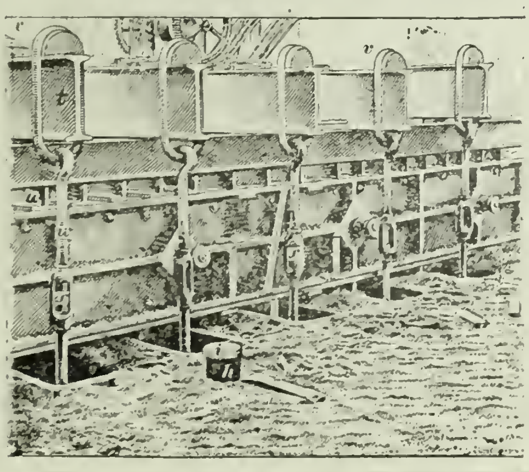
I remember seeing two very large cylinders spoiled by using cast iron chaplets. It would have been bad enough to have lost one without going right at a second one and spoiling it in the same way. I also remember seeing a large pipe weighing well up into the tons moulded in a skin-dried mould and securely strapped to the floor and then weights used to hold the core down. Needless to say, it was lost. On another occasion I saw a large flywheel lost on account of a loose bar.

I might name many more instances which came under my personal observation but I have just named these four cases as examples which will fit into the line of my story.

In the first case the core was carefully made and carefully placed, but it was made of a mixture which was not very hard. A soft core yields under the pressure of the shrinking metal and from this point of view is more to be desired than a hard one, but unless some hard material is at the spot where the chaplet comes the enormous upward tendency of the core will force the head of the chaplet to penetrate into the core to some extent. This, together with the fact that every joint and every clamp and wedge and binder yields a certain amount, and as they all yield in the same direction—upward—the combined amounts make more than can be permitted without making allowance.

The same remedy which would apply in this case would be equally as applicable in all cases, and before going into details on the subject of remedies we will see how close the others come to this one.

In the second case the idea was that the casting being bulky the ordinary light tinned chaplets would dissolve before the casting would set and would be useless, and that by using chunky cast iron chaplets they would remain solid in the centre long enough to let the casting set, and that while this was being done the outer part of the chaplet would be melting and adhering to the casting, but unfortunately this is not what takes place. When the melted metal ran against the heavy chaplets it chilled sufficiently to cause a film of sufficient thickness to form a parting between them before the chaplet began to soften. After this takes place it matters not how hot the chaplet gets it cannot break through this film, and the only thing which keeps the chaplet from falling out is the contraction of the casting while cooling, and this will be of little consequence as the chaplet will have abundant time to expand before the melted metal has become too much set to resist it, after which it all contracts at the same time, and the vibration of the casting while being machined, will loosen the chaplets so that they may be driven out with ease.



COPE BOUND TO ANCHOR IRONS IN THE FLOOR OF THE FOUNDRY.

In the third case, that of weighting down the core, the moulder must have overlooked the fact that there would be about double the upward pressure on the core that there would be on the cope, for the reason that the upward pressure is in proportion to the distance from the top of pouring-basin to the point where the pressure is being exerted. For instance, if there is a distance of twelve inches between the pouring basin and the parting there will be approximately three pounds upward pressure to the square inch of surface where the iron comes against the mould at this level, minus the weight of the cope. If we have a core which projects down another twelve inches below the parting we have an upward pressure of about six pounds to the square inch of bottom surface of core, minus the weight of the core.

In the case of the loose bar in the cope it will yield from the pressure of the metal to the extent of one pound to the square inch of surface of sand supported by the bar for every four inches in height of metal above it

In securing a mould so as to avoid having it yield from the influence of the pressure of the melted metal it must be borne in mind that there will be additional force added on account of momentum if the metal is poured directly down the gate, but this should not be practised. If the metal is poured into a basin and simply flows down into the mould, the tendency for the cope to lift or for the core to crowd against the top of the mould is simply the result of the difference in weight between melted iron and the material from which the mould or core is made. The iron being heavy tends to go to the bottom and the cope and core have to float on top of it unless some means is devised to prevent it.

Cope Bound to Floor

In the illustration shown will be seen how a properly-secured mould looks when one-half is made in the floor. In foundries where pit work is to be done, either in green sand, dry sand or loam, it is always best to have a system of properly-built pits with binders. In binding a cope to the floor it is necessary that staples be securely fastened into the floor so that they cannot be moved, no matter how tightly the bolts are drawn, but this is not always a handy thing to accomplish. In constructing a pit the hole should be dug big enough to accommodate any size of job which it is expected will be put in it. On the bottom of this pit and about 4 or 5 feet apart heavy iron beams should be placed so as to project out to where the staples or eye-bolts will be. These beams should be bedded into concrete, but moulding sand will answer the purpose in most cases.

If these beams are secured to some independent masonry so that they will not budge, they will answer the purpose without any further expense, but even the foundation of the building will sometimes give way on account of the enormous upward force, when the beams have been secured to it, so that it is safer to connect the cross beams to each other by means of a flooring of iron plates or planks. I have seen the roof raised off of a foundry through propping a cope to it with a post, so it will be seen that outside support should not be depended on and that it is better to rely on a good floor in the bottom of the pit and attached to the binder iron as we have just described. On top of this floor is the mould.

In making a mould in the pit, whether for a pipe or an engine bed or lathe bed or whatever it may be, a bed of coke about the size of walnuts should be spread about this flat surface. Pipes will connect this coke bed to the surface as shown at H. The covers I are just to keep the dirt out while the moulding is being proceeded with. Before shoveling in the sand some straw or jute bags should be spread upon the coke to prevent the sand from working through and clogging the coke. Sand is now put on to a depth of about six inches, and this is peened and butted until it is quite hard and vented with a wire into the coke bed, after which the mould is proceeded with according to what it is that is being moulded. Supposing we wish to make a pipe or cylinder on its side from a split pattern, we will presume that the pit has been rammed full of sand and has been used as an ordinary flat floor.

Starting Mold in Pit

We will dig a cavity of slightly greater dimensions than the pattern, and after measuring down the depth of the bottom half of core print we will bed in a heavy bar of iron such as a bar of pig iron or a large clamp at each end and at the proper level for the core prints to rest upon. These irons must be bedded in solid so that they will hold up the weight of the core when the time comes to set it. Planks will be bedded in crosswise and about six inches below the level of where the bottom of the pattern will be. These are to hold up the chaplets. The ramming of the mould and most of the other movements will be of ordinary consideration just now; what I wish to emphasize on this occasion is the setting of the cores and binding down the mould.

When the mould is ready to have the cores set the chaplets will have to be set for holding up the weight of the core. Chaplets should invariably be tinned or copper coated. A half-inch wrought iron chaplet even though ground on the emery wheel does not make a good joint in a casting twice its thickness. If the chaplet is cleaned in an acid bath and then immersed in melted tin there is no formation of oxide, and when the melted iron comes in contact with it it does not have to melt the chaplet in order to take hold of it. The tin, which already has adhered to the chaplet, still adheres, and the melted iron easily melts the tin, which readily mixes with the iron, making a perfect joint. The core, if long, will require to be held with chaplets from moving sidewise. These chaplets require to be wedged to something solid in order to keep them from being forced out of place. Before proceeding further it should be understood that unless the core and mould are bound to near the crushing point, it is next to impossible to prevent it from rising a little bit, and it is always best to put it a little bit low to begin with.

The illustration shows the mould after the cope has been strapped down. The drawbuckles are hooked to the eye-bolts in the floor which in this case are below the level and have to be dug down to. As will be seen, there are angle irons placed crosswise on top of the cope. On top of these are the two long I-beams which run the entire length of the mould, and on top of these are the heavy T-beams, to which the draw-buckles are attached. By this means it is always possible to have the heavy T-beams to come where they will be in line with the floor staples, and it is possible to have the angle iron (U) where they will cover the chaplets as well as the bars in the cope. All of these beams are put in position to start with, care being taken to have every chaplet and every bar covered. The draw buckles are then attached and evenly drawn down until the cope is perfectly secure. This part looks simple and satisfactory enough to the average moulder, who thinks that after he has slipped a wedge in here and there that the job is done, but he should remember that it takes about double the power to hold down the core that it does to hold the cope. Long, thin iron wedges should be driven between the angle iron bars U and the chaplet so that they are as secure as though held in a vise. Wedges are also to be driven between the bars U and the bars of the cope to prevent them from being forced upwards even though the entire flask is made of iron as the bolts are liable to yield a little bit.

The matter of building up runners and attending to the vents, etc., is probably well enough understood, although it is interesting study.

A question which frequently worries a studious pupil is that of securing the anchor iron into the floor. Some will say that the tendency of any heavy body is downward and that if beams similar to the heavy T-beams which are on top are run under the mould in line with the top ones, they would be sufficient, but such is not the case If the cross-beams are not built into concrete or bound fast by some means they will be drawn up through the casting as soon as the core and cope start to strain upward, but by having a floor from one beam to another it is similar to having the mould clamped to a bottom board.

The Editor was a believer in 'yellow' journalism and ran this as a leading editorial: "The business man of this town who is in the habit of hugging his stenographer had better quit, or we will publish his name."

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Jobs Encountered in the Small Rural Foundry

Many Queer Stunts Are Performed in the Little Country Shop and Many a So-called First-class City Man Would Find It None Too Easy to Hold a Job

By A. H. OBO

SPEAKING about the small country foundry brings out many interesting features in foundry practice which cannot be experienced anywhere else to such good advantage as in these small, and now almost extinct wayside institutions, and the experience thus gained is of inestimable value in doing more important jobs in the larger and more modern shops.

Take for instance a kettle. Every molder who has ever worked in a country foundry knows how to make a sugar kettle. It is a simple job with a good pattern. The ears are made so as to draw out in sections, the one part being perfectly straight or with a little taper, while the other half resembles the familiar molder's tool known as a horn gate. These two parts of the pattern are dowelled together at the point

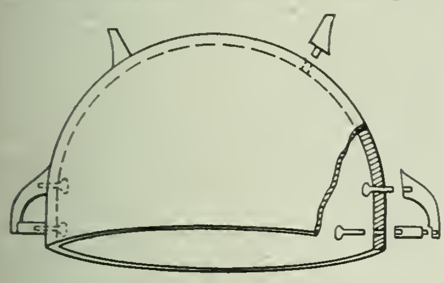


FIG. 1—KETTLE PATTERN WITH LOOSE PARTS.

where they meet, and both parts are pinned to the kettle with loose pins which are withdrawn before ramming the inside. The three leg patterns are dowelled with very short pins on the loose leg, which allows it to lift off freely. The illustration, Fig. 1, shows the pattern with the loose parts ready to be shoved up into place, where they will be tucked into the sand, to be drawn out separately.

Now supposing a farmer comes along with a kettle which he has borrowed

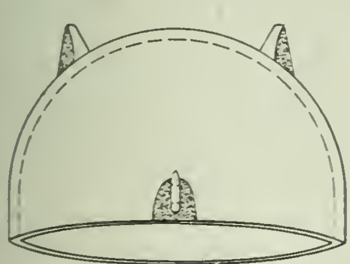


FIG. 2 USING BORROWED KETTLE FOR PATTERN.

from his neighbor and insists on having one like it, how will the molder proceed to use it for a pattern without first removing the ears and the legs? This is very easily accomplished, if the molder puts his thinking cap on.

Place the kettle on a board the same as would ordinarily be done with a good pattern, but before ramming up the cheek fill in around the ears with sand and make a parting similar to that shown in Fig. 2. Do likewise with

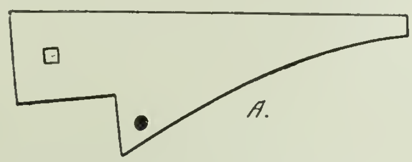


FIG. 1—SHOWING APPEARANCE OF GOOD SHARE PROPERLY MADE.

the legs. The mold will now be proceeded with the same as usual up to and including the time of lifting off the cope and cheek and drawing the pattern. This will be straight ahead work, but instead of having the ear patterns and the legs to draw, we have first to take patterns for these which we may have on hand, or which we have whittled out for the occasion, and place them on the print which has been left by the ears and legs of the erstwhile pattern. Sand will now be tucked in around them and nailed, when the patterns for these parts will be drawn and the mold finished in the usual manner. In making up the sand around the legs, the eye is sufficient guide, but for the ears it is best to have a piece of paste board or any stiff material, cut to the proper circle of the kettle so that the sand may be accurately shaped and the casting produced of even thickness, and as neat as though made from a real pattern.

This same method of molding can be utilized on lots of work to better advantage than making proper patterns, even in good shops where everything is done in modern style, but particularly in the little country shops where things are not always the same as in the city shop. Frequently a customer will bring in a stove cover and want a casting made from it, but, of course, he does not want the catches broken out to facilitate the molding, because if this were done he would require two new ones. The good casting can be used as a pattern by filling in behind the catches the same as was done on the kettle, and then filling up the space after the pattern is drawn. On a delicate thing like the catch on a stove cover it is best, after drawing the pattern, not to try to bed in a catch pattern, but to fill up all the space and then cut in the catch.

Plow Points

Another interesting job which comes to the country shop is a worn out plowshare. If the plow is a foreign make and the pattern is not available, it is quite easy to make a good casting from a badly worn share. The part of the share which fits the plow is never worn, and by cleaning it on the inside and filing away enough to allow for shrinkage, it is molded by laying it on its back on a board, or preferably on a cope which has been temporarily rammed up. A piece of iron about one and and one-half inches wide, and as long as the share is to be, is polished on the emery wheel or cleaned up in any manner, so long as it is clean. This iron is placed on the improvised pattern to form a guide to make the bottom of the share to. It also answers as a chill as far as it goes. This strip of iron may be shimmed up to whatever position is required before sifting on the sand.

In Fig. 3 will be seen the old share lying on its back with the strip of iron on it. The bottom half of the mold is proceeded with as in the case of any

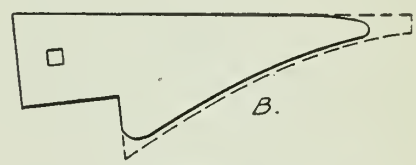


FIG. 2—SHOWING DESIGN OF SHARE BEFORE BEING WORN.

plow point, and after rolling it over, and while making the parting, the amount which is worn away is made up as shown in Fig. 4. In making this up a certain amount of judgment and care is required to get it the exact

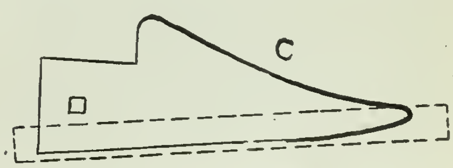


FIG. 3—OLD SHARE LYING ON ITS BACK WITH CHILLING-STRAIGHT-EDGE IN PLACE.

shape which the top of the share should be. Parting sand is put on and the cope rammed up and lifted off. The sand which was built up to form the top design is now cut away, and in addition, the sand is cut away from the bottom

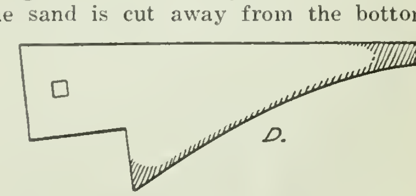


FIG. 4—SHOWING APPEARANCE OF SHARE WITH PROPER SAND BUILT TO IT.

to the proper shape for that part of the share. The pattern is now drawn and the mold finished the same as though a good pattern had been used.

Continued on page 204

The Educational Value of the Scrap Pile

Bad Castings Can Be Used from an Educational Standpoint to Great Advantage if Foundrymen Will Study the Causes Underlying Them.

By HENRY TRAPHAGEN

DEFECTIVE castings—the tenants of the scrap pile—offer to the discerning and ambitious foundryman knowledge that is beyond price. Show the foundry expert the scrap pile, and he will tell you the calibre of the foundry, for evidence of either constructive progress or the senseless repetition of blind ignorance, is indelibly and relentlessly stamped on that tell-tale pile of rusting iron.

It all depends upon whether the defective castings are intelligently examined or whether they are buried away under old barrels, what the real value of the scrap pile will be to the foundry. Intelligently examined and constructively criticized, a defective casting will invariably point out the antidote, but if it is hidden away and treated as an enemy rather than a friend, it means that casting after casting will be turned out in the same old way; the customer will be dissatisfied; the foundryman will have made no progress, and the establishment itself will finally rest in the financial scrap heap.

The up-to-date foundry should have at least one competent, experimental molder, who is paid by the day, and not hurried; his business is to investigate the proper method of gating and heading castings as they come into the shop. Every department is interested, every responsible department head lends his bit to the fund of general knowledge. The work of the experimental molder is thoroughly examined and discussed. If consistent and concentrated effort is made, it will be but a short time before the experimental molder is turning out a sound casting.

He May Go to China

When the casting comes right, then it should be either sketched or photographed with the gates and heads attached, and a permanent record made. If the same job comes back a year or two later it is immaterial whether the experimental molder is in China or the superintendent in parts unknown—that casting can be made again, for the proper method of making it is on record.

It would appear at first sight that experimental melding would be an almost endless task; that the experimental molder would have to start out on an entirely new tack every time a casting came into the shop, and that the number of records necessary would be almost overwhelming, but if foundrymen will carefully investigate this method of experimental work, they will find that after all, the number of real basic defects that are found in castings are comparatively few. They will discover that castings naturally group themselves into a few well-defined classes and that each class is subject to characteristic defects that are easily recognized, and in a short time they will learn to discount possible defects at the start.

If the foundryman can grasp the broad conception of castings as a whole; if he can master the few fundamental laws of solidifying metal, he will have made no small measure of progress toward the desired end. But unfortunately, it seems to be the common impression that the various branches of iron and steel founding are peculiar, each to itself; for instance, the malleable man imagines that his troubles are quite distinct from those of the gray iron shop, while the gray iron founder is under the impression that gray iron and semisteel obey laws that were designed especially for that class of work, and it is sometimes amusing to hear the steel man dilate upon the peculiar and mysterious troubles of the steel business.

Now if the foundryman will only recognize the fact that all these various metals are alloys of carbon and iron, that they all merge one into the other without any sharp line of distinction, and furthermore, that they all in general obey the same laws, then the great light will dawn upon him that there are but few real basic troubles in a foundry.

Several fundamental difficulties that are found in foundries have been described in the literature on the subject, but unfortunately these descriptions seem to be lost in a maze of papers dealing with the various peculiarities of chemical ingredients, new-fangled methods of chemical analysis, long discussions on grain aggregates, and in fact everything under the sun except a frank, plain discussion of the foundryman's troubles. It is because of the great difficulties in wading through a mass of literature that the average foundryman has become disgusted with chemists and scientists in general, and judging from the impractical, high-brow contributions that they have given to latter-day literature, it would appear that the foundryman's disgust is well founded.

If the foundryman will carefully study his defective castings the writer believes that he will ultimately agree that all of the defectives can be traced to one of a very few fundamental errors. In general these fundamental errors may be summed up as follows:

First.—The personal equation, or in other words, the carelessness of the workman.

Second.—Over-production, which puts a premium on careless, sloppy work.

Third.—The attempt to make good material out of junk.

Fourth.—False economy, which results from the use of too little fuel, too much scrap, cheap refractories and too great a reliance in green sand molding.

It has been the writer's experience that of all troubles in the foundry, about 10 per cent. can be traced to the melting department and the other 90 to the molding department.

To produce a good casting from any kind of iron or steel, it is absolutely essential that the metal be hot and fluid. But unfortunately, hot, lively metal is not as common in our foundries as one would be led to expect, and the causes of cold metal may be briefly summarized as follows:

The bed in the cupola may be too low. This is a very common error and generally results in cold, sluggish metal. It is a simple matter to determine whether or not the bed is low. Leave the tap hole open, turn on the blast, and note the time it takes for the first metal to run over the spout. If iron appears in less than 10 minutes, it is almost a certainty that the bed is too low. A low bed means dirty, porous, weak castings, because of the metal melting directly in front of tuyere blast and becoming unduly oxidized.

Another prolific source of cold metal lies in the attempt to conform to a prearranged melting ratio. In the dictionary of common sense there is no such word as melting ratio. The correct melting ratio is the amount of coke that will give hot, fluid metal, and this amount of coke will vary with the size of the cupola, the amount of scrap used, the kind of coke, the percentage of steel used in the mixtures, and the size and condition of the sprues. It is therefore evident how ridiculous it is for anyone to attempt to lay down a specific melting ratio for cupola practice.

Cold metal in the converter can generally be laid to one or two causes. In the first place the metal in the cupola may be cold for one of the reasons just enumerated: the percentage of silicon may be too low for successful blowing, or what is most common, the lining of the converter may be too wet, or there may be a leak either in the wind chest or somewhere along the line. It is rarely found that cold metal can be traced to a variation in chemical content, and before the foundryman wastes any time fooling around the laboratory it is far better that he examine his cupola practice, his converter linings and his wind apparatus.

Another Cause for Cold Metal

There is another great fundamental cause for cold iron, and this cause operates not only in the cupola, but in the converter, the air furnace, the open-hearth furnace, the crucible furnace and even in the electric furnace.

We refer to the effects of oxygen, or as it is commonly called, oxidized metal. There is no disputing the fact that foundries very frequently receive shipments of pig iron that will not produce hot iron, no matter how careful the melting practice may be, and such iron is delivered much more frequently than the average foundryman has any idea of. It is useless to check up the analyses of such material, for the blast furnace laboratory report will in nearly every case be correct, and the fact that it is correct furnishes the chief alibi for the furnace.

Pig iron is sold on chemical analysis only, and it is presumed that if the analysis conforms to the customer's requirements the iron must necessarily be satisfactory, but nothing is further from the truth in my judgment. The pig iron that generally causes such a long train of disagreeable troubles, such as porous castings, skulled ladles, bunged-up cupolas, etc., is a product of over-production; the furnace people may not be able to write a learned, scientific explanation of this phenomenon, but they know when such iron is made and they also know to whom the iron is sent.

The furnace people know when they have what is called an off-heat, and they also know that these off-heats are caused by badly worn furnace linings, the use of coke breeze, the use of scrap and turnings in the charges, or the attempt to smelt a very refractory ore, such as magnetite. It appears that such off pig iron is caused by the presence of oxides dissolved in the metal and it is probable that the most prolific source of this trouble is due to undecomposed ore, descending into the hearth and dissolving in the metal.

The average foundryman is not interested in the theory of this condition, but he is, or should be, vitally interested in being able to pick out such defective irons. Oxygenated pig iron is generally full of gas and dirt, almost invariably upon breaking the pigs a large gas cavity will be found in the interior.

If, on breaking a shipment of iron, you find that it is consistently unsound and full of gas cavities, reject that iron if you can possibly get away with it. But if the furnace absolutely refuses to take such iron back, which is too often the case, then the only recourse left to the foundryman is to hold the shipment in the yard and use it very gradually, say one pig to a charge, until the pile is gone.

Defective pig iron seems to be getting more common every day; the writer has found it in practically every kind of a foundry, ranging from malleable iron up to steel. The furnaces will continue to ship such iron just so long as the foundryman is content to buy by chemical analysis, and chemical analysis alone.

The Effect of Rust

Another source of cold, sluggish iron and steel lies in the use of thin, dirty, rusty scrap. Such material as rusty flashings, turnings, shearings, punchings and other fine voluminous scrap has no place in the melting furnace, if the melter expects to get sound, healthy metal. Such scrap is being used literally by thousands of tons in our open-hearth furnaces to-day. It is common in steel foundries, malleable shops and gray-iron foundries. But the result is the same, no matter what type of furnace is being used or what kind of product is being manufactured.

Witness our quick-rusting sheets, our brittle steel, our deep drawing stock that won't draw, our hard cast iron, brittle malleable, and dirty porous castings, and you have a survey of the penalty for urging your scrap on the producer.

Rust is an oxide of iron, and it is finely divided. During the melting process this rust or oxide enters the metal and becomes emulsified. And no amount of fluxes, deoxidizers, or other cleansing agents will get it out. I believe suspended oxides in metal are causing more trouble to-day in the iron and steel industry than any other one thing. The use of such material is directly at variance with all the sound principles of metallurgy. How long the manufacturers will use this material and how long the consumer will continue to receive such metal is a problem. But the light is breaking and the day of reckoning for the iron and steel manufacturers who attempt to melt up nothing but junk, is close at hand.

It would appear at first sight that cold metal is distinctly a problem of the melting department, but it affects the molding department so strongly that the molder must take it into consideration. It is a well-known fact that the moment molten metal strikes the mold a large volume of gas is generated. This gas is formed from the decomposition of binding materials, but most of it comes from the water that is in the mold.

If such gas is not allowed free exit it is going to be trapped in the metal, and the colder the metal is the more quickly it will set, and the more likely it is that the gas will be trapped under a skin of frozen metal.

How many times does a foundry turn out what is apparently a perfect casting, only to find it rejected in the machine shop just as soon as the first cut is taken from the cope side. The gas trying to escape has been trapped just below the surface because the metal has set too quickly to allow the gas to get away; this is a very common defect in green-sand molding, hence the necessity when attempting to make green-sand work, of having the metal very hot and fluid and venting not only the cope but the drag and making sure that the vents in the cores are wide open.

The Sins of the Covered Core

An interesting sidelight in conection with this discussion is the question of oil-sand cover cores. It is a very common occurrence to find a casting made under a thick, hard oil sand cover core with absolutely no provision for the escape of gas. The foundryman struggles along and probably gets two out of ten castings whereas if he would merely puncture the cover core with three or four pop heads and let the gas out, the probabilities are that all of the castings would come good. There is not a week that passes but that the writer is not called upon to remedy this mistake in some foundry, for it is remarkable how frequently this mistake is made.

The question of shrink heads or risers is one that is given too little consideration in the foundry. A head to be of any value must be large enough in cross section so the heap sand will not freeze it up too quickly. It is well to remember that probably not over 30 per cent. of the cross section of a head is available for feeding, and this statement applies with more than ordinary force to the neck of the feeder; it is folly to make a great big head and then neck it down so narrow that the neck freezes almost instantly, and it is equally futile to expect a head to feed if it is not placed squarely upon the casting. But how often does one find a head with a neck say 2½ or 3 inches in diameter, about one-fourth of which is attached to the casting and the rest is wandering off in space?

The common practice of taking an old splintered block of wood, sticking it into the pattern with a nail, and attempting to make an efficient head is the falsest of false economy. A foundry should have a stock of standard heads carefully made in the pattern shop and fitted with dowel pins so that they can be set squarely upon the pattern with little danger of being misplaced.

There is a tendency among foundrymen of the present day to skimp on heads They love to talk about their very low sprue returns, but they neglect to state that the welder works overtime every night. Molten metal will shrink as it cools, and that shrinkage must be taken up either by overhead feeding or internal chilling, and when a foundryman tries to tell you that his castings are sound without any kind of feeding, that man is trying to change the laws of nature, and personally I cannot see how he is going to get away with it.

Another big question in the foundry to-day is the matter of water in its various forms. There is probably no other one factor, with the possible exception of oxygen, that has so much to do with the success or failure of a foundry as water. Consider a moment some of the troubles directly traceable to the old H_2O. In the cupola, for instance, we have the well known rubber bottom from wet bottom sand; we have cold metal and slow melting from wet coke, wet iron, and moisture-laden air. In the converter we have wild heats, cold metal and cut linings, from the lining being too wet. In the foundry we have the well-known pin holes from the metal boiling on the surface of a wet mold; we have entrapped gas and dirt, because too much water in the facing and heap sand has frozen the metal prematurely and securely trapped the gas and dirt within.

Hydraulic Castings and Green-Sand Molds

A casting may look sound, but millions of tiny bubbles of exploding steam have made it porous so that it will not stand up under gas or water pressure. All over the country foundries are making hydraulic and ammonia castings hy the green-sand method, and they are stoutly claiming the fact that they are getting away with it. Careful investigation, however, will prove that the consumer is kept busy closing up porosities and that every so often a truck load of defective castings are brought back to the foundry and are carefully smuggled in the back door, so too many people won't see them. It is possible to make hydraulic castings in green-sand molds, but it is not possible to make them day in and day out and be fairly certain that they are all sound. It is almost an impossibility to control the water in the green-sand mold, and water suddenly converted into steam has a habit of exploding in the most unforeseen places and in the most peculiar ways. As a general rule, a hydraulic or gas casting should be made in a thoroughly baked mold, and if proper materials are used, and the melting is carefully done and the mold is kept clean, there is no trick in turning out acceptable hydraulic castings.

There is one more item in the molding department that deserves attention and that is the proper method of peuring. The scrap pile receives a great many contributions because of the carelessness or incompetency of the man at the ladle. Every ladle of metal should be held for a minute or two to allow the slag and other impurities to come to the surface. Stopping to allow the metal to clear itself may seem like a waste of time to the modern production hog, but if the gentleman will stand by a ladle and watch the various impurities float up to the surface he will understand why it pays to give the metal time to clear. In the end more good castings will accrue from such practice, and in the final analysis real production will be increased. Metal going into a sand mold should be poured evenly and carefully, and under no consideration should hot metal be poured at high pressure directly over a large flat area of sand. Cuts and scabs and snakes are too often the result of fast, furious pouring. It is far better when dealing with a casting having a large flat surface, to cut back-up gates and break the force of the stream of metal rather than resort to a mass of finishing nails, a lot of swabbing and other dodges to prevent the facing from cutting.

Another exceedingly common error is the practice of pouring metal directly up against a core at right angles to it. If it is possible to allow the metal to slide parallel to the core, there will be far less cutting and much less dirt.

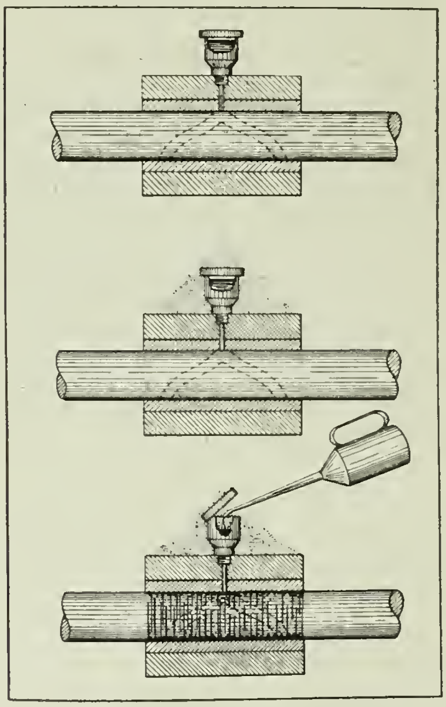
It is obviously impossible for any one man or group of men to enumerate, much less describe, the many apparent defects and troubles that exist in a foundry. If the foundryman will carefully study and examine the defective castings, if he will try to trace out his problems from cause to effect rather than trust to dumb luck, he will find, as stated before, that the real fundamental troubles in the foundry are comparatively few.

The value of a scrap pile lies in the fact that it offers a real course of instruction in foundry practice, and this paper has been written in an attempt to induce the foundryman to commune with his defectives, to study their peculiarities, to grasp principles of casting in their broadest sense, to realize his responsibility to the community, and finally, it is written with the hope that the foundryman will earnestly strive to manufacture sound castings rather than alibis and fictitious production sheets.

SAND AS A LUBRICANT

In the last issue there appeared an article under this heading, and in order to show more clearly the meaning to be taken from it, we have produced an illustration giving three views of a shaft and bearing. On the upper one will be seen a clean, smooth shaft running in a neat-fitting bearing with a tight oil cup connected to the oil channels in the bearing. In an engine-room the cover could be taken off the oil cup at any time and the cup filled, but in a foundry it is different.

The second view shows how it would appear after being used for a while in a



TOP VIEW—PERFECT SHAFT BEARING.
SECOND VIEW—OIL CUP COVERED WITH FOUNDRY DIRT.
BOTTOM VIEW—DAMAGE WROUGHT BY SAND.

foundry. This does no harm, because the cover prevents any of the sand which has accumulated on top from getting into the oil chamber. When the oil cup has to be filled it is a simple matter to take a molder's brush and clean it off as clean as the upper one before lifting the cover, but unfortunately this is seldom done around a foundry.

In the third view will be seen the usual method adopted. The oiler comes along and lifts the lid with the spout of the oil can and in so doing lifts most of the sand which is above the top of the oil cup. If a lot of sand should fall in he might take a hint, but just enough falls in to nicely mix with the oil and find its way into the oil channels, with the result shown in the illustration—the shaft all cut to pieces so that in a few days it is jumping and shaking everything apart.

This is one thing which foundrymen must learn if machines are to be a success. It matters not if it is a molding machine, or the fan or rumbler or emery-wheel, the oil cup must be thoroughly cleaned before opening, as dust and dirt settles everywhere around a foundry. The fact that a man is behind with his work is no excuse. The shaft would be better not oiled at all than oiled with sand and oil mixed. This work should be done the same as it is done in the engine-room, before the shop starts operations in the morning. When the machinery is standing still is the time to clean it up and fill the oil cups.

FOUNDRY INSTRUCTORS

Referring to the scarcity of journey-men moulders and the few shops training a full complement of boys under the old-fashioned apprenticeship method, a writer suggests: "The reason is that it is getting impossible to obtain a sufficient number of boys willing to take a four years' apprentice course in moulding. They prefer other work where the immediate pay is better. The result is that the foundry industry, while making headway, in breaking in laborers to become molding machine operators, is making but few moulders.

"Some of our members are meeting this problem by keeping in their employ one or more moulders' instructors, whose duty it is to take direct supervision of the new recruits and give them intensive training. When not engaged with new-comers, the instructor is assisting in improving the skill and upgrading those previously employed.

"The success of this plan depends on selecting young men who are interested in learning a trade and willing to start at the hourly rates paid unskilled laborers. Placing them under the direct supervision of an instructor, their enthusiasm is kept up, and they can see early possibilities of improving their skill and likewise increasing their earnings.

"It is my opinion that the lack of satisfactory results in obtaining and holding a desirable class of young men on the part of some firms, is that they have attempted to place the work of instructing upon their regular foundry foreman, who, in the majority of instances, is already fully occupied with general supervision of the shop, and is unable to give the necessary attention to the newcomer, who after a few days' experience, gets discouraged and drops out.

"We have recently had brought to our attention a number of instances where foundries have placed ads in local papers for young men to learn molder's trade, stating rate of wages paid while being

Continued on page 205

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

MAKING "MENCO" MOUNTS

The high cost in time and money of making duplicate patterns for quantity production of castings even when using the molding machine has been practically eliminated by the use of a material known as Menco. The system on which it is worked is in many respects similar to the old time method of making plaster follow boards, or perhaps more like making the more modern sand-match. As every foundryman knows, when making a follow-board he must first get his permanent patterns prepared, usually in aluminum or metal of some sort. The molder then rams up the bottom half of a mold with the pattern in its proper place and after getting the parting ready, instead of ramming up the cope, he puts a frame around the pattern and either rams it full of oil-sand compound and screws a board onto the back or else fastens the board on first and pours the plaster through an opening. In the course of a few hours this sets and only requires to be cleaned up a bit to be a finished follow board fitted to the pattern.

This was all right in its day, and was considered as a great achievement, but it is only suited to hand work.

In machine molding, particularly on roll over draw type of machine it is required that two half patterns be mounted on the machines so arranged that they exactly match each other. To accomplish this the molder begins as before and after getting his parting ready, instead of making the follow board he rams up the cope and lifts it off and places it on its back. He then proceeds to draw the pattern and cut the gate unless a gate pattern has been provided. In fact he does everything which he would have done if making an ordinary mold. When both halves are properly finished he puts a frame on each and mixes the "menco" to the consistency of mortar and fills both parts and levels them off. When the mixture begins to get sluggish the boards are screwed onto the frames and the whole thing allowed to stand for about fifteen hours when it will be found to be sufficiently hard to handle with safety.

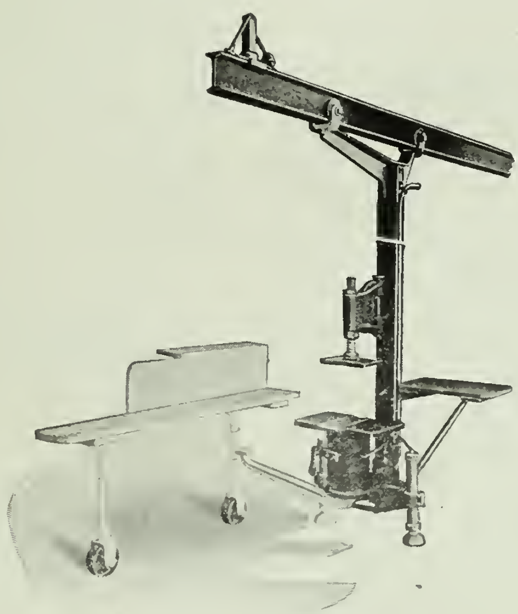
After washing it clean, place it in a warm spot for a few days to dry, keeping the surface moist until the inside is dried out. After it is thoroughly dry it may be polished with a piece of very fine sand paper and given a good coating of shellac, when it will be ready to mount on the machine. Patterns of this kind are known as "mounts" and as will be seen they are a combination follow board and pattern in one piece, and by making them in this way a great saving is accomplished.

A NEW DEPARTURE IN MOLDING MACHINE EFFICIENCY

A novel invention and one which has much to commend it, is the Howe Molding Machine, manufactured by the R. J. Teetor Company of Muskegon, Michigan.

Suspended from an I-beam, extending lengthwise over the molding floor, the machine is held rigidly between the floor and overhead beam by two compressed air legs.

As the molder's work progresses toward the wall, he turns a valve releasing the air in the two air legs, leaving the machine entirely suspended on ball bearing wheels carried by the overhead beam and clear of all obstructions on the floor.



HOWE MOLDING MACHINE.

He pushes the machine a few feet toward the wall, turns the air valve, and the air legs are thrust down to the floor; the machine is level and rigid regardless of irregularities of the floor.

The machine is as stable in use as a wall bench or a stationary machine set in concrete.

A side table for cores, etc., and a riddle shelf are provided.

In its simplest form it is really a movable molding bench, and in addition to this, any degree of complication may be included in the machine, from the plain bench up to the universal machine if so wished.

NEW TYPE OF MONORAIL

The H. M. Lane Company, in their attempts to solve foundry problems, have recently brought out another type of monorail.

The novel feature consists in placing the man in the cage in a basket or elevator which can be raised or lowered by means of a telescoping arrangement. The cables connecting the controllers for the various motors are all arranged with a flexible connection, so that the man has control of the travel motor, the hoist motor and the motor for hoisting himself up and down in whatever position the cage may be. This enables a man to go out into the yard with a one or two-hook monorail, pick up a flask and bring it into the foundry without bothering with a helper. It also enables him, in gathering up boxes of castings in a foundry gangway, to go along some time after they have been loaded and allowed to cool for a while and pick them up, taking care of his own hitches in the foundry and his own releases in the cleaning room. In cases where a laborer is absolutely necessary, the laborer can ride in the cage with the operator to the point where he is wanted, and the cage can be lowered to such a position that he can drop and attend to the hooking. Also, in some cases, both the laborer and operator would have to work together in handling flasks under the monorail or away from under the monorail.

He: "I have your permission to call this evening?"

She: "I shall be very pleased; but don't forget that father switches off the light at ten o'clock."

He: "That's kind of you. I'll be there at ten sharp."

The Design and Treatment of Steel Castings

Paper Read at the Annual Meeting of the Iron and Steel Institute of Great Britain.

By GEORGE F. PRESTON, SHEFFIELD

IT is much to be regretted that, between Engineers and Steelfounders, there is so little interchange of the knowledge gained by experience on the subject of the production and treatment of steel castings, a subject of very considerable importance to a large proportion of the trades carried on in this country, as greater reliability in steel castings would result from a better un-

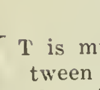


FIG. 1.

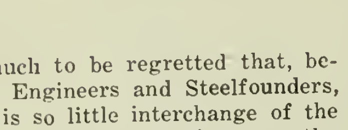


FIG. 2.

derstanding of requirements and difficulties by users and suppliers.

Steel castings are used extensively for very diverse purposes. Some difficulties which have arisen in the foundry have been due to the non-appreciation of the fact that, at the recalescence point Ar3 in the cooling curve of steel, contraction is arrested and an actual expansion takes place. In an ordinary 0.3 per cent. carbon steel the expansion between 690° and 650° C. is approximately equal to the amount of contraction between 790° and 710° C.; therefore in some castings of intricate design reversals of stress do not occur simultaneously in all parts. If such castings are left in the sand or on the floor, cooling at unequal rates in various parts, contraction will be taking place in some portions whilst in others expansion will occur, when adjacent members are in a plastic, or weak condition, resulting in "pulls" or "cracks." When such difficulties due to reversals of stress occur, modification in design by the Engineer, so as more nearly to equalize the thicknesses in critical parts, affords one means of remedy. Another is by "chilling" or using one of the various methods, not altogether looked on with favour by the Engineer, for making the

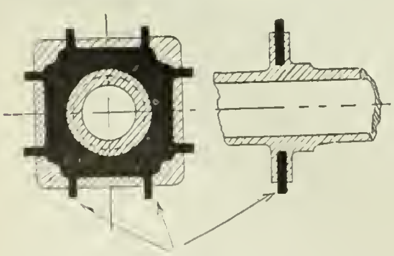


FIG. 3 PROJECTIONS TO BE REMOVED BY CHIPPING.

thicker sections cool more rapidly where feasible, or, for any other reason, not undesirable.

Most steel-founders have probably experienced cases where the use of "chills" has been followed by "cracks" in the casting, through the effect of using such chills not having been fully considered. An alternative method which might be adopted for some castings is to arrange for the cooling from a temperature above 770° C. to take place in a preheated furnace, care being taken to "strip" the casting at a temperature sufficiently above this to enable it to be sealed up in the furnace before the temperature has fallen to the danger point. This method was adopted with success in the case of a casting for a ship of world-wide repute, having a heavy flange, or seating, about the middle of its length, after several unsuccessful attempts had been made to obtain a satisfactory casting by other means.

Cases occur where the Engineer would be put to increased cost, or experience a difficulty, by omitting some portion objected to from the founder's standpoint, as, for example, in a cylinder or

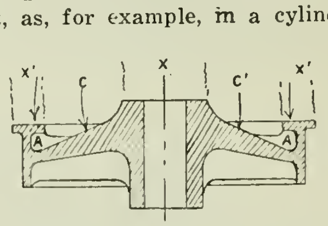


FIG. 4.

tube such as that shown in Figs. 1 and 2, having a heavy flange, XX′, 2 to 4 feet from the mouth, and used only for bolting the cylinder on to its entablature, which presents two difficulties to makers. One is to feed the square flange to ensure soundness; the other, which is possibly of more consequence, is to prevent pulling in the bore of the cylinder about the centre of the width of the flange (see "A"). In such cases probably no really serious objection could be raised to introducing in this heavy flange a frame (Fig. 3), previously cast in steel, to act as a "chill," thus equalizing the rate of cooling and also insuring an absence of cavities in the surrounding metal. There would be little theoretical and probably no practical loss of strength, as unless the "chill" was of excessive thickness it would to a large degree be fused by the fluid-steel.

In the case of important castings subjected to severe stresses, such as large gun mountings, etc., the fullest and most careful consideration should be given by the designer to the placing of heavy masses or sections of metal where adequate arrangements can be made for "feeding," as, in the absence of "feeding heads," the thinner surrounding sections will "draw" on such reservoirs of molten steel and result in unsoundness or "piping" in parts where it is of the utmost importance that a large factor of safety should be provided.

The making of a ship's stem—free from defects—might be instanced as an illustration of this important point as to the position and size of necessary "feeding heads," to ensure soundness, or, on the other hand, of alteration in design to obviate them—a problem which,

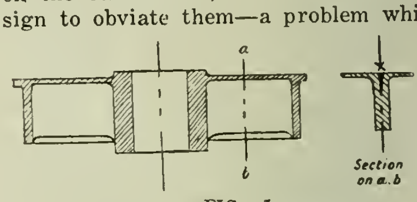


FIG. 5.

owing to the great divergence in the types of castings required by users, is relatively more difficult of general solution (even if not of the same importance) than the recently much discussed question of producing sound ingots.

Such a casting usually has heavy brackets cast between the webs at the deck positions, large radii, advisedly, being usually formed, thus further increasing the relative mass at these places. There is little doubt that a more satisfactory casting would result, even if, superficially considered, such does not appear to be the case (owing to unsoundness or "piping" not being apparent on the surface), by breaking the continuity of the junction of the bracket with the section of the webs, particularly at the extreme forward point, as such recesses in the deck brackets can safely be filled in later by electric welding and caulked to make perfectly water-tight. If "feeding heads" are placed over these brackets the steel will remain fluid at these places after the general contour of the stem casting has solidified, thus tending to unsoundness, distortion, and troubles through contraction. Another point which should be borne in mind in connection with castings of this type is that during the period of cooling after casting the curved contour will tend to approximate to a straight line.

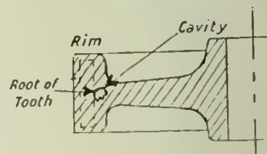


FIG. 6.

Allowance should therefore be made by the pattern-maker for this tendency, particularly towards the two ends. When the annealing, or heat treatment, is carried out the contortion which would probably result if flames are allowed to impinge on the casting must be guarded against before the furnace is closed.

Modifications in design would be the more satisfactory expedient in some of the cases which come before the steel-founder, parts being made separately where possible. This has sometimes the objection of increase in cost of machining, etc., but cheapness should not be the sole consideration in making such castings.

Castings of the type shown in Fig. 4 are sometimes asked for, with light ribs, AA, tied under internal flanges and also to a heavy plate or cone centre, CC'. Such ribs naturally cool at a much quicker rate than the heavy disc portion and "feeding heads," XX', and are therefore in considerable tension, where the members join the periphery, when the plate portion and the centre boss have reached their maximum contraction.

It is likewise a difficult matter to ensure perfectly satisfactory castings of such design as shown in Fig. 5. This shows a disc or wheel having spokes of heavy rectangular section on which are superimposed a plate of lighter section. "Drawing," or other defects, will probably appear in the plate over the centre of the spoke or rib (see X on section *ab*).

It must be admitted that a careful consideration by the management (and especially a joint discussion with all foremen responsible for seeing work through the different shops) of the problems to be faced in these and similar instances would be conducive to the production of better castings; as it is sometimes seen that a pattern is completed, that if it had been made differently in some respect, to allow of a modification in the method of making the mould, provision could have been more efficiently made for "feeding," and also for guarding against contraction and other troubles.

Such expedients as the insertion of tubing of small diameter and of considerable length rammed with sand, in lieu of cores where they are surrounded by large masses of steel—which cores would necessarily have to be made hard to stand and would become much more so through the contraction of the steel —would probably then be arranged for and much expense be saved in fettling and in the machine shop. It is well known that bent or broken cores cause endless trouble when the casting reaches the drilling machine; in fact, in many instances it would be far cheaper to omit small bolt-hole cores altogether.

There is also a danger of small cores in one plane (say for a number of bolt-holes) causing vital cracks in large castings of heavy section, owing to contraction, the cores becoming very hard and offering great resistance whilst the steel is semi-plastic.

Steel-founders of repute have overcome the trouble of "honeycombing" and blowholes in castings. These in earlier days were considered almost unavoidable, in fact it has been stated in the past that the presence of blowholes might be taken as a "guarantee of quality in other respects"!

Given steel properly melted and with suitable percentages of silicon and manganese, and care in making and drying moulds, little trouble is experienced in this respect; "piping," sand defects, etc., being far more frequently the cause of wasters.

The elimination of "honeycombing" has resulted in very largely increased productions of cast steel blanks for machine-cut gearing and similar castings, on which a large amount of machining is done; but, owing to the serious loss which would be incurred if defects developed, particularly at a late stage in the machining operation, it is very necessary that everything which can possibly be done to ensure perfection should be given earnest consideration. Arrangements should be made for the fluid steel to enter the mould at the bottom, and whenever possible a centripetal action, commonly termed "spinning," should be secured. Suitable risers and

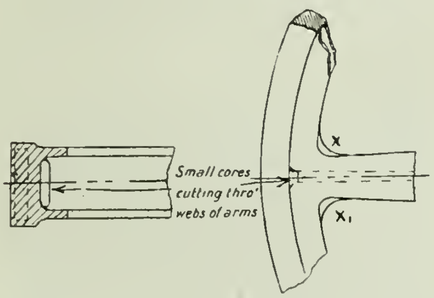


FIG. 7.

"feeders" should be provided where necessary, to ensure any "dirt" being brought up into the "heads." It is usually advisable to cast such articles quickly.

Castings of this kind are frequently produced without the slightest defect, provided the design be favourable. One cause of trouble has been due to the founder being asked to supply blanks of fairly large diameter with solid disc, or plate, centres, which have a pronounced tendency, in large diameters, to result in cavities being formed in the rim, practically in the position where the roots of the teeth are when these are "milled" out. This is due to the rim being of heavier section than the disc and therefore remaining fluid longer, and also, in cases where the change in section is not so great, to difficulty in arranging for adequate "feeding" at this place.

It is preferable to adopt "H" section arms, but it is then found expedient to break the continuity of the metal at the junction with the rim by placing a narrow core through the webs of the arms. If objection be made to such a method resulting in any weakening of the casting, this can easily be obviated by increasing the strength of the faces, or top and bottom flanges, of the arms by having larger radii between them and the rim (see XX'), which is preferable from the founder's standpoint as well.

The same problems are encountered in the production of smaller castings, weighing from a few ounces upwards, as supplied to motor and general engineering firms.

The difficulties might be overcome in many instances if it were possible to arrange to submit suggested designs to some steel-founder of good standing beforehand.

It is not intended, however, to convey the impression that all faults lie with the drawing-office, as by careful attention and thought on the part of the foundry staff better articles could be produced by judicious use of chills, "feeders," etc. Further interchange of opinion would, however, undoubtedly lead to increased efficiency and obviate some of the troubles experienced by the Engineer.

To give one example only: Axle-box guides for locomotives, etc., are still made as shown in Fig. 8, A, which any user will understand generally results in "drawing" at X and X', in addition to causing extra work in the machine shop owing to the absence of tool clearances, instead of a more gradual change in section and also of radii at the corners, as illustrated by Fig. 8, B, the more usual present design.

Innumerable examples might be adduced* affecting practically every type of steel casting made, but the desire at the moment is to persuade the Engineer that exchange of views is of importance not only in respect of the production of castings without inherent weakness, but also in regard to the use of differing qualities of steel, or of special alloy steels, for various purposes.

The provision of suitable test-bars, in the case of some forms of castings, is an important matter if sound pieces for tensile and bend tests are to be ensured. This should not be left to the discretion of the moulder, who is usually, in deciding where to place these, governed by considerations of convenience in respect to the moulding-box used for the job. The question is well worth consideration by the management, owing to the loss incurred if a satisfactory casting be rejected solely through inability to obtain test-pieces free from defects. In some cases, on cutting up a casting for test to represent others produced from the same cast of steel, or on breaking it under the tup for remelting, it has been found that the casting was perfectly sound, defects appearing in the test-pieces only.

It is also highly advisable to provide for spare test-pieces as cutting pieces from "rising heads," etc., often results in disappointment from causes such as segregation, etc.

Consideration should be given to such points as "feeding" the test-bars, and whether the steel is able to flow freely through the part provided for tests; whether any dirt carried off the face of the mould, etc., may be trapped, and whether the test-bar will be sound at the expense of unsoundness in the casting itself, or *vice versâ*.

For small castings it is advisable to treat the test-bar as a separate casting but connected by a "spray" of sufficiently large sectional area to ensure that the test-piece is securely attached to the group of castings, or to the single casting, as the case may be, and also to give an adequate flow of steel into the test-bar, on which a separate feeding head should be superimposed.

A suitable design of test-piece for this purpose is shown in Fig. 9.

The provision of test-pieces from small castings may add very considerably to the cost of production, especially in cases where only a few are required from a pattern. This should be borne in mind when quoting, and the most favourable arrangements made with the Inspecting Engineer as to including a quantity from one cast of steel as well as from a single moulding box.

When moulds are made by machines, it will be found convenient to arrange the patterns on the plate, whenever possible, so that one or more patterns can

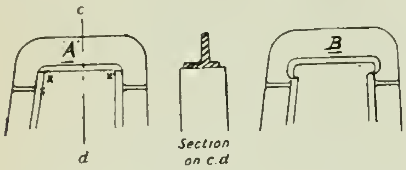


FIG. 8.

easily be removed and a test-bar included in place in several of the moulds which will be put down for each cast. Special attention must necessarily be given to the method of fastening patterns to the plate to prevent any possible chance of displacement through the more frequent changing.

To ensure satisfactory test results it is necessary that the annealing or rather "heat treatment" (as the great majority of castings are now cast in mild steel and "annealing," *i.e.* softening, to permit of the castings being readily machined, was principally required for crucible steel castings), should be carefully carried out. It is very advisable to have some means of recording temperatures, readings being taken in various positions in larger furnaces; at any rate until it is ascertained that something approaching a uniform heat is obtained in the particular type of furnace in use. The furnace attendant, if left to himself, often appears specially interested in recording flame temperatures rather than those of the castings under treatment. If personal attention is given, by some one holding a responsible position, to this matter of heat treatment, economies in working, as well as higher quality material, etc., may result, as small modifications in furnace design, for instance slight alterations in the sizes and positions of admission ports, may be found advantageous.

There is no doubt that an experienced workman can judge temperatures to within a reasonable variation, at any rate under the atmospherical conditions he is accustomed to, but it will usually be found that the tendency is to estimate the temperature higher at night than in daylight, and the cost of a pyrometer is money well spent.

The most satisfactory furnace is one in which the rate of cooling down at the critical temperature can be varied to some extent, as it is then possible to obtain small variations in the maximum stress where castings are made to stringent specifications.

Owing to the difficulty sometimes experienced in obtaining permission for material, which has given results say 2 to 3 tons over, or under, the maximum stress specified, to be retreated, it would appear that some Engineers have not yet realised that the rate of cooling round the recalescence point of the steel governs the maximum stress, and that a substantial increase, or decrease, can be made by accelerating or lengthening the period of cooling through this range.

It is found in practice that heating to a temperature of about 950° C. is advisable to ensure the "breaking down" of the cast crystalline structure; the final structure being of course, coarser or finer according as the rate of cooling through the critical range is slow or rapid. This temperature is much higher than is theoretically necessary, but experiments over a considerable period show the necessity for the higher temperature. The original crystallisation of a casting will, of course, be governed by the mass of metal and the rate of cooling after casting either in the mould or, if "knocked out," early after casting, on the foundry floor.

The length of time necessary thoroughly to "soak" castings and complete the "breaking down" throughout is a matter of judgment depending on size, thickness of metal, position the castings are loaded in the furnace, and probably several other considerations.

When dealing with large castings of heavy section it is advisable to pack them well up from the floor of the furnace. If this can possibly be done, pieces having heavy cores should be rough fetled before being placed in the furnace. The annealing will then be more efficiently and expeditiously carried out.

Generally, if arrangements are made which will admit of castings being cooled off quickly through the critical range without risk of distortion, setting up of stresses, etc., through currents of cold air impinging on one part of a casting, or other causes, an increase in the maximum stress without decrease in the elongation can be looked for and, owing to the closer structure, better results from bend and shock tests obtained.

Many cases have been noted where mild qualities of steel, as cast, have given practically the same maximum stress and elongation per cent. as after annealing, for instance a breaking strain of about 30 tons per square inch with 28 to 30 per cent. elongation in 2 inches. Untreated samples fail, however, to give anything approaching satisfactory bend tests.

It is possible that manufacturers of high quality castings may soon consider that some form of shock test might, by no means, be against their interests if lower grade material, less suitable for the purpose required, and supplied at a cheaper rate, be in this way eliminated from competition. The importance of the annealing or "heat treatment" of steel castings has been specially mentioned in papers read at various times before kindred societies by Mr. Harry Brearley, and a study of these is well worth the time so spent by anyone responsible for the production of steel castings, as are also papers which have recently been read on steel ingots by Messrs. Brearley, Kilby, and others, the problems requiring solution being closely allied.

The aim of every maker should be to produce castings absolutely, not commercially, free from defects, and the

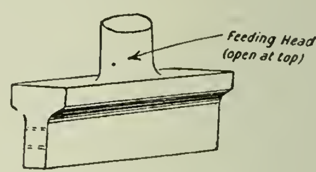


FIG. 9.

engineer should be willing to give earnest consideration to any reasonable modifications which may be suggested by men of experience. By close co-operation, steel castings might be produced which could be used with the same confidence as is extended to forgings when it is borne in mind that practically the same structure in the steel can be obtained by correct heat treatment as by work done on the steel during the process of manufacture.

* Hydraulic cylinders having square instead of rounded or spherical ends, for instance.

JOBS ENCOUNTERED IN SMALL RURAL FOUNDRY

Continued from page 197

Of course the molder requires to have a general idea of what a share should be like, but most molders who work in these shops have. When the nowel is rolled over and the parting is being made, an outline must be made as shown in Fig. 2, so as to make the share appear like Fig. 1. When the shape for the top has been built up to this line a trowel mark can be made down into the nowel so that the top and bottom will be exactly in line.

This same method of molding can be adopted in making repairs for stoves or any kind of work where part is gone. If the fitting parts are available the rest can be made up with sand, and cut away after lifting off the cope.

An Interesting Canadian Steel Foundry

Description of an Electric Steel Plant at Welland, Ont., Within a Gun-Shot of Niagara Falls—The Greatest Source of Electric Energy in the World.

WHILE Canada is blessed with numerous steel foundries, distributed over different parts of the country, and equipped with melting apparatus of practically every known type, there is one in particular which we have in our mind at the present time. We were privileged, on a recent occasion, to visit this foundry and we consider it of sufficient interest to be worthy of note. We refer to the plant of The Electric Steel and Metals Co., Limited, Welland, Ont., which, by the way, is a subsidiary of Electric Steel Engineering, along with Boving Hydraulic Engineering Co., Lindsay, Ont., and The Wabi Iron Works, New Liskeard, Ont.

The Welland Plant

The plant at Welland is a marvel to one who knew Welland a few years ago. In fact the city of Welland itself has had a marvelous growth of late years and has foundries and industrial institutions in every quarter. One of the most interesting of these is the Electric Steel Foundry to which we have just referred.

This plant consists of a foundry building, 600 feet in length and 100 feet wide, used exclusively for foundry work and a parallel building, 500 feet in length, which houses the machine shop and pattern-making and storing departments.

The lines of work which call for steel castings are extremely interesting, including, as they do, great stem and stern pieces for steamers, slag kettles for refineries, also enormous lead pouring ladles, forging ingots in either high or low carbon steel, nickel and vanadium steel or any special steel to order. Anything ranging from a pound up to ten tons is within their capacity.

The equipment, in addition to regular electric traveling cranes of sufficient capacity to handle the heaviest work and such regular equipment as goes with a foundry as large as this one, consists of two basic electric steel furnaces of the Herault type, built by the American Bridge Co. of New York. Each furnace has a capacity of seven tons of either mild steel, manganese steel or any of the made-to-order brands of steel. In addition to these there are the drying ovens for molds of the largest size, annealing furnaces for annealing the castings in order to relieve strains, quenching baths for water cooling the manganese steel castings, electric arc welding apparatus, oxy-acetylene gas for cutting off-risors and sundry other purposes.

In melting and mixing steel in an electric or any other style of furnace there are peculiar characteristics in connection with it that could never have been found out by any other means than by discovery. For instance in the case of manganese steel. If the manganese is kept close around 12 per cent. the resultant casting will be so hard that it will be difficult to file, yet so tough that it can be bent and twisted without breaking. This, of course, is after it has been water-treated, which is simply to be heated red hot and plunged into water—a process which would ruin any other brand of steel or iron.

If the manganese content varies greatly from 12 per cent., either higher or lower, the result is unsatisfactory.

Molding

The molding in a steel foundry is, in many respects, similar to that in any foundry, but the fact that steel requires to be poured at a much higher temperature makes it necessary to use the best of silica sand in order to stand the enormous heat, which is generated by pouring the white hot iron. Other features in connection with molding for a steel casting is the risk of boiling in the metal. Much of this risk has been relieved of late with the increased knowledge which has been gained in melting steel. Not long ago a steel mold had to be nailed over the entire surface to prevent the boiling steel from tearing the mold to pieces, but properly managed steel foundries do not have boiling steel these days. However, considerably more caution is required in steel molding than for gray iron and quite a bit of nailing is still practised and the molds are usually dried. The accompanying illustration shows a nine ton pot, which was lying on the floor of the foundry when the writer visited the plant. This pot was one of an order which was being filled for the Consolidated Mining and Smelting Company of Canada, Limited, and is used in the smelting plant to receive the lead as it comes from the smelting furnace. This pot is what is known in foundry phraseology as a mustache ladle on account of the skimming attachment which is shown at one side. As will be seen this does not reach quite to the bottom and as the lead fills up the ladle the purest metal naturally settles to the bottom and when pouring through this skimmer nothing but the pure metal can come out. In addition to the one which was lying on the floor, another was being molded and was in the early stages, affording a good view of the procedure. This piece, which incidentally is poured bottom up, might be rammed bottom down and rolled over or it might be molded bottom side up and rolled over twice, but to obviate trouble in molding the pattern is made in three parts and molded as it is to be poured. For instance, the pattern is divided at a point about half way up or in line with the "mustache" part and again at a point where the circle would be just big enough to work through.

9-TON STEEL CASTING SUPPLIED TO CONSOLIDATED MINING & SMELTING CO. OF CANADA, LIMITED, TO BE USED IN LEAD SMELTER.

In making the mold the drag is struck off flat, and the first section put in place and rammed inside, with plenty of room to work. The second section is next put on and rammed with a little less room to work, but not much difficult work to do. Before putting on the small piece which covers this last opening the sand is formed up by hand.

The rest of the work is plain sailing. The outside is rammed up, lifted off and finished. The pattern is lifted away in sections, the sand tucked wherever a soft spot appears, nails are inserted where required, and the entire mold black washed and put on the car and put into the oven to be dried.

The Electric Steel and Engineering, Limited, were fortunate in making a contract with the Hydro-Electric Commission at a time when they were seeking patrons instead of the patrons seeking them, and consequently made a favorable bargain. And now during the coal difficulties they are abundantly supplied with fuel and power. Mr. McKenzie is the manager, Mr. W. B. MacDonald is superintendent, Mr. George Cole is foundry foreman and Mr. G. H. Ellis is chief pattern maker.

FOUNDRY INSTRUCTORS

Continued from page 200

taught (which were about going rates for unskilled laborers), and that those engaged would be under direct supervision of instructor, and given intensive training. These firms report plenty of applications from English speaking young men, while in the same localities their efforts to obtain apprentices under the old system have met with failure."

Rigging Up a Dinkey Cupola for Emergencies

Demonstrating that if the Fire Burns Properly the Design of the Cupola is Not of Material Importance.

By THOMAS NELSON

WE have all heard the saying that "eggs is eggs." I am going to change it and say that "cupolas is cupolas." As there are different kinds of eggs, some large, some small, some good, some bad, and some indifferent, each having its own characteristic, so we can apply the same adjectives to cupolas.

Webster's defines a cupola as a spherical cup-shaped roof; a revolving shot-proof turret. That is one variety of the genus cupola, but as there are a great many people whose education has been sadly neglected in things pertaining to REAL life (life lived in a foundry) I am afraid we must include the worthy editor of Webster's in that class, for as every man knows, or ought to know, a cupola is that fearful and wonderful contrivance in a foundry wherein iron is reduced from a more or less solid to a more or less liquid state.

There is a remark sometimes made among cupola tenders that a cupola is pretty much like a woman, to get the best results from it you must know it thoroughly and humor it gently.

The cupola I am describing here I ought to know, as I created it, and I think I must have humored it gently, judging by the results I got from it.

The summer before the great war started I was foreman in a certain foundry and had held the position for some years. Business was so bad there was not one man left in the shop. Any little bit of work that came along I took the patterns to a neighboring foundry, to which I had access, and there made the castings.

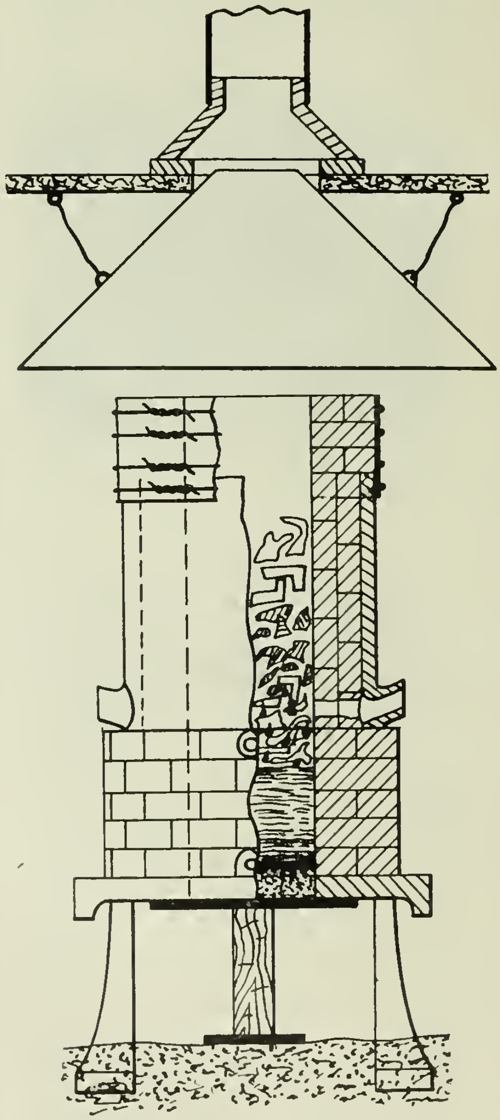
Between times I kept myself out of mischief by working out a scheme I had in mind, of fabricating a small cupola, in which I might be able to melt a few hundred pounds of iron as occasion required.

As I did not feel at liberty to spend much money on the affair, I gathered together some odds and ends of material and got busy.

First thing was to locate the best position for my Dinkey, as it came to be called.

The blower for our regular cupola was located on the charging floor, down through which the blast pipe was carried. At the other end of the charging floor there was a square opening left for a ladder to communicate with the ground floor. This ladder had never been erected and the opening was covered with a plate. In the roof over this opening, there was a similar opening giving access on to the roof.

Beside this opening in the charging floor was a door, and outside this door was the elevator which was operated by compressed air. Thus we have the essential features of the landscape where the dinkey was to grow and, if possible, bear fruit right underneath that opening. I now got busy with my junk pile and commenced erection. I had two iron trestles 24 inches high with a heavy cast iron base. I sunk these 6 inches into the ground. For a bottom plate I had two cast iron ends off an old wooden flask which, when laid on the trestles joint to joint, gave me a plate 2 ft. 6 in. x 3 ft. with a round hole in the centre 12 in. diam. This hole determined the size my cupola would have to be. For a shell I had what they used at one time as a stove to heat the shop, a rough casting 24 in. diam. x 24 in. deep, with two pieces cut out at one end on opposite sides 6 in. x 6 in. through which they raked out the cinders from the stove. Those two openings I meant to utilize for the tuyeres.



THE DINKEY CUPOLA AS IT WOULD APPEAR. THE HOOD WOULD, OF COURSE, BE HIGHER ABOVE THE SHELL TO ADMIT OF CHARGING.

To get sufficient depth of chamber between the bottom and the tuyeres, I built up 10 in. of brick work, carrying it out the full size of the plate to get all the strength possible as I would have no casing at this part. In building this brick work, I made provision for the tapping hole and also for a slagging hole just below the point where the tuyeres would enter through the two openings in the iron shell. I now placed the iron shell on this brickwork and lined it with old fire-brick, using for mortar fireclay I made myself.

As I thought the 24 in. depth of the shell plus 10 in. brick underneath would hardly be enough, I built other 12 in. on top of the shell and wound some wires round it to hold it together.

For a bottom I used a piece of stout sheet iron and held it up with a wooden pin underneath.

The thing that scared me worst was the fact that I would have to charge fuel and iron from the top and the heat would be too much for us, but it turned out to be not nearly so bad as I had figured.

As there was about 6 ft. open space between the top of the Dinkey and the floor above, I hung up an old hood 4 ft. diam. tapered to 12 in. and 3 ft. deep which had been scrapped in the blacksmith shop.

Having removed the plate from the opening in the floor, I replaced it with a rough casting having a hole in the centre 20 in. diam. and over this hole I placed a cone-shaped casting which had been the top of the stove, now the shell of the Dinkey. This cone was 24 in. diam. tapered to 13 in. outside diam. and 12 in. deep. On top of this, I fitted a sheet iron pipe 14 in. diam. which reached 10 ft. above the roof up through the trap door.

The management did not feel like installing a blower and motor of suitable size but gave me permission to use the large blower if I could connect up the blast pipe. The only material we really bought was 16 ft. of 4 in. sheet iron stove pipe and two elbows I cut a hole in the blast pipe, inserted one of the elbows, connected up the pipe, hanging it from the roof well up overhead, fitted on the other elbow right in front of the cupola.

I got our own plumber to make me a "Y" with the two arms 2 in. in length and the stem 4 in. to fit into the elbow, and also two elbows for tuyeres which I connected together with two pieces of 2 in. pipe from the junk pile. Thus the Dinkey was completed, and it only remained to put in the bottom and light up.

Some of my Job's comforters around the place predicted failure, but I put up a big bluff and told them (as greater

Continued on page 207

A Novel and Ingenious Method of Melting Brass

Where First-Class Facilities Are Not Available, Second-Class Ones Can Be Made to Do.

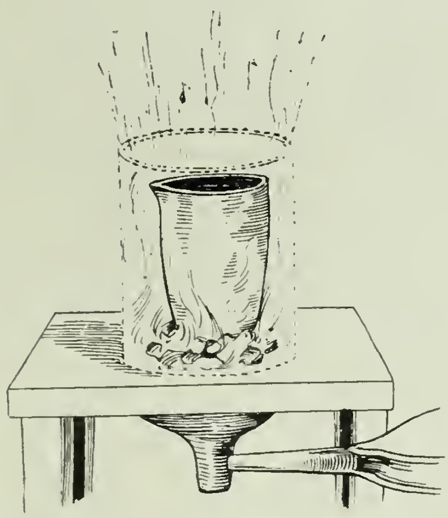
By A. H. OBO

THE lesson to be learned in reading Mr. Nelson's article on a dinkey furnace, has a counterpart in my own experience in melting brass. These improvised makeshifts are not to be recommended to any great extent but still they have a place, and are useful in their place. Where I served my first apprenticeship (I say first because I have been serving apprenticeships ever since), we had a well equipped iron foundry with a splendid melter of a cupola, but we had no brass foundry and had very little use for one, but it was the only foundry in the town and we had to fill some orders for brass castings.

We had a fairly well appointed blacksmith shop fitted out with a forge such as was in use in most shops in those days, viz., a square wooden bench with a frame on the top filled in with brick work, and the tuyere in the middle. The blast was furnished by a leather bellows which was operated by hand. A hood hung from the roof to carry away the smoke.

In the foundry we had a coke stove for heating the shop. This consisted of a cast iron pipe about an inch thick and probably 18 inches in diameter and two feet high. This had a nice bottom and top to it with grate and pipe connection. I presume the reader will know the rest without my going any further but I might as well finish my story. When we wanted to melt brass we removed the top from the stove and lifted the straight pipe portion from the base and placed it on the forge, minus its top and bottom. Of course the bottom could not be of any use and the top would also be in the way. We used to daub it on the inside the same as daubing a ladle and then we would proceed with it the same as with a first-class brass furnace, by putting in a good bed of coke and then the crucible of brass which would be surrounded with coke. There was no need for a top to it, because we did not depend on draught to make the fire burn as is the case with an ordinary pit furnace. The draught was furnished by means of the leather bellows already spoken of which were operated by hand. Had that been a power driven blower such as is used now-a-days, I would still consider it a very good substitute for a real brass furnace. As it was we had good success but it was a terrible job pumping on the bellows for so long. Of course it was not particularly handy when we came to lift the pot out of the fire as we had to build scaffolding to walk around on, but it was all down hill work after the pot was once lifted out.

Reminiscences of those days are interesting, but perhaps not as interesting to anyone else as to myself. However, I can not refrain from relating a few little memories. In those days we only had two kinds of brass. One was machinery brass, and the other was just brass. We invariably used scrap, but in those days it was a safe procedure, because we knew that if it was reddish it was copper and tin, while if it was yellowish it was copper and zinc. We never used to mix them because it was considered that the mixture would not be suitable for any purpose, and that it would be an imposition to sell the castings. It does not seem long since I was serving my time but since those days I have seen opportunities to make a little change (I mean financial change



MELTING BRASS ON THE FORGE. AFTER GETTING THE FIRE UNDER WAY FUEL IS FILLED IN AROUND THE CRUCIBLE, THE SAME AS IN A PIT FURNACE.

or pocket change) if it were possible for me to go back and undo the mischief which I had done. For instance, we had a fad a few years ago of making jardinieres out of old brass stew kettles. The fad became doubly popular because old brass stew kettles were not very easy to lay hold of, and the price ran away up accordingly. Yet many is the brass kettle which I put under the hammer and pounded into a lump small enough to put into the crucible.

Another fad which had quite a run was the brass candle stick, but this fad ran itself out, for the reason that new candle sticks were easily made in imitation of the old timers, still they had quite a run and a genuine old time candle stick would command quite a figure right now, yet I can still see myself subjecting some excellent specimens to the same indignities that I had meted out to the kettles.

As I have said, we usually used old metal, and the only time we ever introduced any new material was when we used some old copper tea kettle bottoms in the mixture, in which case we would mix in new tin, which we could always get at the tinsmith's, as each tinsmith used to make his own solder in those days. We used to calculate that a pound of tin to ten pounds of copper made the best value metal and one to eight made the best journal bearings. As a flux, and mixer, and deoxidizer we invariably used borax. This was put in after the different metals were all melted and was well stirred through. Of course we made No. 1 castings but the price would be prohibitive these days on account of the tin shortage and its consequent high cost.

RIGGING UP A DINKEY CUPOLA FOR EMERGENCIES

Continued from page 206

men have done on occasion) to wait and see, and results exceeded all my expectations.

After running steady for about a year, I got a casting to make which would take at least 300 lbs. to pour it. I was told I could not take that much out of my dinkey, but being Scotch and therefor dour I simply said it shall be done, and done it was. The casting when cleaned tipping the scale at 280 lbs.

The dinky did not recover from the strain on its constitution entailed by that effort, and I decided to rebuild it, which I did with certain improvements suggested by experience, but thereby hangs another tale which will be continued in our next.

CASTING BRASS IN IRON MOULDS

In all cases where brass castings are made in permanent moulds it is necessary to have a small proportion of manganese present in the alloy if a fairly smooth skin is needed. Usually it is difficult to work in manganese in a metallic state owing to its high melting point, and either a manganese-copper alloy melting at a reasonably low temperature has to be prepared for addition to the brass during its manufacture or some salt of manganese has to be added. Probably, however, the use of manganous chloride as a flux instead of salammoniac will provide all that is necessary in the majority of cases, and this somewhat cheap but deliquescent salt can be freely used without injury to the metal—which is an advantage.

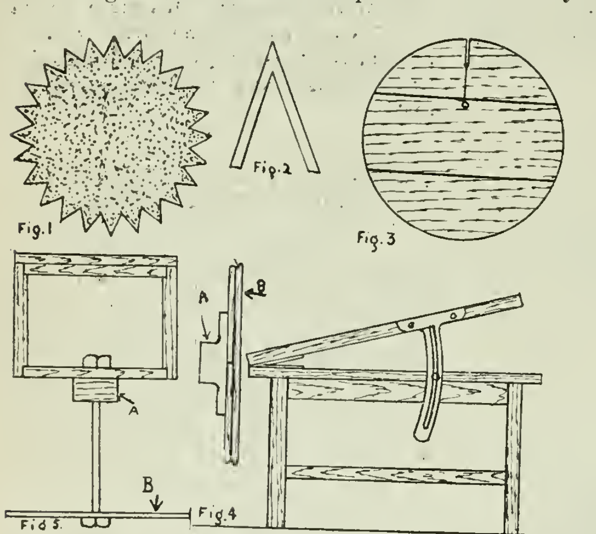
Sand Paper Devices for Small Pattern Shops

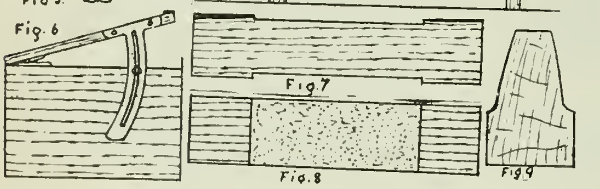
While Every Up-to-Date Pattern Shop Has an Up-to-Date Sandpapering Machine, There Are Small Shops Where an Improvised One Can Be Used.

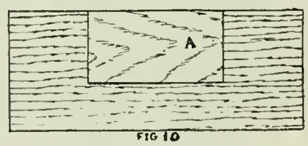
By JAMES EDGAR

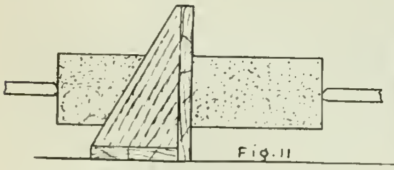
EVERY well-appointed pattern shop has sanders, which are considered nowadays as indispensable as the circular saw, but the small shop has to do without such expensive machinery. There is no reason, however, why work should be planed with hand tools, as, if a lathe is available, it can be easily converted into a sandpapering machine without affecting its usefulness for turning. The sandpapering machines that are mostly used are of the disc and roller types, the former for flat and convex surfaces and the latter for concave surfaces.

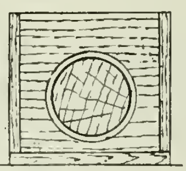
A face lathe is most suitable for disc work. Fig. 4 illustrates an improvised

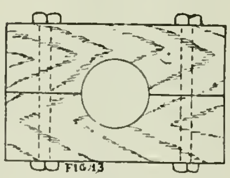












disc machine. A is the iron chuck, and the diameter of chuck used will depend upon the diameter of the disc decided upon. For small work a 24 in. diameter is big enough, and a 12 in. iron chuck will carry this. It will be observed that the faceplate B, which should be made of two layers of timber crossed, and at least 1½ in. thick, has a groove turned in the periphery. The sandpaper should first be cut circular and about 4 inches larger in diameter than the faceplate. This is most easily done by laying a wooden plate or templet of the required diameter on the paper and cutting round it with a heavy knife. The edge has to be notched as shown in Fig. 1, so that the diameter at the root of the notches is the same as the faceplate. The notches can be conveniently cut with a V chisel like Fig. 2, made especially for the purpose.

To fasten the paper on the faceplate it should first be made quite wet and pressed on the plate, the points being pressed over the outer groove. Either a cord or a wire cable looped will bind the paper. When it is pulled tight the end can be drawn down a slot in the faceplate and pulled over a nail behind. The arrangement is illustrated in Fig. 3.

The table or bench (see Fig. 4) should be fairly heavy so that it will not slip back when work is being pressed on the sandpaper. In order that work can be sandpapered to shape at any angle, it has a hinged top with slotted arms on either side. Tapped plates have to be screwed to the edge of the fixed table top so that milled screws can be used for supporting the movable top at any desired angle.

If a faceplate lathe is not at hand, a box like Figs. 5 and 6 may be made to rest on the bed of the lathe and bolted down, the loose headstock being pulled back or removed temporarily. The back of the box has to be left open to give access to the bolt. The piece A, Figs. 5 and 6, fits into the bed and the plate against the under side of the bed.

Using a roller in the lathe necessitates holding the work against a perpendicular face, which is not as convenient as when it is resting on a horizontal table, but good work can be done on it for all that. The rollers should be turned of soft wood and of varying diameters to suit large or small work. A roller is shown in Fig. 11 between the lathe centres and with the sandpaper on. The sandpaper should be glued on the roller, fish glue being perhaps best, and to ensure that it is well pressed on, press blocks like Fig. 13 should be made. These press blocks should be of hard wood and the hole should be just less than a diameter, so that when the paper has been glued on and the nuts screwed up, the roller will be held tightly till the glue is dry. Scraps of paper that are cut from the discs can be utilized by joining them on the rollers. The bracket as shown in Figs. 11 and 12, against which the work is held while being sandpapered, should be strongly made and bolted to the lathe bed. If desirable an adjustable face can be made for angles in similar fashion to the table tops already described, although this is not shown in the sketches. The hole through the face for the roller should have clearance so that the sandpaper will not grind on it.

A very useful adaptation of the sandpaper roller for finishing gear wheel teeth is illustrated in Figs 7 and 8. The roller should be recessed in the lathe as shown in Fig. 7, just sufficiently that when the sandpaper is glued on it will appear like Fig. 8. The teeth would first be planed roughly in a box similar to Figs. 9 and 10. A, Fig. 10, being the teeth. No face bracket is necessary. The teeth box is simply held against the roller as it revolves, the tooth pressing on the sandpaper, and the box ends resting on the roller on each end of the sandpaper. This makes a much better job than finishing by hand and is infinitely quicker.

GET TO WORK

The first and foremost duty of America's workers, including those who belong to Mr. Gompers' trade union organizations and those who do not, is to go to work and keep at work. An honest day's work for an honest day's pay, wholehearted effort to produce as much as possible at as little cost as possible, devotion to the common industrial and political needs of the country, unfaltering opposition to the madmen who preach revolution; if American workers, men and women, hand and brain, will give their energy to these things they will do their whole duty by their country and by themselves.—New York Sun.

Lawyer: "Have you ever been in jail?"

Witness: "Yes, sir, once."

Lawyer (triumphantly): "Ah! for how long?"

Witness: "Long enough to whitewash a cell which was to be occupied by a lawyer who cheated one of his clients."

Report of Sub-Committee on Bearing Metals

Research Committee of the American Society of Mechanical Engineers Presents the Results of Its Studies on Proper Composition of Bearing Metals.

IN the January number of Mechanical Engineering our Committee made a brief report giving concisely the reason for abandoning our original plan of first publishing a complete compendium of the technical literature on bearing metals. At the time, we also pointed out what we considered the most promising outlook for future study and investigation.

2. It is our conviction that a large amount of valuable time is being wasted in testing bearing alloys, in determining characteristics that are of no consequence and are utterly meaningless. The only mechanical or physical test of a bearing alloy, in the aggregate, that can serve any useful purpose, is that of determining whether the given alloy has a sufficiently high factor of safety against possible distortion or rupture under specified service conditions at service temperature. All other characteristics are of a microscopic nature, depending entirely upon the properties of the individual crystals of the alloy, upon their orientation, relative hardness, fusing temperature, quantitative proportions and the like.

3. Our studies have convinced us that any work on our subject without the application of modern metallography is an absolute waste of time; we also feel that studying the hardness of the individual microscopic crystals is of the greatest importance in supplementing the application of metallography to our subject.

4. The instrument shown in our last report has been perfected to a much higher degree and three of them have been substantially completed, one for each member of our committee. This instrument determines the characteristic of a crystal which is the combination of three of the five fundamental conceptions of hardness: namely, the combined effect of cutting hardness, scratch hardness and penetration hardness. This is done by very slowly moving an exceedingly hard and sharp point under a definite pressure, over a highly polished surface of the crystal to be tested; in fact, the point is moved so slowly that no additional penetration is effected by stopping. The point is a solid right angle or the corner of a cube, mounted in such a manner that the diagonal of the cube will be normal to the surface tested, and having an edge of the cube advance directly in the line of motion. The motion is effected by a slow micrometer feed. The width of the cut, scratch, or penetration is a function of its depth, and, therefore, measuring the width of the mark gives us the means for determining this combined characteristic representing the hardness of any crystal. The instrument is properly called a *Microcharacter*.

5. In order to lay the broadest foundation for our work, one that will facilitate the co-operation of other investigators and will make all results directly comparable, it will be necessary that conventional units be established; that is, that a *Scale of Microhardness* be determined upon. With the establishment of this scale, it will be possible to consider the various crystals in the many different alloys in terms of exact degrees of hardness. This is the work that occupies the attention of your Committee at the present time.

6. Experience well shows that a single homogeneous metal is not suited for bearing purposes, and that the first requirement for a bearing metal is that it be an alloy composed of at least two metals, or a metal and a metalloid, which shall have at least a limited degree of solubility while in the molten state; but that upon cooling it shall partially separate out into dissimilar crystals, and thus form the proper microstructure which is necessary in all bearing alloys. It is not only necessary that a bearing alloy shall be composed of chemically dissimilar crystals, but it is all important that these crystals shall have a marked degree of difference in their physical hardness and wearing qualities.

7. The degree of relative solubility necessary for the constituents of bearing alloys is well illustrated by the copper-tin and the copper-zinc compounds, and this also illustrates why bronze is a better bearing alloy than brass. For example, with the addition of not more than 11 per cent. of tin to copper, a three-phase alloy is ordinarily produced — less than a two phase alloy cannot be produced; even with the most instantaneous chilling effect, crystals of different composition are produced. While on the other hand with 11 per cent. of zinc added to copper, only a single-phase alloy can be produced, however slightly it may be cooled; that is, all of the crystals in this copper-zinc alloy are of the same chemical composition and, therefore, all have the same physical properties. Quite the opposite is true in the copper-tin alloy, an extreme dissimilarity of crystals existing both as to the chemical composition and physical hardness. Now, it is due entirely to this dissimilarity of crystals in the bronze that makes it a better bearing alloy than the brass.

8. In the solidifying of the molten bronze the tendency of the tin to separate from the copper is far greater than that of the zinc in the solidifying of brass, for the reason that the bronze solidifies with a distinct microscopic heterogeneity. The matter of having the proper microstructure in a bearing alloy is always of far greater importance than its exact aggregate chemical composition. The value of an exact or definite chemical composition is secondary, in that it can serve only in producing the desired microstructure in a given alloy, provided the alloy is subjected to the proper cooling conditions.

9. The essential characteristic of all bearing alloys is a structure made up of alternately hard and relatively soft microscopic particles intimately mixed. The function of the hard particles or *bearing crystals* is to support the load and resist the wear. These bearing crystals should not be hard enough to prove distinctly abrasive to the journal surface. General experience shows that an extreme hardness of the bearing crystals is characterized by an excessive wear of the journal. The function of the softer or more readily abraded crystals is that of being plastic and permitting the bearing crystals to adjust themselves to surface requirements of the journal. These softer crystals are also more readily abraded, and therefore wear slightly below the surface of the bearing crystals and thus form slight depressions upon the bearing surface which serve for the retention of the lubricant. However infinitesimal amount this may seem, nevertheless it is this lubricant that prevents scoring or seizing when the journal is starting up from rest at a time when actual metallic contact between the bearing surfaces exists. The same is equally true under an excessive load. This function of retaining a slight quantity of the lubricant upon the bearing surfaces when metallic contact exists, characterizes a bearing alloy in its truest sense. Therefore a bearing metal may be defined as: *An alloy that is capable of retaining a lubricant on a bearing surface.*

10. In the operation of a bearing under normal conditions, when a continuous and unbroken film of lubricant exists it matters little what metals are used while the film is sustaining the entire load. In the starting and stopping of the journal, however, or at all such other times when the film is interrupted and metallic contact exists, it then becomes very important that the properties of a bearing metal should be present.

11. A matter of importance, which seems not to have been considered heretofore, is the fusing temperature of the bearing crystals. From observations made it is evident that under severe

Continued on page 211

Melting the Metal at the Ford Foundry

Metal is Melted in a Similar Manner to that in General Use But with Some Additional Features.

As previously stated, there are fifteen cupolas of sixty-inch diameter employed in melting the iron which is used in this foundry. One of these is used in connection with a Bessemer converter for doing steel work; the other fourteen are used seven at a time. The foundry is in operation twenty-four hours per day, divided into three shifts of eight hours each. One of these shifts is for cleaning up and putting things in readiness, while the other two shifts are for continuous molding and pouring, and the cupolas are divided between the two shifts. Why one cupola does not run continuously for sixteen hours I am not prepared to say. As soon as the eight-hour day is over for the one set of men, the bottoms are dropped from the cupolas which they were using and the other seven cupolas are put into commission for the gang which begins the next shift. Each cupola has to melt from fifty to sixty tons of iron during the eight hours it is in operation, after which it is considered best to drop it out and blow in another one.

As will be seen in the illustration the cupolas are in a row and are served by an overhead trolley system for handling the ladles. The trolley system is probably the most used of any of the different units in the entire plant. These overhead tracks are so arranged that the ladles pass on separate tracks and, as has been previously shown, all the metal passes over them on its way to the molds. Some of the heavier parts are poured direct from the trolley ladles, which however, are suspended on tracks provided for the floors, but connected to those which serve the cupolas. By this means one man can handle tons of metal instead of many men lugging themselves to pieces in doing it. Back of the charging floor is the yard where the fuel and raw metal is stored. Even this department is as systematically controlled as any of the various departments of the plant. The borings from the machine shop, which are made of first class iron, but which are usually considered to be worthless, are here melted to good advantage. This is accomplished by packing them in sheet iron containers. As is well known, wrought iron and steel melt at a higher temperature than cast iron. If the cast borings are charged in this manner they will be melted sufficiently to stick together before the sheet iron gives way, thereby passing down through the cupola in a solid mass, whereas if charged openly without the casing they would simply blow away before they had time to become hot. This might seem like extravagance, which would more than absorb all the saving, but it is not. It must be remembered that a hundred pounds of borings could be easily packed into a link of stove pipe and then leave plenty of pipe to turn in, and if the sheet metal is bought right and the pipes made by machinery they can be produced with very little expense, and besides the sheet metal melts and helps to make up its share of the tonnage.

By having seven cupolas in operation at the same time it allows the various parts to be made from whatever brand of iron is most suitable. If it is desired to pour the cylinders from semi-steel, and the piston rings from metal which will be suitable for chilling and heat treating, it simply requires that a cupola be set aside for this work. For handling the iron and transferring it from the yard to the cupola, magnets are used.

These magnets, while representing an outlay of money, pay big dividends, as they will accomplish an enormous lot of work in a short time. They require no power and cost nothing to operate, excepting when in actual service. The magnet does not take the place of a crane, but it goes along with the crane and takes the place of the hook, slings, baskets, etc., and simply requires to be lowered down on top of a pile of pig iron and the electric current turned on when half the pig iron pile will be drawn to the magnet. This is lifted by the crane and placed where required, when the current is turned off and the pig iron drops off automatically.

As we have shown, each casting is made of iron which is especially suited to its particular case. and to be sure that no mistake has been made, test bars are taken from every batch and tested by three separate and distinct processes, viz: for the chemical analysis, the physical strength (which includes the elastic limit and the tensile strength) and lastly the hardness test. All tried by different processes, any metal which does not come up to the required standard will not pass.

Casting Tools

It may seem odd to the smithy, who forges the lathe tools for the average machine shop, to know that in this plant the tools are cast from electric melted steel and do not require to be forged, although the tools cast in this manner are of the exact chemical analysis desired and can be readily forged if need be.

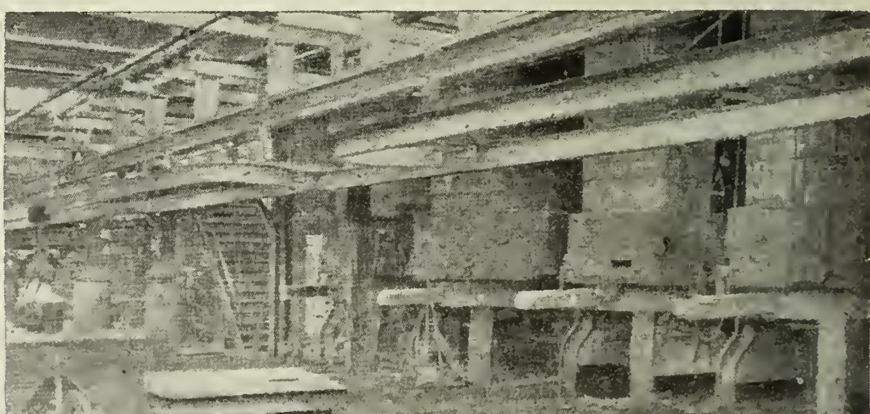
The Electric Furnaces

A brief description of the two "Greaves-Etchells" furnaces, which were installed by the Electric Furnace Construction Co., of Philadelphia, will be of interest. One has a capacity of half a ton at a heat while the other has a three-ton capacity.

The smaller one is used for special experimental work in the manufacture of all kinds of steel, remelting die and other special scrap. It is a two-electrode furnace, in which two phases of the three-phase primary supply are taken through top electrodes and the third phase is connected to the whole of the furnace hearth. The furnace hearth is solid and has no studs or other forms of weakness. The charge lies between the three sources of power, and it is claimed the furnace gives extremely rapid melting and refining and ideal metallurgical conditions. Although nominally designed for 1,000 lb. charges, we understand the regular charge is 1,500 lbs., and the average time taken for melting and refining is about two hours.

The larger one is a four-electrode circular furnace, built on the standard Greaves-Etchells principle, two phases of the three-phase primary supply being introduced through each bank of two electrodes, and the third phase being introduced through the whole of the furnace hearth. We understand that this furnace has given extremely efficient results in the manufacture of steel castings, and the average charge is well over four tons.

In connection with the subject of cast-



BATTERY OF CUPOLAS AT THE FORD FOUNDRY. NOTE THE TROLLEY SYSTEM.

ing lathe tools, most of the human race seem to think that cast iron and wrought iron and steel are separate and distinct metals and that cast iron is meant to be melted while the others are meant to be forged and it is hard to make them believe that all three are the same with very slight variations in the proportions of the metalloids contained in them. The metalloids form a very small part of the bulk, but they exert such a powerful influence on the resultant mixture that it requires a first-class chemist to get them right, but once the chemist has his analysis where he wants it for forging steel, it is heated to the proper temperature and poured into the required shape wished for. So that it will be seen that if lathe tools are cast in the proper shape they are no different from what they would have been had they been poured into ingots or pounded into blooms and rolled into bars and forged to the proper shape.

Other Interesting Features

The heat treating process, which, while not exactly a part of the foundry equipment, is to some extent used as such. Its principal use is in connection with the steel forging and its purpose is similar to that of annealing malleables, and by keeping a forging at the proper temperature for a short period the molecules of the metal become so shaped that all strains are relieved and a much stronger forging is the result. As was mentioned in a former article, some of the castings are heat treated, viz: the piston rings which we cast in the revolving iron mold. The heat-treating department contains about 200 large furnaces, which consume 35,000 gallons of fuel oil per day. Of course there is a lot to learn about the heat treating which is not within the province of a foundry journal, such as regulating the temperature by the use of a pyrometer, and properly cooling the piece after it has been through the process.

Many tons of aluminum and brass castings are also made in this foundry for use on the Ford cars.

WELCOME TO THE 1920 CONVENTION

Exhibit of the American Foundrymen's Association and the Metals Division of the A.I.M.E. at Columbus, Ohio, the Week of October 4, 1920

The annual meeting of the American Foundrymen's Association has long been acknowledged as the most important event of the year among manufacturers of castings.

Convention week brings together the men representing the brains, ability and achievement in the foundry industry.

Here are recorded the most advanced ideas in casting practice. Here are exhibited the latest creations of inventive genius applicable to the making of castings. Here technical problems affecting the welfare of the industry are discussed fully.

Separate sessions are held for the Gray Iron, Steel and Malleable Castings Sections and the Industrial Relations Section. Also for the newly created Non-Ferrous Department, of special interest to brass and aluminum foundrymen.

Supplementing the formal sessions will be special entertainment events, plant visitation an the annual banquet.

Altogether the week of October 4th will stand out as the one occasion of surpassing interest to everyone engaged in or related to the foundry industry. All interested parties are invited, whether members or not.

See—Hear—Inspect—Compare

With increased space available, the 1920 Foundry and Machine Exhibit will be still larger and more instructive than any that has preceded it.

BEAUTIFUL OHIO STATE EXPOSITION GROUNDS, WHERE THE FOUNDRYMEN'S CONVENTION AND EXHIBIT WILL BE HELD.

The exhibit provides conditions that afford the fullest opportunity for deliberate inspection and comparison of the full range of equipment and supplies on the part of the user. And these same favorable conditions enable the maker to display, demonstrate and establish personal contact with large numbers of the very people who are most interested in learning of his products.

New machines and methods are annually introduced that help foundrymen to reduce costs, stabilize quality and save time and labor.

No place in the world compares with the Foundry and Machine Exhibit for the convenience and certainty with which foundrymen can keep posted and enlarge their knowledge of advanced foundry methods.

The ingenuity, attractiveness and variety of the exhibits combine to make a display of surpassing interest and rare educational value. Countless new ideas are set in motion at this great convention and exhibit. COME, GET YOUR SHARE!

REPORT OF SUB-COMMITTEE ON BEARING METALS

Continued from page 209

conditions where relatively low-fusing bearing crystals exist in a high-fusing alloy these bearing crystals actually fuse on their surfaces during the process of the "running in" of the bearing. The delta copper-tin crystal (Cu_4Sn) may be cited as a particular example, and in some severe conditions corresponding to automotive worm-drive service the alpha copper-phosphorous crystal (Cu_3P) seems to function in a similar manner. It is doubtful whether these conditions ever obtain in any of the babbitts, since their bearing crystals are the highest-fusing compounds of these alloys.

12. The study of bearing metals is very incomplete unless these alloys are considered in conjunction with the other corresponding bearing member. The extreme variety of modern steels makes this necessary, since a bearing alloy suited for a soft low-carbon machine-steel journal would not be an economic selection for a high-carbon nickel-chrome heat-treated journal, and a most economic selection for the latter would prove destructive to the former.

13. It seems exceedingly improbable that laboratory accelerated service tests can ever give general satisfaction, owing to the difficulty of reproducing in a few hours' time the equivalent of many years of service conditions. It is our conviction that much more can be learned from the study of failures, and also in studying old bearings together with their journals, which have given eminently satisfactory service for an exceptionally long period.

"There are seasons in every country when noise and impudence pass current for worth, and in populous communities especially the clamor of interested and factious men is often mistaken for patriotism.—Alexander Hamilton.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

B. G. NEWTON, Manager.

A. R. KENNEDY, Managing Editor. F. H. BELL, Editor.

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THE PRINCIPAL CONTENTS

Business in General

THE months of July and August are not usually looked upon as rush months from a business standpoint, no matter how times are during the remainder of the year, and this year is no exception, although in some respects it is different. Reports continue to come in to the effect that things are easing off in certain lines and that this, that and the other commodity is more plentiful than last week, but on the whole things are not as they should be, either in Canada or elsewhere. There seems to be no lack of business for those who are in a position to accept it. Coal, iron and transportation are the three items which most interest foundrymen and these three seem to be about the most difficult to put on any kind of satisfactory basis. Market reports and price quotations are worse than useless for the reason that wholesalers are reluctant to quote prices except from day to day and even then after getting quotations, the customer has no assurance that he can get delivery.

However, prospects were never better as an enormous amount of unfinished business is still waiting its turn, and while reports from New York and other American centres indicate a slight falling off in orders, it can be safely assumed that it is simply due to the holiday season, or dog-days as they are sometimes called, when the weather is not ideal for working.

As far as Canada is concerned things could not be more encouraging, were it not for the draw-back—shortage of material. If anything like a panic is awaiting us it is going to be a terrible surprise to a class of people who are not usually surprised in that manner. When an American concern is prepared to invest three million in a coke plant in Toronto, and when some of the largest steel plants in the world are locating here, it certainly looks as though those who have so far been successful were confident of the future.

The Exchange Situation

THE fact that the Canadian dollar does not pass at par in the United States is certainly a draw-back to both the Americans and the Canadians, but obviously the Americans are the biggest losers, as they miss a certain amount of trade, which they could easily secure, were it not for the exchange. However, this is due to right itself in the near future, and many of the leading publications over the line predict that there is a bright prospect of the Canadian dollar being at a premium before many years.

This is too optimistic a view to take of the situation, and is in fact a condition which we do not desire. A dollar represents one hundred cents. That is all we want for it. Canada is just coming into her own and will rapidly expand as a manufacturing and exporting country, while America has perhaps seen her best days, but the time when Americans will not be able to hold their own is still in the far distant future and we have no desire to see it otherwise. Our aim, and the aim which we intend to back up, is that we may make our country as great and as prosperous as possible, and in this we know that we have the best wishes of the American people.

The exchange is really an abomination, but it seems to be part of the game. We cannot remember very far back into the dim past, but we are still able to recall the days when American coins passed regularly in Canada at eighty cents on the dollar and were not wanted at any price at any distance from the border. Things were just as undesirable in those days as they are now. What everyone wants is for the dollar to pass for one hundred cents, no matter where coined or where circulating.

Make-Shift Methods

IN the foundry, as well as in every other branch of industry there are times when it is advantageous to resort to make-shift methods in order to accomplish some object, which can not well be done by any other means. When in our editorial columns, however, we describe how some contrivance has been rigged up in an emergency we do not claim that such a method is in any way to be compared with systems of operating with up-to-date equipment.

In this issue we have shown how an improvised cupola may be made from such material as can be found around any foundry, how brass can be melted on the blacksmth's forge and how molding can be done from almost any kind of a pattern if a little study is given to the subject. We do not intend to say that a foundry can be run in this manner and that improved methods are not required. On the contrary we believe that the best is invariably the cheapest. We believe that every foundry should be equipped with first-class cupolas and brass furnaces, and even though they have a foundry and boiler shop of their own and could build these for themselves we would advocate the old adage of the shoemaker sticking to his last, which is to say, stick to your regular line and purchase your equipment from those who have made a study of such articles. However we consider that every foundryman should know every detail of the business and should be in a position to know just how to proportion everything about the cupola, etc., but it must be remembered that there are many towns which do not support more than one foundry, and we trust that the time will never come when any town will be considered too small to keep up at least one. Now suppose the one foundry in a town were fitted out with the best of everything and should have a break-down, such as any concern is liable to have, it is well to be in a position to take off a heat in the stove or on the forge. It might seem odd to think that iron can be successfully melted in a barrel, but as we have said we do not advise such makeshifts, except in emergencies.

When the emergency does arrive, however, it is a good thing to be sufficiently familiar with the scientific principles involved to get results by any means.

An Accident Hazard

AMMONIA, while deadly enough in itself if let loose in the refrigeration plant, is usually not looked upon as much of an explosive. By itself or mixed with air in varying proportions it is harmless, but when varying amounts of oil vapor, hydrogen, etc., are mixed with it as in a refrigeration system explosions have been known to occur. An article in the present issue points out a number of accident hazards in the refrigeration plant which are not likely to occur to the operating engineer and is well worthy of careful study.

Explosions can also take place in a compression system itself without the presence of ammonia. This was shown in testing out a compressor under 250 lbs. air pressure when the oil separator exploded with great violence. The explanation advanced was that the superheated air, forced from the compressor into the oil separator, found an explosive mixture with the oil vapor.

Explosive accidents to absorption systems are also quite possible, many of those which have occurred having been simply due to overpressure. There is also another cause for explosions in this type of plant; the dissociation of ammonia and the liberation of hydrogen is quite possible and the gases from the purge line being almost highly inflammable probably consist chiefly of this gas.

The author concludes with the statement—"that explosive accidents are so few in number is due not so much to the care with which the plants are operated as to the fact that fortunately all of the necessary conditions are only infrequently at hand. Finally it is most essential that strict watch is kept on the whole system from end to end in all details, as the failure of even an apparently unimportant part has been found sufficient to cause general havoc and even fatality."

Our Pre-Convention Number

FOLLOWING our usual custom, we purpose publishing two very interesting special numbers dealing with the annual convention of the American Foundrymen's Association, which this year takes place at Columbus, Ohio, during the week of Oct. 4.

Our next issue will be the Pre-convention Number, and while we urge as many as can to be present, we know many will be unable to attend. For the benefit of the latter we will endeavor in the October convention number to provide as full an account as possible of the convention, including the programme, the proceedings, the exhibits and a general impression of what transpired. For the benefit of those whom we confidently expect to meet at the convention we will publish in our September Pre-Convention Number a complete programme of what they may expect to enjoy at the convention.

The number will be illustrated, showing views of the various buildings which are at the disposal of the Association and which far surpass anything which has yet been secured for the purpose.

Other illustrations will include some of the beauty spots and interesting features of the city of Columbus.

As has already been mentioned in former articles, Columbus is the capital of the State of Ohio, and is consequently well provided with hotels of the highest class. A complete list of these will be published, together with the charges for accommodation, etc. Railroad routes and rates will also be furnished, in fact every information procurable and of interest to prospective visitors will be published in the September Pre-Convention Number.

In addition to this, the number will form an interesting special issue and will cover every department of the foundry, plating, and polishing and pattern-making field, with live stories by various writers on interesting topics.

Columbus is an ideal place for the convention, being situated in the centre of a veritable hive of foundries and the buildings which are those of the Ohio State Fair and which were built specially for exhibition purposes, are ideal buildings in which to hold the convention and exhibition.

Canadian Foundryman booth will, as usual, be the headquarters for Canadians, and we urgently appeal to all Canadians to call on us and register as guests. We also urge our countrymen who are interested in the foundry business to make a determined effort to reserve the week of October 4 and attend the convention. The exhibit of everything which is the latest in foundry equipment is worth many times the cost of attending, while the reading of the papers and the discussions which follow make the convention a veritable school of foundry practice. "All work and no play makes Jack a dull boy" is an old saying, and is equally applicable to a foundrymen's convention as elsewhere. It will certainly not be the order of the day in this case as the committee in charge is sparnig no pains in preparing a programme of amusements, all of which will be published in our next issue. In the meantime we will trust to the Canadian founders to make the necessary preparations to attend.

The Old System of Barter

AN interesting story comes of Samuel M. Vauclain, president of the Baldwin Locomotive Works. While financiers talked of credits and exchange and the chances of opening trade with Europe, Mr. Vauclain went abroad and came back with orders that filled his plant. And the pay? He is taking it out in iron ore, grain, and oil. He probably finds that way of doing business easier than having to explain to the Rumanians, Serbians and Pole why United States take a bite out of their money when they want to spend it in the States. The armistice was not much more than signed when Vauclain was in Europe with a proposition to swap engines for oil, grain, ore, etc.

Where Do You Fit In?

TAKE 100 men at the age of 25. By 35, five of these have died; 10 are wealthy; 10 are well-to-do; 40 live on their earnings; 35 show no improvement. At 45 sixteen have died; one is wealthy; three are well-to-do; 65 live on their earnings; 15 are no longer self-supporting. At 55, 20 have died, one is wealthy; three are well-to-do; 46 live on their earnings, and 30 are not self-supporting. At 65, 36 have died, 1 is wealthy, 4 are well-to-do; 5 live on their earnings; 54 are not self-supporting. At 75 years, 63 have died; 1 is wealthy; 2 are well-to-do, and 34 are dependent. The estates of these men look like this: One leaves wealth, two leave comfort, 15 leave from $2,000 to $10,000, while 82 leave nothing.

PASSING a hand over his forehead, the worried drill-sergeant paused for breath as he surveyed the knock-kneed recruit. Then he pointed a scornful finger. "No," he declared, "you're hopeless. You'll never make a soldier. Look at you now. The top 'alf of your legs is standin' to attention, an' the bottom 'alf is standin' at ease!"

Scraps from the Foundry Scrap Pile

The Cockshutt Plow Company have let the contract for extensions to their plant at Brantford, Ont. The blacksmith shop will be the department mostly increased.

The Canadian General Electric Co. has taken out a permit for a new factory to be erected at the corner of Ward and Wallace Avenues, Toronto, to cost four hundred thousand dollars.

Alcock and Brewer, Limited, Montreal have been incorporated to manufacture machinery, etc., by Lewis P. Crepeau, Maurice Dugas, S. H. R. Bush and others. They are capitalized at $25,000.

The Joliette Castings and Forgings, Limited, has been incorporated in Montreal to do a manufacturing business, with a capital of one million dollars, by Alexander H. Duff, Walter A. Merrill, Archibald Stalker and others.

The Belanger Foundry Co. has been incorporated to take over the plant and business of O. Belanger and do a general foundry business, by Auguste Kean. Elric Genest, Ovicle D'Amour and others. They are capitalized at $100,000.

Molders on Strike at Kingston. The molders employed at the Kingston, Ont., plant of the Collingwood Shipbuilding Company went on strike on Monday, July 19th, having made a demand for ninety-five cents an hour, which was refused.

Beatty Brothers, Fergus, Ont., manufacturers of barn equipment, hay forks, carriers, pumps, farm machinery, etc., are making arrangements for the establishment of a manufacturing plant at Regina, Sask., to cost $60,000. The company is also extending its plant at Fergus, Ont., and is installing additional machinery.

St. Thomas Foundry Damaged by Fire. Fire damage to the extent of one hundred thousand dollars was caused to the plant of the Canadian Iron Foundries, Limited, St. Thomas, Ont. The fire which was of unknown origin, totally destroyed the pattern making and pattern storage departments and badly damaged the roof of the foundry. Some of the out-buildings of the Dominion Brake Shoe Company were also damaged.

New Brass Foundry for Brantford: Brantford Brass Foundry Co. is the name of a new concern which has just been opened for business at 22 Leonard St., Brantford, Ont., by David L. Webster and Richard Hart. Mr. Webster, who is at present, water commissioner for the city, was for a number of years chief engineer at the Brantford water works. Mr. Hart is a practical foundryman. At present the company will do a general jobbing business, but expect to launch into a special line in the near future.

Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, Ill., have just issued their 78-page catalog, No. 11, illustrating and describing their "Thor" pneumatic tools and electric drills. The book shows in detail the internal mechanism of their piston air drills, reversible wood boring machines, turbine air drills, pneumatic grinders, pneumatic hammers, pneumatic rivet-heating forge, pneumatic motor hoist and pneumatic tools of every description, together with pipe and hose couplings and other accessories. The electrical section of the book contains a description of a full line of electrically-driven tools, including: screw driver attachment for electrical drill, etc., with much advice as to the importance of care and attention to details. Dealing, as it does, with two of the leading subjects in modern foundry practice, it is a book well worth asking for.

TO DISCUSS LIQUIDATION

Montreal, Aug. 4.—The board of directors of the Canadian Car & Foundry Company have arranged to meet here on Thursday afternoon. It is expected that the question of liquidating 22¾ per cent. arrears on the preferred stock of the enterprise will be discussed.

ERROR IN FORMER EDITION

The Electric Furnace Construction Co., 908 Chestnut street, Philadelphia, advise an error in recent issue of Canadian Foundryman, describing their new Electric Furnace Electrode Economizer.

The figures given of reduced electrode consumption of 10 to 15 lbs. per ton of steel referred to Amorphous Carbon Electrodes, and not Graphite Electrodes, as was erroneously stated. Using this device on Graphite Electrodes there is a saving of 20 per cent.

"Is your wife one of those women who look at their husbands and say, 'I made a man of him'?" asked the impertinent friend.

"No," answered Mr. Meekton. "My Henrietta is very unassuming. She merely says she has done her best."

He but half lives who lives for himself only.

Coinage of gold has been suspended in England since October, 1917.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—One of our products includes a steel bar 18 inches long, 7/8-inch wide, by 1/4-inch thick. This bar is tempered and drawn in oil, the burnt-on oil being very difficult to remove. We have tried several well-known cleaning compounds and combinations of cleaning compounds with soap with no practical result. Our plater suggested that we write your correspondent for a formula which will remove the burnt-on oil. You now have the facts. Can you assist us? Our plater uses Canadian Foundryman as a text book. What has become of Abe Winters?

Answer.—To clean the burnt-on oil from the steel bars use any cleaning compound which contains a small amount of caustic and is totally soluble In combination with the above selected compound use a strong soap compound, the proportions being half and half. About 4 or 6 ounces of each per gallon of soft water. Boil this solution at least one hour before using, then add 1 quart of coal oil per each 50 gallons of solution, boil a few minutes and immerse the steel. A fifteen-minute immersion in the boiling solution should suffice to loosen the oil, rinse in hot water and place in an ordinary electric cleaning solution for about two minutes, possibly less may do, using direct current on the later bath. The foregoing method should clean your steel bars very satisfactorily. We are glad to hear that your plater esteems the Canadian Foundryman's efforts so highly. Abe Winters will again contribute to our columns in the near future. If you are particularly interested in any branch of polishing or electro-plating practice and desire an article written in detail regarding same, notify the editor and we will try and please you.

* * *

Question.—I shall be greatly obliged if you will publish a formula for a black pickle for iron, one which will remove scale, etc., from castings, forgings, and heat-treated steel, also a formula for a bright pickle for iron.

Answer.—To prepare a black pickle, add 1 part of sulphuric acid, 66 deg. to 15 parts of water. Always add the acid to the water, never the reverse. A good bright pickle for iron consists of water, 10 quarts; sulphuric acid, 66 deg., 28 ounces; zinc, 2 ounces; nitric acid, 12 ounces, mix in order named.

* * *

Question.—Kindly inform me of best method for removing black nickel deposit from brass or steel. This black nickel deposit is very hard and it not easily cut with brush. Is there any chemical which can be added to the black nickel solution to effect a softer plate?

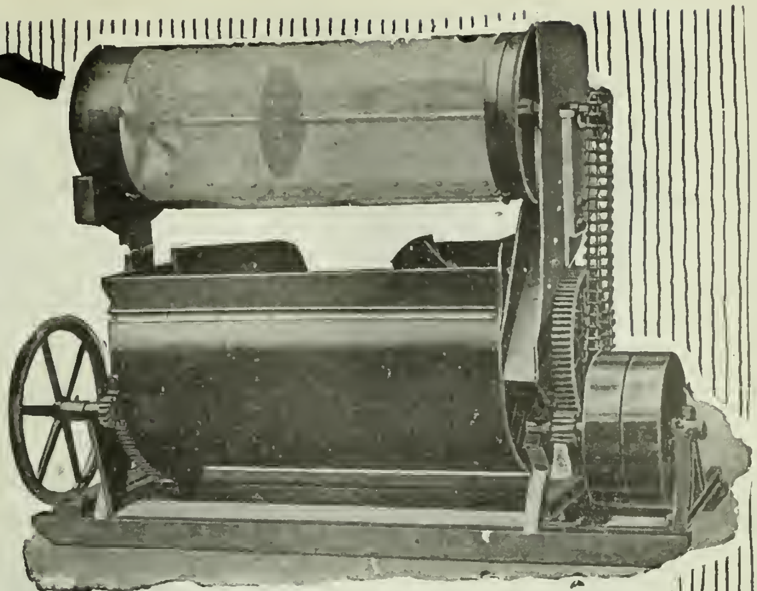
Answer.—To remove an ordinary deposit of black nickel, immerse in a strong solution of sodium cyanide. If the articles are lacquered, remove lacquer by immersion in boiling caustic solution. If the deposit is unusually heavy or resists the action of the cyanide solution use a dilute solution of sulphuric acid with a reverse electric current, lead cathodes are best for this purpose; do not cut down current, employ complete open circuit from the generator. The action is rapid and the base metal is cleaned ready for plating or final drying. To soften a black nickel deposit, try small additions of benzoic acid to the solution.

* * *

Question.—I am engaged at present as foreman plater in a small shop; we are kept busy during the entire year by taking in job plating when our our business becomes slack. I am often prompted to make a start for myself in the job plating business, but lack the confidence which seems necessary to success. Can you help me decide the question. I will appreciate your candid opinion.

Answer.—If your experience does not include a thorough understanding of the several branches of electro-plating, polishing and buffing, we would advise you to remain in the employ of others, possibly a change of employer would assist in bringing you into a more contented frame of mind. The average job plater does not make more than a living, and more men totally fail in the jobbing business than succeed. There are cases where men who have absolutely no practical knowledge of electroplating have bought out job shops and made a success of the business, but these men were naturally good business men possessed of splendid executive ability and invariably employed capable men to operate the plant. One of the main causes of failure in job shops is the absence of a suitable system of estimating costs. We venture to say that 95 per cent. of the jobbing shops have practically no system of finding costs. Many manufacturing firms maintain their plating plants as an expense department simply because they are unable to arrange a satisfactory cost system which would allow them to regard the department as a productive unit. Basing plating costs upon polishing costs will never yield correct results. To establish a job planting business requires capital, special judgment, and a keen relish for work. The location of the plant is also a very important point to consider; it should be centrally located. To be successful in job plating you must be not only a good plater but a good business man. When a chemist begins to do business as a druggist he ceases to be a chemist and becomes a merchant, the financial end of his business necessitates this change, otherwise there is a vacant store to let in a very short time.

The McClary Manufacturing Company have just about completed the four-storey addition to their Montreal factory. This section has been built on the south-east corner of the old building and will provide an additional 20,000 square feet of floor space.



One Man With a Blystone, or Six With Shovels?

It has been proven that the Blystone Sand Mixer will do at least the work of six men mixing by the old shovel method.

Blystone—the only mixer with adjustable shovels

One man can mix core sand for 25 core makers and facing for 100 molders *—and it takes less than half his time.* Does your experience show that the six men could compete with shovels?

The demands of labour for higher wages presents the biggest problem to the foundrymen to-day. Nevertheless this problem can easily be solved in the sandmixing department. The Blystone offers the certain means.

"The Mixer That Shovels"

The Blystone shovels the sand over and over, throws it from one end of the drum to the other with each revolution of the shaft; every bit is thoroughly and evenly mixed.

Send for particulars of our 10 days' free trial offer and test a Blystone out in your own plant under your own conditions.

BLYSTONE MANUFACTURING CO.
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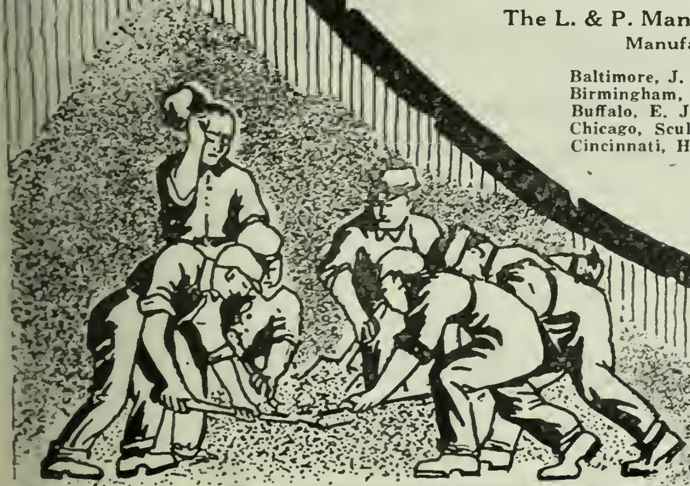

A BLYSTONE Would Save the Wages of Five of These Men.

SLY FOUNDRY EQUIPMENT "UP - TO - DATE"

30-40 Sand Blast Mill at Olds Motor Works, Lansing, Mich.

Is the Finishing of Small Parts and Casings Costing You Too Much?

Here's a profit leak that bears close analysis. The cost of small parts may become out of proportion to the cost of larger parts unless they are finished in sufficient volume in the least possible time and with the minimum amount of labor.

Since cost depends on volume, where 6 or 8 tons a day have been cleaned by one method or another, the installation of a 30/40 Sly Sand Blast Mill actually turns out 8 to 20 tons a day and with the minimum amount of labor.

Drop forgings, stampings, small gears, auto parts, brass and bronze work and malleable iron castings that are put through a 30/40 Sly Sand Blast Mill are cleaned with the thoroughness of a sand-blasting operation that imitates hand work, lessening machining on parts that are to be machined; eliminating defective parts; giving a surface that is ready for plating.

It is your privilege to draw on over forty years' experience in the business, bv putting your cleaning problem up to us. Write or wire.

The W. W. SLY Mfg. Co.

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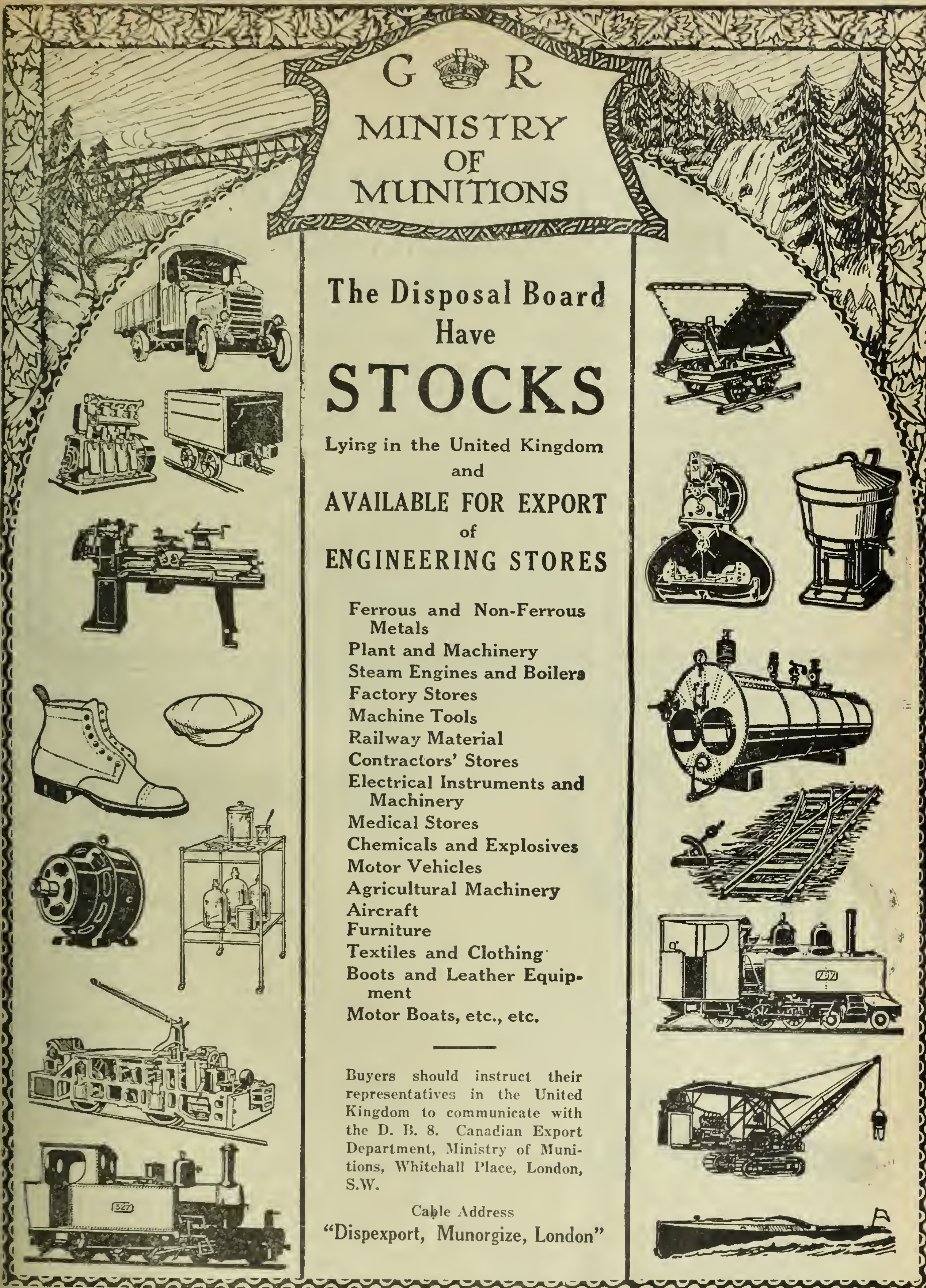
Reduce Molding Cost

Showing a Berkshire Portable Air Squeezer with pattern-drawing device turning out molds in one of the largest foundries on the Continent. Berkshire machines will increase your production 50 to 100 per cent. and give you perfect satisfaction.

See Exhibit at Columbus Convention, week Oct. 4th.

The Berkshire Mfg. Co.
Cleveland Ohio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Buyers should instruct their representatives in the United Kingdom to communicate with the D. B. 8. Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.
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HOLLAND
CORE OIL

There is a grade of Holland Core Oil to meet the conditions arising from all classes of molding—grey iron, malleable, steel, aluminum and brass. Compare a trial barrel of *Big Stick, Regular, Old Regular, Special No. 1,* or *Extra Fast Drying* with the oil you are using at present. We know what your decision will be!

HOLLAND
TRIPOLI PARTING

Our mills are of the most modern type and turn out parting of uniform dependability.

Over thirty years' constant study of foundry requirements have been necessary to make the improvements in Holland Products which have made them foremost of all in efficiency and economy.

The result of the improvements thus gained is apparent every time you use a Holland Product.

The Dominion Foundry Supply Co., Ltd.

Toronto - Montreal

HOLLAND CORE OIL COMPANY

4600 West Huron St., Chicago, Ill.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CABINETS, SANDBLAST
Frederic B. Stevens, Detroit, Michigan.

CALKING HAMMERS
Holden Co., Ltd., The, Montreal.

CARBON BLACKING
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison Co., E. J., Toronto.

CARS, CORE OVEN AND FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CAR LIGHTING EQUIPMENT
Holden Co., Ltd., The, Montreal.

CAR MOVERS
Holden Co., Ltd., The, Montreal.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CASE HARDENING
General Combustion Co., Montreal.

CERAMIC KILNS
General Combustion Co., Montreal.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Chaplet & Mfg. Co., Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Lindsay Chaplet & Mfg. Co., Philadelphia.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.

CHIPPING HAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CHISEL BLANKS
Holden Co., Ltd., The, Montreal.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

CLAMPS, FLASK
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CONTRACTORS' STORES
Ministry of Munitions, London, England.

CONVERTER BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOXES (STEEL AND WOOD)
Woodison Co., E. J., Toronto.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., T
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRANES, HAND TRAVELLING
Curtis Pneumatic Machy. Co., St. Louis, Mo.

CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros. Co., Buffalo N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Welle, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Welle, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC DRILLS
Holden Co., Ltd., The, Montreal.

ELECTRIC FURNACES
Electric Furnace Construction Co.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, OIL, GAS AND STEAM
Holden Co., Ltd., The, Montreal.

ENGINES, STEAM
Ministry of Munitions, London, England.

ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS, INDUSTRIAL
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS (FOUNDRY)
H. M. Lane Co, The.

FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison E. J., Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FITTINGS, CAST IRON
Crane Ltd., Montreal.

FITTINGS, FLANGED
Crane Ltd., Montreal.

FITTINGS, MALLEABLE
Crane Ltd., Montreal.

FITTINGS, SCREWED
Crane Ltd., Montreal.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FLEXIBLE JOINTS
Holden Co., Ltd., The, Montreal.

FORGINGS
General Combustion Co., Montreal.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

FOUNDRY EQUIPMENT
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.

FOUNDRY SUPPLIES
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Woodison Co., E. J., Toronto.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

FURNACES, ELECTRIC
Electric Furnace Construction Co.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEAT TREATING
General Combustion Co., Montreal.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOURNAL BOXES
Holden Co., Ltd., The, Montreal.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Berkshire Mfg. Co., The.
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
The Cleveland Osborn Mfg. Co., Cleveland, O.
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Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
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Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
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Woodison, E. J., Co., Toronto, Ont.

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OIL METERS
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OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS
General Combustion Co., Montreal.

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PATTERN MILLING MACHINES
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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PATTERN WAX
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Woodison, E. J., Co., Toronto, Ont.

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United Compound Co., Buffalo, N.Y.
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Preston Woodworking Machinery Co.

WOOD TRIMMERS
Oliver Machinery Co., Grand Rapids, Mich.

WOODWORKERS' VISES
Oliver Machinery Co., Grand Rapids, Mich.

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Pre-Convention Number

CANADIAN FOUNDRYMAN and Metal Industry News

Volume XI.
Number 9

Publication Office, Toronto
September, 1920


KAWIN
Are You Satisfied
With the Production in Your Foundry?
Is your cupola practice troublesome or expensive? Likewise your molding practice? Is there any department of your foundry that is not producing up to the mark? You may be doubtful. Then you should secure Kawin Service. Kawin not only points out the weak spots in production but suggests a remedy. The Kawin staff includes cupola experts of long and varied experience, metallurgists, foundry engineers, etc. They advise in all branches of foundry work and guarantee to get paying results. Kawin Service staff is in demand, in the most important industrial centres of Canada and United States because they are giving practical help to foundrymen. How can they serve you?
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THE
1920
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and the METALS DIVISION of the A.I.M.E.
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OCTOBER 4-8
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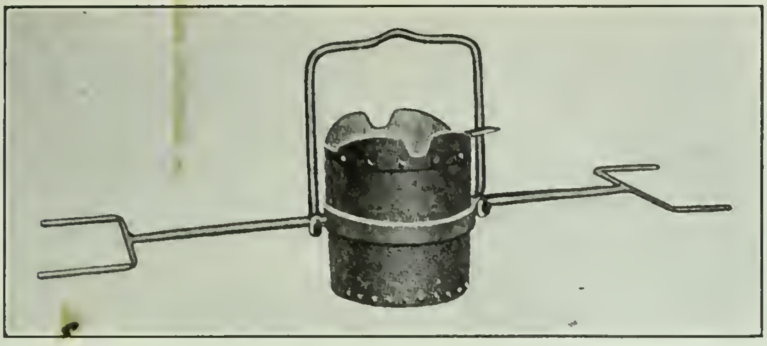

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Canadian Made for the Canadian Trade

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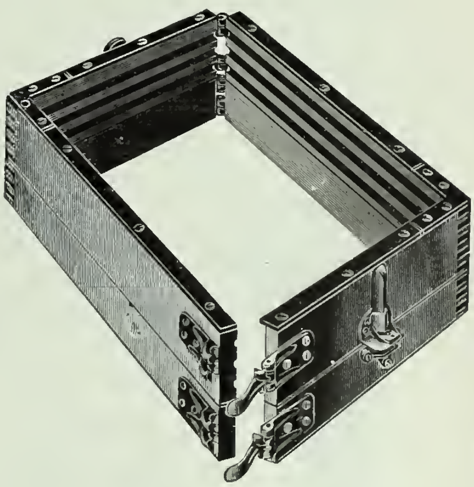

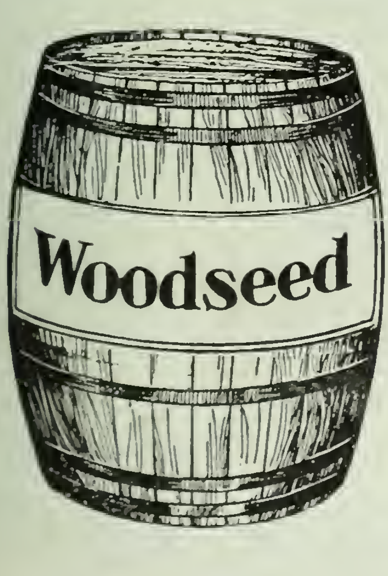

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Woodseed is another purely Canadian product manufactured in our Toronto plant. It is always lower in price than Linseed Oil and it will bind as much sand and produce as good a core as Linseed. **Woodseed** is always uniform. No experimenting with this binder. Its merit is already established.

A trial barrel will convince you that you can make a big saving.

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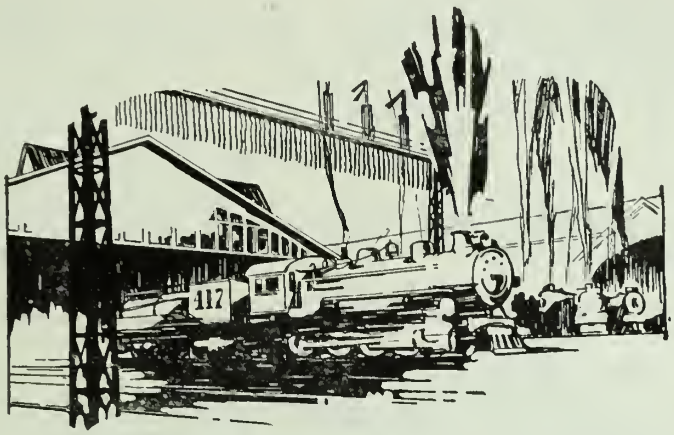
TORONTO - - ONTARIO

"Buy the Best! It's Cheapest in the Long Run"

CANADIAN FOUNDRYMAN, September, 1920. Vol. XI., No. 9. Published monthly, at 143-153 University Ave., Toronto, Can. Subscription price in Canada, $2.00; in the United States, $2.50. Entered as second-class matter July 1st, 1912, at the Post Office at Buffalo, under Act of March 3rd, 1879, and at the Post Office Department, Ottawa, Canada.



WHEN building operations, now under way, are completed the Dominion Oxygen Company, Ltd., will offer Canadians atmospheric oxygen of the highest purity.

Not only will the highest standard of quality be rigidly maintained in the production of Dominion Oxygen, but every possible measure will be taken to insure a prompt and never-failing supply of pure gas to Canadian users.

Dominion Oxygen cylinders are of the most modern type, designed to hold the maximum amount of gas with the minimum weight—thus insuring the lowest possible freight and handling charges.

The Company will supply its customers with such cylinders in any necessary quantities—great or small on a liberal loan basis.

The Dominion Oxygen Company, Ltd., invites inquiries from users of oxygen throughout Canada.

DOMINION OXYGEN COMPANY, LTD.
Hillcrest Park
Toronto - Ontario

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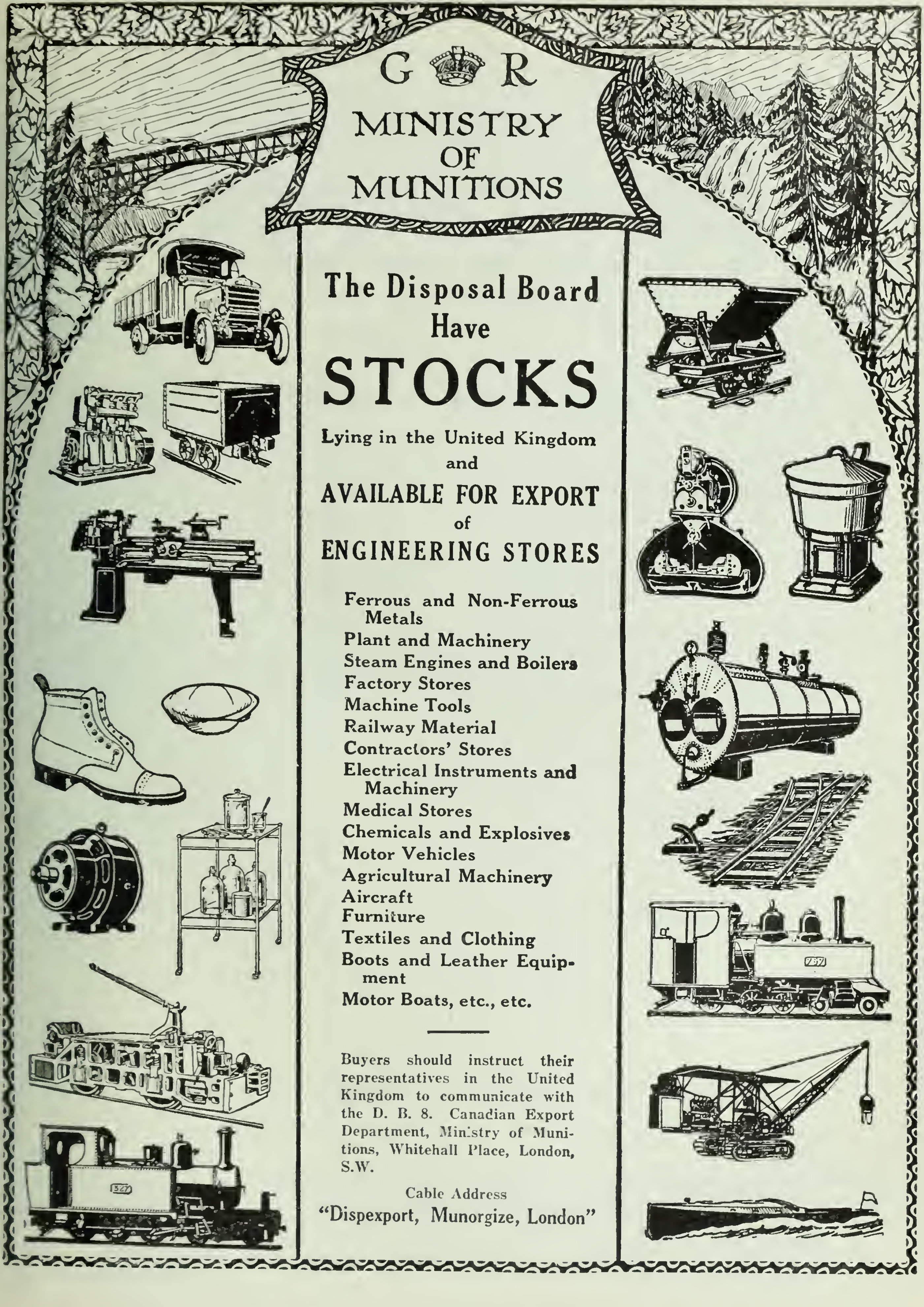
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Buyers should instruct their representatives in the United Kingdom to communicate with the D. B. 8. Canadian Export Department, Ministry of Munitions, Whitehall Place, London, S.W.
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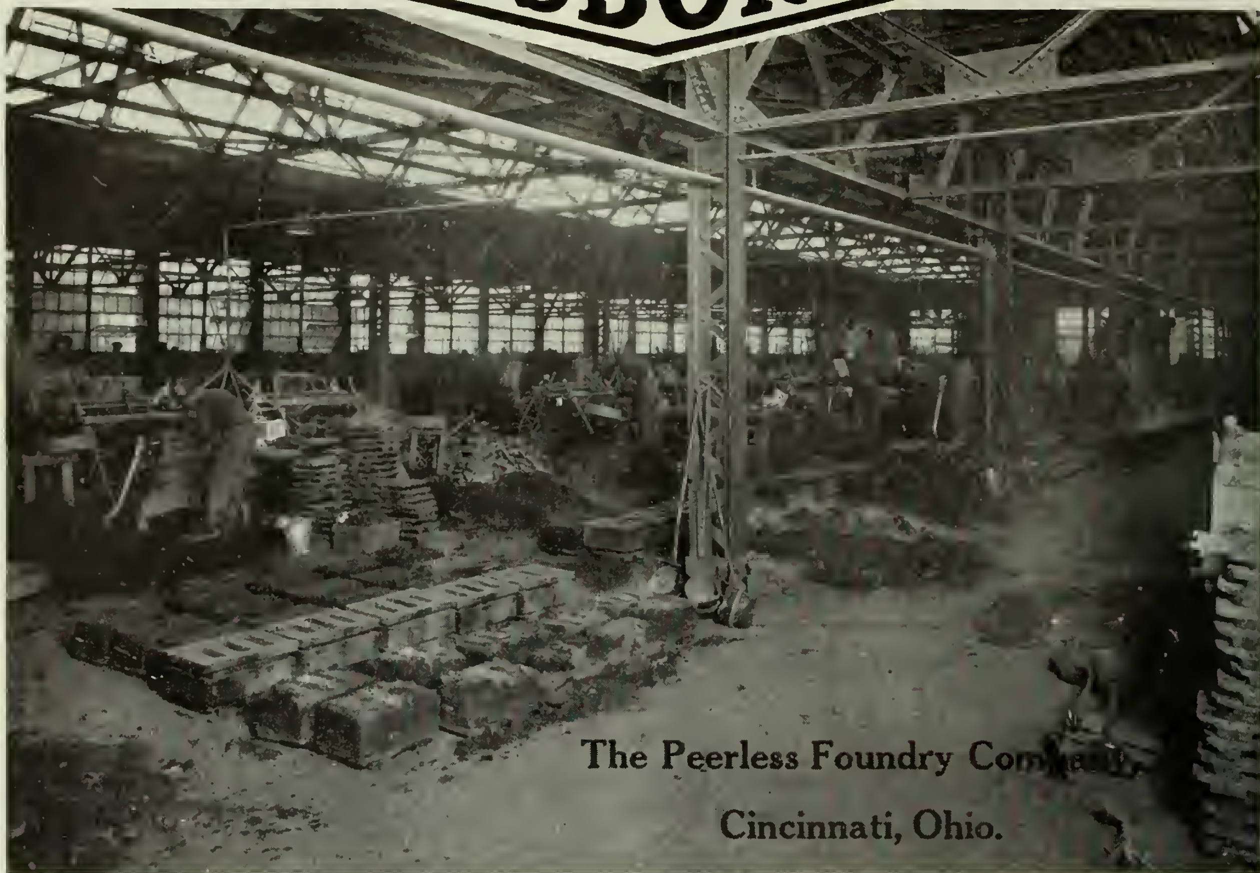


Osborn Air Squeezers

The floor above shows a portion of The Peerless Foundry Company, Cincinnati, Ohio. They have installed over one hundred Osborn Combination Jolt and Plain Air Squeezers, working on practically every class of light work. This plant uses the continuous pouring system which accounts for their small floors.

The picture at the left shows two bracket plates being made from a match plate pattern on a No. 75 Osborn Plain Air Squeezer.

This plant is devoted exclusively to the manufacture of light grey iron castings.

Our experienced engineers are always at your service. They will be pleased to work with you and advise the proper rigging and equipment to solve your foundry problems and increase your production.

Ask for 1920 Condensed Catalog

Some Osborn Moulding Machine Advantages:

1. Insure rapid production
2. Lower direct moulding cost
3. Accelerate delivery
4. Effect saving in metal
5. Lower overhead per ton
6. Reduce grinding
7. Lessen pattern repairs
8. Relieve labor shortage

PLAIN AIR SQUEEZERS

Made regularly in the following sizes:

No. 74 ...33"	Distance between strain rods
No. 75 ....36"	" " "
No. 76 ....40"	" " "

COMBINATION JOLT STRIPPER SQUEEZERS

Made regularly in the following sizes:

No. 78........36"	Distance between strain rods
No. 80........29"	" " " "
No. 81........38"	" " " "
No. 82........45"	" " " "

COMBINATION JOLT SQUEEZERS

Made regularly in the following sizes:

No. 74J.......33"	Distance between strain rods
No. 75J.......36"	" " " "
No. 76J.......40"	" " " "

THE OSBORN MANUFACTURING COMPANY

INCORPORATED

Main Office and Factory

New York 5401 Hamilton Ave. Cleveland, Ohio San Francisco

FOREIGN REPRESENTATIVES

Allied Machinery Co. de France, 19 Rue de Rocroy, Paris, France

J. W. Jackman & Co., Ltd., No. 28 Victoria St., Westminster, London, Eng.

Horne Company, Ltd., 6 Takiyama-Cho, Kyobashi-Ku, Tokyo, Japan

E. Isbecque & Cie, 36 Rue Otlet, Brussels, Belgium

Allied Machinery Co. d'Italia, 40 Corso Dante, Torino, Italy

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

Foundrymen's Convention, Columbus, O., Oct. 4-8

Bigger and Better Than Ever, the Annual Convention of the American Foundrymen's Association Will be Held Under Ideal Conditions in the Buildings of the Ohio State Fair

THE annual convention of the American Foundrymen's Association, in conjunction with the annual exhibit of foundry and machine shop equipment, etc., has now become such an all-important factor in the successful manufacture of metal products that it is hardly necessary to mention the fact that the time is again drawing near when progressive foundrymen from all parts of the American continent as well as many from remote sections of the globe will meet together to discuss the vital questions of foundry practice; to view the latest which the world has to offer in the way of foundry and machine shop equipment; to become enlightened on what the world knows about iron and steel, about non-ferrous metals, about malleables, about mining, about the application of electricity, oxy-acetylene, thermos, etc. In fact to learn the latest and best method to be adopted in the successful management of the foundry and its allied industries.

The experiences of the past twenty-four years have also taught foundrymen that it is not necessary to say that the twenty-fifth convention will be the biggest and best yet. Each one has surpassed the one preceding it. Nothing is ever omitted but something is always added.

Columbus as a City

Before going into the details of the convention let us introduce to the reader the city of Columbus, where the 1920 convention will be held.

Columbus is the capital of the State of Ohio and the capital of Franklin County, and is one of the most beautiful and fertile sections on the continent.

Franklin County has a population of over 300,000, about five-sixths of whom live within the corporate limits of Columbus.

Columbus is built on a rich alluvial plain near the centre of the State, on the Sciota River, 110 miles north-east of Cincinnati. It was laid out in 1812, the site being selected by commissioners appointed by the Legislature in 1810. The state officers removed from Chillicothe in 1816, the Legislature meeting in December of that year.

Columbus was laid out in regular squares with broad streets, and was incorporated as a city in 1834. High Street, the chief business thoroughfare, is 100 feet wide. Broad Street, the finest avenue for residences, is 120 feet wide, and has four rows of shade trees. At the intersection of these, in Capitol Square, occupying ten acres, stands the State house, built of grey limestone in the Doric style, and covering two acres.

Attractive Features

Columbus is a typical American city, its public buildings and private residences having done much to enhance its beauty. It is well provided with parks and playgrounds, baseball grounds, driving parks, swimming pools, gymnasiums, etc.; its churches,, schools, banks theatres, hospitals, fraternal societies, clubs, libraries, etc., being among the best in the country.

Manufacturing

As a manufacturing centre Columbus ranks twenty-eighth in volume of manufacturing goods, which is not a bad showing in a country with a population in excess of one hundred million. To attempt to illustrate them would be beyond our limit, but a casual glance over the list will reveal some interesting plants from the standpoint of the metal worker.

STATE HOUSE, COLUMBUS, OHIO. McKINLEY MONUMENT IN FOREGROUND.

The Jeffry Mfg. Co. manufacture a line of mining machinery, elevating, conveying and transmission systems, and employ 4,000 men. The Ohio Malleable Iron Plant, which is a subsidiary of the Jeffry Co., employs an additional 700 men and is wonderfully equipped and efficient.

The Buckeye Steel Casting Co. is the largest concern in the world manufacturing car couplers, freight car side frames, bolsters and yokes.

The Jaeger Machine Co. has the largest plant in the United States devoted exclusively to the manufacture of concrete mixers.

The Pennsylvania railroad shops are the second largest in the country.

The Ralston Steel Car Co., with its capacity of 40 complete steel cars and 25 composite cars daily, is among the largest of its kind in the world

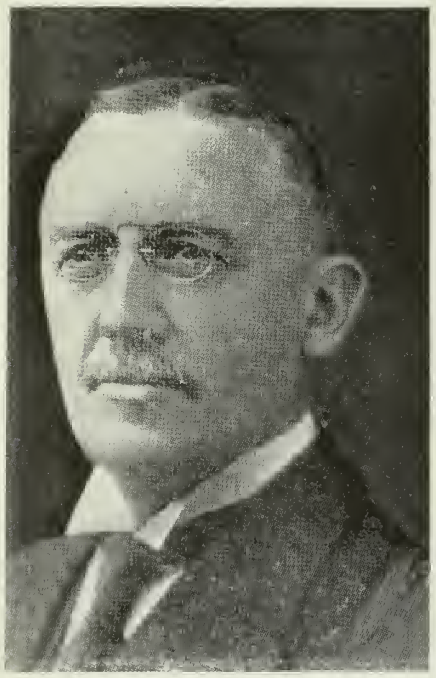
Tremendous amounts of iron and steel are produced in the Columbus plants of the Carnegie Steel Co. and the American Rolling Mill Co.

The Seagrave Manufacturing Co. is probably America's largest producer of fire-fighting apparatus.

Columbus has several stove foundries, the largest ones being the Ohio State Stove Company and the A. T. Nye & Son Co.

The W. E. Lamneck Co. is one of the country's largest manufacturers of furnaces.

Other reputable concerns would include the Atlas Brass Foundry Co., the Solar Metal Products Co., the Columbus



GEORGE J. KARB,
Mayor of Columbus, 1891-1895, 1912-1920.

Heating and Ventilating Co., Columbus Die, Tool and Machine Co., and the Columbus Welding Shop.

The plants of the Columbus Forge and Iron Co. and the Columbus Anvil and Forging Co. make this city the largest producing centre in the U. S. of anvils.

The American Chain Co., the Columbus-McKinnon Chain Co., and the Hayden-Corbett Chain Co. make Columbus a leading chain centre.

All told there are over 800 manufacturing institutions producing $80,000,000 worth of products annually.

Transportation Facilities

The railroad connections are exceptionally good, sixteen divisions entering the city, with 103 passenger trains entering and leaving daily, whilst 11 interurban lines furnish 440 cars daily.

Location

Columbus is in the centre of the state, equidistant between Cleveland, on the north and Cincinnati on the south. A slightly curved line from Pittsburgh, Pa., to Indianapolis, Ind., cuts Columbus about midway, two hundred miles from both points. Within the circle pivoted by Columbus lie twenty of the most important industrial centres in the United States, including Chicago and Detroit.

The State Fair

Each year during the state fair Columbus is called upon to entertain from 200,000 to 250,000 visitors coming not merely from all parts of the state, but from all sections of the country as well. The fame of the Ohio State fair is international. No other state has buildings and grounds which, in their completeness and equipment, compare with those of this state. This fair, for the success and improvement of which the best brains of the state are at work twelve months each year, is sponsored by the state. Within the last few years a Coliseum building, with a seating capacity of 18,000 has been erected on these grounds at a cost of $200,000, and the other numerous and spacious buildings have been built on the same magnificent plan. The fair, the clearing house of the entire state, brings manufacturer, merchant and farmer into closer association than would otherwise be possible. The value of the exhibits shown each year runs into millions, individual exhibits frequently running as high as $50,000.

A Convention City

The completeness of the state fair grounds and the accessibility of Columbus to all parts of the country were in a large measure responsible for bringing to this city the centenary of the Methodist Episcopal Church, the largest Protestant denomination in the world. This meeting, an international one, with delegates from every corner of the globe, brought to this city more than 250,000 visitors for a three weeks' stay and gave Columbus a chance to more than make good in entertaining the biggest religious convention ever held anywhere.

Other mammoth conventions have found the state fair grounds an ideal site. The National Dairy Show met here for two successive years, the Coliseum affording an unexcelled place for the exhibition and judging of the finest dairy cattle brought here from practically every state in the union.

From the above description of Columbus and the State Fair grounds, where the convention will be held, it is evident that nothing is lacking to make the convention a success beyond anything yet experienced. A more detailed description of the buildings, will, however, be in order.

One prominent feature in connection with the buildings as well as with the railway station is that the weather has no effect upon the visitor. On alighting from the train the visitor finds himself under cover, from whence he takes the trolley car to the grounds, where he again finds himself under cover. On alighting from the trolley car a covered walk connects with building No. 1 at the entrance shown in the plan view between the registration and information booth. After registering, he passes up the centre aisle to booth 14, shown in plan, where he again registers, and where he is cordially invited to call every day as often as he pleases. Here he makes dates and arranges to meet friends, writes letters, talks, chats, and makes himself at home. This is the Canadian foundrymen's booth. In the list of exhibitors shown on another page will be seen the names of those who will utilize the remaining space in this building.

As is shown on the plan there are two lecture halls in building No. 1 that will be used for meetings, morning and afternoon, throughout the week, and in addition to registration and information headquarters there is considerable exhibit space. It is proposed to do something out of the ordinary in this building in the way of booth construction and decorations. From this building the visitor passes to building No. 2 by way of the covered walk shown in plan.

CITY HALL, COLUMBUS, OHIO.

Building No. 2 was planned for exhibitors who require a small amount of space, and who will not need power other than that which can be obtained from the lighting circuits.

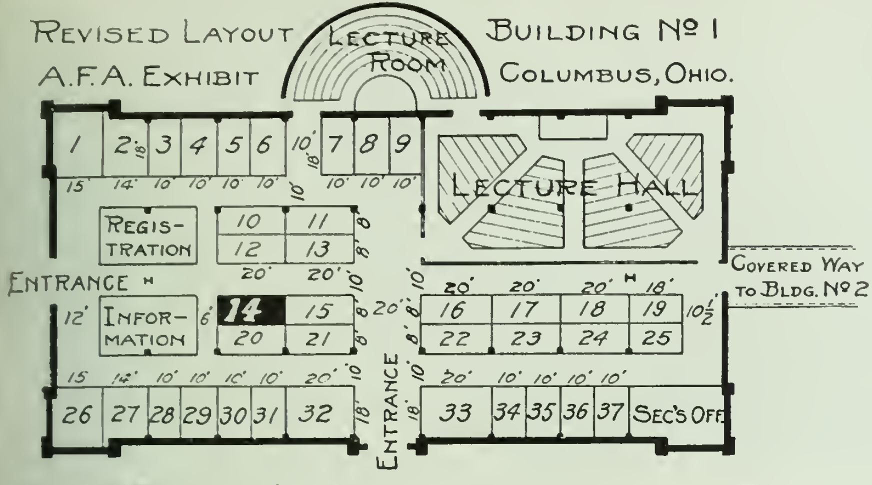
The buildings—eight in number—are all connected by covered walks, insuring the visitor against inclement weather. The first seven buildings, while not being exactly alike, are to some extent similar. No. 1. as we have shown has the lecture halls and will be headquarters for technical department meetings, registration, information, etc., along with the secretary's office. The other ones are of regulation exhibition design. Nos. 2, 4, 5 and 7 are each 98 feet wide by 198 feet long. Nos. 3 and 6 are each 98 feet wide by 148 feet long. All the floors are of cement and walls of brick.

The Coliseum

The eighth building is the Coliseum, which is a new building constructed of brick, steel and concrete, 202 feet wide and 320 feet long. The exhibits will be in the Arena, which is 112 feet wide and 225 feet long. There is a cement walk, 11 feet wide, around side walls The floor in the centre of the arena is hard earth, level with cement floor.

This building offers excellent opportunities for the installation of heavy machinery, requiring pits and foundations, and will be used largely for exhibits of that character. The Coliseum is splendidly lighted.

Buildings No. 3, 4, and the Coliseum, will be utilized for general foundry equipment, and exhibits requiring heavy power lines and compressed air. Building No. 5 for machine tool and machine shop equipment exhibits, and buildings Nos. 6 and 7, for miscellaneous and general foundry and shop equipment.



Note Booth No. 14, where "Canadian Foundryman" will be located. Note, also, the Information and Registration Booths, the two lecture halls and the covered way leading to next building.

HOTEL ACCOMMODATION

Being the capital of one of the greatest states in the union, Columbus would naturally be expected to furnish adequate hotel accommodations for a vast transient population. The city does more than that. It not only houses them well but makes them feel entirely at home and welcome.

There are 59 hotels in the city, the recently built Deshler being rated as the finest between New York and Chicago. All of the spacious and splendid hotel structures are absolutely fireproof and are conducted on up-to-the-minute lines of elegance and refinement. In addition to the hotels proper there is an unlimited number of restaurants, flats, apartments, boarding and rooming houses of the highest class. It is with pardonable pride that Columbus boasts of the conduct of its hotels in treating the convention proposition fairly and never increasing their usual commercial rates to delegates but frequently lowering them.

TENTATIVE PROGRAMME

American Foundrymen's Association

TUESDAY, OCTOBER 5

9.30 a.m.—Technical Session—Gray Iron and General.

"Zirconium in Cast Iron," by Richard Moldenke, Watchung, N.J.

"Standardizing Gray Iron Samples for Analytical Determination," by Edward J. Fowler, Pacific Foundry Co., San Francisco, Cal.

"A Note on the Electric Furnace and the Problem of Sulphur in Cast Iron," by George K. Elliott, Lunkenheimer Co., Cincinnati.

"Production of Milling Machine Table Castings," by Leroy Sherwin, Brown & Sharp Mfg. Co., Providence, R. I.

"Foundry Methods and Equipment for Producing Machine Tool Castings," by A. N. Kelley, Cincinnati.

"Electrical Apparatus in a Modern Iron Foundry," by F. D. Egan, Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

TRAIN SERVICE TO COLUMBUS

For the benefit of those who purpose attending the convention, we publish movement of trains from Toronto by different routes, so that those who live at points lying east or west of Toronto may govern themselves accordingly. From Toronto to Columbus it is necessary to go around the lakes, and it matters not whether the Buffalo or Detroit route is selected as the distance and the fare is the same. Parties living nearer to one or the other of these points would of course take the nearest route.

Time Table

G. T. R. train leaves Toronto, Union Station, at 6.05 p.m., arrives at Buffalo 10.35 p.m. Leaves Buffalo at 12.02 a.m., arrives at Columbus at 8 a.m.

C.P.R. train leaves Toronto, Union Station, at 7.15 p.m., arrives at Buffalo 10.50 p.m. Leaves Buffalo at 11.57 p.m., arrives at Columbus 8 a.m.

Alternative Routes

C. P. R.—Leaves Toronto 3.20 p.m., arrives Detroit 10.10 p.m.; leaves Detroit 10.20 p.m., arrives at Columbus 8.45 a.m.

G.T.R.—Leaves Toronto 11.45 p.m., arrives Detroit 6.45 a.m.; leaves Detroit 7.10 a.m., arrives Columbus 4.25 p.m.

G.T.R.—Leaves Toronto 1.25 p.m., arrives Detroit 9.10 p.m.; leaves Detroit 10.20 p.m., arrives at Columbus 8.45 a.m.

LIST OF HOTELS AND RATES FOR AMERICAN FOUNDRYMEN'S CONVENTION, COLUMBUS, OHIO, OCTOBER 4 to 9, 1920

	Rates Per Day				
	Min., Single	Max., Single	Min., Double	Max., Double	
Deshler, Broad and High	$ 2.50	$ 6.00	$ 4.50	$ 8.00	
Chittenden, High and Spring	2.00	4.00	4.00	6.00	
Neil, High and Capital	2.00	5.00	5.00	6.00	
Southern, Main and High	1.50	2.00	2.50	5.00	
Hartman, Main and Fourth	2.00	3.00	6.00	10.00	
Virginia, Third and Gay	1.25	3.00	2.00	6.00	
Star, 227 North High	1.00	3.00	2.00	5.00	
Seneca, Broad and Grant	3.00	5.00	4.00	8.00	
Norwich, State and Fourth	1.50	3.00	3.00	5.00	
Waldo, 312½ North High	1.25	1.25	2.00	2.00	
Arcade	.50	1.50	1.50	4.00	
Lazelle, 130 East State	1.25	1.50	1.50	2.50	
Rector	1.25	...	...	4.00	
Davidson, High and Naghtey	3.50	6.00	7.00	10.00	Week
Jefferson, 17 East Spring	1.50	2.50	3.00	6.00	
Winton, 135 East Town	1.50	1.50	2.50	3.50	
Hartman Annex, 247 South Fourth	.50	2.00	1.50	3.00	
Metropole, 77½ South High	1.00	...	...	1.50	
Dennison, 793 Dennison	10.00	25.00	25.00	40.00	Month
Columbus, Lond and Fifth	1.25	2.00	2.50	3.50	
Lenox, Goodale and Armstrong	1.50	...	...	2.00	
State, 32 West State	1.00	1.50	3.00	4.00	

Rates for rooms with and without bath are not given, but minimum and maximum rates for both single and double rooms are given. Each member who is looking forward to attending the Convention should correspond directly with the hotel of his choice and make necessary reservations. We have been assured that all will be taken care of comfortably. Rates prevailing for regular transient trade at Convention time are guaranteed to members and visitors. Rates given above are of date of March 17, 1920.

Parlor suites not included in schedule.

Headquarters for all Convention Activities will be at the State Fair Grounds.

VIEW OF BUILDING NO. 1. AT LEFT IS SHOWN COVERED WALK LEADING FROM STREET CAR TO UNLOADING PLATFORM.

"Report of Committee on General Specifications for Gray Iron Castings to Co-operate with A. S. T. M.," by Richard Moldenke, chairman, Watchung, N. J.

"The Control of Metallurgical Operations in the Foundry," by H. R. Campbell, Industrial Works, Bay City, Mich.

TUESDAY, OCTOBER 5

2.00 p.m. — Technical Session — Non-ferrous Practice (Held jointly by Institute of Metals Division of A. I. M. E. and the American Foundrymen's Association).

"Investigation of Brass Foundry Fluxes," by C. W. Hill, T. P. Thomas, and W. B. Viez.

"Laboratory Testing of Sands, Cores, and Corebinders," by F. L. Wolf and A. A. Grubb.

"The Reclamation of Metal From Brass Foundry Refuse," by F. L. Wolf and J. E. Alderson.

"A New Process for Making 15 Per Cent. Phosphor Copper," by P. E. Demmler.

"Recent Developments in Die Casting," by Charles Pack, Doehler Die Casting Co., Brooklyn, N. Y.

"The Solubility of Hydrogen in Molten Copper and Copper Alloys," by C. W. Hill, T. P. Thomas, and G. P. Luckey.

TUESDAY, OCTOBER 5

2.00 p.m.—Technical Session—Steel.

"Obtaining Molding Materials for the Steel Foundry," by R. L. Lindstrom, Canadian Steel Foundries, Ltd., Montreal.

"Desirability of Working with Prospective Customers in the Design of Castings," by K. W. Wheeler, Lebanon Steel Foundry, Lebanon, Pa.

"Methods of Heading and Gating Steel Castings," by R. J. Doty, Sivyer Steel Casting Co., Milwaukee.

"Gating, Pouring and Feeding Steel Castings," by R. B. Farquhar, Electric Steel Co. of Indiana, Indianapolis, Ind.

"Report of Committee on Steel Foundry Standards," by W. A. Janssen, chairman, American Steel Foundries, Chicago.

"Report of Committee on Specifications for Steel Castings to Co-operate with A. S. T. M.," by R. A. Bull, Chairman, Duquesne Steel Foundry Co., Coraopolis, Pa.

"A Novel Core Oven," by Stephen B. Phelps, Jones & Laughlin Steel Co., Pittsburgh.

WEDNESDAY, OCTOBER 6

9.30 a.m. — Technical Session — Non-ferrous Practice (held jointly by Institute of Metals Division of A. I. M. E. and the American Foundrymen's Association).

"Casting Losses in the Aluminum Foundry," by Robert J. Anderson, Bureau of Mines, Pittsburgh.

"Coke and By-Products as Fuels for Metals Melting," by F. W. Sperr, Jr.

"A New Electric Furnace for Melting Brass," by C. H. Booth, Booth Electric Furnace Co., Chicago.

"Status of the Electric Furnace in Non-Ferrous Industry," by E. F. Cone, "The Iron Age," New York.

"Problems of the Non-Ferrous Foundry." by Russell R. Clarke.

WEDNESDAY, OCTOBER 6

9.30 a.m.—Technical Session—Steel.

"Annealing Steel with Pulverized Coal," by C. H. Gale, Pressed Steel Car Co., McKees Rocks, Pa.

"Accurate Treatment of Steel Castings," by T. F. Baily, The Electric Furnace Co., Alliance, O.

"Heat Treatment of Steel," by F. E. Brown, U. S. Bureau of Standards, Washington.

"Electric Heat Treating of Steel Castings," by E. F. Collins, General Electric Co., Schenectady, N. Y.

"Heat Treatment of Steel Tractor Castings," by Fred Grotts, Holt Mfg. Co., Peoria, Ill.

"Electric Steel Making," by James W. Galvin, Ohio Steel Foundry Co., Springfield, O.

WEDNESDAY, OCTOBER 6

2.00 p.m.—Industrial Relations.

"Industrial Relationships Between Employer and Employee," by Myer Bloomfield, Industrial Relations, Boston, Mass.

"Training Foundry Executives," by R. E. Kennedy and Bruce W. Benedict, Shop Laboratories, University of Illinois, Urbana, Ill.

"The Foreman's Relationship to the Worker," by Chas. Prosser, director, Dunwoodye Institute, Minneapolis,

"Developing the Foreman," by M. C. Evans, secretary, Foreman's Development Course Committee, International Harvester Co., Chicago.

"Americanization," by Fred H. Rindge. executive secretary, Y.M.C.A., New New York.

"Report of Committee on Safety, Sanitation and Fire Prevention, by Benjamin D. Fuller, chairman, Niagara Falls, N. Y.

THURSDAY, OCTOBER 7

9.30 a.m.—Industrial Relations.

"The Right Man on the Right Job," by Arthur H. Young, manager, Industrial Relations, International Harvester Co., Chicago.

"Modern Employment and Personnel Methods," by Dudley R. Kennedy, Cluett, Peabody & Co., Troy, N. Y.

SIDE VIEW, SHOWING GENERAL CHARACTER OF BUILDINGS 2, 4, 5 AND 7.

VIEW FROM ROOF OF COLISEUM, SHOWING COVERED WALK, LEADING FROM COLISEUM TO BUILDING NO. 4, AND IN THE FOREGROUND AT THE RIGHT THE DINING HALL.

"Industrial Relations From the Manufacturers' Standpoint."

"Employment Problems," by Ralph M. Wells, Employment Managers' Association, 6 Beacon Street, Boston, Mass.

"Industrial Relations Work as Applied to Foundries," by James W. Brown, manager Industrial Relations Dept., Chain Belt Co., Milwaukee.

"Various Plans of Industrial Relations," by Ray Vance, service director, Brookmire Economic Service, Inc., New York.

"Education and Vocational Training for Employees," by A. C. Horrocks, educational director, Goodyear Tire & Rubber Co., Akron, O.

"Report of Committee on Industrial Education and Training of Apprentices," by C B. Connelley, chairman, Department of Labor and Industry, Harrisburg, Pa.

THURSDAY, OCTOBER 7

9.30 a.m.—General and Metallographic Session of the Metals Division of A. I. M. E.

"Charpy Impact Test as Applied to Aluminum Alloys," by E. H. Dix.

"Colloidal States in Metals and Alloys," by Jerome Alexander.

"Transition Phenomena in Amalgams," by A. W. Gray.

"Physical Tests on Sheet Nickel-Silver," by W. B. Price and P. Davidson.

"Nickel-Chromium Alloys," by Leon O. Hart.

"Copper Crusher Cylinders," by A. I. Krynitzky.

THURSDAY, OCTOBER 7

8.00 p.m.—Business Meeting.

"Annual Address of the President," by C. S. Koch, Fort Pitt Steel Foundry Co., McKeesport, Pa.

"Report of Board of Directors," by C. E. Hoyt, secretary.

"Report of Secretary-Treasurer," by C. E. Hoyt, secretary.

"Americanization," by Dr. R. M. Little, director, American Institute of Safety, New York.

9.00 p.m.—Smoker.

FRIDAY, OCTOBER 8

9.30 a.m.—Technical Session—Malleable Iron.

"The Triplex Process of Making Malleable Iron," by H. A. Schwartz, National Malleable Castings Co., Indianapolis.

"Notes on Malleable Iron," by Enrique Touceda, Albany, N. Y.

"Fractures and Microstructures of American Malleable Cast Iron," by W. R. Bean, H. W. Highriter and E. S. Davenport, Eastern Malleable Iron Co., Naugatuck, Conn.

"A New Research Department for a Large Malleable Plant," by H. A. Schwartz, National Malleable Castings Co., Indianapolis, Ind.

"Fuel and Combustion," by Max Slosky, Deere & Co., Moline, Ill.

"Refractory Brick and Materials," by Dr. N. L. Hartman, Carborundum Co., Niagara Falls, N. Y.

"Report of Committee on Specifications for Malleable Iron Castings," by Enrique Touceda, chairman, Albany, N. Y.

FRIDAY, OCTOBER 8

9.30 a.m.—General Session.

"The Care of Foundry Equipment," by David McLain, McLain's System, Milwaukee.

"Important Considerations in the Design of Modern Foundries," by J. H. Hopp, Chas. C. Kawin Co., Chicago.

"Cleaning Room Methods," by A. W. Gregg, Whiting Foundry Equipment Co., Chicago.

"Arc Welding Machines for the Foundry," by A. M. Candy, Westinghouse Electric & Mfg. Co., East Pittsburgh,

"The Fusion Welding of Iron Castings," by A. S. Kinsey, Stevens Institute of Technology, Hoboken, N.J.

"Proper Illumination as an Aid to Foundry Production," by James Brakes, Jr., Chicago.

"The Equipment of the Foundry—Today and in the Near Future," by A. R. Atwater, Osborn Mfg. Co., Cleveland.

"Approved Methods of Testing Molding Sand," by S. W. Stratton, Bureau of Standards, Washington.

"Report of Committee Advisory to the U. S. Bureau of Standards," by Richard Moldenke, Watchung, N. J.

"Cost Accounting," by F. C. Everett, Miller, Franklin, Bassett & Co., New York.

"Report of Committee on Foundry Costs," by J. Roy Tanner, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh.

"British and Continental Molding Machines," by H. Cole Estep, Penton Publishing Co., London, Eng.

"Foundry Engineering," by Frank D. Chase, Frank D. Chase, Inc., Chicago.

"The One Best Way to Do Work," by F. B. Gilbreth, Montclair, N. J.

"The Foundry of the U. S. S. 'Prometheus,' Repair Ship of the Atlantic Fleet," by Lieut. R. F. Nourse, United States Navy.

"Report of Committee on Specifications for Foundry Scrap," by J. G. Garrard, chairman, Northwestern Malleable Iron Co., Milwaukee.

"Concrete Molding Floors," by Lieut.-Col. H. C. Boyden, Portland Cement Association, Chicago.

VIEW OF COLISEUM TAKEN FROM WEST END BEFORE COVERED WALK WAS BUILT.

C. S. KOCH, President A.F.A.

C. B. HOYT, Secretary.

W. R. BEAN, Vice-President, A.F.A.

List of Exhibitors at Convention

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United States Graphite Co.	Saginaw, Mich.	2
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Moulding Tank Plates and Making Equipment

Showing Advantage of Iron Flasks Over Wooden Ones, and Demonstrating How the Same Cope Can be Used on Two Drags Without Being Re-rammed.

By JOHN H. EASTHAM

THE tank plate casting of rectangular type is usually ordered in fairly large quantities, sugar mill, paint factory, soap works, and many other trades needing vat or liquid storage being responsible for a large share of foundry work of this description in connection with their machinery installation. While engineering plants specializing in these lines are in many

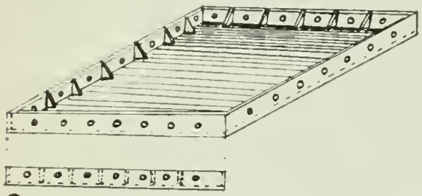


FIG. 1—MOLDING TANK PLATES.

cases splendidly equipped for the economical production of the repetition work attached to these contracts, the fact remains that in many foundries the crudest methods prevail with consequent loss from a financial standpoint.

The example shown at Fig. 1, let us say fifty-four by forty-eight inches area of five-eighths inch section, including flanges, bracketed, duly filleted, and with cored bolt holes as shown, weighs approximately five hundred and twenty pounds, and presents no unusual moulding features; a full pattern rolled over in any flask you can find that is big enough, carefully rammed and vented so as to avoid scabbing or straining, being about the usual method resorted to.

If your box is of wood you would, of course, after closing, lay a couple of rails across the cope and carefully wedge under each rail over every bar, thereby keeping the casting to the requisite thickness, and after you have turned out a good casting in a good many hours everybody concerned is justifiably happy. But what of the unnecessary labor and lost motions involved? Let us suppose your order is for one hundred plates and

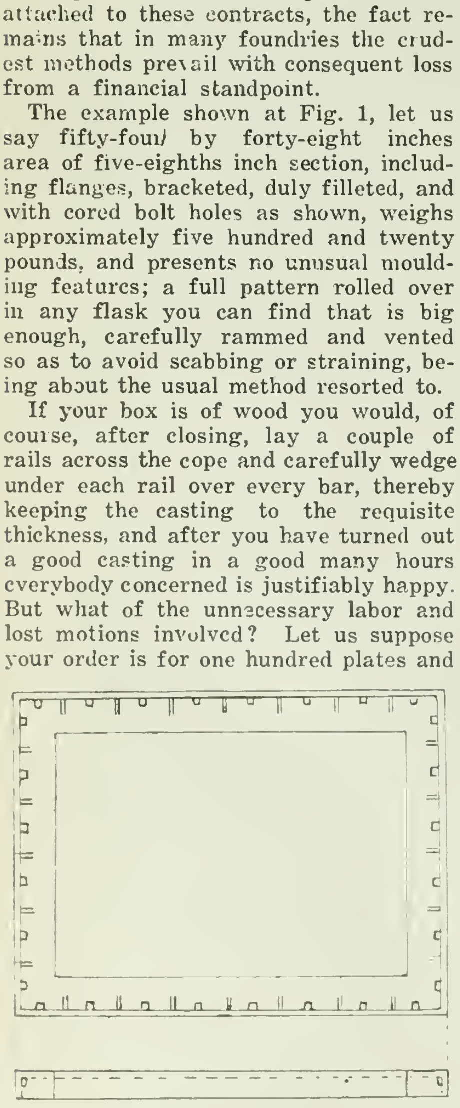


FIG. 2—SKELETON PATTERN.

that you would not object to a larger profit, with a very small initial outlay in the way of equipment by a method which need not turn your moulders into rabid Bolsheviks on account of being overworked.

Fig. 2 shows a skeleton pattern of the style of casting under discussion, the brackets, bolt-hole core prints, and fillets being all secured in the usual way, while the inside area with the exception of about four inches from each end and side is left open to facilitate bedding in. And here let me make peace with the ancient and honorable craft of patternmakers. A good many of this recent series of articles have been in the direction of pattern making economy, or no pattern at all, apparently a persistent effort to abolish your trade, or nearly so; but be calm, there are others coming of a different type, in fact, if you look over the sketches accompanying this article you will see that any work taken out of the tank plate pattern is more than replaced in the way of equipment hereafter detailed, therefore those of you of the wood butchering persuasion who used to be occasionally kind to me in the days before the GREAT DROUGHT, be of good cheer, future greetings and salutations to be celebrated a la chocolate sundae.

If your shop is equipped with jarring machines, or those of the roll-over type, the system about to be described may not appeal to you, but if you have not machinery of sufficient capacity and have no intention of buying, you may get a pointer or two by reading it.

First, as to flask equipment. Figure on one cope part only for every two drags made, the copes being intended to do double duty, the material of which they are made being cast iron. The drag parts may be made in one of two designs, they being of the fast barred type shown at Fig. 3 or the slightly more costly (primarily) but eminently more useful for general purposes style of loose barred flanged box indicated at Fig. 4. If you cast them as at Fig. 3, say eight inches deep, you have nice handy rigging for flat work of a general nature only, four lugs as shown being advisable, not so much for guide pin purposes as for even clamping when closing the moulds prior to casting, the journals shown making them very easy to handle when suspended in the crane slings.

Should your range of work, however, embrace castings of a heavy, deep type, which it is necessary or desirable to roll over in order to get the best results,

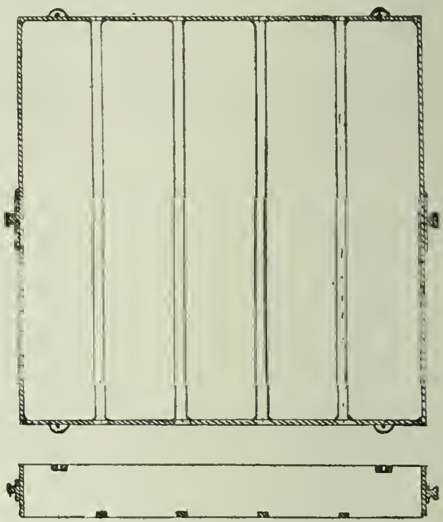


FIG. 3—DRAG PART WITH FAST BARS.

the open frame flanged design of cheek or drag part at Fig. 4 will be your best investment as they may be built up to any desired depth and bolted together by convenient holes drilled or cored in the strengthening flanges. Bow handles are

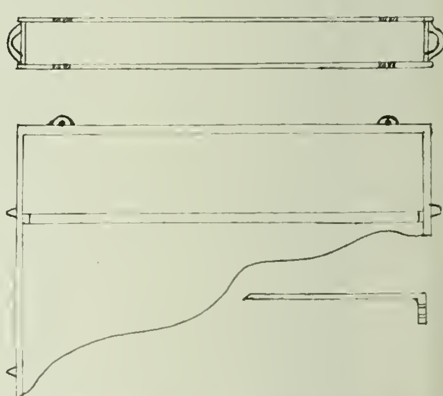


FIG. 4 LOOSE BARREL DRAGS FORMING CHECK PARTS.

also necessary in this design in place of the journals above mentioned as the latter style is obviously impossible when more than one drag is to be rolled over at the same time. Cast iron or wrought

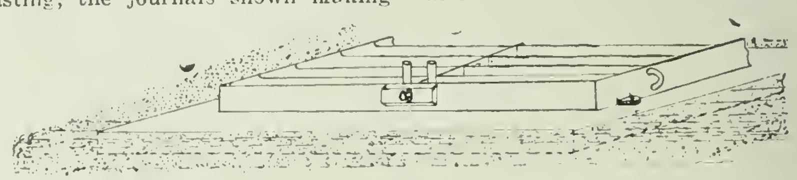


FIG. 5—MACHINE PLATE IN FOUNDRY FLOOR, WITH COPE FLASK PRIOR TO RAMMING.

bars as shown in the sketch, or the familiar bottom grid or puncture plate may be bolted in any cheek so as to form a drag part.

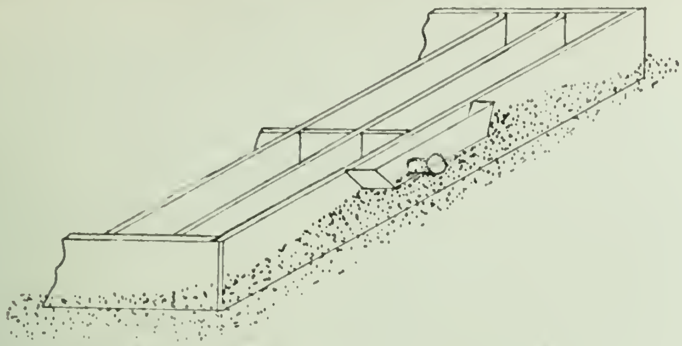


FIG. 6—SHOWING DRAWBACK BOX USED TO COVER JOURNALS

The reversible cope shown at Fig. 5 is worthy of special mention, much labor and time being saved by its adoption. The bars are cast in place in the usual way, with the difference that a half inch or so of clearance is left both top and bottom from the box edge, single or double sets of lugs being optional and entirely at your discretion. Journals are advisable for speedy handling as will be shown later, in fact almost imperative in the class of work under discussion, though bow handles may be used if insisted on, their classification, in this instance, however, being archaic.

When casting the copes a cover by means of another cope, or cores, is of course essential, and is also advisable in the case of the drags, a cut along all joint faces on the planer being also an absolute boon if you have a machine of sufficient capacity.

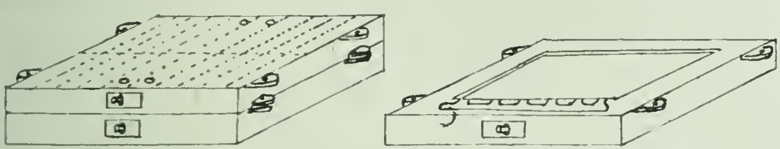


FIG. 8—CLOSED MOLD, AND DRAG READY FOR SECOND USE OF COPE PART. WHEN MOLDING COPE FLASKS.

The box journals are best made in dry sand cores, bedded in the mould when ramming up the outside of the pattern or dropped into an oblong print after its withdrawal as your fancy dictates, though if you are anxious to keep your coremaking costs down to rock bottom they may be moulded from a journal pattern fast to the main frame, or, in the case of deep boxes bedded in loose to correct marks, a half joint made and a small drawback used as shown in Fig. 6.

Before describing the moulding of the plates one other valuable piece of equipment which pays for its original cost in a very short time should be noted. A glance at Fig. 5 will show that the cope flask is placed on a base plate of similar design to a marking-off table, in fact; a spare casting of that description free from holes could not be improved on for the purpose, any absolutely straight smooth face bedded solidly and level on the foundry floor is a fine thing to ram flat copes on.

Moulding the Plate

Fig. 7 gives two views of the drag mould as bedded in the flask, using the skeleton pattern above mentioned, the upper view showing a straight-edge placed across the pattern and box edges before ramming, great care being necessary to keep the pattern flush with the box edge at all points, a simple way of ensuring this being the placing of a pair of rail sections across the whole fabric during the bedding in process.

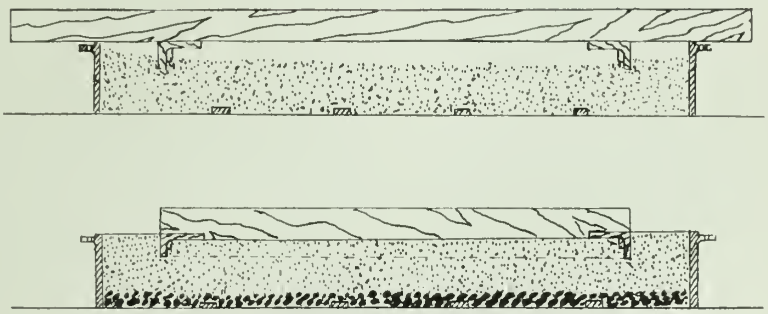


FIG. 7—SHOWING TWO VIEWS OF DRAG MOLD.

The lower view shows the strickle used to shape the face of the plate prior to venting and drawing the pattern, the mould face being cut up and a layer of facing sand spread over the whole interior in accordance with good practice. It will be noted that a cope bed is shown in the lower sketch only. Individual taste will of course determine the method of venting, either by this means or driving a long wire under the drag, which latter form of punishment should be reserved for criminal offenders and possibly for the guy who first in his trusting way introduced the foreman to SHE, who afterwards became his mother-in-law, as a coke bed can be left in place for months, used every day, is easily vented down to from the top face, and will show a less proportion of scabbed castings than any other method.

When ramming up the copes two sets of gate pins should be used, one for the first plate to be cast and one for the second, no risers being necessary if good fluid iron is used, this arrangement being displayed in the vein of the closed mould at the left of Fig. 8, a second drag mould ready for the cope being shown at the right of the same sketch. The question of how many plates to pour at one time is of course a matter of proportion, governed by the amount of plates ordered, number of boxes made, cupola capacity, and local conditions generally, the

Continued on Page 226

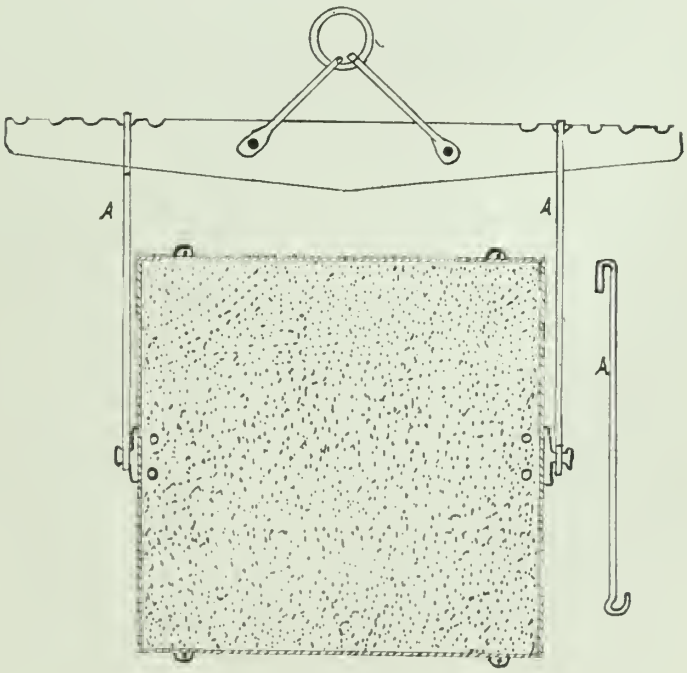


FIG. 9—COKE PART SUSPENDED ON STRIP AND BEAM.

Small Contributions from Various Authors

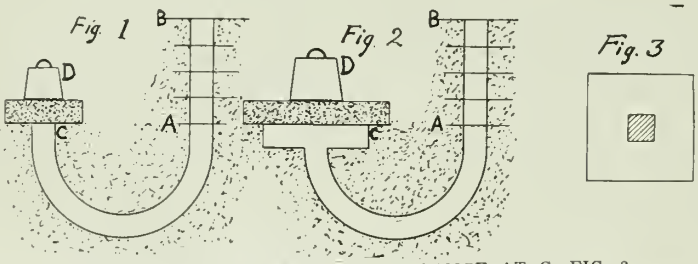
Core Making Stunts, Open Sand Molding, Lessons on Pressure, Effects of Heavy Weighting, Pouring, Gating, etc.

A LESSON ON PRESSURE

By F. H. Bell

Many articles are written along the line of pressure on moulds, and many formulae given for figuring out how to combat it, but I doubt if very many foundrymen ever absorb the meaning of what they are reading, and while they may follow the instructions and accomplish what they were aiming at they have been more or less apeing the instructor instead of understanding him.

In the sketch will be seen two views of the same article with the exception of the part C, Fig. 1, and C, Fig. 2. As we have frequently been informed, a cubic inch of iron weighs approximately a quarter of a pound, and if we have an upright body of iron one inch square and four inches high it will have a pressure of one pound on the floor beneath it. Now, supposing we have a mould made with an opening an inch square and shaped like Fig. 1, with a cover core over the end C, we will have a pressure of one pound at A and likewise at C, and the weight D which holds down the cover core will require to weigh one pound in order to resist the pressure. Now suppose we take the mould Fig. 2, which is precisely the same with the exception of the part C, which, instead of being one inch square, is twelve inches square, the weight D, Fig. 2, which holds down the cover core, will require to weigh 144 pounds, because there are 144 square inches of surface exposed to the pressure of one pound to the square inch, and while there is only one pound of upward or lifting strain at the point A, there will be 144 pounds of upward strain at C. This seems to be a difficult problem for the average moulder to solve. If the portion below A and C, Fig. 2, is filled with melted iron there will be no upward pressure, and if we have a cope containing the portion between A and B and put it in its place, there will, as we have already shown, be only 1 pound of pressure at the point A; if we fill this cope with melted iron, and regardless of the fact that the metal between A and B only weighs 1 pound, the weight D will have to weigh 144 pounds, or the core will certainly be forced up and the metal will run out.



NOTE C, FIG. 1, COMPARED WITH FLANGE AT C, FIG. 2.
FIG. 3 IS CROSS SECTION WITH OPENING 1 INCH SQUARE.

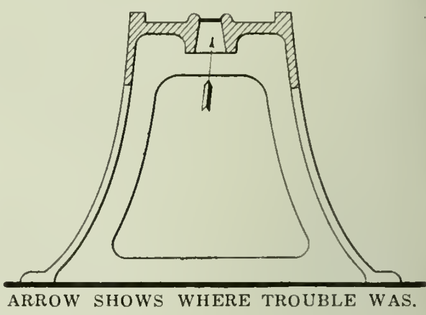
This fact is so little understood by the average moulder that he makes many simple mistakes which he should not make. Supposing the plate C was the only part that was being done and the moulder had a 14 by 16 inch flask with a cope 4 inches deep, he would keep the pattern to one end to allow room for the gate, and would in all probability clamp it with two clamps, and the mould would in all probability spring a leak at the joint when being poured. He would of course blame it on to the poor quality of the flask or get up some such an excuse.

Another mistaken view is that the part of the mould nearest to the gate is most apt to run out. If it does it will be because the mould was soft at that point or else the moulders brushed some of the parting away when cutting the gate. The upward strain on the cope will not be as great at that end as at the other for the reason that the broad-faced pattern is at the other end.

THE SNAP WEIGHT MADE THE TROUBLE

By F. B. Gordon

A very simple job will sometimes tax a fellow's patience as well as his ingenuity, as the little illustration here shown will demonstrate. The design of the casting is of no concern, as it is the green-sand core shown at the point of the arrow, which made all the trouble. The casting was the base for a very light cistern pump, and was made in a deep snap-flask. It was perfectly round and the flask was almost as small as the pattern, but that did not matter, as we used to put slip jackets on after taking off the snap-flask, so there was no possibility of them running out, provided we weighted them heavy enough to prevent them from lifting. However we used to make them in large quantities, and when we came to take them out of the sand after pouring, we would find enormous quantities of them bad, on account of the core crushing. I might say that the pattern was on a match plate and I took it to the pattern maker and had it calipered and measured and tested in every imaginable way, and it was always found perfect, but still the castings came bad. I made molds with the greatest of care, and after closing


ARROW SHOWS WHERE TROUBLE WAS.

them I would put my weight on them and try them off, and they would be all right, but as soon as I would give it to a molder and have him put up a floor they would come bad again. I tried one myself after the molder had his floor up, and I was pinched for time, so I left the snap-flask on instead of using the jacket, and it came all right. This settled the trouble. I found that after making a perfect mold and removing the flask and putting on the jacket that there was nothing to hold up the weight which was put on it, to hold it down, with the result that the little bit of bearing between the bottom flange and the outside of the mold would yield enough to let the load come upon the little green-sand core and crush it. This did not show on the flange, but the shape of the core was such that it would not stand any crushing strain, but would give way entirely. The only remedy that I could devise was to fill in a little film of wax to shorten the core, so that when the cope was put on it did not touch the core. This might not seem like a mechanical idea, but it worked wonders.

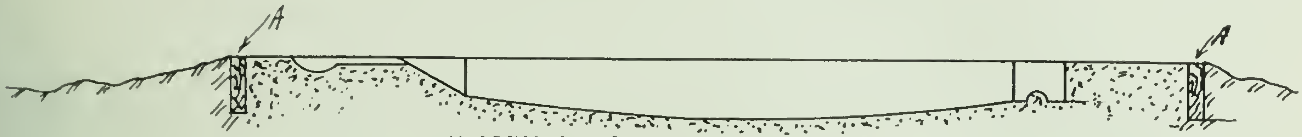
When the weight was put on the bottom yielded as usual and let the cope come down upon the core and just pinch it enough to hold it in place, with the result that we had no further trouble.

CASTING IN OPEN SAND

The practice of casting in open sand molds those parts which will answer their purpose equally as well when cast in this way as when cast in a flask with cope is practically universal in Europe, but, although known on this continent, is not much practised, more because of a habit of always using a cope, I believe, than for any more cogent reason.

In case my reader may not be familiar with open sand casting practice. I may say that it consists of making the mold on a bed of sand, levelled off on the floor of the shop, without any flask or cope.

The casting of plain single grate bars by this method gives a good general idea of the method of procedure, and the drawing accompanying this article shows the method generally followed,



MOLDING GRATE-BAR IN OPEN SAND MOLD.

and shows that considerable labor is saved over the flask and cope method.

The wood sticks marked A, in the figure, are first driven into the bed of sand, at the proper distance apart, to accommodate the length of the grate bar pattern, and then levelled up both ways. The sand between the sticks is then struck off level with the tops of the sticks, and molding is commenced, the molds being usually made about one foot apart.

It is best to have at least two patterns, one being left in the last preceding mold, while tamping the next one. The sticks A, being left in place, afford a permanent guide to keep the molds level. Obviously, it is essential in open sand molding that the molds be exactly level, as there being no cope, the mold would not be completely filled by the molten iron unless the upper surface is level.

The iron must be poured rather on the hot side, to get the top surface of the casting level, and with square corners, as there is a tendency for a skin to form on the top of the iron, while pouring, which may cause the upper edges of the casting to be rounded.

For such castings as plain single grate bars, base plates for stacks, or other castings with one flat surface, and no core, this method will give satisfactory results with less than one half of the labor involved in molding in the usual way with a flask and cope, even if a flask of the required size is available, which is not always the case.

MAKING A SCRAPER BLADE

The country shop articles which appeared in the last issue of Canadian Foundryman appealed to me so forcibly as being of exceptional interest that I

END VIEW OF SCRAPER-BLADE WITH SHARP EDGE.

cannot refrain from contributing an experience of my own along the same lines for the enlightenment of those whose experiences in this direction may not have been as varied as my own.

Fig. 1 might be taken for an illustration of a hockey stick, an axe handle, or a stove-lid lifter, but it is neither of these. It is an end view of what was known as a scraper blade, the making of which formed one of the jobs on which I served my apprenticeship. It is upside down to what it would be if in use on a scraper, but it seems that it had to be molded this way. If I remember right there were some attachments which went with it which would not lift right if made the other side up.

If any of our readers remember forty years ago on the farm they will remember that there was an implement known as a road scraper, used for leveling roads and taking down hills and filling gulleys and digging ditches, etc. It was made of wood and had two handles projecting behind like on a barrow and on the front was this cast iron blade. The blade would be about three feet wide and about 16 or 18 inches from front to back. At the front it was sharp like a knife and then thickened up to about an inch, after which it receded to about half an inch until it came to the extreme back, when it thickened up to the thickness of the lumber forming the body.

There was nothing to it to mold, the only trouble was to get that sharp edge to run without notches in it. We used to pour it lying as it is in Fig. 1, with nice hot iron and the edge would run up sharp enough with the exception of an occasional spot, which would not run at all. We tried raising the back three or four inches and pouring it with two bull ladles and soaking it for all we were worth with white hot iron, with the result that we strained it all out of shape, but still had the notches. The trouble was that the iron had to fill the low thick place back of the edge before it could get to the edge, and if we raised the back a few inches we simply changed the angle of the thick spot instead of improving matters any. In fact a little raise on the back made it less likely to run properly, because when we forced the iron into the mold it simply ran into that thick spot faster than it would have done and of course some of it would run up hill on the opposite side until its momentum was spent, but it would not reach such spots as were directly in line with the gates, but there would be no pressure to hold it; the tendency being to run back into the low place.

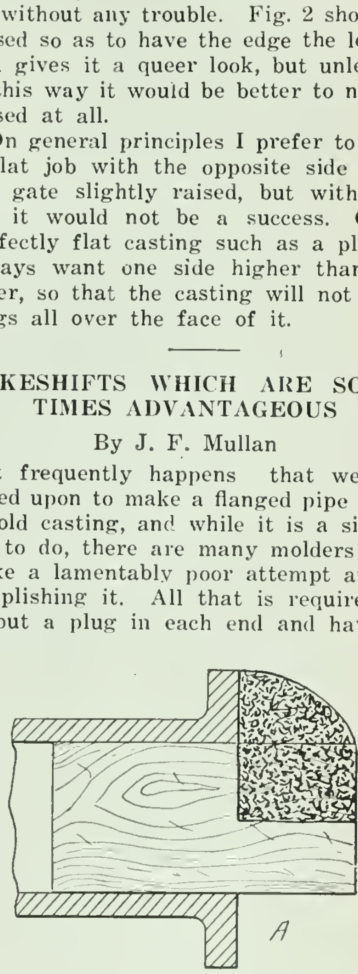
If we raise the back sufficient to have the edge slightly lower than any other part the iron will flow into it first, without forcing it, and the rest can be filled up without any trouble. Fig. 2 shows it raised so as to have the edge the lowest and gives it a queer look, but unless it is this way it would be better to not be raised at all.

On general principles I prefer to pour a flat job with the opposite side from the gate slightly raised, but with this job it would not be a success. On a perfectly flat casting such as a plate I always want one side higher than the other, so that the casting will not have rings all over the face of it.

MAKESHIFTS WHICH ARE SOMETIMES ADVANTAGEOUS

By J. F. Mullan

It frequently happens that we are called upon to make a flanged pipe from an old casting, and while it is a simple job to do, there are many molders who make a lamentably poor attempt at accomplishing it. All that is required is to put a plug in each end and have it

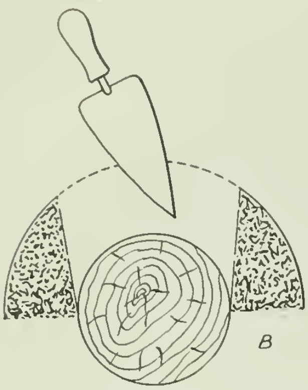


NOTE SAND, BANKED OVER CORE PRINT.

to project out a few inches to make a print. If the inside diameter of the pipe is to be different from the old one, this change is made on the projecting part of the plug, which forms the print. The pattern thus improvised is molded the same as any pattern, either by bedding it into the nowel, or laying it on a false cope and rolling it over. The parting of the mold will be at the largest diameter of the pipe, which is, of course, where the parting in the pattern would have been if a split pattern had been used. After making a parting at this line, the portion on the outside of the flange will require to have sand built up the entire size of the flange as shown at A. This will be all rounded nicely so as to allow a good lift of the cope. The only part which can make any trouble will be the inside of the flange, but this is unavoidable, and will in all probability have draught, which will relieve the likelihood of trouble.

After lifting off the cope a trowel is used to remove the sand, which is directly over the core print, as shown at B, after which the "pattern" can be drawn with ease.

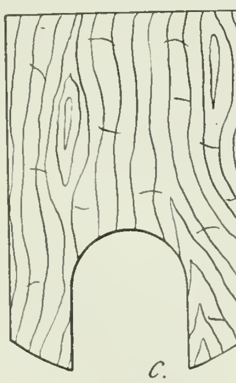
After setting the core a stop-off board



DIGGING AWA YSAND TO ALLOW PATTERN TO BE TAKEN OUT.

C is placed against the inside of t sand B, and fitting down over the core. The proper circle can be scribed on this stop-off board and the sand built up to the exact height and curve to fit the cope, but it is always best to flour the joint and try it off for fear of crushing or not being full enough. This style of molding is often resorted to in making new patterns. A core print often comes in a place where it is not convenient to make a parting, and in such cases it can be buried until after the cope is lifted, after which it will be uncovered as shown, and filled in after the core is set.

In tucking the sand in back of the stop-off board, care must be taken to



STOP-OFF BOARD FOR FILLING OVER CORE-PRINT.

not cave it in below, but at the same time care must also be taken to get it firm. In setting cores in this way it is always advisable to secure the core in its place with good, big nails, before tucking in the sand, and the sand which is being tucked in is not safe to depend upon.

A CORE-MAKING EXPERIENCE

By Thomas Nelson

I WAS greatly interested in Mr. Edgar's article on cores and core boxes appearing in the May Foundryman.

I have made cores by all the methods illustrated, besides some others, and appreciate the points of advantage and disadvantage propounded by the writer.

I have thought it might be of interest and perhaps profit to the readers of Foundryman if I gave my experience in connection with one little core making stunt I put over.

I had about twenty cores to make for a 3 in. elbow in lengths varying from 12x24 in. to 24 in. by 4 ft. with a flange on each end.

We had always been in the habit of making plates for such a job, if there were none suitable in stock. I never liked to make more work on a job than I could help and very much disliked the idea of going into the core oven oftener than necessary. The plan I hit on covered both these points.

There was a large heavy plate standing against the wall in the loam end that had been used on a job with the loam on it comparatively unbroken.

I got permission from the boss to lay that plate down flat and patched the broken parts. Then I took the elbow pattern and got the blacksmith to lend a length of square iron corresponding in thickness to the metal thickness of the pipe which in this case was ¾ in.,

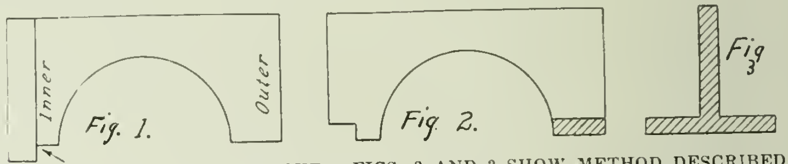


FIG. 1 SHOWS USUAL STRICKE. FIGS. 2 AND 3 SHOW METHOD DESCRIBED.

to fit snugly around the joint on the inside edge of the bend and long enough to take care of the longest casting plus core prints. The patternmaker had the strickle made in the style always used when making the cores on plates, but when I explained to him how I was going to make them he willingly altered it to suit my wishes. Fig. 1 shows the usual strickle. Fig. 2 and 3 show the changes this flat bearing surface on Fig. 3 preventing it from cutting into the loam surface of the plate.

I laid down the guide iron, putting a weight at each end and proceeded to strickle them up in the usual way, bedding a piece of ¼ in. square iron into each half core for a stiffener. I covered one half of this plate with half cores and to make the other halves, turned the guide iron over and covered the other half of the plate. It took but a few minutes to make each one and the plate was run on to the core oven truck with the crane and brought back in the same way. Getting them jointed was an easy matter as they were all there at hand and as each one was finished, I laid them on another plate and run them again into the oven with one trip of the crane.

The boss was not much given to paying compliments, but he did say that was all right that time.

THOMAS NELSON, Toronto.

A SIMPLE METHOD OF WATER PURIFICATION

A level teaspoonful of chloride of lime should be rubbed into a teacupful of water. This solution should be diluted with three cupfuls of water, and a teaspoonful of the whole quantity added to each two-gallon pailful of drinking water. This will give .4 or .5 parts of free chlorine to a million parts of water, sufficient to destroy in ten minutes all typhoid and colon bacilli or other dysentery producing organisms in the water. Moreover, all traces of the chlorine will rapidly disappear.

This method of purification has been tested with Toronto Bay water inoculated with millions of bacteria. Every germ has been destroyed and it has been unnecessary to boil the water.

This method should be very valuable for miners, prospectors, campers, soldiers, and those living in summer resorts where the condition of the waters might not be above suspicion.

A little girl was asked, upon her return home, how she liked the singing of the congregation in the church.

"I liked it very much," she said, "though all the people said it was bad."

"All the people said it was bad! What do you mean, my dear?"

"Oh, it was so bad that I heard the people praying, 'Lord, have mercy upon us miserable singers.' "—Tit-Bits.

"Then we're engaged?"

"Of course."

"And I am the first girl you ever loved?"

"No, dear, but I'm harder to suit now than I used to be."

MOULDING CAST IRON TANK PLATES

Continued From Page 223.

mode of procedure in all cases being to ease off the clamps and take away the runner heads as soon after casting as possible, cut up the sand on the upper face of each cope, spread facing sand to a reasonable depth over its whole area, ram, and sweep off, then liberate the sand round the necks of the gates attached to the casting below by poking round them with a small chisel bar (or you can spoil your trowel that way if you wish) black and slick the face either now or after hoisting the cope by the slings and beam shown at Fig. 9, A. A. A, being a handy light style of sling to hang on a notched cast iron beam, swing the cope over and lower on to the next waiting drag mould, clamp, make up the runner head on the two extra holes aforesaid, and you are ready again for your metal.

The Use of the Pyrometer in Steel Industry*

An Interesting Paper Discussing the Progress Made in the Accurate Measurement and Control of High Temperatures in the Heat Treatment of Steel of All Kinds

By R. P. BROWN

If anyone stops to consider the remarkable progress which has been made in the accurate measurement and control of high temperatures in the heat treatment of steel, one realizes that this progress has been phenomenal during the past ten years. This progress has been largely due, first to improvements in temperature measuring instruments, and secondly to the education of the user in the proper use and care of pyrometers.

It is safe to say that greater progress has been made during the past ten years in the use of pyrometers than was made in the two hundred preceding years during which pyrometers were known and used to some small extent. This progress has been largely due to the constant efforts of pyrometer manufacturers to develop and improve their instruments.

It is also true that in the last ten years an unusual amount of interest has been exhibited by the men who must use pyrometers, in becoming fully acquainted with the construction of the various types of pyrometers which are available and the proper installation of the instruments in order that they will give the best results and the proper method of using and checking the instruments.

Numerous papers and books have been written on this subject, and one has only to call on any steel plant to-day and interview the metallurgist or the practical hardener, to realize how much more these men know of pyrometers than the man of ten years ago. One rarely calls at a plant where heat treatment of steel is carried on where the man who is charged with this work is not well acquainted with the use of pyrometers and the proper equipment to use for his requirements.

Ten years ago it was a question solely of endeavoring to convince the prospective pyrometer user that he should use a pyrometer. He had never used one before and it was a difficult matter to convince him that the instrument was necessary. To-day it is a question of convincing the same man that a certain type of pyrometer is properly designed to best meet his requirements, that it will give maximum life under his conditions, and that the pyrometer installation will require a minimum amount of attention. He does not have to be convinced that he should use a pyrometer; he must be convinced that he is going to buy the best pyrometer equipment for his requirements.

When I compare the average metallurgist or steel hardener of to-day with the same man of ten years ago, it is true that I may do an injustice to the men associated with a few of the larger companies where the advantages of pyrometers were appreciated at that time, but these plants were few and far between and it must be realized that I am speaking generally and of the average conditions of ten years ago and of to-day.

The old methods of measuring temperature by the expansion or fusing points of clay, by the expansion or contraction of metals, and by numerous other methods have largely been eliminated to-day and we have practically only two methods of measuring high temperatures. The thermo-electric pyrometer embraces either a thermo-couple inserted directly in the heat, or in the form of a radiation pyrometer with the thermo-couple heated by the furnace rays; secondary the optical pyrometer, in which a color comparison of an incandescent body and the steel under treatment is made. The optical pyrometer is used only portably as this instrument is not suitable for permanent installation or for automatically recording temperature. It is used quite extensively where it is necessary to focus on a particular piece of steel in a furnace to secure its temperature, or where excessively high temperatures are measured, around 3,000° Fahr. or 1,600° Cent., where a thermo-electric pyrometer is not suitable.

Optical Pyrometers

The optical pyrometer as generally used compares the incandescent filament of an electric lamp bulb with the luminosity of the steel under treatment. A milli-ammeter is used to measure the current passing through the lamp; the more current the brighter the filament and the greater the number of milli-amperes indicated on the meter. By turning a rheostat the amount of current passing through the lamp can be adjusted. When the color of the lamp filament blends with the piece of steel under treatment it is assumed that the two are at the same temperature. The indications on the milli-ammeter are then read off and by a conversion table the actual degrees Fahrenheit or Centigrade are secured.

Other forms of optical pyrometers compare the flame of a small oil or kerosene lamp or the color of multi-colored lens with the steel which is being heat-treated.

Having referred to this method of measuring temperature by an optical pyrometer, which has been used to some extent for twenty years or more, and the use of which is still limited, I can take up the thermo-electric pyrometer, which is almost universally used to-day.

I think that almost everyone understands that a thermo-electric pyrometer consists of a thermo-couple, a measuring instrument, and the leads connecting the thermo-couple and the meter. The thermo-couple is formed of two dissimilar metals, usually drawn into wire and with one pair of ends twisted together. When this junction is heated it generates a small current of electricity which can be measured on a milli-voltmeter.

It is true that a thermo-couple produces current, dependent on the temperature of the twisted junction extending into the furnace, known as the hot end, and the opposite end outside the furnace, known as the cold end or cold junction. It is at these ends that the leads running to the meter are joined to the thermo-couple. In accurately measuring temperature with a thermo-couple it is therefore essential that the cold junction be maintained at a known fixed and uniform temperature, which may be 75° Fahr. or any other temperature. If the cold junction of a thermo-couple is at 75° Fahr. and the hot junction in the furnace is at 1,400° Fahr., the actual millivoltage generated is equivalent to the difference in temperature between the hot end and the cold end of the thermo-couple, equivalent to 1325° Fahr. If we heat this cold junction to 100° Fahr. we will then only have a millivoltage produced by the thermo-couple equivalent to the difference in temperature of 1300° Fahr. instead of 1325° Fahr. as previously cited.

The effect of heating the cold junction of a base metal thermo-couple is such that with a rise in temperature of the cold junction of 25° Fahr. the instrument will read approximately 25° low. With a platinum thermo-couple this error is approximately one-half. In other words, with a platinum couple, the error would amount to only approximately 12° Fahr. for a rise in temperature of the cold junction of 25° Fahr. above normal.

In the use of any thermo-electric pyrometer it is essential that this point be realized, because far too many thermo-electric pyrometers are still in use to-day with the cold junction of the thermo-couple located right above a furnace and subject to constant changes in temperature and to probably a normal temperature of not less than 200° Fahr.

Assuming that the pointer on the instrument is set at 75° Fahr., such an instrument is actually reading 125° Fahr. too low. Of course, if the user of the instrument only realizes this fact which I have brought out, he will set the pointer of his instrument for the proper cold junction temperature 200° Fahr. instead of that usually adopted in supplying the pyrometer, 75° Fahr.

All modern pyrometers are equipped with zero adjusters which permit of setting the pointer to any desired cold junc-

*By courtesy of National Safety Council.

tion temperature and this point can be readily taken care of. Unfortunately in the case I have mentioned above where a thermo-couple is located just above the furnace, when the furnace is first started up, the temperature of the thermocouple inside might attain 1400° Fahr. and the cold junction outside will have only reached 100° Fahr.; after the furnace has been run six hours the heat radiation from the crown of the furnace may be such that the cold junction temperature will reach 200° Fahr. In consequence, the pyrometer is reading 100° lower than it did formerly for exactly the same temperature in the furnace. In consequence, the operator, in order to make the pyrometer read the desired temperature, 1400° Fahr., is actually carrying 1500° Fahr. in the furnace when actually exactly the same temperature existed.

I hope I have made this point clear, as it is of the utmost importance if accurate temperature measurements are to be secured with a thermo-electric pyrometer.

Cold Junction Compensation

There are a number of ways in which we to-day overcome this course of error due to changes in temperature of the cold junction of the thermo-couple. First, we can supply compensating leads, as they are called, consisting of material the same as that forming the thermocouple, which will remove the cold junction to some distant point where the temperature will be constant. These compensating leads can be selected of material the same as the thermo-couples or of the other alloys which will offset the effect of change in temperature at the cold end of the thermo-couple. If we run these compensating leads to some point near the floor in the heat treating room the temperature will probably vary from 60° to 110° Fahr. from winter to summer, or a possible error of 50° Fahr. where a base metal thermo-couple is used.

There are several ways in which we can further reduce this possible error. First, we can run the compensating leads into a pipe driven into the ground for some 10 feet and at the bottom of this pipe we make our junction with the copper leads running to the instrument. The cold junction is now in the ground where the changes from winter to summer under usual conditions vary 5° Fahr.

In using this method it is very desirable to use two pipes, the outer and larger one welded to a point at the end to drive easily into the ground. The inner pipe welded tight at the end can be slipped into the outer pipe. It is possible to split the outer pipe in driving and in consequence water may enter.

By using a second interior pipe this second pipe can be slipped down in the larger outer pipe and it is not under any strain in driving and can be easily made water-tight. The compensating leads for placing in the ground should have moistureproof insulation to prevent any danger of short circuiting or grounding on account of moisture. Where these precautions are taken this is an excellent method of maintaining a constant cold junction temperature.

Another common method is to place the cold end of the compensating leads in a compensating box, which consists of a thermostat and lamps or heating units. By means of the thermostat it is possible to maintain any desired temperature usually up to 150° Fahr. within a limit of + or — 2° Fahr. The ordinary compensating box is designed to take care of as many as 20 thermo-couples, which are led into one compensating box, and this affords an easy method of maintaining a constant temperature.

In using the compensating box it is essential that the thermostat be set with the graduated temperature scale at a temperature higher than that which will be attained in the room in which the compensating box is located; for example, if the room will attain a maximum temperature in summer of 120° Fahr., it is common practice to set the compensating box at 125° Fahr. and the pointer on the scale of the pyrometers which are operated by the various thermo-couples connected through this compensating box will be set likewise for 125° Fahr. on the scale.

The compensating leads from the thermo-couples can be also run to the instrument, which may be located in the room subject to variation in temperature from probably 70° to 100° Fahr. from winter to summer. In this case it is possible to have an error of as much as 30° Fahr.

Thermo-electric pyrometers are now supplied with automatic compensating means at the instrument so that, provided the compensating leads are run to the instrument, automatic compensation takes place to overcome changes in temperature at the instrument itself. This compensation can be readily incorporated in the thermo-electric pyrometers through a shunt of large temperature coefficient, which will be materially affected with atmospheric changes in temperature.

Base Metal Thermo-Couples

I have referred previously to the use of thermo-couples formed of base metal and of platinum wire. Base metal thermocouples are almost universally used for measuring temperatures to 2000° Fahr. or 1100° Cent. These base thermocouples for temperatures up to 1200° Fahr. or 650° Cent. are usually formed with one wire of constantan, a nickel copper alloy, and the other a pure iron. This form of thermo-couple is advantageous for use in a reducing atmosphere within the above temperature limits. For temperatures above 1200° Fahr.. up to 2000° Fahr., equivalent to 650° Cent. or to 1100° Cent., a thermo-couple formed of one wire of 90 per cent. nickel and 10 per cent. chrome and other wire of 98 per cent. nickel with balance manganese, silicon and aluminum, would give the most satisfactory service.

Base metal thermo-couples as supplied to-day are furnished in all diameters from .01 in. up to ¼ in. in diameter; sensitive thermo-couples of wire .01 in. in diameter can be used experimentally to advantage in testing the temperature of the surfaces of metal, particularly at moderate temperatures, whereas thermocouples formed of wire ⅛ in. or ¼ in. diameter are better suited for constant service in large heat-treating furnaces.

Platinum Thermo-Couples

Where we have to measure temperatures from 2000° Fahr. or 1100° Cent. up to a maximum of 3000° Fahr. or 1600° Cent., it is best to use a platinum rhodium thermo-couple, one wire being of pure platinum and the other platinum 90 per cent. and rhodium 10 per cent. The wires forming this thermo-couple are usually .02 in. in diameter. A platinum rhodium thermo-couple gives very satisfactory life even under severe service at temperatures up to 2500° to 2600° Fahr., provided the wires are suitably protected from the gases with a tube of porcelain or silica, which is impervious to gases. These tubes are in turn protected with a tube of graphite, carborundum, fire brick or other suitable material which serves to protect the fragile porcelain or silica tube from mechanical injury and introduces a slight lag to prevent breakage through contraction and expansion due to sudden changes in temperature.

While it is of the utmost importance to properly protect a platinum rhodium thermo-couple to exclude gases which very actively attack the platinum, it is equally desirable to properly protect a base metal thermo-couple if maximum life is to be secured. The usual method of protecting a thermo-couple for temperatures up to 1400° Fahr. (750° Cent.) or below, is to use a common wrought iron pipe with the lower end plugged or welded. The life of common wrought iron pipe can be increased to some extent by calorizing, a process developed by the General Electric Company of impregnating the pipe with an aluminum oxide.

A material increase in the life of base metal thermo-couples for temperatures above 1400° Fahr. or 750° Cent. is secured by the use of protecting tubes of nickel chromium or of a special alloy which we have recently adopted in our Resisteat tube, as they are trade-marked. The nickel chromium tubes withstand to a satisfactory extent normal use in heat-treating furnaces where the temperature does not exceed 1600° Fahr., but for the most common conditions and where maximum life is secured this special alloy resisteat tube is given the best results.

To insulate the wires forming a thermo-couple from each other and from the protecting tube, it is common practice to use beads of porcelain or lavite, which are the most satisfactory for this service. Formerly asbestos tubing or string was used to insulate each wire and this was painted with a solution of sodium silicate and carborundum, but this form of insulation rapidly disintegrates at temperatures above 1000°

Fahr. The porcelain or lavite insulation is most certainly to be recommended.

Standardized Voltage from Thermo-Couples

A platinum rhodium thermo-couple, on account of the care taken in the refining of the precious metals and the proper alloying, can be reproduced continuously with the same millivoltage. As new ingots are cast every few years from which this wire is drawn, it has been possible to carefully duplicate these ingots so that the millivoltage is reproduced within some 5° Fahr. of the millivoltage produced by a previous lot.

With base metal thermo-couples it has been extremely difficult to select wires which will accurately reproduce the standard millivoltage of a certain base metal thermo-couple. It seems that the limit in this respect is approximately 15° + or — or a total possible error of 30° Fahr. We have, however, made some progress through special care in selecting wire producing the desired millivoltage, and it is possible for us today to supply wire for thermo-couples with an accuracy within 10° Fahr. + or —.

Where extreme accuracy is required it is possible to shunt the thermo-couples to a definite or standard millivoltage by reducing the voltage produced by the thermo-couple by some 2 millivolts. With this method it is possible to standardize any thermo-couple with extreme precision and an accuracy within + or — 4 Fahr can be easily obtained.

A shunted thermo-couple can be used to advantage where the immersion of the thermo-couple at any time provided it exceed 18 in. For unusual immersions where the thermo-couple must protect, for example, several feet inside the furnace, the unshunted thermo-couple is preferable. Where the shunted thermo-couple is used it has the advantage that it is possible to restandardize this thermo-couple at any time provided it falls off in voltage. With the unshunted thermo-couples, should this occur, it must be either junked or shortened if this is possible.

The shunted thermo-couple has the disadvantage that the shunt may be broken accidentally or through mechanical injury. Both the shunted and unshunted thermo-couples have their advantages and disadvantages and each has its uses.

There are two common methods of measuring the voltage produced by the thermo-couple, the milli-voltmeter method and the potentiometer method.

The Milli-Voltmeter Method of Measuring Temperature

The milli-voltmeter method has been in use for a great many years. The original milli-voltmeters were constructed with a movable element swinging in the air-gap of a permanent magnet and hung by a fine suspension wire. As a platinum thermo-couple produces some twenty thousandths of a volt for 300° Fahr. and a base metal thermo-couple some 40 thousandths of a volt for 3000° Fahr., the usual temperature scale, the internal resistance of an instrument is dependent on the type of thermo-couple used and the voltage is consequently available.

These suspension type instruments, which were largely made in France, England and Germany some twenty or more years ago, had an internal resistance of some 300 to 600 ohms with a platinum thermo-couple with full scale of 20 millivolts. On account of the delicate construction of these instruments and the continual breakage of the suspension wires, certain manufacturers in this country produced a low resistance form of milli-voltmeter pyrometer consisting of the standard form of switchboard or portable milli-voltmeter used with a shunt as an ammeter. This instrument usually had from 3 to 5 ohms internal resistance. While it was true that such an instrument was exceedingly robust and could be handled without likelihood of injury, it was equally true that the accuracy of such an instrument was exceedingly poor on account of the low internal resistance of the instrument. Frequently the total resistance of the thermo-couple and the leads connected to such an instrument might vary from a total of 1 ohm to 2 ohms, affecting the actual readings of the instruments as much as 20 per cent.

If an instrument of this kind was calibrated for a 3 ft. thermo-couple of the usual ⅛ in. wire and it had later to be used with a 4 ft. thermo-couple, unless the instrument was re-calibrated it read 20° too low. If the instrument was calibrated from 25 ft. double conductor No. 12 gauge copper leads and it had later to be located at a greater distance where 75 ft. of the above leads were required, the instrument read some 18° Fahr. too low. Under such conditions it was absolutely impossible to secure any precision in measuring temperature.

In the past five or six years high resistance milli-voltmeter pyrometers have been developed with an internal resistance with a platinum couple of as high as 600 ohms or with a base metal thermo-couple as high as 1,200 ohms, which have a standard double pivoted construction used in the ordinary low-resistance instrument, eliminating the suspension wires. By re-designing the standard instrument, by lightening the movable element and narrowing the air-gap, it has been possible to attain this high resistance. This high resistance can be attained, first, as I have outlined above, by the changes in the design of the instrument and also in part by the use of an aluminum alloy for the winding in the movable elements. This decreases the weight of the movable element 100 per cent.

Where an instrument of 600 ohms resistance is used, a change in line resistance from 5 ft. to 500 ft., which is naturally very excessive, will affect the readings of the pyrometer only 4° Fahr where the scale is graduated to 2000° Fahr. Any likely change in the length of the thermo-couple has absolutely no effect on the readings of such a pyrometer.

In the last couple of years, instruments have been brought out in which the effect of line resistance can be entirely eliminated by balancing the voltage of the thermo-couples against that of another source of emf such as a dry cell. Usually an adjustable resistance is installed for a total of 15 ohms, and any variation in line resistance can be compensated for in this type of instrument up to a total of 15 ohms. After this adjustment has been made, the instrument is direct reading and independent of line resistance.

Messrs. Harrison and Foote, of the Bureau of Standards, Washington, have recently hit upon a method of accomplishing this result by using the voltage of the thermo-couple itself and by simply the depression of a key and the turning of a rheostat, adjustment can be made for any line resistance up to 15 ohms. This new instrument requires no dry cell or standard cell as a source of emf. The instrument is similar to the ordinary milli-voltmeter in appearance, with the addition of the small key and resistance knob. The operator has only to read the temperature in the usual way. He presses the key, and if the reading is any different from that which was previously observed he turns the resistance knob until there is no change, whether the key is depressed or not. The instrument has then been adjusted for line resistance, which may be any amount whatsoever up to 15 ohms, equivalent to many miles of copper leads.

We have secured the exclusive license from Messrs. Harrison and Foote for the use of this construction in connection with our milli-voltmeters in this and foreign countries, and there is no question in my mind but that it is a radical step forward in the milli-voltmeter method of measuring temperature, for it has the following radical advantages:

As in the ordinary milli-voltmeter the instrument is direct reading throughout the whole scale range. The instrument is independent of line resistance up to a total of 15 ohms and what little temperature co-efficient exists in the ordinary high-resistance milli-voltmeter is balanced out in this instrument. Accuracy in calibration of an instrument of this kind can be guaranteed within one-tenth of a milli-volt equivalent on the base metal scale of 4° Fahr.

The Potentiometer Method

The potentiometer method of measuring the voltage produced by a thermo-couple has been quite extensively adopted in the past six or eight years where extreme precision is required. The potentiometer method differs from the milli-voltmeter method in that the milli-voltmeter uses the current produced by the thermo-couple to deflect the instrument. The potentiometer opposes the current of the thermo-couple to that of a dry cell and the dry cell current, equivalent to that of the thermo-couple, is measured.

To be continued

Guide: "Would m'sieu' like to see one of the robbers' strongholds, of which there are several in the neighborhood?"

Tourist: "No thanks. We're fixed up at a hotel already."

The Manufacture of Brass Globe and Gate Valves

Describing the Construction of the Valve from the Drawing Through the Molding, Core Making and Pouring, Together with Receipts and Formulae.

By P. W. BLAIR

THE brass globe or gate valve which is in use in every manufacturing plant or engine room where steam, water, and other liquids are used, is an important item as it has to stand up under very severe pressures and is also subjected at times to much abuse and wear.

A valve to stand the wear and tear it is subjected to in every-day use all the year round should be manufactured from virgin metals and have a large percentage of copper and tin. The different manufacturers advertise their products of steam valves and specialties with the amount of copper they contain, and I often wonder who will be the first manufacturer to advertise that his valves are of special bronze, tempered in the same manner as that used in prehistoric times. The famous mixture of antiquity known as Corinthian bronze was made of 90 parts of copper and 10 parts of tin. It is interesting to note that for many years the standard government specifications for valves has been 88 parts copper, 10 parts tin and 2 parts zinc, familiarly known as 88-10-2. A number of manufacturers had a hard proposition on their hands when they secured some of the large government contracts that were allotted and specifications called for this alloy. The writer of this article is connected with one of the largest valve manufacturers in Canada, who secured one of the large contracts from the U. S. Naval Board, also Emergency Fleet Corps for all brass 2, 2½ and 3 inch screwed and flanged globe and gate valves, and the specifications called for an alloy 88-10-2, and should not show a percentage of 1 in lead.

They had had experience in the machining of this alloy and were able to comply with all the requirements and receive further orders. Also, when most manufacturers of brass valves say that they only use copper, tin, and a small portion of zinc and not a particle of lead in making their faucets, they are making a misstatement, because, unless zinc is super-refined it carries more or less lead. In order to make a casting for brass valves that will have the desired tensile strength, be free from blow holes, and that can be machined at a normal cost, a mixture of copper, tin, zinc and lead is necessary, and the alloy that enters into the composition of brass valves is composed of 85 parts copper, 5 tin, 5 zinc, 5 lead. Tin is just as important as the copper, and the lead and zinc reduce the cost of both of the castings and the machining processes. To secure sound and solid castings, a certain percentage of tin must be used, and no substitute has been developed in the brass foundry to take its place.

There are some very curious and interesting things in connection with the mixing of different metals to form compositions. The slightest variations in proportions of the metals or the most minute quantity of some foreign metal not supposed to be there will cause one the most astonishment when the casting is produced and sometimes not until the machining or final testing has been performed does it develop. The composition or mixture must not be too hard or too soft, too brittle, or too ductile, it must have sufficient density, tensile strength, and above all must be capable of being machined by automatic machines. Many brass foundries of to-day, where bronze steam metal valves and engine room specialties are made, use furnaces in which the metals are melted by means of oil or gas under forced draught. As a result what goes into these furnaces is not always there when the molten metal is ready to pour, some of the elements having gone up the chimney or out of the spout of the furnace. The government department allows a certain percentage of variation from their specifications, whereas in the olden times of the crucible-fired furnace they were not so liberal because formerly, when 88-10-2 went in, 88-10-2 was expected to come out.

Copper alloyed with tin or zinc in certain proportions is strengthened. Hardness varies in metal quite as much as the tenacity, and both are greatly influenced by very slight changes, either physical or chemical. The addition to an alloy of scarcely more than a trace of impurity often produces a marked change in the hardness. The special qualities of the useful metals which give them their importance are strength, hardness, density, ductility, malleability, fusibility and color.

Color of the rough castings, and, if polished, lustre. There is not a manufacturer of high grade brass valves who does not give great consideration to the color and make sure that it is a nice golden red as there are so many engineers and dealers who are impressed with the idea that they can tell by its appearance when a valve has too much lead or not enough copper. When the small brass founder or manufacturer flourished, the brass valve was made in one dozen lots and the one workman did the complete valve. In these days of quantity production, however, the routine is all changed. The first thing that is now made is a drawing. The draftsman must determine the general outline of the parts and must be guided by his past experience in the foundry and finishing shop. Not only must a brass valve be a real piece of first-class work, but it must present a pleasing appearance both as to finish and shape, so that it is symmetrical. The drawing then proceeds to the pattern shop where the patternmaker uses wood, white metal, which does not shrink, brass and iron, also plaster of Paris, until there is finally evolved a pattern and core-box. The pattern is exactly in the shape of the outside of the part and the core-box is exactly the shape of the inside of the part. The difference between the pattern and the core represents the part of casting. Wherever the part is symmetrical about a given axis only a half pattern is used. In general practice this half pattern is mounted on a plate. This gives a clear impression of the pattern. An iron frame with neither a top or bottom is placed on this plate filled with sand, turned over and the plate lifted off. If this is repeated and the two halves turned over face to face a mold has been made. But before doing so ways and means must be provided for leaving the passage for the steam, water, or fluid through the body of the valve. This is done by means of the core.

This core is principally made from sand, having been packed into a core-box of two halves. The main ingredients of the core are sand, oil, rosin and wire. It is shaped similar to the inside of the body of the valve. Great care is exercised by some of the manufacturers to produce nice clean core work in the castings so that the sand will not be burnt into the metal or any fins inside, and will allow a clear passageway for the steam or fluid.

The core-sand mixture used for light and medium work should be composed of 55 lbs. sharp sand, 20 lbs. moulding sand, 4 pounds dry core compound, 1 lb. ground rosin, ¼ lb. flour. For multiple core-box work, sharp sand 20 parts, molding sand 1 part, linseed or other prepared core oil, 1 part.

As the body of the cores on smaller sizes of brass valves are fragile before baking, or removing cores from the box in their green state, core dryers are used. The cores are then baked in an oven at a temperature ranging from 350 to 500 degrees. When dry they are then cleaned, inspected, all fins removed, racked, and ready for the moulder to use.

The moulder now having made his two half moulds, one of which is the drag, he places the core in same, the upper half or cope which he places on top.

The mould is now ready for the metal,

and in some plants it is melted in pot furnaces in crucibles with forced draught, in others it is melted in direct-fired furnaces, using oil or gas, which means that the metal is charged into the furnace and has projected into it or directly over it a gas or oil flame. Still another method that has come into vogue is the melting in an electric furnace.

The trimmings for a valve pass through the foundry under the same methods and proceed to be cut off the gates and remove off all fins of metal and core sand removed from the inside preparatory to being delivered to the machine room.

The next step is the machining of these castings so that a good serviceable valve inside and out can be produced. The actual processes of the machining and the equipment to be used depend entirely on the quantity to be produced. If large quantities are to be produced it is a good investment to equip with modern tools and semi-automatic machines. The seating operation is the most important part in the body of a valve, as the entire wear and tear is

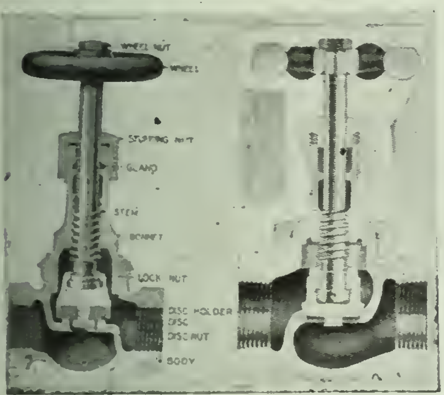


FIG. 1. FIG. 2.

placed on that part. Fig. 1 shows Jenkins' type brass valve.

A perfect true flat seat, also nice cut threads on pipe and bonnet ends of a body is the main feature. When care is taken in the machining operations and the parts are true to the gauges the assembling is facilitated.

Parts or Truings of Globe

Valves in the smaller sizes are small relatively, and on this account extra accuracy is necessary if the valve is to be satisfactory at the testing and inspecting bench. This accuracy can only be secured in one way, and that is by the proper use of gauges. Gauges as a rule travel in pairs, one gauge called "Go," and the other "No go." These two gauges differ by what is known as the tolerance. This tolerance is expressed in thousandths of an inch. Every part which proceeds to the assembling must go into the "go gauge" and not go into the "no go" gauge. The bodies then meet the other component parts that enter into the making of a complete valve in the assembly room, where they are screwed together. If they accumulate at the assembly benches, however, here a pile of stems and yonder a pile of bonnets that do not go together, then the work has been poorly done. The gauges have then to be applied and the mistakes discovered. Fig. 2 shows high class regrinding valve.

Owing to the development of the marine and shipbuilding trade within the last few years in Canada, a new valve has been put on the market named the Reliance Regrinding Steam Valve, for heavy pressures and the construction is along different lines. After assembly they proceed to the testing and inspection bench, where they are subjected to a rigid inspection and tested from 200 to 500 pounds hydraulic pressure. They are then carefully cleaned off and wrapped individually in brown paper, and some packed in cartons of cardboard and labelled with a printed label, designating their size and style of valve.

After the packing and boxing they are ready for shipment to be used, and sometimes abused, by the steamfitter or engineer into whose hands they arrive.

Before closing this article I desire to call attention to the fact that a great many manufacturers of valves and brass castings are very careless in the manner of inspecting castings when they come from the moulds and before they proceed to the machine room. There is no one point in the plant where carelessness can wreck the profits of a manufacturing concern quite as much as in the foundry. The matter of sending misshapen or shifted castings through the machine room and paying for finishing them is a bad policy when they should have been rejected at the shears when they are cut off. If this one point is attended to it will save many a dollar in the course of a year, and result in better and more perfect casting coming from the foundry.

HARDNESS OF ALLOYS OF NON-FERROUS METALS

In the "Zeitschrift des Vereines Deutcher Ingenieure," P. Ludwik describes a series of experiments on the effect of varying composition upon the hardness of an alloy. For copper-tin alloys, the hardness increases with the percentage of tin, slowly at first, and then more rapidly. An alloy containing 1 per cent. of tin is 10 per cent. harder than pure copper. Bronzes containing 10, 15 and 20 per cent. of tin are, respectively, twice, three times, and four times as hard as pure copper. Annealing these alloys makes little difference in the hardness. Adding lead decreases the hardness slightly, and adding zinc slightly increases it.

The hardening effect of aluminum upon copper is not quite so great as that of tin for the smaller percentages. An aluminum-copper alloy containing 8 per cent. aluminum is just about as hard as a tin-copper alloy containing 8 per cent. tin. Above 8 per cent., however, the hardening effect of aluminum increases rapidly, and an alloy containing 15 per cent. aluminum is twice as hard as one containing 15 per cent. tin.

The hardening effect of zinc on copper is not so great as that of either tin or aluminum, 30 per cent. of zinc having about the same effect as 4 per cent. of tin. Large quantities of lead soften brass, while iron makes it harder. Tin and aluminum both increase the hardness of brass to a greater extent than they do pure copper. In the case of tin, this hardness is produced at the expense of ductility. All this latter class of allays are rendered much softer by annealing. Nickel and manganese both have a hardening effect upon copper, although much less than either tin or aluminum. Annealing has no appreciable effect on the hardness of alloys of copper with either nickel or manganese. Magnesium has a greater hardening effect upon copper and its alloys than any other substance.

MANGANESE-BRONZE

By W. C. PHALEN

Manganese-Bronze made its first appearance about 1876. Its name is somewhat misleading, for the alloy contains only a small proportion of manganese. Indeed, it is simply a brass to which have been added, by proper methods of alloying, small quantities of aluminum, iron, or manganese with the view to strengthening the alloy and making it denser and closer-grained than the average yellow-brass casting.

Manganese-bronze should not contain much manganese, in fact not more than 0.05 per cent. in high-grade bronze. The consumption of manganese, therefore, in such alloys is small. The object of the manganese is not so much to act as an ingredient of the alloy, but to serve as a carrier of the iron that must be present to ensure the required strength and elastic limit. The manganese in the alloy serves one purpose only, namely, to introduce the iron, for without the manganese the iron would not alloy with the copper. It is added usually in the form of ferro-manganese. If manganese is used in large quantities it hardens the alloy, but not nearly to the degree produced by iron; such an addition also lowers the elastic limit. Aluminum imparts good sand-casting properties to the bronze.

There are two grades of manganese-bronze now in common use. One is a mixture used for rolling into sheets or drawing into wire or tubes and for forging. This contains no aluminum, has slightly less zinc than the other, and cannot be cast in sand. The second alloy is used for sand-casting and is the one employed in making propellers and other common appliances.

P. E. McKinney describes a process of manufacturing manganese-bronze wherein by-products and scrap are used instead of virgin metals and raw materials of the highest purity.

The composition of manganese-bronze is as follows:

Copper, 57.00; zinc, 38.00; tin, 1.20;

Continued on Page 245

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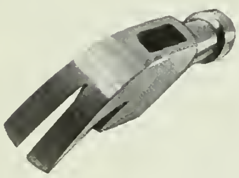

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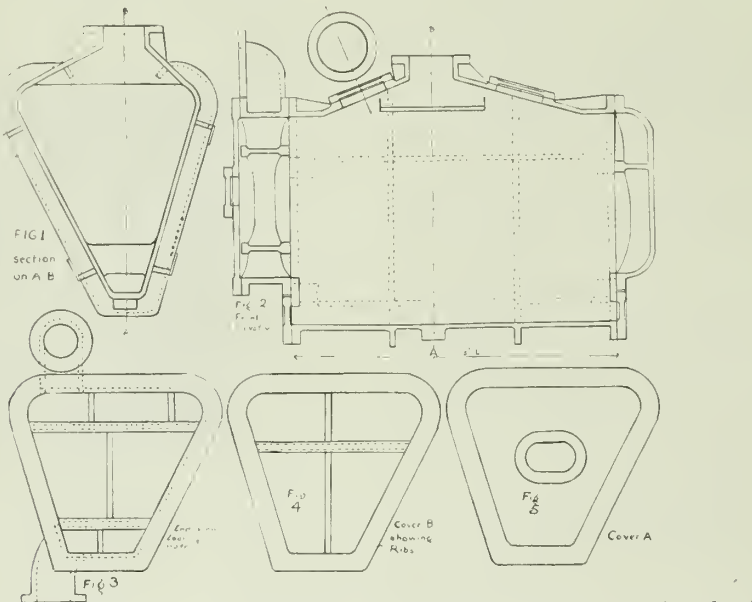
Patternmaking and Castings for Condenser

Being First Installment on Series of Articles on Pattern Making and Casting of Ship Parts.

By BEN SHAW and JAMES EDGAR

THE old circular form of condenser was inexpensive compared with the type shown in Figs. 1 to 5, because it was seldom necessary to make a pattern. Either the cope was swept out, or a sand barrel was made and the flanges, branches, and facings nailed or otherwise fastened to it. It was only when a large number of castings were required that a pattern was made, and a



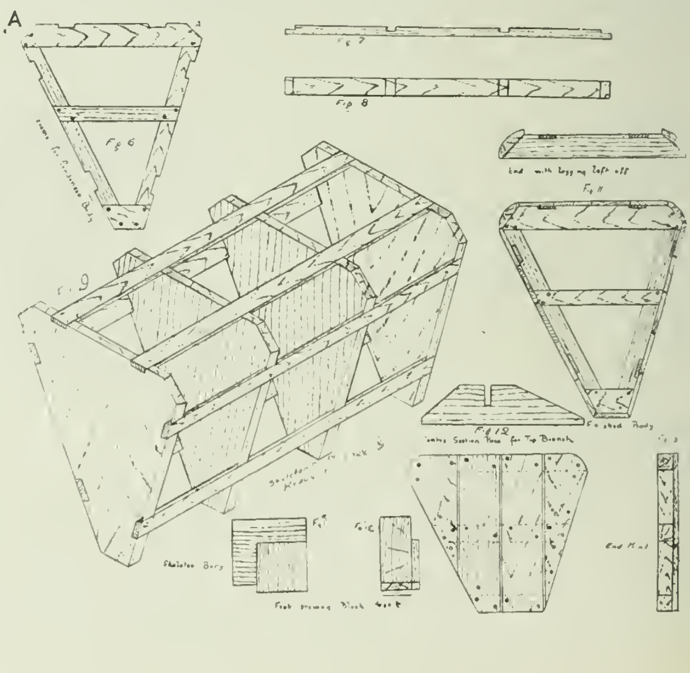
taper had to be left, in order that it would deliver from the sand; or, better still, a square boxed centre was built with circled face, which could be drawn into the mould after the box was withdrawn, which is a good practice when dealing with large circular work which has to be cast on end.

On nearly all modern high-speed ships, however, the uniflux type of condenser, the construction of which will be described in this article, is installed. Until recently both the main and the auxiliary condensers of this design were built in the boiler shop, but the tendency is to have them cast, as being cheaper and equally as effective in use. Of course it is quite impossible to sweep out a mould for this design, and equally as impracticable to make a sand pattern. Full wood patterns must be made for the condenser itself, the water end and the doors. Not only is it necessary to make a pattern, but it is also necessary to make a corebox for the condenser. The metal is usually about ¾ in. thick, but occasionally it is thinner. The condenser shown in the sketches is 5 ft. 6 ins. long, which will give the reader an idea of the size of the finished pattern. It may be here mentioned that the method of wood thicknessing the mould to obtain a core is sometimes practised, and it can be recommended for thin metal. It will be discussed and explained when we come to consider the moulding and coremaking.

The condenser, which we shall consider first, may be moulded on its side or on end, but whichever way is adopted does not affect the construction of the body of the pattern. The moulder may be left to make his own joint, except for the branch on the top of the condenser, where the flange and the print should be made in halves and dowelled, which will act as a guide for the moulder when making his joint.

As frames for such a pattern should not be more than 18 in. apart, four ought to be made for the condenser, and they ought to be about 2 in. thick to ensure rigidity in the finished work. Fig. 6 shows a frame finished to shape, and with the slots for the supporting stays cut out. After the four frames have been half-lapped and screwed up they ought to be screwed together and cut as one, as it will be quite impossible to plane four such frames separately and make them sufficiently accurate so that the work will be quite square. The cutting of the half laps may be done at a circular saw if no half-lapping machine is available, and if care is exercised it should not be necessary to touch the frames with hand planers, if a surface planing machine is in the shop.

It will be observed that the corners at AA are cut diagonally instead of to a radius. It is easier to do this and put on a sufficiently thick piece to allow the outside radius to be planed than to plane a stave concave and convex, and it is much quicker. The stays (Figs. 7 and 8) should be about 2½ in. thick and planed to a parallel thickness and width. If these stays are warped or not straight in the length the pattern body will not be square when constructed, and if the sides are not built square with the ends, it is, if not impossible, very difficult to rectify afterwards. In Fig. 9, which shows the skeleton of the body built and ready for the lagging, these frames are drawn as solid plates so that the drawing may not be too confused. In building the skeleton it is advisable to draw a straight line on the floor or on skids, and a square line on one edge of the frames while they are screwed together. The length having been marked on the floor and divided for the middle frame, the four frames should be fastened to the floor, the lines on the edge being



placed to the centre line on the floor or skids. Blocks with screws into the frames and into the floor will hold the frames quite firm while the stays are being screwed on. When the four stays that are above the floor have been fixed, the ends should be tested with a square before the skeleton is turned over and the remaining stays fitted. If the condenser is a very large one or the frames show any tendency to sag in the centre, it may be wise to fit three half-lap frames between the contour frames. The lagging need not be more than ⅞ in. thick and 9 ins. or 10 ins. wide, and should be left with open joints. It is as well to have one or two screws in each piece, but driving nails are quite good. In Fig. 11 the lagging is shown all round the frames, but with a spread branch such as there is on this condenser it is a waste of timber to lag the top, which will be covered by the branch except a strip on either end, which can be fitted after the branch is completed. It is not necessary to build the branch on a bottom plate. The pattern can be supported by means of temporary legs screwed to the end frames so that the face on which the branch has to be built will be in a horizontal position.

Large branches which are of irregular shape are invariably best made by making cross sectional pieces which define the shape on the centre lines both in the length and across, and it is a comparatively simple matter forming the shape between. Figs. 16 and 17 show these defining cross pieces checked so that one fits into the other. The outside rectangular shape in Fig. 18 is the shape on the condenser top, but on the left side of the centre line this shape alters to a diameter at the top, while on the right side the shape at the top is square. As it does not affect the utility of the branch and it simplifies very considerably the patternmaking, the draftsman can usually be persuaded to modify the design. If, however, the shape at the top must be a diameter, diagonal piece CC can be fitted and the shape between built of thicknesses of timber as illustrated in Fig. 19. If these thicknesses were carried into the centre it would make the pattern needlessly heavy, so they ought to be cut in widths so that when the shape is finished off, at no part will it be more than 2 ins. thick. Many craftsmen err in thinking that weight means strength, whereas it very often is a weakness, a waste, and a great inconvenience in the foundry. The design on the right side of the centre line, Fig. 18, is less troublesome to shape. Grounds AAAAAA ought to be made on which covering timber can be screwed. It is a simple matter to calculate the shape of these grounds. The covering plate need only be ⅞ in. thick, the end ones being shaped and fitted and the side ones being carried over the end edges. The shape of the end covering the plates can be drawn accurately by geometrical projection.

The body and the branch, which is really part of the body, being finished, the details have to be made and fixed. The end prints are the biggest job. If the pattern is going to be moulded on its side they should be 4 or 5 ins. thick. The best way of making them is shown in Figs. 12 and 13, a top plate about 1 in. thick has timber 2 or 3 ins. wide screwed to it to make up the thickness. The plates can be laid over the drawing board and two temporary battens screwed to them while the thick timber is fitted on the other side. The edge can be finished at the sandpapering machine.

The top and bottom flanges of the condenser ought to be divided so that they can be drawn into the mould when the body has been withdrawn from the sand. Indeed this applies to all the ribs as well. A common failing of patternmakers is to drive screwheads into the timber, which causes endless trouble in the sand because the wood swells over the head and moulders have not sufficient tools for getting them out without destroying the pattern. Wiring loose pieces on a main body is a good practice, but if a pattern has a long journey to the foundry, the pieces are apt to get knocked off and lost. Cheese headed screws are a great improvement over countersunk heads, and if washers are used there cannot possibly be any trouble afterwards.

The straight ribs that run from flange to flange should be screwed on in one length with a slight taper planed on each side and the ribs that go round the body can be fitted between. It is advisable to ascertain which way the pattern will be moulded before screwing on the circular part of the big branch, because this part and the flange and the print ought to be in halves as has already been explained, but the small branch, or boss C, Fig. 1 and 2, being small, may be made in one piece.

A special arrangement has to be made for moulding the feet dddd, Figs. 1 and 2. It will be quite impossible, even if the faces of these feet were left loose, to draw them into the mould. If they were made as models of the finished casting the moulders would have to take them off in draw-backs or by means of loam cakes, and would have much labour. A better way is open, however. The spaces between the back of the face of each foot and the body can be cored. Figs. 14 and 15 show a block print of this kind. There should be sufficient width beyond the face to give a satisfactory bearing for the core, and a core-box will have to be made. The small end prints for the sight holes EE, Figs. 1 and 2, need not be as thick as the large prints. Screwing on the various other small ribs is a simple matter, care being taken that the moulder can unscrew them if he wants to use them for making up his mould.

We have not dealt yet with one very important part of the patternmaking work, and that is making provision for drawing the heavy pattern out of the mould. It is not uncommon for patternmakers to forget this part of their work, and it not only causes annoyance in the foundry but may result in the pattern being badly damaged through a bad method being adopted. What the moulder frequently does is to loosen off a board on the top of his mould and put a rope or sling through one of the frames which has to stand the full strain. It is obvious that this is not good for the pattern. The sensible way is to put lifting plates on the bottom of whichever side will be under in the mould, arranging them two in number, so that the strain will be equally borne by the various frames and stays. It is almost necessary to arrange for these plates while the main body is being constructed, as it may be necessary to bore holes through inside frames through which the bolt can pass.

The finished pattern is shown in Figs. 20 and 21, and it will be noticed that the lagging on the body is left open jointed. It does not matter how well seasoned


Fig 16

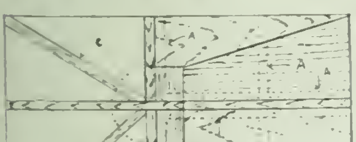



Fig 19

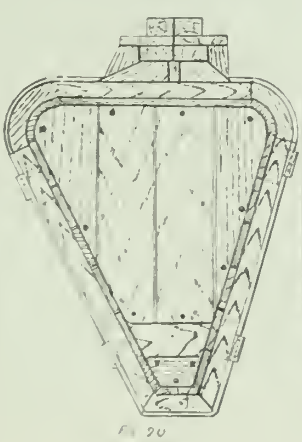


Fig 20

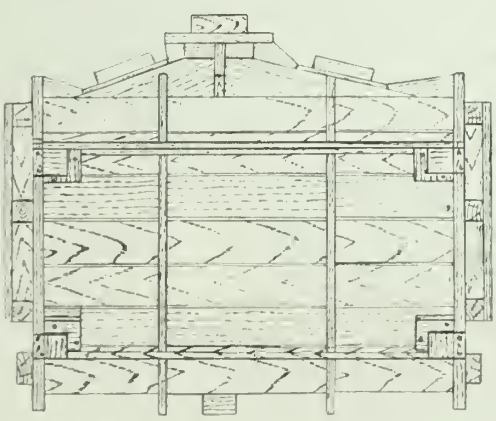


Fig 21 Finished Pattern

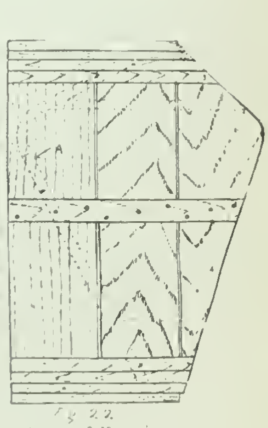


Fig 22

the timber is, it absorbs moisture and swells or dries and shrinks, and so, when a pattern goes into damp sand, if the joints are close, something must give, and the pattern becomes contorted. The only safeguard against this, apart from open joints, is to cover the pattern with a waterproof skin of paint and shellac varnish. But certainly the best way to preserve large patterns, if many castings are needed, is to leave open joints as well as paint and varnish them.

There are several ways of making the cores for this condenser, one of which can be very briefly reviewed as it will be discussed more fully when we are at the moulding of the job. It is the method of wood thicknessing. To save making a large corebox thickness, pieces are supplied to the moulder who practically builds a corebox inside his mould. An advantage claimed for this is the equality of thickness which results, but there are

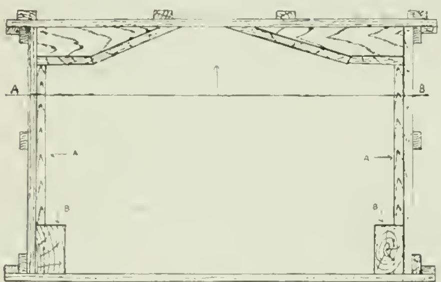


Fig. 23 Top View of Main [illegible] box

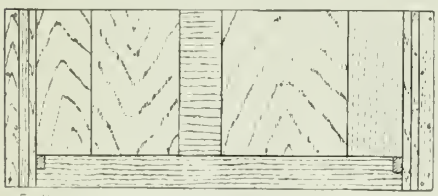


Fig. 24 [illegible] Box on AB [illegible] in direction of [illegible]

disadvantages. Five boxes have to be made, but it will only be necessary to discuss one here. The corebox for the foot is a plain frame box with ends checked about ¼ inch into the sides. The boxes for the sightholes are very simple, the circular part of the main branch of the condenser being made separately. The body corebox must have blocks in so that the sight holes EE will be separate cores.

The best kind of corebox is shown in Figs. 22, 23 and 24. The problem in making such a box is to construct it with three things in view, as little timber as possible, as little labor as possible, and, most important, so that the moulder can make his grid easily and get in his lifters. If the pattern is to be moulded on end, naturally the corebox ought to be made on end, but the expense of making such a box on end would be almost prohibitive, and it would be very clumsy to handle, so the method shown in the sketch is preferable. It is a box so made with runners on the ends that a bed can be strickled off and the core made on this. The top of the box can be strickled off with a straightedge so that the shape of the ends of the corebox will be as shown in Fig. 22. The bottom and side edges planed square are made up of widths battened together, the top edges being cut to the necessary angles. The sides are parallel of course, and made in a similar fashion. The method of check battening the ends of large coreboxes so that they cannot be knocked out is a good one. When the box, which should have been of 1¼ in. timber at least, has been screwed together, test the diagonal corners to make sure that it is square, as any discrepancy will be fatal when setting the finished core. Although they are not shown in the sketches it is advisable to screw battens diagonally from the sides to the ends on the bottom edges of the box, which will hold it square.

The box has now to be filled in. The runners already spoken of are seen in Figs. 22 and 23 (A). They should be about 1½ or 2 ins. thick and 2 or 3 ins. wide. They must be well screwed so that they will not move when the bed is being swept. It may be thought unnecessary to make the box square on the bottom with runners instead of shaping the ends to the shape of the finished core. This could be done, but apart from the sides being very narrow the moulder would have to prepare a bed, and for a large core this can be most conveniently done in the patternshop. The work saved in the patternshop would be wasted in the foundry. There ought always to be such a perfect understanding between the patternshop and foundry that there will be no temptation for one department to save at the expense of the other. Ultimate costs are the important factors. Blocks (B Fig. 23) have to be made to shut off the distance from the end of the main prints to the end of the core. Pieces have now to be made to define the shape of the core at the main branch. Face plates screwed on shaped grounds suffice for this and they have to be cut to fit on the moulders' bed and in line with the top edges of the ends, so that they will not be in the way of the strickle. Fig. 24 is a section on AB, Fig. 23, showing the ends of the runners and a face view of the bevelled pieces for the branch.

It is important before sending a job such as this to the foundry that it be well marked. Practically every piece of the pattern and the corebox will be taken off by the moulder, as if it is not necessary for the purpose of drawing from the mould it will probably be necessary to assist him in making up corners, and if well marked there is no difficulty in screwing up again. Chiseler V cuts are much better than lettering as the grain does not rise and fill them, and if they are also colored, it is the simplest task possible to put the pattern together after each casting has been made.

(To be continued)

LAYING OUT HELICAL GEARS

By James Bell

The reason for the use of helical in preference to the ordinary spurs and bevels must be of considerable weight to justify the extra trouble in making them.

The reason is because it has been found commercially impossible to make the usual forms deliver a uniform velocity to the driven relative to the driver.

In conversation with a representative of Brown & Sharpe, I remarked that I had been unable to devise a form that would transmit a uniform speed and gave it up. He said they all gave up at that point.

He also mentioned the difficulties in producing gears for operating telescopes. These require the greatest possible accuracy.

On another occasion a representative of Gleason said they made gears for automobiles and although they tested all before shipment and sent only those they considered perfect, quite a number were rejected by the auto people.

The irregularity is responsible for the noise when the gears are properly adjusted.

The cause of the irregular motion is

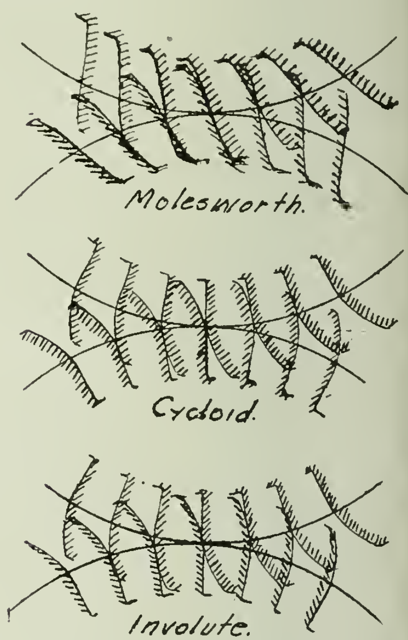


FIG. 1—THREE OUTLINES OF GEAR TOOTH.

the manner in which they work. Teeth must be long enough to keep one or more engaged at all times. When two teeth come into engagement the point of the driven tooth meets the driver about the pitch and slides in. At all points in this action the flank of the driver bears on the face of the driven, imparting a slower motion. The curves used minimize this, but do not quite eliminate it.

These sketches represent three outlines of tooth. They are drawn to full size of 3-in. diameter, 4 diameter pitch, 12 teeth.

Most Englishmen have Molesworth and one sketch is from that book. It will be noted that there is considerable interference which must be allowed for in back lash.

Those of the cycloid and involute forms are very close to perfect in the way of interference, but the contacts are not always on the pitch. These tooth outlines represent what happens as the tooth advances ¼-in. at pitch if motion were uniform. While the error is too small for the sketch to show, it is there; the wear and noise prove it.

With the helical tooth the contact is, or should be, at the pitch, moving across on the pitch cylinder or cone. As the radii of the points of contact remain the same relatively, the motion is uniform and noise is absent.

The method of laying out the twist with a flexible scale will do the trick, the only drawback being that it requires two to work it, one to hold the scale, the other 'to scriber. Another plan

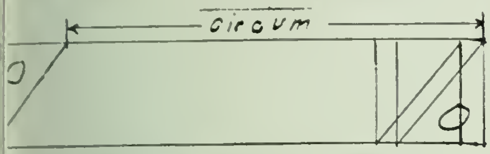


FIG. 2—PAPER WRAPPED DIAGONALLY AROUND BLANK.

which can be worked by one person is to wrap a strip of paper around the blank and mark the circumference and allow enough extra to cover another tooth; divide for the number of teeth and draw lines at right angles to the edge for the tops of two adjacent teeth. The triangular pieces will lap and may be cut off. The diagonal lines will be the tops of the teeth. See Fig. 4.

The diagonal being the twist, must reach at least the distance indicated, in order that as a tooth lets go at one end the following tooth takes hold at the other end. The templet must be kept parallel to the side.

For a bevel the procedure is much the same. The extra arcs (Fig. 3.) are locations for extra templets adapted to their respective diameters. These papers are glued or pasted on.

I saw a patternmaker do a fine job on a worm gear. He laid the worm out on paper as above and finished it, to templet in the usual way. The wheel was grooved to follow the circle of the worm. He cut out the spaces in the wheel to about a fit on the worm. Then he glued sandpaper on the outside and faces. Then he mounted the wheel on a vertical pin on a fixture fastened to the lathe shears and put the worm on centres and hobbed the wheel teeth.

This discussion leads to some conclusions.

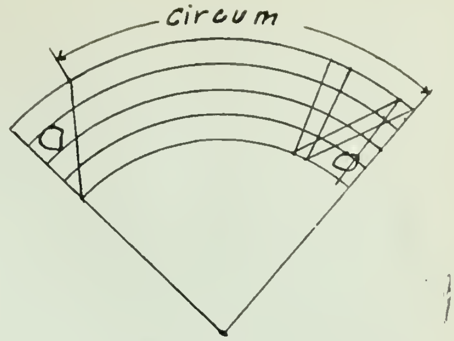


FIG. 3—LAYOUT FOR BEVEL.

All the helicals I have seen had teeth formed in the same manner as ordinary ones.

A helical tooth should, and if it accomplishes its purpose, must bear at the pitch and nowhere else. That being the case, why should the teeth have more length than is necessary to provide reasonable wear? Being shorter they could be more numerous and be as strong and require less twist and therefore less wedge action in herringbones.

NEW AND IMPROVED EQUIPMENT

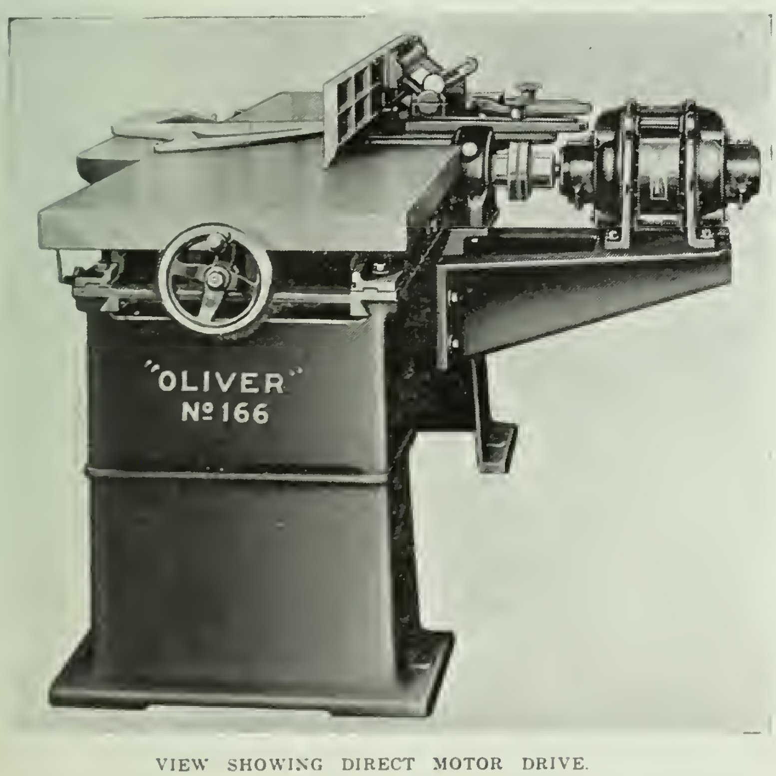
A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

DIRECT MOTOR-DRIVEN PLANER

The direct-coupled motor-driven planer and jointer shown in the illustration has recently been put on the market by the Oliver Machinery Co., Grand Rapids, Mich., who have given us the following information regarding the same.

For some time we have put out a machine with the motor built right into the machine, but being limited to three phase, 60 cycle, 220 volt we decided to bring out this new type of jointer which would permit the use of any current motor providing the speed is approximately 3,600 r.p.m. That is, we can furnish this type for direct current or for alternating current or for one, two or three phase in the various voltages.

This machine has all the advantages of our No. 166 Ball-Bearing Jointer, at the same time eliminating bothersome belting and the danger that accompanies such belting. There is no necessity for belt guards; it saves room on the floor. It operates at a greater efficiency because of there being less bearings and no belting.



VIEW SHOWING DIRECT MOTOR DRIVE.

This machine is equipped regularly with three high-speed knives in the head, which is of the Oliver round or safety type. The machine above described does especially smooth work and is highly recommended for furniture plants, cabinet shops, pattern shops and other institutions requiring a smooth and accurate cutting jointer.

THE BAUER REVOLVING KNIFE WOOD TRIMMER

The illustration shown on page 245 is of the Bauer revolving knife wood trimmer, an entirely new machine designed to trim by actually cutting the wood instead of crushing it as is apt to be the case with the straight knife. The knife has a cutting edge of 16½ inches, all of which is in operation, thus greatly minimizing the necessity of sharpening. The specifications of the machine are as follows: Length over all, 17½ in.; width, over all, 11 in.; maximum length of cut, 7½ inches; maximum height of cut, 2½ inches; diameter of knife, 5¼ inches; weight, 40 pounds. The design of the machine is such that the risk of the operator clipping his fingers has been reduced to a minimum. Each machine is furnished with a device by

(Continued on page 245)

A Lunch Hour Talk With Our Friend Abe Winters

Showing How Carelessness in Ordering Supplies Leads to Unsatisfactory Results, Also Telling Many Valuable Pointers on Plating and Polishing Usually Considered as Secrets

PLATING chemicals and supplies receive the attention of many plating room foremen only to the extent of signing a requisition for the goods. Quality is of little consequence as long as results obtained are apparently up to their expectations. Eventually a day comes when something occurs which indicates the need of greater care in ordering and in employing the various materials used in the process of cleaning and electro-plating metals. Possibly the management complain of excessive cost of supplies, or of larger consumption for given period of normal production. Some reason must be forthcoming, and in an effort to satisfy the management that conditions are unavoidable, the foreman becomes aware of leaks which have been heretofore unobserved, or, certain solutions failing to yield satisfactory deposits owing to inferior quality of salts or anodes. When the foreman thoroughly realizes the importance of attention to details with reference to plating room supplies, one-half of his troubles are ended if he puts into action the knowledge he has acquired. Nickel deposits which may be termed good are easily possible in a nickel plating bath, equipped with very inferior nickel anodes. If the metal strength of the bath is maintained by frequent additions of nickel salts of good quality. Inferior nickel anodes in a nickel solution prepared from first-class chemicals, will eventually prove expensive, and cause more or less annoyance, but inferior nickel anodes and inferior nickel salts form a combination which will defeat the best efforts of an expert to maintain efficiency and economical conditions over any reasonable period.

Nickel Anodes

As the anode is the proper source of metal in a fluting bath, we may regard it as rating first in importance when considering plating room needs. There are three classes of anodes in general use to-day. Each class has its merits and demerits for various kinds of employment. For nickel plating, cast anodes are in general favor, they disintegrate more readily in the universally employed sulphate or chloride nickel solution than do the harder and less soluble rolled nickel anode. Cast nickel anodes, properly cast, replenish the solution liberally and aid in keeping uniform plating conditions, evolved hydrogen is reduced in quantity and less metal salts are required for general commercial plating. The external appearance of nickel anodes is not a safe basis upon which to judge the quality of the casting from the anode standpoint. The casting may be a perfect specimen of the foundryman's skill, judging from external appearances, the metal of which it is made may analyze within a fraction of one per cent. of the specifications, but, if the metal is not poured at the proper temperature and cast with great skill and care, the resulting casting will not wear away smoothly and will produce an excess of scrap in either granular or chip form. Recently we received a letter of inquiry from a foreman plater who had several nickel anodes which were suspended in a double sulphate nickel solution used commercially in a manufacturing plant for three years, without a reduction in weight exceeding one-fifth the original weight of the anode. Unusual care in keeping the contacts perfect did not cause any marked increase in the anode reduction, yet it required three years to arouse this foreman to a state of mind which enabled him to realize that something was radically wrong with his nickel anodes. After the treatment which was advised the anodes wore away very satisfactorily but with excessive waste, due to spelter-like structure of the cast metal; these anodes were of the 90-92 per cent. grade and under any ordinary solution conditions should have broken up very readily. If you have nickel anodes which retain the white external surface after prolonged suspension in a plating solution and the contacts are found to be good, it indicates ineffective anode surface, and such anodes should be removed from the bath and replaced by new ones. The anodes removed may be rendered fit for plating purposes by grinding off the outer crust with a fine solid emery wheel or by suspending them in a solution consisting of 4 ounces sulphuric acid and 3 ounces hydrofluoric acid per gallon of water and passing a strong current of electricity through them for a few hours. Such treatment does not change the structure of the metal or correct the faulty quality of the anode, it simply makes it possible to use the casting for the purpose it was intended and should provide ample reason for greater care in accepting future consignments of anodes. Do not allow your confidence in any supply house to cause you to accept any old thing they may send you; test your supplies. If you cannot do it, have them analyzed by a reliable analyst and keep a sample for future comparison. Rolled anodes are usually quite thin and a given effective surface area may be maintained in the plating bath with less weight of metal than is possible with cast anodes. Rolled nickel anodes are not employed for ordinary commercial plating because they are too hard and will not feed the solution rapidly enough to keep the metal content properly balanced. Rolled anodes being less soluble than cast anodes necessitate the frequent addition of metal salts to the solution to prevent the latter becoming impoverished of metal; this feature renders the production of uniform deposits extremely difficult under ordinary circumstances, consequently the operating costs are necessarily greater. Rolled nickel anodes contain less carbon than cast anodes; this characteristic is of little practical value when contrasted with carefully cast anodes of highest possible percentage of pure nickel.

> **AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.**
>
> **Officers for 1920-1921**
>
> President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
> Vice-President Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
> Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.
>
> **PLACE AND DATES OF MEETING**
>
> The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

For copper plating, either in acid bath or cyanide bath, there is nothing that can equal the electrolytic anode; a cyanide copper plating solution will produce more perfect deposits with less anode surface when electrolytic anodes are employed than is possible when either rolled or cast copper anodes are used. Electrolytic copper anodes require less power to disintegrate them and being the most soluble form of copper anode they easily feed the solution, and the copper is the purest obtainable in anode form. For practical commercial copper plating it is advisable to maintain an anode surface area equal to the average cathode surface processed in the bath. Cast copper anodes can be obtained which contain 99 per cent. to 99.5 per cent. pure copper and are free from arsenic. Rolled copper anodes are not advisable for the general run of commercial copper plating.

When specifying your requirements in nickel anodes it will be well to consider the principal features in the construction of such anodes, and right here we wish to impress upon the reader's mind the importance of specifying what you want when ordering anodes of any metal, then satisfy yourself that you get what you order and keep a record of results obtained from the material accepted. Any supply house, although they be possessed of a reputation for honesty, may, from some cause, send you an inferior grade of goods. They may bill your employer correctly with the price of the material shipped, but that does not make the results obtained in the plating bath correct. If you want 97 to 98 per cent. nickel anodes, 12 inches long, and of a certain shape or form, say so on the order. Every manufacturer of nickel anodes is prepared to furnish low as well as high percentage anodes and is very likely to assume that you want something that you really do not want. For example, suppose you are in the stove plating business and conclude you will try 95 to 97 per cent. nickel anodes, but when ordering you omit to specify this percentage, chances are you will get 85 to 87 per cent., or 90 to 92 per cent. nickel anodes. Furthermore, keep a watchful eye open for indications of scrap metal being used in your anodes; such anodes may be quite easily accepted as perfectly good anodes if you are satisfied to judge the quality by the simple determination of iron content and take it for granted that the balance is all nickel. The presence of detrimental oxides and foreign matter in nickel anodes containing scrap render them less efficient and hasten their end. They are not uniform in composition, soft portions wear away faster than the harder spots and the anode breaks off and possibly the greater portion falls to the bottom of the tank and remains there unnoticed for a considerable period of time. This not only wastes material but reduces the practical usefulness of the bath. When you use the 95 to 97 per cent. nickel anode the liability of having scrap metal anode troubles is eliminated. Low percentage nickel anodes such as 85-87 per cent., or 90-92 per cent. contain very objectionable quantities of iron, and when iron, even in extremely small particles is deposited along with the nickel it furnishes a condition which is conducive to an early breakdown of the coating when the plated article is subjected to the corrosive effects of moist atmosphere or ordinary wear. The cost of manufacturing a low percentage nickel anode differs in only one respect from the cost of manufacturing a practically pure nickel anode—the value of the nickel content. Electro platers are gradually becoming convinced of the economy and actual efficiency of the purer grades of nickel anodes. We have always advocated the use of pure anodes and fought the anode manufacturers until we procured them, believing it absolutely unnecessary to pay nickel price for cast iron, then place the iron in the plating bath, fully conscious of the detrimental effects which would gradually develop, and finally shovel out the iron and wash it down the sewer in the form of sludge. We admit we have obtained commercial nickel deposits from double sulphate nickel baths equipped with 90-92 per cent. nickel anodes, which have resisted unusual wear and exposure to the elements for several years, but nickel deposits possessing equal physical properties would not be commercially possible from similar baths to-day if present speed of production were employed. Anode manufacturers at one time in recent history were very antagonistic toward demands for pure nickel anodes, now the pure nickel anode is recommended by all reliable supply houses, the claim has been repeatedly made that only an infinitesimal quantity of iron is deposited along with the nickel, the iron being introduced in the casting merely to facilitate easy disintegrati of the casting when employed as an anode in the plating bath; this claim has long since been proven false. Simple tests of deposits obtained from nickel solutions containing iron will convince the skeptic; deposits from aged solutions should be chosen if very pronounced results are desired. For example: An analysis of deposits made in a double sulphate nickel solution equipped with 90-92 per cent. nickel anodes, in operation eight months on strictly brass cathodes, revealed 4.69 per cent. iron, while an analysis of deposits obtained in single sulphate nickel solution equipped with 96.75 per cent. nickel anodes shows only .26 per cent. iron. The plater may ask why the test was not made of deposits obtained from same type of bath equipped with the two grades of anodes. The answer is simple. Pure nickel anodes do not break up readily in the purely doub'e sulphate solution and therefore a large percentage of nickel sulphate is used in the solution or the bath may contain absolutely no double sulphate, depending on results desired and method of operating the solution. If you have an old double sulphate nickel solution operating with pure nickel anodes mixed with the lower percentage anode you may have observed that the pure nickel anode remains practically unattacked after several months suspension in the bath; possibly you have condemned them and regretted the purchase. but you can use them up to mere stubs by placing them all in a bath by themselves and occasionally adding a few ounces of hydrofluoric acid to the solution. Hydrofluoric acid differs from sulphuric acid in the noticeable effect on the solution. The acidity caused by use of hydrofluoric acid gradually grows less from the time of its introduction, therefore the most pronounced effects occur immediately following an addition. Acidity from additions of sulphuric acid does not reach the maximum until from 24 to 48 hours following an addition and the rate at which this acidity is neutralized depends on the manner in which the bath is loaded, or the ratio between the anode surface and the cathode surface. Nevertheless the consistent use of hydrofluoric acid is good practice when refractory nickel anodes are causing trouble and expense in the production of deposits.

Blow Holes

A nickel anode full of blow holes is one of the most prolific producers of profanity that ever left a supply house. We have heard some of the best-mannered platers indulge in a copious flow of furious and blood-curdling language upon the discovery of several nickel anodes of only recent purchase lying peacefully at the bottom of a tank as a result of blow holes. Blow holes never decrease in dimensions, a small cavity just under the surface may ultimately become large enough to effect a 50 per cent. waste. An ideal cast nickel anode will not break when forcibly thrown upon a solid flat surface, such as a concrete floor or large iron plate, and it is cut with difficulty by a sharp cold chisel, and if fractured reveals a sound close grain, is tough and has a rather porous exterior. An anode with the above physical points will usually be found to be high in nickel; an anode containing large percentages of iron will naturally be more fragile, and those of the latter grade which are carelessly cast will show a coarse grain, with blow holes. Then there is the nickel anode with a coarse, spelter-like grain which wears away with great waste, becomes rubber-like in the solution, and is eventually removed from the plating bath and thrown in the scrap. Then, when the tank is cleaned, huge piles of dross in the form of granular nickel are found beneath the anode rod; this waste also goes to the scrap. Now just what percentage of such anodes actually reaches the cathode would be difficult for the average plater to determine. An ideal nickel anode retains its original size and form until approximately one half or more of its metal has been delivered to the bath, unless the anode is roughly treated by careless workmen during the placing of work in the bath or the removal of same. Now the question as to whether it is good practice to clean nickel anodes frequently has been the topic of very able discussions in various circles composed of electro-platers for several years, and both sides still have many earnest advocates to-day, therefore it resolves itself into a problem for the individual plater to answer according to his respective experience. Personally we do not favor frequent disturbance of the nickel bath in any way. Naturally the frequency should depend on the amount of and the condition of cathodes processed in a given period, together with the care exercised in hanging in and removing the cathodes. The average acidity and temperature at which the solution is maintained also have a bearing on the subject. Under no circumstances should the surface of a partially used nickel anode be scraped with a file or brushed to remove the carbon residue. Like a well-known brand of rubber tire, nothing is needed except the hands when removing the casing. Simply slip the anode through one partially closed hand while holding the anode hook with the other hand, allowing the residue to fall into a box or bag. An ideal nickel anode will clean in this way like a slippery eel, while an inferior anode will have the coarse, sharp, granular surface characteristic of seriously over-pickled cast iron or fractured spelter. As there is much to be said both pro and con relative to the frequent cleaning of nickel anodes, we will not enter into the subject further in this article. In the following article we will endeavor to explain why nickel anodes should be cleaned under certain conditions, and why they may economically remain undisturbed under other conditions, and also treat on various points which will assist the foreman, superintendent, or manager in choosing a satisfactory type of anode for the different classes of plating such as copper, bronze, brass, silver, etc.

Review of the International Malleable Iron Co.

As an Example of What Co-operation Between Employer and Employee, Together With Business Ability, Can Achieve, This Company Has Much to be Proud of

STANDING upon a site which, six years ago, was a wilderness in the suburbs of Guelph, Ont., are the buildings of the International Malleable Iron Company, Limited—a corporation which was just springing into existence at that time. To-day some 400 hands are employed, and more will be added as soon as the additions which are now under way are completed.

As the name implies the company make a specialty of malleable iron castings, but in addition to this they operate an extensive grey-iron foundry, machine shop, pattern shop, and in fact, everything which goes to make up a complete plant.

The buildings as originally constructed, consisted of a foundry, 450 feet in length, with an annealing room of proportionate size, and a two-story building which housed the machine shop on the first floor, with the pattern shop upstairs. Since then, each year has witnessed additions to some part of the plant. An addition of 200 feet has been added to the foundry, making it approximately an eighth of a mile in length. This additional space has all been utilized, but it has left the annealing capacity inadequate, with the result that an extension of 150 feet has been added to this department, and two new annealing ovens are being installed.

In addition to this, a new brick machine shop has been built, and is being equipped with the latest improved machinery for tapping and threading pipe fittings, facing and drilling flanged fittings, etc. The room vacated by the machine shop is being remodelled and equipped as an up-to-date pattern making department; the brick, fire-proof pattern vault for which has already been built.

Melting Equipment

The melting equipment is of the forced draught reverberatory type of furnace, connected to large brick chimney, and fired with gas coal.

Utilizing Waste Heat

This type of furnace, while being most adapted to malleable work, is necessarily wasteful of heat, but to overcome this waste the company has devised means to save the heat after it has passed through the melting furnace, and it is conveyed by large overhead pipes to the steam boiler, where it is used as fuel to generate the steam which supplies the power for the plant.

Power

The power equipment consists of steam engine, which drives the dynamo to supply electricity for direct connecting the machinery with motors, also air compressor to supply pneumatic power to the machinery.

Products

One of the staple lines manufactured by the company is pipe fittings, and this runs into some very large sizes, which brings grey-iron castings into the field, and a fair sized cupola furnace is used for this work.

Other units of the plant are the core making department, the scratch and fettling departments, grinding room, complete lavatory, and incidentally the office, which is soon to be replaced by a more pretentious one.

The entire plant is well heated, ventilated and lighted, and everything about the place savors of comfort and contentment.

The Picnic

In their efforts to cement the confidence and goodwill which the company and the men have for each other, it was decided to hold a picnic at Waterloo Park at which everyone, from the manager down through the entire group of employees, should attend, with the exception of those who, from sheer necessity,

SNAPSHOT OF GROUP OF INTERNATIONAL MALLEABLE IRON WORKS' EMPLOYEES AND STAFF, AT THEIR PICNIC AT WATERLOO PARK.

-emained behind to keep the fires burning in the ovens.

In the illustration will be seen a snapshot of some of those who were in attendance.

The Programme

The programme consisted of a baseball match between the company's picked team and the Kitchener team, which, needless to say, was won by the Internationals. A tug of war between the molders and machinists, of which modesty prevents comment as to results;

W. H. BURGESS.

oot races and games of various kinds.

The day's doings were terminated by itting down to a sumptuous dinner, provided by the company, and which received ample justice after a day in the open air by the participants.

After the customary toasts and peeches, in which all took an active nterest, the day was brought to a close and the picknickers returned to their homes feeling better acquainted with each other, and on the whole feeling hat the day had been well spent. The executive of the company consists of Mr. H. E. Bullock, president; Mr. W. H. Burgess, vice-president and manager; Mr. W. J. Aiken, treasurer.

PICTURESQUE ELORA

In reading technical literature, one oes not expect to be forced to read uch subjects as travel, nature, history, tc., but in searching for material wherewith to interest readers of this class, he writer is sometimes confronted with material which, while carrying some weight of a mechanical nature, carries ther features of a more dominant character. Thus it was when we visited the hriving little town of Elora, Ont., with a view to business in connection with he foundry, we beheld sights which were truly amazing.

The name of Elora takes us back to our school days, when in learning our essons on geography, we were taught the names of the rivers, together with those of the towns which dot their shores. In our lesson on the "Noble Grand" river, we learned that it had its source in the county of Wellington, in the neighborhood of the town of Elora, and flowed through many thriving places on its way to Lake Erie. There our knowledge ended until we were privileged to view with our own eyes the grandeur of the scenery connected therewith.

In the school books of to-day Elora is mentioned as one of Canada's leading industrial centres, mainly from the standpoint of the furniture industry, but incidentally there is one iron manufactory of no small magnitude, viz., the Bissel Mfg. Co. This company manufactures a line of agricultural implements, and are well provided with work. New buildings have recently been erected to replace others which were damaged by fire, and the plant is now strictly modern in every respect. This, with the two large furniture factories and the usual run of flour and lumber mills, etc., make it a prosperous and lively little place wherein to make a home.

Apart from its industrial importance, the scenic beauty, the picturesque grandeur and the awe-inspiring beauty of its surroundings surpass many of the world-famous beauty spots of story writers.

The Grand River does not have its source here, but travels through some little distance before passing Elora, and on arriving at this point has achieved sufficient importance to have a tributary. The Irving River coming from a direction at right angles to the Grand, flows into the latter at this point. Just above the juncture of the two the Grand has a fall of several feet, and during the spring season the noise and tumult of the waters, together with the rugged walls and precipices of the two rivers, present a spectacle which compares favorably with that of Niagara. During the dry season the sight is even more sublime, and the wonders of nature are seen at their best. The water at this season is shallow and so clear that the bottom is easily discernible. Standing upon this and projecting in a perpendicular direction for over 100 feet, are the walls of gray limestone, cut as though with a knife, by the hand of nature in ages past, through the abrasive action of the water and ice in its course to the sea. Strange freaks in nature's work are to be seen in places where the limestone was harder and resisted this cutting action. Standing like a lone monument on the bottom of the Irving is a straight shaft of stone about 15 feet in diameter and over 100 feet in height and entirely surrounded with water.

At a point in the Grand is what is known as "the island." This, instead of being straight up and down, is shaped like a giant sugar bowl, standing on a small pedestal and flaring out at the top, which is covered with rich foliage.

From an engineering standpoint these gigantic walls present important possibilities, and it is quite possible that in the not far distant future a dam will be constructed at a point somewhere between Elora and Galt, and this enormous reservoir will hold back the water which goes to waste in the spring, to be used during the dry season for irrigating purposes and possibly for power.

THE REAL MAN

The real man is found through watching him when he is mad. There is an old saying to the intent that you can judge a man after you have played poker with him and watched him lose.

Doctors in insane asylums tell us how they grade their patients and judge if they are to be encouraged with more liberty, and whether they are standing still mentally or going backward. They tell us that the simplest method is to do something that will make the patient angry, and then they walk off and without letting the patient know it watch and study his face.

Fear and anger are the first emotions that human beings and animals develop after birth, and they are the last emotions that they lose as the mind goes.

If, in studying the irritated patient, the doctor sees the anger pass away, and signs of thought and reason appear, the patient evidently explaining to himself that anger was not worth while if kept up, then the doctor knows that the patient is on the road to recovery.

If, on the other hand, the anger remains and the patient nurses it and keeps it alive, the doctor knows that the patient is standing still or going backward, according to the intensity of the symptoms.

What the doctor tells us about the study of the insane should interest all human beings, especially those who have power and are able, without fear of losing friends, money, or position, to display ill nature.

No matter how important they may be or think themselves, they may be quite certain that the longer the fit of temper lasts with them, the weaker the mind is and the more in need of care.

Look out for yourself if you nurse ill temper, or the blues, or a fancied injury. The human mind is like rubber; when it loses its elasticity it is poor rubber and a weakened mind.

FOUNDRYMEN'S WEEK, SEPT. 20-25

The American Foundrymen's Association has designated September 20-25 as a special "Foundrymen's Week," during which time a concerted effort will be made to reach all non-member foundrymen with a personal invitation to join.

The committee on promotion and membership is enlisting the co-operation of members in all parts of the country, and team captains are being appointed for each city or group of towns.

Applications for membership received before or during Foundrymen's Week will be acted upon by the A.F.A. board of directors in time to qualify the applicants with full membership privileges for the big annual convention and exhibit that will be held in Columbus, Ohio, the week of October 4th.

Galvanizing, What it is and How it is Done

Describing and Illustrating the Process as It is Practised in One of Canada's Leading Industries, together with a Short Story of Its Origin.

By F. H. BELL

THE subject of galvanizing is one which will be read with interest by many foundrymen, and being a comparatively simple process, and in many respects a part of the foundry business, I will endeavor to describe in a brief way how it is accomplished.

There are two processes by which galvanizing is performed. The original method, and the one from which the art derived its name, is that of an electro-galvanic battery operating on a bath in which zinc anodes are placed along with the articles to be galvanized, and is in many respects similar to electro-plating of any kind. The battery which has since been succeeded by the electric dynamo was originally the work of Aloysius Galvani, an Italian electrician, who was born at Bologna, Italy, in 1737, and died in his native town in 1798. Galvani did not discover the art of galvanizing, but one, Febroni, observing that the zinc in batteries became oxidized in contact with the acidulated water, and adhered to copper or whatever metal it came in contact with, adopted the name of galvanize. Electro-galvanizing is still practised on some classes of work, but it is not on this process that we will dwell on this occasion.

While the word "galvanize" rightfully belongs to the genus "electrique," it has become so associated with the process of zinc plating that its original meaning has been forgotten. As a matter of fact it never rightfully belonged to the original process for the reason that Galvani's discoveries and inventions never reached the stage where the zinc pole was used, but his successes gave his contemporary, Alessandro Volta, a foundation upon which to build, and which led up to the discovery of the zinc and copper positive and negative poles, known as the "Voltaic Pile," but usually referred to as the "Galvanic Battery."

The process of galvanizing which I will attempt to describe on this occasion is that of immersing the article to be treated in a vessel of molten zinc. While this may appear to be simply a mechanical process it is in reality a chemical process, although perhaps unbeknown to the mechanic who performs the operation. In chemistry there are two elements to be considered, one the metallic and the other the acid. Different acids act differently in contact with different metals, but we will not go into the chemical aspect of the subject, suffice it to say that the acid and the heat generated by the electric current caused the two metals to adhere to each other in the former process, while the acid and the heat generated by fire cause the two to adhere to each other in the process about to be described.

In the illustration will be seen a typical galvanizing plant, being that of the Goold, Shapley and Muir Co., Limited, Brantford, Ont. This company manufactures a line of windmills, pumps and sundry other specialties which require galvanizing, and incidentally do an enormous amount of the custom galvanizing which is done throughout Canada. At the extreme right of the illustration and behind the workman is a large wooden vat, a portion of which is shown. This vat is approximately 20 feet long, six feet wide and two feet deep, and contains diluted sulphuric acid. It is connected up to steam pipes for the purpose of heating the acid, not by radiation, but by the direct action of the steam being forced into the acid. The vat, as we have seen, is of wood. The acid would dissolve an iron one, but strange as it may seem, does not affect the wood.

Next to this and in front of the workman is another vat containing muriatic acid.

To the front of the picture and behind the pile of pipes will be seen the end of another vat containing water.

Beyond this will be seen one of the kettles in which the molten zinc is contained, and at the rear left corner of the room will be seen another of the kettles.

At the rear, to the right, will be seen the open doors of the hot air ovens. Thus we have the equipment of a modern galvanizing plant.

The kettles are of electrically welded steel, one and three-quarter inches in thickness on the sides, slightly thicker on the bottom, and flanged at the top. These kettles are built into furnaces with fire doors the entire length. Soft coke is the fuel used and the metal is kept melted continuously. One of these kettles is long and shallow, being in dimensions 21 feet long, 22 inches wide and 30 inches deep, and with a capacity of approximately 20 tons of melted metal. The other kettle is 5½ feet by 8 feet by 22 inches, and holds approximately 16 tons of metal.

By having two kettles of such different dimensions it is quite possible to galvanize almost any piece which could be offered.

When material is brought to be galvanized, if it is a casting with sand burned into it, the sand should be removed by means of an emery block or file, and if necessary, by the application of hydrofluoric acid, which will dissolve the silica even though burned into glass. A plant where much of this would require to be done would have a vat of hydrofluoric acid, but where the bulk of the work to be done is on sheet metal this is not necessary.

For the regular run of work such as is done at this establishment, the articles to be galvanized are put into the sulphuric acid, where they may remain all night if the acid is not boiled. In the day-time steam is turned into it, keeping the acid in a boiling state. This hastens the action and several lots may be done in one day. When the article shows that all scale has been loosened, it is removed from the acid in a slimy state (from the action of the acid) and is taken to the water vat and washed. From this it is taken to the muriatic acid vat and allowed to remain in this for a short time, when every vestige of the first acid will be removed and the article will be perfectly clean metal with a thin film of chloride of iron on the surface. Muriatic acid is a combination of chlorine and hydrogen, sometimes re-

VIEW OF GALVANIZING DEPARTMENT, GOULD, SHAPLEY & MUER CO., LTD., BRANTFORD.
(Photo taken by star-light.)

ferred to as hydrochloric acid. This acid not only cleans the surface of the iron but eats into it, and the chlorine combines with the iron, forming the coating referred to. The article is taken in this condition and placed in the oven and dried with this coating on it. When thoroughly dry and preferably when still warm, it is immersed in the melted zinc. When dipping anything long like a pipe or even a flat plate it should be put into the zinc very carefully, one end first, and should be taken from the tank with equal care.

When the melted zinc comes in contact with the chloride of iron it becomes impregnated and the zinc is actually alloyed with the iron through the influence of the chlorine rather than adhering to the surface. The acid, while assisting in the work of securing the zinc to the iron, also attacks the melted zinc as well as the article being galvanized and also to a certain extent the tank in which the metal is melted. Oxidation also takes place and the effect of these various influences is to form a sort of dross or crystallized zinc, and, unlike zinc oxide or iron oxide which would float on the surface, this dross settles to the bottom, and if allowed to remain there would soon cause the ruination of the kettle. To avoid this lead is introduced, and the lead being heavier than the zinc or dross settles down to the bottom and as the dross settles it remains between the zinc and the lead, and is scooped out with a perforated ladle and pounded into iron molds, from which it is taken and shipped back to the refinery where it is again converted into good zinc.

As we have said a certain amount of oxidation takes place and that some of the oxide was in the dross which settled to the bottom, but as a matter of fact the percentage of oxygen in that material would be small. The bulk of the oxidized zinc gathers on the top and is skimmed off. Some of this will be seen in the pile in front of the tank. This would be much more in evidence were it not for the use of flux in the metal. The flux removes the oxygen from the metal and at the same time forms a covering on the melted metal which to some extent prevents it from further oxidation. The zinc is only exposed by skimming when a piece is to be dipped, and only at such a portion as is necessary to allow the dipping to take place. The flux used consists of sal-ammoniac and sawdust, and in some cases glycerine and sawdust. The pile of skimmings seen in the illustration contains a certain amount of good zinc which can be recovered.

As might be imagined, coats are not required in this department. The fellow with the coat on is only a visitor. The gentleman next to him is Mr. Wm. Lusby, who for the last 20 years has been superintendent of this department and knows the galvanizing business from A to Z.

This galvanizing room is but one department of the Goold, Shapley and Muir Co.'s works, and the windmills, etc., which require to be galvanized form only part of the output of this plant. Gas, gasoline and oil engines, stationary and portable, are among their products. They also manufacture a line of pumps, from the smallest kitchen pump to the largest of mining pumps. But the windmill which they have manufactured in unlimited numbers and which was their earliest venture, has gained such a hold on the public mind that the plant is commonly known as "The Windmill."

The company, in their various departments, employ some 300 hands, and were among the first to undertake the art of galvanizing in Canada.

In conclusion I would say that while galvanizing is a comparatively simple art, it represents quite an outlay. The electrically welded steel kettles constitute a big item, and the 30 odd tons of zinc at 18c. per pound, which is the prevailing price, is no small item. This being kept in a molten state year in and year out would consume a considerable quantity of fuel. But such is business.

HOMER FURNACE CO., OF COLDWATER, MICH., GIVE TECHNICAL TRAINING

A step in the proper direction, and one which has always been advocated by Canadian Foundryman, has been taken by the above company and been greatly appreciated by the employees. Mr. H. D. Keller, the superintendent of the plant, in talking on the subject, gave as his opinion that while the foundry business was not a white collar job, he knew of no business which offered as attractive prospects for the future as the foundry business, and speaking from a life's experience and knowing the difficulty experienced in securing men capable of holding executive positions, he has advocated the step which has been taken. Mr. Keller Jr., who is in charge of the foundry department, is also enthusiastic over the idea. Since the offer was made twenty-two of the employees have taken advantage of it.

The course of study has been prepared by David McLain, of Semi-Steel fame, and as planned, is to consist of twelve lessons, each lesson to cover a period of about two months. The entire course will extend over a couple of years, and the papers will come from the office of the McLain System at Milwaukee, but during the period of study there will be a weekly lecture to which all the men are invited and expected to attend, and at two periods during the coming winter months Mr. McLean will lecture in person. These lectures cannot be estimated in their value to the men connected with the foundry business. The subjects to be taken up will be shop work, cupola work, and intricate points in moulding. In addition there will be many other interesting features valuable to the men, not included in the regular lessons.

A hint of the completeness of the McLain System is given by the following list of titles from the different lessons: Composition of Iron; Grades of Iron; Coke and Scrap to Purchase for Different Castings; Mixing by Analysis; How to Figure a Heat; Coke Savings; Mixture for Different Classes of Castings; General Foundry Practice; Chill Castings; Cupola Practice and Semi-Steel.

It is to be hoped that many Canadian foundrymen will be moved to see things in the same light as the Homer Furnace Co. and follow their example. As Mr. Keller says, there is no business to-day that offers as attractive prospects for the future as the foundry business, and it is a well-known fact that there is no business which, so far, has been neglected as the foundry business.

It is a well-known fact that at the present time there are innumerable foundry foremen who could not take off a heat if the melter should be laid up, and there are many melters who are simply working in a rut which happens to work good enough, but few who know how to produce metal to specifications.

Courses such as the Homer Co. have adopted, with men such as David McLain, to prepare the lessons, cannot help but be of benefit to the employer and employee alike.

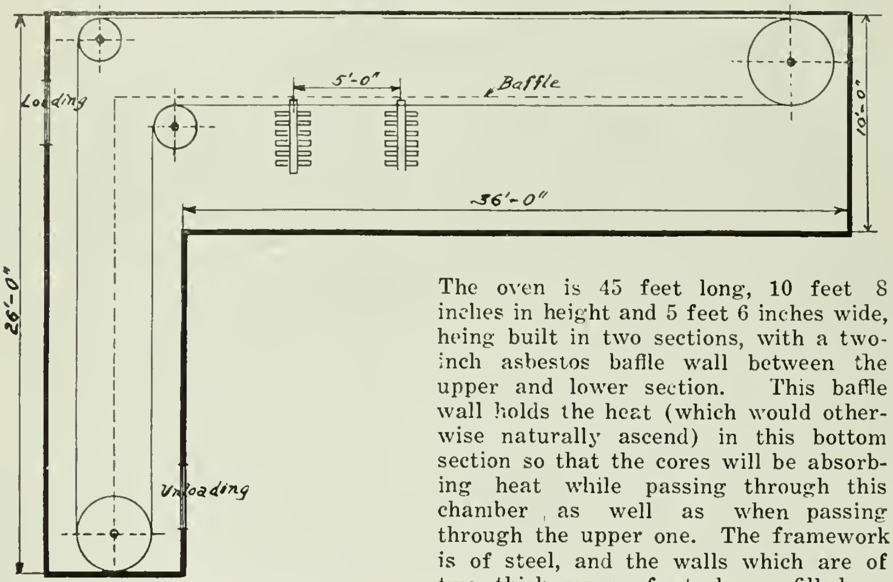
SHOULD BE GOOD NEWS FOR THE FOUNDRY

The building of a hotel might not appear to offer any great encouragement to foundrymen, even though they realize that quite a few cast columns and various cast iron bases, etc., for steel columns are used. It might, however, be of interest to look over the specifications for the new addition to the King Edward Hotel, which is being built in Toronto. In addition to the thousands of tons of structural steel, which is of no direct interest to the foundry trade, there are a great number of cast columns, etc., and a number of elevators, which are well provided with iron work, but perhaps the most interesting feature from a foundry standpoint is the fact that every one of the five hundred and thirty bed rooms which are to be in the new structure each one will have a complete bath and lavatory. Just think what this means. A few of them will have shower baths in place of bath tubs, but there will be five hundred and thirty lavatory basins and say five hundred bath tubs, all made of enamelled cast iron. In addition to this the entire building which will include the five hundred and thirty bed rooms, as well as all the other rooms, will be heated by hot water radiators, which will mean an enormous tonnage of cast iron radiators. When we include all the hardware, such as locks, hinges, etc., it will be seen that the building of a hotel means something for the foundry. In furnishing a hotel it is considered most proper to use metallic bedsteads from the standpoint of cleanliness, but a hotel of the King Edward class would probably use brass, unless that possibly the enormous cost of good furniture lumber might make wooden bedsteads seem more attractive.

Electrically Heated Continuous Core Oven

Demonstrating the Use of Steel with Insulated Lining for the Oven—Link-Belt for Conveyors and Electricity for Heat and Power

THERE is probably no department of the foundry which has made more rapid strides in the direction of economy in fuel, time, labor etc., than the core room, and there was certainly no part of the foundry where improvements



LINE SKETCH, SHOWING ALL DETAILS.

were more called for. The average foundry is none too well equipped in that direction even now as most core ovens smoke, and most core makers have a lot of hand conveying to do which could as well be done on power conveyers, but on the whole a lot of improvements have been made during the last few years.

In the sketches herein shown, I will endeavor to show what would appear to be about as near a perfect system as anything which has yet appeared. It is a steel encased, electrically-heated continuous furnace, so arranged that the core-making is done on the second floor, while the cores are discharged in a finished state on the first floor. The sand is also stored and prepared on the first floor and carried to the core maker by power-driven devices.

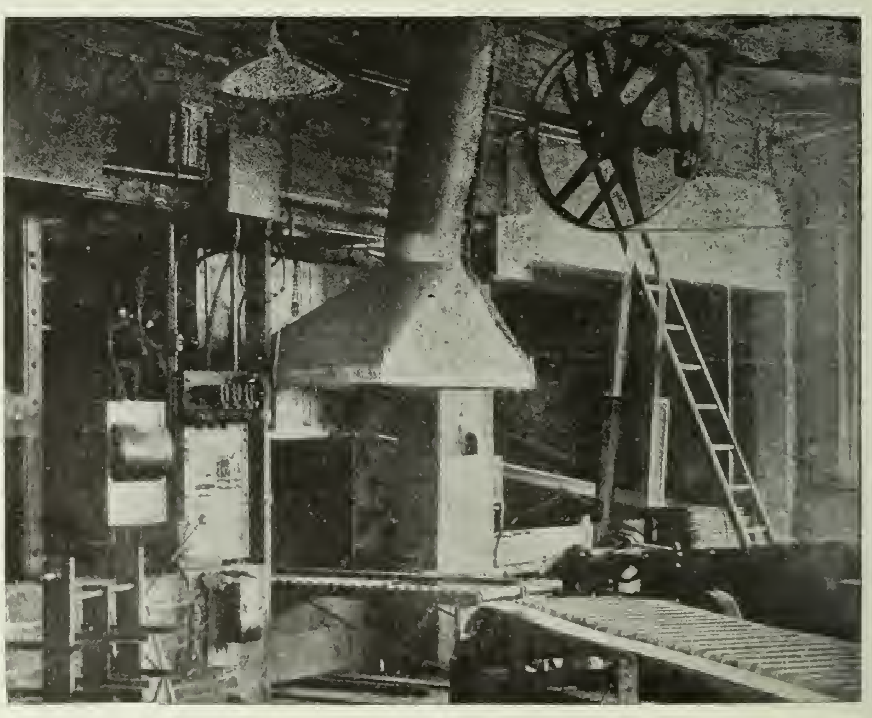
This system can be utilized to good advantage and occupy practically no room by having it in the upper part of the molding department. The unloading door can be arranged to come where it will be convenient to the molders while the loading door which is on the opposite side will be convenient to the core room. This room can be partitioned off so as to be free from the smoke and dust of the foundry, and have its own ventilating system. It is not necessary to adhere strictly to the design of the one shown here, but the general principles are well worth considering.

The one here described is in operation at the aluminum and brass foundry of the Willys-Overland Co., Toledo, Ohio. It is not in the molding room, however, but is in a room by itself. The oven is of the continuous-conveyor type, and has a vertical leg of the same section, 20 feet long at the front of the oven, extending to the floor, in which doors are provided for unloading the cores.

The oven is 45 feet long, 10 feet 8 inches in height and 5 feet 6 inches wide, being built in two sections, with a two-inch asbestos baffle wall between the upper and lower section. This baffle wall holds the heat (which would otherwise naturally ascend) in this bottom section so that the cores will be absorbing heat while passing through this chamber , as well as when passing through the upper one. The framework is of steel, and the walls which are of two thicknesses of steel are filled on all sides with asbestos and Nonpareil insulating brick. The oven is supported by steel trusses on which is laid a floor of steel plates. Other steel trusses carry the conveyor machinery in the ovens, so that the supports of the ovens and their conveyors are entirely independent.

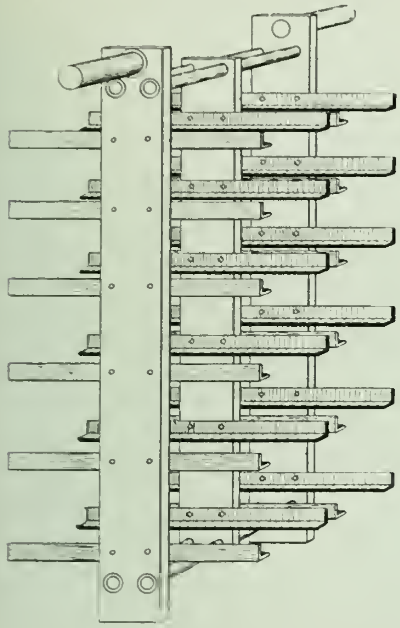
The cores are made in a room on the second floor as spoken of, at one end of which, at a convenient height above the floor for loading are the oven doors. Beneath this coremaking room is a sand storage room, from which core sand is carried up in a bucket elevator. A roller chain conveyor, 100 feet long and 24 inches wide, extends the length of the second storey core room through the centre, terminating near the entrance to the oven. The coremakers' benches are located on both sides of the conveyor, and when a plate of cores is ready it is put on the conveyor and thence carried to the oven. The core plates are 14 by 30 inches.

The movement of the coreroom conveyor, which is not in continuous operation, is controlled by a push button by an operator, who stands at the end of the conveyor. This operator lifts the plate of cores from the conveyor and places it on the short section of a roller platform built on a slight incline, over which he pushes it into the oven conveyor, the core plate fitting into an angle-iron shelf in a carriage or rack in this conveyor. See Fig. X. These carriages or racks, which are pivoted to the conveyor on 5 foot centres, have double rows of shelves, each carriage having six shelves on each side. The conveyor is 126½ feet long and has 23 carriages. The travel of the cores, after being placed on the conveyor at the loading door on the front of the oven, is upward to the top half of the oven, then from the front to the back of the oven, back through the lower section, and down the vertical section to the lower floor,



OUTSIDE VIEW OF OVEN, SHOWING CONVEYORS, GAS-HOOD, SWITCH, ETC.

where the baked cores are taken out. Here a short section of roller platform is provided for handling the plates of cores similar to that at the loading end. The conveyor carriages pass on up to the loading end of the oven, to be again



HANGING CORE RACK FOR OVEN.

filled. After the cores are taken off the plates the plates are put on a 12-inch belt conveyor with steps bolted to it and again conveyed to the upper floor.

The oven was built by Young Bros. & Co., Detroit. The conveyors and steel frame supports were supplied by the Link Belt Co., of Chicago and Toronto, while the electric equipment was supplied by the General Electric Company, Schenectady, N. Y., and Toronto, Ont.

As showing the large capacity and high efficiency of core baking by electricity the results of a recent test are interesting: Average temp. of operation, 386 deg.; cores baked, 6,907 lbs.; electric power, 915 kw. hr.; total heat to bake, 1,488,556 B.t.u.; heat input, 3,121,980 B.t.u.; efficiency, 47.68 per cent.; time of test, 5 hrs. 20 mins.

The heating of core ovens is but one of the many applications of G-E oven heaters to industrial processes. Where the temperature must be closely regulated electric heating has been particularly successful.

MANGANESE-BRONZE

(Continued from page 231)

iron, 1.25; aluminum, 1.25; magnesium, 0.50; manganese, 0.50; lead, 0.30.

The manganese should be in the form of manganese copper and the iron can be in the form of turning or scrap tin plate.

Turning has always been condemned, but aluminum drives out the carbon, after which the iron mixes readily.

High-grade manganese-bronze cannot be made from the above raw materials on a small scale. Consequently, crucible furnaces cannot be used. A reverberatory furnace or other equipment with which a bath of considerable proportion may be employed is required. Mr. McKinney discusses a typical charge, the materials being melted in the presence of charcoal, using salt as a flux.

The most important use of manganese-bronze is in propeller blades. A strong, tough alloy that will resist the action of sea-water is necessary. The blades are made thin to save weight.

CANADIAN PLANT FLOURISHING

Brockville, July 24.—Canada Foundries and Forgings, the head office of which is in Brockville, had a busy time here Friday and Saturday. The directors held their regular quarterly meeting on Friday, and owing to late trains the proceedings continued well into the night. There were present: T. J. Dillon, president; Hon. G. P. Graham, vice-president; J. H. A. Briggs, secretary-treasurer; J. A. McKay, H. Bertram and Lieut.-Col. Montsarrat.

The statement presented fully justified the optimism of the board as to the success of the company on a post-war basis. The task of readjusting such an industry so as to take care of stable business as it develops is not easy, but it is being accomplished. The earnings were well beyond the amount required for the annual quarterly dividend and the customary 1¾ per cent. on the preferred and 3 per cent. on the common were declared.

On Saturday the shareholders met, about 70 per cent. of the stock being represented, and approved of the by-law presented by the directors providing for the purchase of the Mann Axe & Tool Co., of St. Stephen, N. S. If certain negotiations now being carried on with that town are successful it is probable the works will be rebuilt there without delay.

COKE PLANT FOR TORONTO

It is understood that the harbor commission has closed a deal with the Solvay Coke and Gas Company of the United States, by which the American firm have been given control of 29 acres of harbor front property, on which a three million dollar plant will be erected.

Negotiations between this concern and the Toronto authorities were opened about three months ago, and it is understood that the Americans were prepared to undertake the manufacture of gas in the city and deliver it to the Consumers' Gas Company, who have a monopoly on distribution in Toronto, for 61 cents per thousand cubic feet, but that the Consumers' Gas Company declined to make a deal with them. This is about half the price at which gas is being retailed at present in the city. The Solvay people are said to have big plans for manufacture of coke and gas for the industries on the new harbor commission property and also to carry on a number of subsidiary industries.

GURNEY FOUNDRY COMPANY EXTENSIVE CHANGE

The Gurney Foundry Company, Limited, has purchased the plant, including all of the machinery, equipment and patterns of the Canada Stove & Foundry Company, Limited, at St. Laurent, a suburb of Montreal, Quebec.

The rapidly growing business of the company has for some time taxed the capacity of the stove plant on King street, Toronto. It was impossible to enlarge this plant further, as no vacant land was available, and these conditions made it necessary to consider another location.

The Canada Stove & Foundry Company has done a very large stove business in the Province of Quebec and this business will be added to the turn-over of the Gurney Foundry Company.

The Montreal plant also has a modern well-equipped plant for producing white and colored vitreous enamel on iron and steel.

The head office of the company will remain at Toronto. The largest manufacturing plant of the company at West Toronto will be increased in scope and will produce the warm air furnaces heretofore manufactured in the King street plant.

First Lawyer: "Did his speech carry conviction?"

Second Lawyer: "It did. His client got five years."

"So you want to be my son-in-law, do you?" asked the man, with as much fierceness as he could assume.

"Well," said the young man, "I don't particularly want to, but I suppose I shall have to be if I marry your daughter."—Pittsburgh Chronicle-Telegraph.

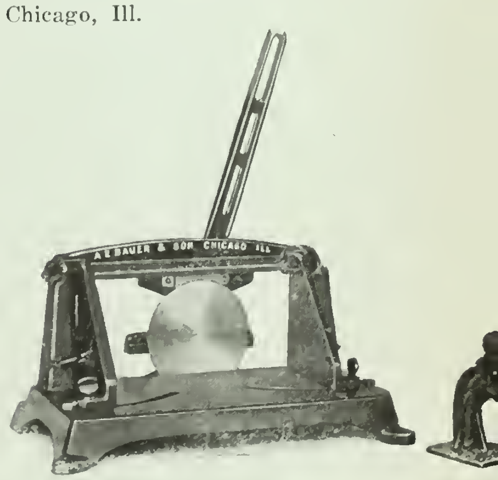
Disraeli said: "The greatest secret of success in life is to be ready when your opportunity comes."

THE BAUER REVOLVING KNIFE

(Continued from page 237)

means of which the knife can be easily, accurately and quickly sharpened.

The illustration tells its own story but further information can be received from the manufacturers, the A. E. Bauer Co., 1342 West 69th Street, Chicago, Ill.



Business None Too Brisk Over the Line

PITTSBURGH, Sept. 9.—Producers, dealers and consumers in all branches of the general iron and steel market, including coke, pig iron, semi-finished steel and finished steel products, unite in declaring that there is a condition of quietness if not of absolute stagnation. Coming on the heels of the ending of the July-August midsummer period, which is traditionally a dull one, the situation today is important and suggestive. The markets ought to be growing more active. Looking back to June, one can now see that the markets have grown more and more quiet as time passed, and the fact that what is normally a dull season of the year was passed through seems to have had nothing to do with it.

There is nothing in the technical position of the markets that would presage any increase in activity in the near future. Producers are moderately well sold up and consumers are moderately well covered. No large number of producers will run out of orders in the near future, requiring them to force sales, while buyers are unlikely to be forced to buy heavily for quite a while to come. The attitude of producers is that of "standing pat" on prices as there is nothing to be gained by trying to stimulate activity. The position of buyers is that they will buy only for absolutely known wants in the near future, and as they are already covered, in the main, the current purchases are very light.

Pig Iron

The pig iron markets are stagnant, particularly in the western Pennsylvania and valley district. Men are discussing now how it happened that foundry pig iron recently was shoved up $4 a ton to $50 valley. As there has been little buying at the new price the advance does not seem to have done the producers much good, and it may prove to have done them harm by straining the patience of consumers to the breaking point. If the furnaces had left the market at $46 they might have pulled the consumers along and gotten them to buy from time to time. One man who is practically neutral as between buyer and seller, but very well posted, remarks that the advance was simply a sort of notion, so many furnacemen having made up their minds it would look nice to have pig iron advance to the round figure of $50, and it is known that quite a number of bets were made as to whether or not pig iron would reach $50. Bets can be collected even if little pig iron can be sold. The same observer just referred to remarks that the southern furnacemen seem to have handled their market with more skill. They got the price of pig iron at Birmingham up to $42 at the end of last April, and they have held it there steadfastly, though sometimes obtaining delivery premiums. When northern iron started advancing over again there was afforded a wider field for the sale of southern iron, of which the southern furnaces have been taking advantage. For instance, years ago the alignment of prices became such that Birmingham iron could rarely get into Pittsburgh, being shut out by valley iron, but even with the advance in freights Birmingham iron can beat valley iron for Pittsburgh delivery by over $2 a ton, the freight Birmingham to Pittsburgh being advanced from $5.70 to $7.60, making southern iron at $42 Birmingham $49.60 delivered Pittsburgh. Valley iron, on the other hand, at $50, furnace, is $51.96 delivered Pittsburgh. The Pittsburgh consumer may not buy southern iron, but he is deterred from buying valley iron unless he needs a small lot for very early delivery, in which case the price matters very little.

A fair conclusion is that there will be a prolonged deadlock in the pig iron market, with only very light transactions. A certain amount of iron has been sold and bought, and the question is whether the producers will first need orders or the consumers will first need iron. For a long time past production and consumption have balanced, while the present outlook is that production will increase and consumption will decrease. Unless fundamental conditions change, therefore, it would look as though sellers will have to come into the market first, and necessarily with cut prices, but this may not be, possibly, until several months have elapsed.

Steel Prices Unchanged

The gap between Steel Corporation and independent prices is not being narrowed, despite the dullness of the market. In the past week or two there have been little cases of price declines and also little cases of price advances, on the part of some independents. The point seems to be that when there is competitive business the price declines while when there is no business a mill may mark its prices up, as it loses nothing by doing so. It is about a year now since there first appeared a distinct difference between Steel Corporation and independent prices, the difference increasing until substantially the maximum was reached last February or March, since when there has been practically no change, taking the general average of the market. Expectations used to be entertained that the phenomenal and almost unbelievable condition of there being two markets would be terminated by a gradual sagging of the independent prices. The course of the market recently indicates that nothing of the sort will occur. There will be no sagging, but rather the prices will be maintained to the last moment, the banners waving and the band playing. The independents still talk of there being further price advances, and have even revived talk of the Steel Corporation being about ready at last to advance its own prices, which have been maintained without change since the Industrial Board adjustment of March 21, 1919. While there is no official statement, there is an intimation from New York, possibly inspired, to the effect that the corporation has no intention of advancing its prices. Now would be the time of all times for the corporation to advance its prices, for by the recent advance in freight rates its costs are increased by about $50,000,000 a year in increased freights it pays on materials assembled at its various plants and on shipments between plants. The corporation gets a part of this back, however, possibly a fourth or a third, in that it makes a greater profit on such material as it sells on the "Pittsburg basis" to point taking a lower freight from the producing mill to the point of delivery. The $50,000,000 a year is approximately equal to the rate at which the corporation accumulated surplus during the first half of this year, after paying charges and dividends. However, the corporation does not necessarily need to accumulate surplus all the time, having a good surplus now, while its book-keeping has been particularly conservative, large sums having been written off lately, keeping the property account down.

CASTING BRASS IN IRON MOULDS

In all cases where brass castings are made in permanent moulds it is necessary to have a small proportion of manganese present in the alloy if a fairly smooth skin is needed. Usually it is difficult to work in manganese in a metallic state owing to its high melting point, and either a manganese-copper alloy melting at a reasonably low temperature has to be prepared for addition to the brass during its manufacture or some salt of manganese has to be added. Probably, however, the use of manganous chloride as a flux instead of salammoniac will provide all that is necessary in the majority of cases, and this somewhat cheap but deliquescent salt can be freely used without injury to the metal—which is an advantage.

WHY SHE DID IT.

Eva S.———, twenty-four years old, a maid employed in Jersey City, was locked up in the West Thirtieth Street Police Station, charged with grand larceny. She is alleged to have stolen $160 worth of articles from a Sixth Avenue store.

The explanation she gave was that she saw a sign in the store which read: "Customers, please take small packages home."

The Editor was a believer in 'yellow' journalism and ran this as a leading editorial: "The business man of this town who is in the habit of hugging his stenographer had better quit, or we will publish his name."

The next day thirty-seven business men called at the office, paid up their subscriptions a year in advance, left thirty-seven columns of advertising to run indefinitely, and told the editor not to pay any attention to fool stories.—"The Yellow Strand."

Canadian National Exhibition Again Over Million

FOR the third time in its history the Canadian National Exhibition exceeded the million mark in attendance, the grand total for 1920 standing at 1,152,000. While this is not equal to the record of the Peace Exhibition, the year previous, the decline is accounted for in two very good reasons. The first one lies in the fact that there was no stellar attraction as in 1919, when the presence of His Royal Highness the Prince of Wales drew thousands to the Exhibition. The other reason is accounted for in the weather on the concluding day. When it was thought that the record of last year might have been reached, a deluge of rain on the concluding Saturday kept many hundreds away, that otherwise would have swelled the grand aggregate.

In spite of the fact that the Exhibition was behind in numbers attending, it continues to grow in size and in importance. It outrivals anything of its kind held annually anywhere. The steady development of all the departments of the Exhibition is a matter for congratulation, and serious consideration is being given by the directors to the question of providing more accommodation for exhibits.

While the Exhibition of 1920, perhaps, was not as spectacular, in some ways, as in certain previous years, yet from many standpoints it stood very high in the opinion of representative men in close touch with the progress of this annual event. The exhibits were all of a high order, showing as they did the position of Canada industrially and commercially, as well as showing the goods of American and Old Country manufacturers. In fact the exhibits would have been on a much greater scale had the space been available for them, and many were unable to be represented owing to this lack of space. Already plans are under way for increasing facilities, and it is not unlikely that before another year, more buildings will have been erected in the Exhibition grounds.

The carnival features of the Exhibition were as popular as ever, and the special arrangements devised for the entertainment of the throngs were much appreciated. The motor boat races, the stunting aeroplanes, the performance daily in front of the Grand Stand and the display of fireworks, to say nothing of the diversion of the Midway, all provided unlimited amusement. Then again for the lovers of art the beautiful showing of paintings, and likewise of photography were an attraction in themselves that made the visit to the Exhibition well worth the money and time spent.

The rain on the last Saturday interfered somewhat with the athletic events that were a special feature this year, but a number of them were run off, creating a great deal of interest.

The Exhibition closed with much justification for pleasure at its success, and looking to another year, when this great annual Exhibition will be on a larger scale than ever before attempted.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

B. G. NEWTON, Manager.
A. R. KENNEDY, Managing Editor. F. H. BELL, Editor.

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THE PRINCIPAL CONTENTS

The Foundrymen's Convention

ON the fourth of October of this year the American Foundrymen's Association will meet in convention for the twenty-fifth time, and, according to predictions, it will be the most successful convention yet held.

Twenty-four years ago the first convention was held in Philadelphia, and, all things considered, was a success. Since then it has been an annual event and each year has added a little bit to what had already been achieved until it is now an event looked forward to by the majority of foundrymen throughout the United States and Canada, and to some extent by foundrymen throughout the world. Ten years after the inauguration of the association the exhibit of foundry equipment was added. Since then the exhibit of machine tools and machine shop equipment has been added. Year after year additional attractions were added until now it includes the Iron and Steel section and the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers, the American Malleable Castings Association and the "Non-Ferrous Casting Section," which will be represented for the first time.

All of this, or just such part of it as is interesting to the visitor, is at his disposal when attending this year's convention.

The buildings and grounds which the association has been fortunate enough to secure for this year's convention are admirably suited for convention purposes. There are eight buildings on the grounds, all connected by covered walks, and in case of unfavorable weather the visitor is always under cover.

In this issue we have endeavored to show the reader what he may expect to witness by attending and will ask all our readers to read carefully the editorial material on the subject and to also notice what the advertisers have to say. Many of the advertisers will be represented at the convention and will tell in advance what they will display.

Canadian Foundryman's Booth

IN the illustrated section of this issue will be seen the layout of No. 1 building, in which this publication will be represented. Booth No. 14, right next to the registration booth, will find us, and we cordially invite you to make it your headquarters during the week of the convention.

The programme is given in detail on page 217 of this issue, and the list of exhibitors with the number of the building in which their exhibit is shown is also published in the same article. From our experience at these annual events we would certainly advise all those who can to attend, and as this will be our last opportunity of appealing to you before the convention we urgently invite you to make use of our desk and our chairs and everything within our allotted space as freely as though you were at your own home and fireside.

The Machine Shop Exhibit

IN connection with the Foundrymen's Convention it must not be overlooked that exhibit of machine tools and accessories has been playing a prominent part for some years past and has become a part and parcel of this annual event. In this department will be seen the latest and best in everything which goes to equip a machine shop, including not only lathes, planers, drill presses, etc., but various types of clutch pulley, hangers, vises, electric, hydraulic, and pneumatic tools, oxy-acetylene and electric welding and cutting tools; in fact the machine shop exhibit will be as interesting to the machinist as the foundry exhibit will be to the foundryman.

The Non-Ferrous Department

THIS is the latest addition to the association's many departments, having been a separate organization until this year. Last year they met at Philadelphia on the same dates, but under separate control. This year it is all one organization and will be for the benefit of those who are interested in brass foundry work, etc.

Facts and Figures re Convention

IN support of the early predictions regarding the exhibition in connection with the conventions the following facts are submitted: Total number of exhibits to date, 220; highest previous total, 208. Total space sold, 71,492 square feet; highest previous total, 60,500 square feet.

This convention and exhibition has received, and will continue to receive, greater publicity than any previous one. A record attendance is expected. The programme, which is being published, is correct as far as it goes, but it omits some features which we wish our readers to keep in mind. An unusually interesting programme is being arranged for the ladies, and the entertainment features, in charge of joint committees from the association and the Columbus Foundry interests, will be well attended to.

Headquarters for all activities will be at the Fair grounds, a plan that we are sure will be approved by all.

Our Next Issue

THE October issue of this publication will be our post-convention number, in which we will endeavor to give our readers a substantially correct description of the doings at the convention, together with what each exhibitor had to show to those who were fortunate enough to be eye witnesses. This number will not only be for the benefit of those who were absent, but will be equally as valuable for those who attend, inasmuch as it will save the visitor the trouble of marking down the innumerable things which he will want to remember.

By the time the November number is due the autumn season will be well advanced and visions of winter will be upon us. This will be the time of the year when reading will be interesting, and with this issue we will begin a series of interesting and instructive topics along the line of foundry practice. There are many subjects of vital interest to foundrymen which do not receive a fraction of the attention which they should. For instance, few people realize that the air we breathe can be harnessed and made to be a most obedient servant. They know that compressed air is used for some purposes, but give little consideration to the enormous amount of use to which it can be put.

Electricity is another agent which is understood fairly well by most everybody, but few people seem to realize that its usefulness in a foundry covers almost the entire field, furnishing heat, light, and power, and that Canada is in a better position than any other country in the world to develop electric energy.

These and many other subjects of real value to the foundryman will be dealt with and papers written by eminent authorities on the subjects throughout the winter months.

Serving an Apprenticeship

WHAT does it mean to serve an apprenticeship? and what are the benefits to be derived from the same? These are questions which might seem easy to answer, but which are seldom answered correctly.

A trade and a profession are, to all intents and purposes, the same thing, unless we might say that a profession is a higher grade of trade than what is commonly known as a trade.

Now, take for instance the medical profession. Can anyone imagine a boy going into a doctor's office or a hospital to serve an apprenticeship? Certainly not. The same arguments hold good in learning a trade. Before undertaking to practice as a doctor or a surgeon it is necessary that the student be shown the anatomy of the human body and be instructed on every detail by a professor who is capable of giving the instructions, after which he is made to answer questions on the subjects that he has been taught, and when he is capable of answering the questions he requires practice to make himself perfect.

Now, compare this with learning a trade. Life is short and all we are supposed to have of it is three score years and ten, with a big chance of being called off before getting very far into the last score. The best part of the first score is gone before a boy is through with his school days and then—. Does it pay to try to learn a trade by spending several years as an apprentice and then tramp around from place to place getting experience? It is certainly a crude way of getting knowledge. If it is possible to learn the medical profession from teachers and from books, it ought to be possible to learn molding by the same means. One year would be an abundance of time to get all the practice required if the apprentice was properly instructed on what to practice, and with life so short one year is all that can be spared. No employer can afford to pay an apprentice any wages and then do justice to the apprentice in the way of instructing him. The best that can be done for the apprentice under the present system is to give him such work as he can earn his wages on and then let him keep his eyes open and watch what the journeymen molders are doing and how they do it. After spending three or four years at this kind of learning he is set adrift to check his way in fresh fields, where the employer is obliged to put up with what he can get. The present system is unsatisfactory from the standpoint of both the employer and the apprentice.

In this twentieth century the old-fashioned apprenticeship method is too slow and nothing else being available to take its place in most localities, the mechanic of every class is gradually disappearing.

What is wanted is technical education, either at night school, or at a school provided by the employer in connection with the shop or by whatever means is most available. The question of production should be out of mind when instructions are being given.

If the boy has to draw a couple of dollars per day in order to keep alive he could be given simple work in the shop, and then for an hour each day he could be taken to the class room for instructions, and, if under a proper instructor, he could easily be a better workman at the end of one year than after four years of ordinary apprenticeship. He could, of course, keep on improving with practice, but his rudimentary education should be given to him by a proper instructor and at a time when he is free from the anxieties of work. It is a remarkable fact that the least capable workmen are the ones who have the most to say about where and how they served their time. The really good mechanics are the ones who study and try to become proficient. It is useless to get experience unless you are sure that the experience is on the best methods. Never practice doing anything without first learning why it is done that way.

It is not an uncommon expression that we hear from workmen that they served six years in a foundry employing a thousand men. Now, what did the thousand men have to do with the apprentice? and what chance would the foreman of a shop of that size have to instruct apprentices? It will always be our contention that while experience and practical application of principles are essential to success, it is of the greatest moment that the student or apprentice be instructed on the "whys and wherefores" by a competent instructor so that he will not spend his time practising and getting experience along lines which are not the very best.

The Canadian National Exhibition

THE Canadian National Exhibition, commonly spoken of as the Toronto Exhibition, has again terminated a successful two weeks' show, and while not quite up to the highest record as regards numbers in attendance, it was nevertheless, one of the best as regards quality and by far the best as regards quantity of exhibits. Ideal weather prevailed throughout the entire time, with the exception of the last day, which is usually looked upon as Toronto's own day. On this occasion, rain prevented some of the attendance which otherwise would have been on hand and made a vast difference in the total attendance.

With the enormously increased amount of space required for exhibits during the last few years and which will undoubtedly continue to increase from year to year, more buildings are certainly demanded. These, we understand, will be erected before the next Exhibition takes place. The C. N. E. is without doubt the greatest annual event of its kind in the world and something of which Canada, and Toronto in particular, may well be proud.

Scraps from the Foundry Scrap Pile

Toronto, Ont.—The Fuel Burner Co., Ltd., has been incorporated to manufacture oil burners, etc., with a capital stock of $45,000, by G. Bowman, Albert F. Cornelius and Morley G. Pritchard.

Darling Brothers, Limited, Montreal, Que., mfrs. of heating and ventilating machinery, etc., has been incorporated with a capital stock of $1,250,000 by George Darling, Edward Darling, and G. K. Darling.

The **Canadian Baldwins** announce their intention to instal two 50-ton open hearth furnaces at their plant, and that the two 35-ton furnaces which were purchased by them at Collingwood will be enlarged.

Toronto, Ont.—The Purser Machine Tool & Stamping Co., Ltd., has been incorporated to manufacture machines, tools, etc., with a capital stock of $40,000, by C. L. Carrick, F. Walkingshaw and Charles Purser.

The **Everhot Heater Co., of Canada**, Limited, has been incorporated with a capital of $400,000 to manufacture heaters, etc., by Augustus Pinson, Leander, Vallee, Charles Laparee and others of Montreal, Quebec.

Imperial Steel and Wire Co., Collingwood, Ont., will receive bids for the erection of a plant to cost $150,000. Philip C. Palin, Hurontario street, is the architect and George Royal is the plant superintendent who will receive the bids.

Toronto, Ont.—The Superheater Co., Ltd., has been incorporated to manufacture machinery, etc., with $1,000,000 capital, by Archibald W. Langmuir, 801 Dominion Bank Building; George M. Huyke, 143 Bloor street west, and others.

Toronto, Ont.—The Canadian Farm Power & Machinery Co., Ltd., has been incorporated to manufacture steam engines, farm implements, etc., with a capital stock of $1,000,000 by M. J. Adolph, Clem E. Strike and Wilson J. Wylie.

The **Stratford Machine Co., Limited**, has been incorporated at Stratford, Ont., with a capital of $50,000, to run a foundry business and manufacture machinery. George H. Langan, Thomas Brown, Leon J. Long and others are the incorporators.

Dunnville, Ont.—A new company has been formed here under the name of J. H. Charles & Co., Limited, by J. H. Charles, G. H. Orme and others, with a capital stock of $40,000. They will carry on a general iron foundry business.

The **Weaver Products, Limited**, has been incorporated with a capital stock of $24,000 to carry on the manufacture of stoves, heaters, etc., at Waterville, Que. Samuel Weaver, John W. Breakenridge, Charles E. Church and others are promotors.

The **Milton Foundry, Machine and Tool Co.**, Milton, Ont., have decided, owing to labor shortage, to close down their foundry for the time being, and devote all their attention to machine and tool work, and purchase their castings from outside foundries until the labor situation becomes more settled.

The **International Malleable Iron Co.**, Limited, Guelph, Ont., has completed a 200 foot addition to their foundry, a 150 foot addition to their annealing room, in which they are installing two additional annealing ovens, and a large modern machine shop which is being equipped with special machinery adapted to their line of work.

Toronto, Ont.—The Davis-Bournonville Co. recently completed and moved into their new premises at 32 Eastern avenue, here. The company was previously located at Niagara Falls, Ont., and only had sales offices in Toronto. The new building is 50 x 110 feet, two stories, and will be used for the production of equipment for the Canadian trade.

Montreal, Que.—The plant and business of the Clyde Engineering Co. here has been taken over by the A. and J. Weir, Limited, which company has been incorporated with a capital of $750,000 to manufacture and deal in marine auxiliary machinery, power plant equipment, boilers, iron and steel work, by Francit T. Peacock, John Bryson, Arthur F. Cagney and others.

The **Callander Foundry**, Guelph, Ont., has been purchased by the Louden Machinery Co. of Canada, also of Guelph, and will in future be run in conjunction with their plant, manufacturing overhead industrial conveyors, etc. The foundry has been extended by an addition of 90 feet to its length, and it is the company's intention to manufacture all their own castings, additional molding machines will be required for some of their lines.

Beatty Bros., Limited, Fergus, Ont., are adding extensively to their plant in this town, putting up an addition to their woodworking shop, also to the assembling room and shipping room. Plans are also in progress for a new machine shop in connection with their London plant next year to be followed by a new foundry for their Fergus plant two years hence. It is also their intention to build large extensions to their western plants in the near future.

Dominion Motor Castings, Limited, a new company which has been formed to manufacture all the different castings used on motor cars and industrial motors will soon begin operations at Windsor, Ont. The incorporators are A. Marrill, P. McKee, C. A. Ripley, L. Smitherman and R. St. Clair. The company will be capitalized at $25,000. The buildings, which are nearing completion at the corner of Windsor Ave. and Hanna St., will have a floor space of 23,000 square feet. One hundred and fifty hands will be employed, with a daily output of 40 tons of castings.

The **Canadian Pattern and Castings Co., Limited**, is a new concern which will open its doors for business on Oct. 1st at 49 Drouillard Road, Ford City, Ont. This company is promoted by men at the head of the Modern Pattern and Machine Co. of Detroit, one of the largest pattern shops in that city. They will have all modern machinery and equipment, and will specialize on wood and metal production patterns, brass, bronze and aluminum castings in production quantities. Mr. J. M. Alexander, who has been connected with the Detroit establishment for many years, will be the resident Canadian manager.

CATALOGUES

Young Brothers Company, of Detroit, are distributing an interesting circular on their insulated steel-panel core ovens, to be heated by electricity, gas, oil, coal or wood. The illustrations show large molds, such as those for propellers being baked at the Cramp Shipyard, Phila., as well as the small complicated cores used in automobile plants. The advantages of insulated steel over brick for the walls is clearly shown, together with much valuable information of use to core room foremen and foundrymen in general.

Pittsburgh Crushed Steel Co., Pittsburgh, Pa., U.S.A., are distributing their latest pamphlet on Scientific Metallic Blasting Abrasive for use in sandblasting machines. The pamphlet describes in detail their abrasive known as Angular Grit, which is a steel abrasive and as its name implies angular in shape of grain instead of globular as is the case with some brands of sand. The illustrations show magnified views of different sands and also of the steel angular grit abrasive. The pamphlet will be mailed on request to the above company.

Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, Ill., have just issued an interesting and instructive circular, No. 33, describing and illustrating their "Thor" Universal Electric Drills. On the front page is their size "00" Thor electric drill, equipped with new Bristol grip handle at work on a motor truck frame. Other tools illustrated are the No. 2 extension screw-driver attachment, special spindle and gear case, and No. 3 short screw-driver attachment for use in limited space and No. 6 electric portable grinder. The various different sizes of tools are shown and described, giving their capacities, etc. The circular is just off the press and is ready for immediate distribution.

Mussens, Limited, Montreal and Toronto, are giving to the trade some interesting literature, treating on the goods which they handle for the Barber-Greene Company of Aurora, Illinois, U.S.A. Among the illustrations are loading machines for removing refuse from the yard into a wagon without the use of a shovel, handling stone on road jobs; loading cars, feeding conveyors with coal and innumerable things which can be done by means of self-feeding bucket loaders. Other illustrations are drop-forged wrenches and "Crosby" bar splices or clips. The public is invited to send them their address and the literature will be mailed.

NEW FOUNDRY OF HENRY GIES, KITCHENER, ONT.

A model foundry in every respect is that which has just been put into commission by Henry Gies to replace the one which has for so many years supplied Kitchener with a large proportion of the castings required — a jobbing foundry pure and simple, but with all the appurtenances of a fully equipped manufactory.

The main building is a solid brick structure, 70 x 164 feet and 32 feet high. It is well lighted on all sides and from the roof. Large ventilators extend the entire length of the roof. The heating system is of the warm air blower type, with pipes overhead. The cupola is of the Collean type, and is bricked up to 42 inches inside diameter. Alongside of the charging floor and on the same level is a large dust-proof room containing the new Connersville positive blower, the heating and ventilating machinery, etc. Connecting the ground floor with the charging floor is the elevator—not of the dimensions usually seen, where the workman has to get on top of the barrow in order to go up with it—but big enough for a man and barrow to stand as they enter, and have plenty of room. There is also a complete lavatory and shower baths.

The core-making department is supplied with three ovens. A fair sized brick oven for large work, the small portable oven from the former shop, and a medium size steel oven with drawers of different depths to suit the requirements of the work for which it is intended. This oven was built by the E. J. Woodison Co. at their Toronto plant.

The crane equipment consists of an electric travelling crane which spans the entire centre bay, and built by The Niles-Bement-Pond Co., in addition to two powerful jib cranes built by the John C. Hepburn Company of Toronto. Artificial light will be provided by an electric system. Pits for heavy work and ladles big enough to pour the work, are also provided, the ladles being built by the Woodison Co.

Other features worthy of note are that nothing is out of doors but the pig iron; concrete houses, or enclosed bins of proper dimensions are provided for material. One bin holds enough molding sand of the ordinary heap variety to last all winter, another holds special sand, such as Albany, in one car lots. A small bin holds core sand, another cupola dauling. Two bins are provided for coke, so that one can always be in reserve. All material, such as core binder, facing, etc., are kept where they belong, and nothing ever has to be dug out from under something else.

Mr. Gies also has a modern machine shop, built previous to the new foundry, and this latest addition makes the plant one of Canada's most up-to-date institutions.

Mr. Gies, like most of Kitchener's manufacturers, is a self-made man, and while yet a comparatively young man, he has certainly set a pace worthy of emulation.

Kitchener As a City

Kitchener, while not a foundry centre, is certainly one of Canada's leading manufacturing cities. The specialties which are manufactured here seem to be those which are not manufactured elsewhere. Five large button factories turn out all the buttons which are made in Canada. One of the largest tire factories in the country is located here, in fact, most of the rubber goods which are made in Canada are made in this city. No less than 14 furniture factories are here. In boots and shoes Kitchener leads. Large tanneries are also numerous. Other lines include felt boots; white shirts; kid gloves; toys and innumerable lines frequently overlooked, but which all help to swell the grand total and make Kitchener a thriving hive of industry.

BOOMING PARIS FOUNDRY

The G. W. MacFarlane Engineering Limited, who have taken over the plant of the International Harvester Company at Paris, Ont., and who operated it during the days of the war as a munition plant, have gone entirely into the foundry business and are making a specialty of gray-iron and semi-steel castings of every description.

The foundry which was comparatively a new structure was equipped with a Colliau cupola of 15 ton capacity, but being built for agricultural work the crane equipment was inadequate. This has been reinforced by the the addition of a ten-ton electric travelling crane. A more suitable core oven than would be required in the former line has been installed. Pits for big work have been put in the floor and all told the shop is right up to date for the work which it is now to be used and the company is doing some good lines of casting. Chemical analysis of the metal used it recorded and any special brand of metal is used to order. The pattern shop is at the disposal of patrons.

The machine shop will no longer be operated by the MacFarlane Co., but is being taken over by an American concern, who will run it to its capacity on a line of work of interest to Canadians, announcement of which we hope to make in the near future. It is the intention of the MacFarlane Co. to build an extensive addition to the foundry during the coming year and devote their entire attention to this department, making a specialty of heavy and difficult castings, but refusing nothing which is worthy of consideration.

MY EXPERIENCE AS A WOULD-BE FOUNDRY FOREMAN

Anyone who has never had experience as a foundry foreman can not possibly have any conception of what he has missed. In fact he has missed so much that he is in no position to appreciate how really thankful he should be.

However it must be admitted that the young man who has no further ambition than to remain dormant on a journeyman's job is terribly deficient in self-esteem. My own experiences along these lines have been so extremely interesting to me that I have been forced to laugh about them myself on frequent occasions, and for that reason have thought that perhaps while not posing as humorous or funny, but on the contrary being of a very prosaic, staid disposition, I might, nevertheless, at least amuse others by relating them.

To begin with I served my apprenticeship in a little jobbing foundry which was owned and operated by my father, who I might say was a molder with no mean qualifications. From this it may be inferred that I was a privileged character, which in reality I was—coming and going as I pleased.

I made various trips to other shops threughout Canada and the United States, but always fetching up at home when there was nowhere else to go. The experience gained through these spasmodic jaunts added to the experience which I received at home doing such jobs as attending to the cupola and making cores and so on down the line, imbued me with a store of conceit which led me to believe that there was not much about a foundry with which I was not familiar.

However there came a day when my preordained programme destined that I should say goodbye to my old home town and seek a livelihood elsewhere, knowing this time that I had to make good, as I no longer had a haven to fall back on. Then came the crucial test. With all my good opinion of myself, was I capable of holding a real job? I began to fear that I was not. I had different positions offered me—some in the States and some in Canada, but being a good Canadian I decided to remain among my own, and forthwith selected as my future abode the thriving industrial city of Brantford. Brantford, at that time, boasted of a population of about eighteen thousand, and according to the usual method of accounting—six to a family—there should have been about three thousand families. But, alas! It was not so. There were about two thousand families of six and about six thousand extra or spare fellows. These poor fellows used to spend their evenings standing around in bunches on the street corners, looking at each other until about ten o'clock, when they would turn in for the night, and by half past ten a cannon might be fired down most any street without doing bodily harm to anyone, because there would be no one on the street to harm.

Next to Moscow, Brantford had probably more churches in proportion to its population than any other city in the world, and the inhabitants were of the class that when the vote was taken on local option and a majority of three-fifths was necessary to make it become law, it was carried, all but eleven measly little votes, so it will be seen that the population of Brantford was made up of an exceptionally righteous class of citizens.

As every one acquainted with Brantford knows, it is a city of foundries and practically every boy works at the foundry business. Now here was a city with a superabundance of the highest type of manhood which would have made excellent catches for the fair sex, had there been any of the fair sex to catch them.

Up the shore of the noble Grand River about seven miles was another thriving little borough, by the name of Paris. Here everything was entirely the reverse. The main industry of the town was a knitting mill, which in fact was the largest institution of its kind in Canada. I am not prepared to give exact figures as to how many hands were employed at this establishment, but if they had eight hundred, one hundred would be old and experienced men who had been in the business long enough to be holding such positions as foremen and experts of one kind or another, and would in all probability be heads of families. The other seven hundred would be girls. These girls all had to be of unblemished character, as one bad one would be like a bad peach in a basket—likely to contaminate the whole basket of peaches. Just think of it, hundreds of A1 girls and hundreds of fellows such as we have just pictured and seven miles of country road dividing them. It could not be expected that such a state of affairs could long endure. A bicycle works was started in Brantford which relieved the situation to some extent, by providing the means of lessening the seven mile difficulty and in course of time a trolley line was put into operation which improved matters to a much greater extent. Still all of this was only make-shift and as something real had to be done it was decided that a foundry would have to be started in Paris. Accordingly the proprietor of the mills hit upon the idea of instituting a stock company, consisting of his funds and a few names for fillers and launching into an enterprise known as the Paris Plow Company. A thoroughly modern plow shop was built and a plow maker of renown was imported along with a supply of operatives, and everything was in readiness to be put into full swing with one exception—they required a competent and efficient man to take charge of the foundry and with rare judgment they decided upon me.

I reported promptly at the office and had a lengthy interview with the manager, the result being that I was engaged at the handsome salary of three dollars per day with absolute authority over my department and in interference from anyone. I was shown through the foundry and learned that they had all the floors rammed up, but were afraid to take off a heat and they wanted me to come on at once.

Bright and early next morning I was on the job to put the cupola into commission and get the work poured off. The manager was there also, not in the office, but in the foundry. Of course he was not interfering with me or my work; he was just showing me how to proceed. Before putting up the bottom doors of the cupola he decided that we should try out the fan to see if it was properly speeded. It was set up in accordance with instructions from the makers, but he would take no chances. He had a pressure gauge on the wind pipe and he would have a certain stipulated pressure on that gauge or we would not attempt to run the cupola. By running the fan at the speed mentioned in the catalogue he did not seem to get any pressure on the gauge and he concluded that it was a lucky thing for him that he did not listen to my advice and make a try at it. In order to get off the heat it was decided that some of the machinery in the machine shop would have to be shut off so that we could borrow the pulleys until such time as we could have proper ones brought in. We were not able to make the alterations in time to pour off on that day, but we had a good early start for next day and I had the honor of lighting the fire for the first heat. Of course in the meantime we had put up the bottom doors and put on the coke and iron which made all the difference in the world with the pressure gauge when the blast was put on. Common sense should have dictated to the manager that it would, but common sense appeared to be the one thing which he lacked. However, we got the heat off all right. We had plenty of pressure on the gauge; in fact the gauge registered right up to the top and no telling how much further it would have gone if it had been of greater capacity. We had all the tuyere doors open and then had iron clean to the top of the stack and coming down like rain in the yard, but we got there just the same. Next day the pulleys were replaced as they were in the beginning. After we got the castings out and found that they were good, the manager came to me and explained that he was well satisfied, but that it would now be necessary to get to work and make some money out of the place, so he proceeded to start operations on this money-making plan of his. Not interfering with me or my work he pointed at one corner of the shop and said: "We will call this No. 1 floor,—Alex. you take this." Next, he says: "This will be No. 2,—Herbert you take this." And so he numbered off each floor and put a man on each of them until the men were used up. After this he turned to me and informed me that he had engaged a core-maker, who had not yet arrived, but that in the meantime I was to make what cores were required, after which I was to mold some things which he had laid out for me. On the fourth day he came to me and told me that he would be out of town for a while but that I should mold some plow shares for which he showed me the patterns and gave me to understand that they would have to be cast with the face down. I suggested that there would have to be some getting ready done first, to which suggestion he replied in a very stern voice that there would be no more getting ready but that getting the work out would be the only consideration. He then left me and I have never seen him since.

I wended my way back to Brantford that night and wrote to him advising him that we had parted company and that on pay day I would draw on them at the bank for my money. To this I received a rather waspy reply from the manager who seemed to be put out at my not liking his methods. True to my promise I drew on them at the bank but my draft was neither paid nor returned for over a week, when I learned that the directors had held a meeting and accepted my resignation and also asked the manager for his, so that they could both be accepted at the same time. This was done and we were both paid off—two birds killed with one stone—leaving two vacancies to be filled. Thus ended my first experience as a foundry foreman.

FORD MOTION PICTURES

The moving picture operators of the Ford Motor Company of Canada, Ltd., have just returned from an extensive tour of the Dominion.

Thousands of feet of interesting subjects, industrial, scenic, historical and scientific have been secured which will keep the laboratory men busy for months developing and assembling.

The itinerary of the operators took them from coast to coast, and into parts of the country seldom trodden by the foot of man.

The educational value of the work done by the company through the medium of these films has received very favorable comment in the press of late, and it was recently decided, owing to the gratifying reception given to these productions, to double the yearly output. The company will, therefore, release 26 complete subjects a year.

SAFETY AND EFFICIENCY FACTS AND FIGURES

By C. W. Price, Chicago.

As I understand it I am to place before the foundrymen, not the humanitarian side of the safety movement, but the safety movement from the standpoint of efficiency, from the standpoint of dollars and cents; and, in presenting this—what may sound like the cold side of the safety movement—I don't want to be understood as minimizing the humanitarian side of the movement. But, we have been talking about the humane aspects of this question for a hundred years. It may, possibly, be somewhat new and interesting to all of us to consider what this movement has come to mean from the standpoint of efficiency, from the standpoint of profits.

I remember while I was with the Industrial Commission of Wisconsin, one day I went to the Simmons Mfg. Co., the largest brass bed manufacturing plant in the world. Mr. Simmons, the president, is a young man about fifty, a live, successful business man. I had never met Mr. Simmons before, and as we sat there, talking, he turned to me and said this very significant thing. "Mr. Price, I believe the time is fast approaching when it will no longer be possible to work any of the great revolutionary economies in industry that were brought about with the invention of the steam engine, by the discovery of the application of electricity, and by the discovery of the process of making steel; I believe the next great field in economy in industry is in the conservation of the human equipment in our plants." Mr. Simmons has testified to the faith that is within him by making his plant one of the model plants of Wisconsin. For instance, they had a large foundry in which were employed some 550 men, pouring these little castings that join the rods on cheap bedsteads; the roof was very low and gas conditions were very serious. I know many times during the summer they would have half a dozen men prostrated from gas. They spent $43,000, raised the roof of that foundry to some 45 feet in height, made it a model from the standpoint of light and ventilation, one of the finest foundries I ever saw, they reduced the number of men from 550 to 450, and they so increased the efficiency of that foundry that they saved the $43,000 the first year. I think that is one of the finest examples of the efficiency of good sanitation that I have ever seen.

The Road To Ruin

Now, in my work as field secretary I am meeting general managers every day: I suppose I met 500 general managers in the plants of Wisconsin and spent from a half hour to two hours in their offices; and I want to say to you, gentlemen, that managers everywhere—and most of them are young men of fifty years of age or younger—are waking up to an appreciation of the value of the human equipment in their plants. I hear it every day; it is coming to be a commonplace. Manufacturers are waking up to a realization of the fact that any manufacturer who deliberately pursues a course that disregards the rights of his employes to live their lives, to preserve their limbs and health, to be contented and happy, whether he knows it or not, is pursuing a course that at last leads to loss and inefficiency.

I want to give you the figures that prove that statement—and most of them are very recent figures. First, I want to give one figure that came to my attention from the bureau of statistics at Washington, which is very significant. This report went on to say that in the United States right now there are 38,000,000 wage earners and out of that 38,000,000 wage earners every 12 months—every 365 days—there are 25,000 wage earners killed by industrial accidents; that is 83 wage earners killed every day; 83 killed yesterday, 83 will be killed to-day. I tried to picture the thing to myself the other day and make that 25,000 real to myself. I said, "Let's bury that 25,000, as they buried those poor soldier boys over in Europe, shoulder to shoulder, allowing about 2 feet per man, and see what it will come to." I took out my pencil and it figured 9 miles and a half—a trench 9 miles and a half long, and in the bottom of that trench a solid sidewalk of human bodies every year in the United States as the result of industrial accidents. And this report went on to say—an entirely new figure to me—that there are 700,000 wage earners that are so seriously injured that they lose over four weeks of time, 2333 each working day.

But I want to give the bright side of the picture, to show what has been done in reducing accidents, and the economic gain which has come out of the work along safety lines. The first company I want to give you is this: I was at Rochester the other day, and for a long time I have been aware that the Eastman Kodak Co. has been doing exceptionally fine work, but they refused to give me any figures as to what reductions they had made in accidents or what savings in money they had made. I met Mr. Robertson. He took out a sheet of paper from his desk, which was divided up into five sections, showing details of the accidents for five years; that report revealed the fact that during five years the Eastman Kodak Co. has reduced its accidents 80 per cent., as compared with its record prior to that time.

One Company's Record

Here is another interesting figure that came to my desk three months ago. I have been connected with the International Harvester Co. and it was my lot to be engaged with that company during the early days of safety work; and I was also employed as a department head in the old McCormick factory, and I know something of the old conditions. The Harvester company was the second company, I think, in the Middle West to take up safety work in a thorough-going manner. Here are the figures they gave me covering the last five years' experience: They have reduced deaths in their 23 plants 60 per cent.; and—keep in mind—those 23 plants include coal mines, iron mines, railroads, logging camps, all kinds of machine shops and woodworking shops. Included in the International Harvester Co. you have practically every kind of a hazard you have in the state of New York. They have reduced deaths 60 per cent., they have reduced the hours lost per man 61½ per cent., and they have cut the actual cost of compensation from 54 cents on a $100 payroll to 25 cents on a $100 payroll. If you will look it up I think you will find that that is about what a clothing store has to pay for liability insurance. So you have that great Harvester company, with all that hazard in those 23 plants, so reducing the cost of compensation that it costs them practically what it costs a clothing store to carry liability insurance. That one figure—25 cents—gentlemen, really indicates what that company has accomplished; and that figure, gentlemen, to me is one of the most significant figures which I have found, because that company more nearly represents the average hazard that you will find in all industries, and, therefore, represents what is possible. If the International Harvester Co. can do it, any company can do it.

Here is another instance—the Dodge Mfg. Co., which manufactures transmission machinery, representing an average hazard—just gave us these figures. They have reduced the cost of compensation and medical service, which includes the entire cost of accidents, from 50 cents on a $100 payroll to 7 cents on a $100 payroll. I don't know what the premium would be on a millinery shop, but I imagine it would be more than 7 cents. Think of it, a big machine shop and factory reducing the hazard to 7 cents on a $100 payroll!

As you know, the United States Steel Corp. has 25,000 men working in its mines and steel mills; it is probably the most hazardous industry in this country, and it was the pioneer in safety work. This great concern has done more to teach other manufacturers and has been more generous in its contribution toward the safety movement than any other corporation; and it is one of the leaders in safety work in getting results. They gave me this figure, using 1906 as a basis and comparing the years since 1906 down to the end of 1915 with the record in 1906. They have saved 14,967 human beings from either being killed or so seriously injured that they lost over 35 days time, as a direct result of their safety work. Now, I picture that to myself in this way: that would mean a city of a hundred thousand human beings—men, women and children—in which city the father of every family, the head of every home, had been saved from either death or serious injury since 1906. Now, do you think, ladies and gentlemen—that the United States Steel Corp. will ever go back to the old days? I want to say to you that safety is put on the map in that company so it won't blot off; safety is recognized in every one of the plants of that company as an indispensable part of the manufacturing organization; and the head of every department is expected to make a record on that just the same as he is expected to make a record on any other thing that makes for efficiency, absolutely.

The Spirit of Co-operation

I want to give you another figure: I spent five years in Wisconsin, and I am rather proud of Wisconsin, so you will pardon me if I brag a minute now. But the Wisconsin experience is significant, because it covers an entire state. If you are familiar with Wisconsin, you know there are large logging interests, large woodworking plants, and many large machine shops like the Allis-Chalmers and International Hardware Co., and steel plants. In the state of Wisconsin, in the last five years, the manufacturers have reduced the deaths 61 per cent., by actual record from the industrial commission's report. And here is a very interesting figure: During the year just before the industrial commission came into existence, according to the report of the old industrial commission, there were 365 manufacturers dragged into court and prosecuted for violation of the safety laws. During the first five years there hasn't been a single manufacturer prosecuted in the state of Wisconsin on account of violation of the safety laws. The figures reveal the fact that there has been a spirit of co-operation in Wisconsin among the representatives of labor, representatives of capital and the industrial commission.

Take it in machine accidents alone. The records of the industrial commission show that accidents happen at points where something in the way of a mechanical guard could have prevented them. By the installation of mechanical guards alone the number of accidents was cut in two in five years; that is, there are now one-half as many accidents on mechanical parts in Wisconsin as five years ago; that shows that some guarding has been done. For instance, in Milwaukee, in 1901, there were 22 accidents on elevators and six deaths; in 1915 there were two deaths on elevators, one of which was a suicide. This reduction was largely accomplished by the mechanical device.

I wish to give you one figure from the Kimberly-Clark Co. of Wisconsin. This was the first paper mill in the state to get started in safety work, some four years ago; and through their influence every paper mill in the state of Wisconsin is now doing good safety work. A few months ago I visited this company, and as I entered the door of one of the plants, I noticed a piece of paper on the wall, and I went up and read it and found this report: that in two of their mills during 12 months up to that time they had had just two accidents and neither of them cost compensation; that is, neither of them caused a disability of over seven days. The treasurer of this company stood up at a meeting of the papermen and said: "Gentlemen, if we had never prevented an accident in our company, the change in the attitude of the officers toward the men, and the change in the attitude of our workmen toward the company, which has resulted from the workmen's safety committees which have been organized in all our plants has more than paid us for every dollar we have invested."

Some Interesting Figures

Here is an interesting figure—you will notice I am sticking to my text and giving nothing but figures, and I am going to keep right on. The Chicago & Northwestern railroad appointed 600 workmen on its committees and these committees brought in 6,000 suggestions on danger points; and from that number all but 200 were considered good by the company and carried out. The Northwestern railroad during the first years reduced deaths of employees 6 per cent.; and so remarkable were the results, and so quickly were they realized, that every great railroad in the United States—starting with the experience of the Northwestern—has organized an accident department and is pushing safety vigorously, and is backing it with millions of money. Taking all of the rail roads in the United States during the last five years, they have reduced the numbers of passengers killed in wrecks 50 per cent.—just one-half as many passengers killed in wrecks as were killed five years ago, according to the official statement of the interstate commerce commission.

They have reduced the number of train operators—brakemen, engineers and conductors—killed 47 per cent. And here is a still more striking statement: During the year ending June 30, 1916, there were 325 railroads—that includes some of your big systems like the Pennsylvania, New York Central and Northwestern—there were 325 railroads with 162,000 miles of track, and carrying 485,000,000 passengers, that didn't kill a passenger in a wreck. Now, gentlemen, that is the most remarkable thing that has happened in the history of safety: and if there is any doubting in this audience—if there is any man that doubts the practicability of this safety movement—all he has got to do is to contemplate for a minute the significance of a movement which, within five years, can command the attention of the officers of every great railroad in the United States, and can gain their confidence so that they have backed the movement with millions of money, to appreciate what there is in this safety movement.

A little while ago I was in Omaha, and while there I visited the American Smelting & Refining Co., employing a thousand men, most of them humble Italians. I should say that this smelting plant is a little more hazardous than an ordinary foundry, and a little less hazardous than a steel plant; it is a hazardous plant. As I entered the door through which the men go to check in for work, I noticed a long blackboard, about 15 feet long and 6 feet high, which was divided into two sections. On one section was the record, month by month, of the accidents in 1915; on the other was the record, month by month, for 1916. That blackboard, gentlemen, revealed this remarkable result: They had reduced the actual number of hours lost by those thousand men 90 per cent; I mean they had just one-tenth the amount of time lost during the corresponding months in 1916 as in 1915, and they had reduced the deaths 100 per cent., and they had reduced the number of accidents 70 per cent. Any accident was tabulated as an accident if it caused a loss of over 24 hours of time. And here is a more remarkable statement than all. I was there on Oct. 27; if they ran four days more they would have gone through the month of October without a single man out of the thousand men being sufficiently injured to lose over 24 hours' time. I told them to write to me if they made the record. I got a letter a few days later saying that they made it. I have never seen anything like the pull-together spirit there was in that plant between the foremen and the workmen; the day I was there every foreman had his shoulder to the wheel and it seemed to me that every workman in that plant was vitally interested in making a record for his department. That experience to me was one of the most revealing and encouraging things I have seen in my eight years of safety work; and, Mr. Chairman, it revealed to me the possibilities there are in this safety movement when the head of every department puts his shoulder to the wheel in earnest and gets his workers with him.

Better Shipments.—Freight conditions at Buffalo have improved in the last few days. The Pennsylvania Railroad are undertaking to relieve the congestion of cars in its yards at Buffalo to provide a freer movement of coal. About 150 trainmen were brought into Buffalo from other points and are working in the yards. Coal shipments were reported to be coming into Ontario in fairly regular quantities by the Grand Trunk. On one day 159 cars of soft coal and 108 cars of hard coal were brought into Toronto.

CARE OF PATTERNS

By H. Bentley

The treatment usually accorded to patterns is far from what it should be, considering the time and money that are expended on them. In recent years some of the larger engineering works have paid particular attention to this department, but with the exception of these the methods usually adopted are very haphazard, so says the author in "Mechanical World." Possibly the explanation for this state of affairs is to be found in the fact that patterns, like drawings, are considered a necessary evil, and only a means to an end, and so expenses in connection with same are cut down to a minimum. The time and money that are wasted, and the annoyance that is caused, due to the bad handling and misplacement of patterns, have caused many a manager to think furiously. With the large works, where an elaborate system is in operation and a man has control of the patterns both in and out of the stores, we need not deal. But, obviously, when such a system is in vogue successfully in a large works, one can reasonably expect a less elaborate system to work satisfactorily in the smaller shop. The works which allows its patterns to be huddled together, large and small, cannot realize the wastage of time caused by this lack of system. If once the care and storage of the patterns were allocated to some responsible person, the saving effected would many times outweigh the extra cost involved.

Where the foundry is integral with the engineering works the consequences are perhaps not so serious as in the case of general iron foundries. At the present time, when castings are so difficult to obtain and patterns are being duplicated and sent all over the country to try to keep up with the requirements, one can readily understand the irritation and delay which are caused by an incomplete or a dilapidated pattern being despatched. The proper provisions for storing the patterns systematically are, of course, just as essential in the foundry as in the works. The usual practice is to maintain patterns at the foundry that are in constant use, while those that are only used occasionally may be returned to the works. It appears rather strange that many firms with excellent stores for finished parts consign their patterns to any dark old corner in the works. Proper care and attention to the patterns mean better and quicker work in the foundry, for dilapidated patterns usually produce unsatisfactory castings.

An Essential

One of the first essentials to a satisfactory system is, of course, a proper record of all patterns, and for this purpose a record book should be kept, with full particulars as to loose bosses, coreboxes, etc. This book should be divided into sections for the different types of machines that are manufactured, and some system of numbering adopted which allows of easy reference by person, telephone, or letter. The writer prefers the method which adopts an initial letter for the type of machine—say, A for lathe, B for drilling machine, C for planing machine—and where various sizes of these machines are built a figure should precede the letter—say, 1A for 6 in. centre lathe, 2A for 7 in., 3A for 8 in. centre lathe, etc., and simliarly with the other types of machines. The arrangement allows the type and size of machine to be quickly determined. Further, the separate patterns for each machine should have an individual number, which should follow the letter, and as far as possible the similar part in each machine should have the same number. For example, for 8 in. lathe parts the following system may be followed: Bed, A1, gap-piece, 3A2; large cabinet, 3A3; small cabinet, 3A4.

Brass figures can be obtained which can readily be fastened to the patterns, and each loose boss and corebox should have the numbers imprinted by metal letters and figures in an unmistakable manner. If proper supervision is made of the numbering, no difficulty should be found in allocating the proper pattern with bosses and coreboxes. The pattern-maker usually marks both loose pieces and coreboxes in such a way that no mistake will occur in fixing either the loose pieces or arranging the cores.

In addition to the proper identifying of the patterns, a simple plan of storing is necessary unless considerable time is to be wasted sorting through a mass of patterns. The writer is familiar with stores where provision is made for both the patterns that are in regular use as well as those which have been discarded, due to improved design, but which have to be occasionally utilized on account of renewals and breakdowns. The arrangement in each case is identical, the stores being divided into the two sections—up-to-date and out-of-date patterns. These sections are subdivided for the various types of machines. Each subdivision has the patterns arranged on the general principle of large patterns on the floor, medium-sized patterns on shelving, and the smallest patterns in lockers. This arrangement allows ready access to any of the patterns, and between the two main sections sufficient floor space is provided for the fitting together and laying out of any patterns prior to their being sent to the foundry. Similarly, sufficient space is provided to allow for the withdrawal of any pattern without upsetting the others. Pattern numbers should not be transferred from a discarded pattern to a new one, or trouble will result. New patterns should have new numbers.

Considerable Saving

The system is equally good for works or the foundry, and if the issue and care of the patterns are placed in the hands of a responsible person the consequent smooth working which is bound to follow will mean considerable saving in a year's time. If the pattern store is placed in the hands of a person whose only knowledge of them is that they are of wood, then failure will result. Immediate attention and overhaul of incoming and outgoing patterns are essential so that errors and omissions may be quickly rectified.

This arrangement is probably as simple as possible, and for this reason is to be recommended in preference to some of the more elaborate arrangements, which, while answering quite well in a large works, are too expensive to uphold in the smaller works. Printed sheets, with list of parts suitably arranged, facilitate the checking of patterns in and out.

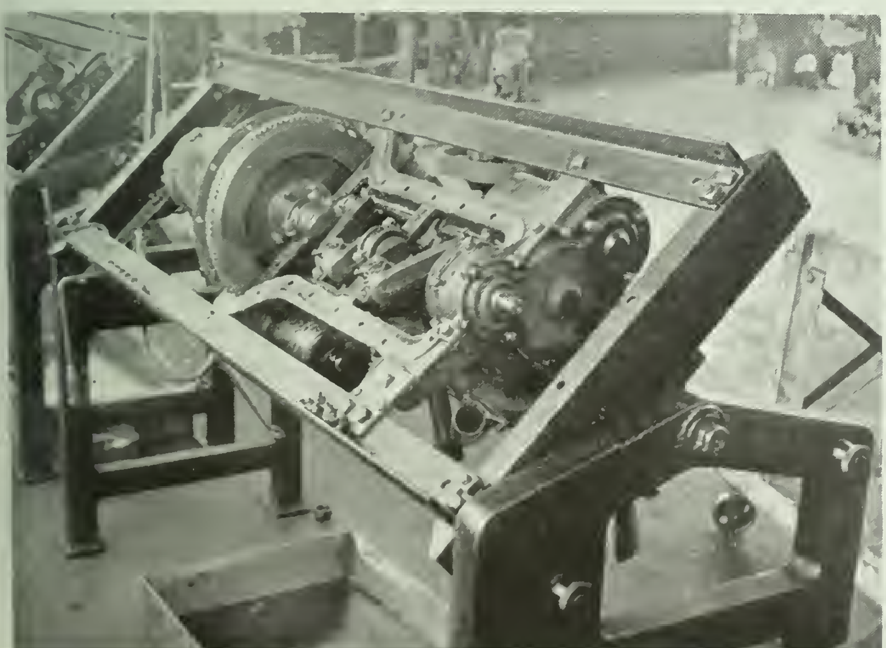


FIG. 5—THIS ADJUSTABLE STAND HAS PROVED ITSELF TO BE OF PARTICULAR VALUE.

Evolution of the Electric Brass Furnace

Electric Crucible Furnaces and Overhead Resister Furnaces Are Discussed in This Interesting Paper which Was Presented Before the American Electrochemical.

By H. M. ST. JOHN

AN electric furnace classification is based, as a rule, on the difference of method utilised for the application of heat to the material under treatment. In this case the species are three:

The induction or direct resistance furnace, in which heat is generated in the metal itself by virtue of its own resistance to the passage of an electric current.

The arc furnace, in which heat is generated between an electrode and the metal, or between independent electrodes, and transferred to the metal by conduction or radiation, direct or indirect.

The indirect resistance furnace, in which heat is transferred from an incandescent resistor to the metal by conduction or radiation, somewhat as in the arc furnace.

All of the electric furnaces so far proposed for melting brass naturally fall in one of these classes, or a combination of some two of them.

In the beginning the would-be inventor of an electric brass-melting furnace was obsessed by the idea that such a furnace should bear a close resemblance to the combustion furnaces then in use for that purpose. In the electric crucible furnace as in the fuel-fired crucible furnace, the heat must, in general, be generated at some point outside the crucible and transmitted to the metal through its walls. A favorite suggestion was to surround the crucible with an electric resistor of granular nature, which was heated to incandescence by the passage through it of a suitable electric current.

Most of these fundamental difficulties were obviated by using a resistor which surrounded the crucible but did not come in contact with it. In this way the heat generated in the resistor was first transmitted to the crucible by radiation, and, finally, by conduction through the walls of the crucible to the metal.

To the writer's knowledge, the only furnace of this type which was ever operated with any degree of technical success was equipped with wall resistors of thin carbon slabs, provided with means of variably adjusting the contact pressure between the slabs. The generation of heat in this furnace depended, not on the resistance of the carbon itself, but in the contact resistance between the slabs which could be varied at will in such a way as to provide an excellent means of controlling the current and voltage, and thus the rate of power input. Despite its good qualities, it was soon apparent that this furnace could never be commercially successful. Its maintenance cost, both for carbon electrical parts and refractories, was a serious handicap, but more serious still was the fact that its thermal efficiency was inherently and irremediably low.

The latest proposal to melt brass in an electric crucible is one which has recently been very thoroughly described and discussed, in which the metal within the crucible is heated by a high-tension, high-frequency induction or eddy current. The walls of the crucible itself are electrically conducting and serve to heat its contents during the period while the metal is still solid and in pieces not in good electrical contact with each other. Most of the disadvantages already described as characteristic of the crucible furnace have been overcome in this design. This new type has, however, so far been built in sizes more suitable for the laboratory than the foundry.

The low thermal efficiency of crucible furnaces heated from without naturally suggested the possibility of utilizing the walls of the crucible itself as a resistor. This principle was tried out quite thoroughly rather early in the development of electric furnaces for melting brass. In one type the crucible was built of a special mixture with suitable electrical conductivity, but no attempt was made to insulate the walls of the crucible from the metal which it contained. In another design this feature was taken care of by means of special insulating lining separating the conducting walls from the metal. It proved almost impossible, however, to maintain this insulating layer, and short circuits invariably resulted.

Overhead Resistor Furnaces

Not all, even of the early experimenters, limited their attention to the crucible furnace. The advanages of a larger furnace capacity and the elimination of crucibles were sufficiently obvious, and had already resulted in a considerable use of various types of direct-flame oil and gas furnaces. The earliest attempts to melt brass electrically in a furnace of this sort made use of an incandescent resistor supported above the bath and radiating heat directly to the metal. This construction, applied to an open-hearth furnace of small capacity, gave rapid melting and a fairly high thermal efficiency. The principal difficulties were two; the development of a resistor which would stand up continuously under the required conditions without an excessive maintenance cost, and the invention of some reliable method for supporting the resistor in the desired position over the bath. Neither of these basic problems has ever been adequately solved.

The difficulties which interfere with the use of an overhead resistor are partially avoided if the resistor is located above the bath, but at either side or surrounding the central portion of the melting chamber. One well-known type of furnace now in commercial use employs this principle, utilizing for the purpose a granular resistor contained in a nearly circular refractory trough. This trough is exposed to very severe usage, since the resistor temperature must be much above that of the molten metal. The roof also is at a temperature considerably in excess of that of the metal, and must be highly refractory. Another type of furnace which is in somewhat limited commercial use employs a combination of granular resistor and smothered arcs at either end of the melting chamber. In this type also most of the heat must first be radiated to the roof and then to the metal.

A high thermal efficiency was early recognized by investigators in this field as an absolutely essential qualification for the permanently successful electric brass-melting furnace. It semed obvious that if some practical method could be devised for generating heat in the metal itself, conditions most favourable for a high efficiency would be produced. The celebrated pinch-effect phenomenon is too well known and has been too often discussed to require definition here. The pinch-effect can be utilised to increase substantially the electrical resistance of molten brass through which a heavy electric current is flowing. This was done with considerable success in designing the first practical direct-resistance furnace for brass. It has recently been proposed to change the construction of this furnace in such a way as to eliminate the massive metallic electrodes.

The elimination of electrodes from the design of the direct-resistance furnace was evidently of the highest importance. This was done in a somewhat later type of furnace by constructing it as a vertical-ring induction furnace with the resistor channels jointed at the bottom to form a complete circuit for the passage of electric current. The limitations of the vertical-ring induction furnace are due, first of all, to the fact that it is an induction furnace, and, as such, cannot be constructed in large sizes without introducing electrical disadvantages such as low power factor

Furnaces of the Arc Type

The widespread success of the arc furnaces in the melting of steel was not overlooked by those more particularly interested in the brass industry. Many attempts were made to apply both direct and indirect arc furnaces directly to the melting of brass, without changing the design which had been found most suitable for steel melting. These attempts were pretty uniformly unsuccessful, because copper and its alloys—particularly the high-zinc alloys—suffered under the direct application of such a high temperature heat source as the electric arc.

A great deal of study was devoted to the discovery of some method which would make possible the utilisation of t good features of the electric arc for brass melting. The direct type of arc furnace was evidently out of the question. In the indirect arc furnace, overheating was less localised. It seemed probable that if the metal could be stirred with sufficient vigour, the entire bath could be maintained at a uniform temperature, and tendency toward local overheating could be entirely neutralised. It was found by experiment that rocking the furnace mechanically, at the rate of approximately two oscillations per minute, resulted in a degree of agitation ample to maintain complete uniformity of temperature throughout the molten bath, and that the obvious advantages of the arc furnace could be utilised in this way without the slightest injury to the metal, even in the case of alloys containing 40% or more of zinc.

The so-called rocking electric furnace resulted from this development and is in wide commercial use at the present time for melting all classes of copper alloys, as well as copper itself. As in the induction furnace, the vigorous stirring of the metal results in a uniformity of temperature and of composition throughout the alloy, a feature which is of particular importance in the melting of high-lead alloys.

The pronounced success of the rocking type of arc furnace has prompted many suggestions for modified designs, similar to it in principle but differing from it in details of construction. For example, it has been proposed to rotate the furnace body instead of merely oscillating it.

The evolution of the electric brass furnace has now proceeded to such a point that fundamental improvements in design are henceforth likely to be rather slow to materialise. There will, of course, be constant progress in the development of refinements in mechanical and electrical design, calculated to make the furnaces more reliable, more durable, and more nearly foolproof than they are at present.

This brings us to a brief consideration of what the brass-foundryman can expect and ought to realise from the use of electric furnaces.

The first and probably the most important point is the saving of metal—commonly wasted during the melting process—which electric melting makes possible. If the charge to be melted consists of new metal or clean scrap, the net metallic loss during melting and pouring from the furnace should not exceed 1 per cent. for yellow brass and 0.5 per cent. with red brass. With clean yellow brass, containing 40 per cent. of zinc, losses as low as 0.75 to 0.85 per cent. have been experienced as an average for a considerable tonnage of metal melted. In melting a scrap charge containing a high percentage of non-metallic, such as oily borings, chips, grindings, etc., the net loss should not exceed 2 per cent.

It is also true that the furnace which melts without agitation is not particularly well suited for melting a charge which contains a high percentage of finely divided, dirty scrap, while these can be handled without difficulty in either induction or rocking arc furnaces. Brass melted in the electric furnace is practically free from metallic-oxide drosses and has no opportunity to pick up sulphur or other contamination from combustion gases.

The consumption of electricity energy under average conditions of 8 to 10-hour operation is as low as 240 kw.-hours per net ton for yellow brass, and 275 kw.-hours per ton for red brass, in the induction or arc furnaces. In 24-hour operation figures as low as 200 kw.-hours per ton or less have been obtained. Less efficient furnace types use from 400 to 500 kw.-hours per ton, depending upon conditions.

Flexibility, which in this case may be defined as the suitability of a furnace for radical changes in operating conditions or for an abrupt change in the composition of the alloy to be melted, is a marked characteristic of the resistance and rocking arc furnaces, which is notably lacking in the induction furnace.

The net melting cost, considering all factors which should properly be considered under this head, is naturally lower in those furnace types which melt the metal most rapidly and efficiently, since their use of electric energy is more economical and their higher rate of production reduces the fixed charges per ton of metal melted. In many cases the cost of electric melting is not more than half the cost of melting the same alloy in combustion furnaces. Even in the less efficient furnace type, electric melting is usually less costly than the older methods.

Electric brass melting can no longer properly be called "the coming thing." It has arived in a most convincing fashion, as is evidenced by its rapid adoption by the larger and more progressive rolling mills, foundries, and manufacturing establishments which use brass in large quantities.

ADJUSTABLE TAPER GAGE

The Knauel Tool Works of Rock Island, Ill., have brought out an adjustable gage that may be quickly set to any desired taper and locked in position. These gages are only made in the open size but will cover a wide range of taper work.

GRAPHITE IN CANADA

A report on graphite, just published by the Mines Branch of the Department of Mines, contains a wealth of information on the subject of this interesting and important mineral. The report is written by Mr. H. S. Spence, mining engineer of the department, and treats of the properties, occurrence, distribution, mining, and uses of graphite in a most comprehensive manner. Interesting information is given on the present status of the graphite industry in Canada, and on the outlook for the industry as it is likely to be affected by foreign competition.

The report points out that Canada possesses deposits of flake graphite superior in richness and quality of flake to any on the American continent. What is probably the largest and richest deposit of flake graphite known in the world occurs in Ontario, and is worked by the Black Donald Graphite Company of Calabogie. Difficulties of concentrating and refining the graphite, however, have long hampered operators and have mitigated against the establishment of a flourishing industry. Quite recently these difficulties have been overcome by the employment of the oil-flotation system of ore concentration, which yields far better results than were obtainable by the old methods, both in the richness in carbon of the concentrates made and in the amount of graphite recoverable from the ore treated. Several Canadian mills have now been equipped with the above flotation process and are producing refined graphite equal, if not superior, to the best graphite on the market.

Crucibles used in the melting of steel and alloys consume a large proportion of the graphite produced, and other important uses are in lubricants, paints, foundry facing, pencils, stove polishes, dry batteries, dynamo and motor commutator brushes, electrodes, and boiler scale preventives. In all, about 50 different uses of graphite are listed in the report, which, in addition, gives much interesting information on the methods of manufacture of a number of the more important graphite products. The report consists of about 200 pages, and is profusely illustrated with photographs, drawings, and maps. Copies may be obtained by application to the Director, Mines Branch, Department of Mines, Ottawa.

SMOTHER THE FIRE

Ammonia generates a heavy vapor that tends to seek the floor. In case of a gasoline fire this vapor settles on the flames, keeping off the air and smothering the fire. A good-sized bottle of ammonia hung from the roof of the private garage by a light but strong string makes no mean fire extinguisher. The principle is that the flames burn the string, letting the bottle fall and break on the cement floor, when the ammonia vapor spreads and tends to smother or at least check the fire.

CAL. FORD OWNER.

Extending Canada's Trade to Every Harbor

Development of Canadian Marine is Proceeding on a Profitable Basis—Ships Are Now Sailing from Canada to Many Points—Equipment and Service of a Very High Order.

ALTHOUGH Canada has come into the world view in maritime matters of recent years, many of her people, far removed from the sea board, are but dimly aware of her position in this respect. As a means of putting first hand information on the activities of the Government marine before these people, a party of press representatives from Toronto, Hamilton, Ottawa, London, Quebec, and Montreal were entertained to luncheon on board the "Canadian Victor," the latest acquisition to the fleet. The party travelled over Government-owned lines from their respective towns to Montreal, where the vessel was loading for Liverpool at Pier 12, Montreal. The Toronto and Hamilton representatives travelled via Napanee, Smiths Falls and Ottawa over the C.P.R., transferring to the Grand Trunk at Ottawa for the remainder of the journey to Montreal. The trip to Ottawa was made by daylight, and the scenic beauties of the route were much enjoyed by the newspaper men. The portion of the route through the Rideau chain of lakes is especially beautiful, and the excellence of the road bed contributed materially to the pleasure of the trip. The train at times made considerably over 60 miles an hour, and there was no evidence of the usual bumping and swinging which so often accompanies railroad travelling on the roads of this country. Montreal was reached about 11 p.m.

Luncheon on Board

Luncheon on board the "Canadian Victor" was set for 1.30 p.m. on Tuesday, August 21st, and at that hour a deeply interested company gathered around the table in the smoke room. Yes, the "Canadian Victor" has a smoke room in her accommodation, which is far in advance of that on any cargo steamer the writer has so far run across. The head of the table was taken by Captain Coffin, master of the vessel, while facing him at the other end was Mr. R. B. Teakle, manager of the Canadian Government Merchant Marine, who had on his right Mr. M. P. Fennell, secretary of the Montreal Harbor Commission and on his left Capt. S. E. Tedford, marine superintendent of the C.G.M.M. Besides the representatives of the press, there were present Captain Bourassa, Harbor Master of Montreal, Captain Bales, Port Warden of Montreal, Mr. H. Milburn, assistant manager of the C.G.M.M., Mr. H. J. Whiteside, publicity agent of the C.N.R., and Mr. Walter Thompson, publicity agent of the G.T.R. During the luncheon, the subdued clatter of the winches rapidly lowering the cargo into the holds formed a bass accompaniment to the hum of conversation and served to remind one that this was no pleasure ship, but a busy commerce carrier, carrying Canada's goods and Canada's flag to the far confines of the Empire.

Mr. R. B. Teakle, in a post-prandial speech, gave a highly interesting and closeup view of the attainments of the C.G.M.M. from its inception to the present day, and the achievements that are aimed at for the future. Mr. Teakle's speech impressed one as that of a man who knew his subject thoroughly and was imbued with a very warm enthusiasm for the project he had under his charge. In fact, every official of the C.G.M.M. one meets seems to be infected with this same spirit.

Started After the War

Mr. Teakle spoke of the inception of the fleet, which was really started in order to keep the shipyards, then concluding their Imperial Munitions Board contracts, employed for a further period. The world shortage of shipping induced the Government to increase their earlier orders, and then the vision of what such a fleet might mean to Canada decided them to bring the fleet up to its present dimensions. The "Canadian Victor" was the 38th ship to be delivered, and brought the total tonnage now in commission up to 203,000 tons. There were 28 more steamers to be delivered, which would make a total of 400,000 tons dead weight and a fleet of 66 steamers. A fleet of this size was a very respectable one for any company to own. The first vessel to sail was the "Canadian Voyageur," a product of the same firm that had built the "Canadian Victor," the Canadian-Vickers, Ltd. At the end of 1919, the total tonnage in commission was 93,900 tons. The fleet when all are delivered will virtually girdle the earth, services being established to every part of the world. Close by the "Canadian Victor" the "Canadian Pioneer" was loading for Bombay, Calcutta and Kurrachee, while from the British Columbia coast the "Canadian Importer" and "Canadian Exporter" had inaugurated a service to Australia and New Zealand, Hong Kong, Shanghai and Japan, and the Dutch East Indies will have services and the Canadian vessels from the Pacific coast will meet in far Eastern ports with Canadian vessels from the Atlantic coast, thus forming virtually a girdle of the globe.

ONE OF THE CANADIAN MARINE VESSELS

Training Canadian Officers

Not only were these vessels Canadian built, but they were 80 per cent. Canadian manned. In order to provide future officers from the youth of Canada every steamer carried two apprentices, selected from various towns in Canada. Mr. Teakle was one of the originators of the Navy League and through this organization many of the boys were supplied. These apprentices, after four years' service, would be eligible to sit for examination as junior officers, and then climb up the ladder in the usual way, until they attained the highest position attainable at sea. The "Canadian Victor" was the first of the Government vessels to be fitted with a cold storage hold, and some of the future vessels would probably be equipped with oil fuel. Speaking of the organization, of the fleets, Mr. Teakle mentioned that they had as Australian manager, Mr. Geo. E. Bunting, a Canadian of long experience and training in the shipping business, while in London, England they were represented by Mr. Wm. Phillips, also a Canadian. The ships we run in exactly the same manner as the large English companies ran their ships In fact in some ways they were run better, and he instanced cases where Canadian Government ships were turned round in four or five days, while old country ships in the same ports took ten or fourteen. They handled in the port of Montreal as many as six or seven ships a week, and they came and went quietly with no fuss, but with full holds. So far the ships had been run at a handsome profit. It had been said, and there was some truth in it, that even if the vessels were run at a loss they would be of value to the country. However, that was not the view that he and his assistants took of it, and they were running them as a business organization, to make a profit for the owners, who were the people of Canada.

At the conclusion of his speech, Mr. Teakle was thanked very heartily, and congratulated on his clear exposition of the purpose of the C.G.M.M.

The "Canadian Victor"

Following Mr. Teakle's speech, the company were taken on a tour of inspection of the vessel, and the various features pointed out by the officers in charge. As before mentioned, the accommodation for all hands is very much above the average to be found in a cargo steamer, and there is in addition accommodation for eight passengers, should there be need at any time to carry someone from port to port. The men's accommodation under the poop is spacious and considerably better than used to be provided for third class passengers up till quite recently. The poop deck itself is long and spacious and makes an excellent promenade deck.

The facilities for handling cargo are very good, there being four winches at each hatch, besides one on the poop, and the anchor windlass on the fo'c's'le head. The steering engine is located in the poop, and is operated by telemotor gear from the wheel-house on the bridge. Hand gear is fitted in case of emergency and a powerful brake is fitted that can hold the rudder stationary in case of a breakdown of any part of the gear.

The vessel's leading dimensions are: 400 feet long by 52 feet beam and 32 feet deep, while her deadweight tonnage is 8,432. She has triple expansion engines, with the contraflo type condenser, the air pump and bilge pumps only being operated off the h.p. cylinder. A winch condenser is fitted for port use. The main feed pumps are independent, made by the well known G. & J. Weir, of Glasgow. There is also a Lamont pump. The circulating pump is of the centrifugal type. There are three boilers of the Scotch marine type, with three furnaces in each, operated under the Howden system of forced draught. Mr. McGregor, the chief engineer, had two vessels blown up under him during the war, but looks none the worse for his unpleasant experiences.

Canadian-made Goods

Going through the sheds afterwards under the guidance of Capt. Tedford, it was highly impressive to observe Canadian-made autos in huge crates consigned to India, and even Arabia. Those were part of the cargo of the "Canadian Pioneer," which was loading for these ports. At another shed was observed the "Canadian Observer," loading for Newfoundland and Gulf ports, while at another wharf the Canadian Government steamers have been the means of bringing 8,000 tons of Cuban sugar to Montreal, which otherwise would have been difficult to get. Captain Tedford becomes enthusiastic when speaking of the steamers of the fleet and claims that there is no line of ships that can show better operation than the C.G.M.M. He wants the funnel of the line to carry a maple leaf to distinguish them, and let everyone who sees them know that there is a Canadian ship. He rightly contends that there is no better advertisement for Canada than a Canadian ship in every port of the world.

A Little "Extra" Work

Despite the work of looking after a fleet, Captain Tedford is ready for any special duty that comes along. Quite as a matter of course he mentioned that he had lately returned from a little salvage operation on the coast of the St. Lawrence. The steamer J. E. McKee went ashore on the rocks at the mouth of the Saguenay River in a thick fog, and at high tide. A vessel going ashore at this place under these conditions usually stays there. and most people thought that the McKee would. However, Captain Tedford thought she could be salved and proceeded to salve her. They left Quebec for the scene of the wreck in the afternoon and arrived at 2 o'clock the following afternoon, which was a Saturday. At 2 o'clock Sunday the vessel was afloat, after a portion of her cargo had been discharged. Her propeller was gone and her rudder badly damaged but she was towed into Quebec three days after the expedition started. This was a highly successful and expeditious salvage feat, for which Capt. Tedford came in for many congratulations.

Canada possesses an organization in her merchant fleet which is a distinct asset to the country. It is carrying her flag to countries which have hardly heard of her, and incidentally opening up trade routes for her manufacturers. The company, for it is a company, is to be congratulated on the men it has secured to organize and operate the fleet. The fleet is Canadian-built and 80 per cent. Canadian manned. May it soon be 100 per cent. Canadian and 100 per cent. successful.

Mr. H. J. Whiteside, of the Canadian National Rys., and Mr. Walter Thompson, of the Grand Trunk Ry., were responsible for the guidance and comfort of the party, and were tireless in their efforts for the well being of their guests.

DEFECTIVE ALUMINUM ALLOY CASTINGS

Ten per cent. of the light aluminum alloy castings made in the United States in 1919 were defective, according to a report which has been compiled by the Bureau of Mines. The monetary loss caused by scrapping the defective castings is estimated by the bureau at $1,125,000. The total castings recorded in the statistics of the bureau is 90,000,000 lb., and its experts have figured that it cost 12½c per lb. to scrap the castings which were not usable. "The investigation made by the bureau," says the report, "warrants the advice that this loss could be reduced by 50 per cent. at an approximate saving of about $600,000. The highest average losses found by the bureau were in the manufacture of automotive castings, with vacuum cleaner parts second, and cooking utensils third.

"About 97 per cent. of the output of sand castings," continues the report, "is poured from an alloy containing about 92 per cent. aluminum and 8 per cent. copper, known in the trade as No. 12 alloy. The rest of the output is cast from various alloys including different kinds of binary aluminum-copper alloys, aluminum, magnesium alloys, and aluminum-zinc alloys and ternary aluminum-copper-manganese alloys, and aluminum-copper-tin-alloys, aluminum-copper-zinc alloys, and aluminum-manganese-zinc alloys. Also some exceedingly complex alloys are cast, but these make a small percentage of the total output.

"In founding any kind of castings," says Robert J. Anderson, who compiled the report, "even with the best practice, scrap castings are produced because of rejections for certain defects. Casting losses are a serious source of financial loss in iron and steel foundry practice as well as in brass and bronze, but they are particularly serious in aluminum-foundry work because of the high value of aluminum. The indications are that in many aluminum foundries, in the United States, the casting losses are at times high, and in some plants they are entirely too high when compared with average practice. Of course defective castings have a residual value for remelting, but if much machine work has been done on a casting before it is scrapped, the labor costs alone may exceed the cost of the metal and even that of the rough casting.

"During the war, losses in the production of light aluminum-alloy sand castings for the Liberty, Hispano-Suiza, Curtiss, and other aircraft engines were uniformly high, particularly in the founding of crankcases and oil pans. The chemical and physical requirements for aluminum-alloy aircraft castings were not difficult to meet, but the rigid inspection and salvage specifications caused losses which were much higher than those usually experienced in the manufacture of commercial automotive castings. Rejections of crankcases and oil pans for the Liberty motor were as high as 50 per cent. in some large foundries, with an indicated average casting loss of about 30 per cent. for all plants.

"In the production of light aluminum alloy castings to meet the rigid specifications, higher losses must be expected than where no specifications, or only lax ones, are in force. Some of the difficulties in connection with the manufacture of aircraft castings during the war arose from labour troubles, lack of competent molders, lax supervision, and the general stress of the times, but many of the defects in rejected castings were traced to avoidable causes which in turn were the result of inadequate supervision."—O.F.S.

FOUNDRY VS. MACHINE SHOP

Machine tools are made for a wide variety of uses under a variety of conditions. The crane, for instance, is made for service in the engine room, where its operating conditions are as far removed from the ideal as is possible to be conceived. By way of contrast let us consider the machine shop as opposed to the foundry in the light of working places in which tools are to operate. The machine shop is arranged in orderly manner, the grouping and spacing of machines has received careful study. The routing of material is reduced to an exact science. The morale of the working force has been stimulated and is kept at a high point by means of schedules to be maintained and record of production to be pushed as high as possible.

When we step into what unhappily is true of the majority of foundries, logical arrangement of the shop is lacking. Working conditions are bad. It is either too hot or too cold. It is always too dirty and always poorly lighted. These conditions are naturally reflected in the attitude of the men toward their work.

The machine introduced in such surroundings is operating under a severe handicap and cannot be expected to show satisfactory results. It is a well known fact that many foundrymen who install molding machines in their plants will employ only unskilled labor. These men have never worked in a foundry before and therefore can start in at once to absorb the spirit of quantity and quality production without first having to undo their attitude of carelessness and indifference forced upon them by unfortunate circumstances. In a great many cases no attempt is made to impress upon these men that the proper care of the machinery intrusted to their charge is just as important in the eyes of the management as maximum production. The foundry is an older institution than the machine shop and in the natural order of things, should be able to show a greater improvement in processes and methods. There has been more time for improvement but apparently the time has not been taken advantage of as it might have been. The reasons underlying these conditions in our foundries should interest us because they are conditions confronting us every day, crippling our efforts and retarding production. It is the task of us in whose hands the foundry industrial problems are placed for solution to see that an active policy of increasing the mechanical and human efficiency of our individual shops is introduced and encouraged. In this way we shall benefit not only ourselves but as a result of collective effort, the nation as a whole. Increased efficiency, gained through an intelligent application of the many forms of mechanical equipment available will also reduce the amount of human energy required to secure a largely increased production and the workman will be in better shape to enjoy life either while at his work or away from it.

Apart altogether from humanitarian motives and considered strictly as a business proposition, it is well to remember that the primary motive for installing mechanical equipment in a foundry is because such equipment is classed, and rightly so, as a labor saving measure; in other words each piece of machinery installed increases the productive power of the man who operates it. With the increasing scarcity of labor and an ever mounting demand for foundry products it is essential to the successful conduct of a business that every facility furnished should be utilized to its fullest capacity.

Anything which prevents the mechanical device from functioning properly interferes to a greater extent with the sequence of operations and delays production in a greater corresponding degree than where no such system is provided.

THE FOUNDRY IS A POOR ENGINE-ROOM

Shut your eyes and visualize the last engine room which you have been in or the one with which you are the most familiar. Every detail of the room has been decided upon with a view to obtaining the best working conditions for the engine. Foundations, the temperature of the room, cleanliness of the air, all of these matters give constant indication that the machines located in this room receive the best of care and attention. This impression is confirmed by the engineer, an expert in his line, always ready to administer to the needs of his machines, and by the oiler, who constantly goes up and down the room guarding the brightness of his polished surfaces and looking for the least sign of dirt or trouble.

Now by way of contrast visualize the conditions under which the crane in your foundry operates. The track supports were originally aligned, each one carrying its share of the load. Have they been checked up within the last few years. The intense heat from a large ladle is concentrated on it for a short time and then removed only to be applied again and again. The air around a foundry crane seems to have for its chief function the carrying of as large a quantity of dirt as possible. The exposed, and frequently the unexposed, parts of a crane are covered with dirt, making inspection difficult and wear excessive. Crane manufacturers have to some extent taken care of this difficulty by liberality in design, but even this does not prevent breakdowns. Dirt and neglect are the two worst enemies of the machines. Foundry machines get far more than their share of both dirt and neglect. Of these two evils dirt is the worst because it is the cause of carelessness and neglect. Dirt in itself is a very poor lubricant. Hard steel will resist the wear of sand for a short time, but softer metals, such as those use in shafts, bearings, pistons and cylinders, will begin to wear as soon as sand comes in contact with them. These facts may be verified by inspection of machines or by direct test. The illustration of the sand cutter shows it working under its normal condition, with the surrounding air full of dirt and dust. Particles of the sand heap are present in the air all around the machine and deposit a coating of dirt over the entire machine. If a dust storm should suddenly introduce this same condition in an engine room, no effort would be spared to clean all of the machines immediately.

It is a well known fact that machines in a foundry require more attention than machines in an engine room if they are to give the same service.

There is no valid reason why they should not give equally satisfactory service if they receive an adequate amount of attention. Owing to the fundamental difference in the operating conditions of the two installations, and also to a considerable extent to the training of the class of operatives involved, it becomes correspondingly necessary on the part of those in charge of foundry equipment to exercise eternal vigilance, and to lose no opportunity of impressing on the men who are brought into direct contact with the different pieces of machinery the necessity of keeping their machines as clean as the exigencies of the work will permit.

Mechanical equipment in the foundry requires more regular and frequent inspection than any other form of mechanical appliance if it is expected to operate at the highest point of efficiency and yield an adequate return on the investment.

REFRACTORY CEMENTS

By W. S. Quigley, New York

The title I have chosen for this brief paper is purposely selected to bring out a point with reference to high temperature cements on which there is some misapprehension. A refractory cement is not of itself just a refractory but bears its title from the fact that it is used as a binder for refractories. There is probably not a commodity used to-day by manufacturers in general that is as little understood or as much overrated as are high temperature cements.

In foundry circles there has been a great deal of educational work done during the past two or three years on the use of refractory cements, and while their successful application is well understood by many foundrymen there remains much information yet to be uncovered on the whole subject of their many and varied uses. Their use sprang up rapidly during the war owing to the necessity for using a material for bonding refractories which, by increasing the life of linings, would prevent shutdowns and by the use of which repairs to furnaces could be quickly made.

Four Classes of Bonding Materials

Bonding materials may be divided into four classes.

First we have fire clay, the primary function of which is to compensate for the inequalities of the bricks or shapes as a pliable refractory filler, and with which unduly thick joints generally are made. It has not binding strength of itself unless subjected to a vitrifying temperature. For the material itself there is no definite recognized standard or specification so that the user is dealing with a varying commodity. Furthermore, since heat is required for vitrification in order to obtain a bond, it is obvious that only a surface bond is obtained, as the required heat for vitrification will not penetrate the entire thickness of the wall. The result obtained may be likened to a vitrified shell with a weak structural backing. Furthermore, the shrinking of the fire clay, due to its own moisture and the combined water used in mixing it, causes a separation between the bricks or shapes in walls or arches, which frequently results in bulging walls or collapse of the whole structure.

Secondly we have coarse grades of mixed materials or so-called cements which also have no binding quality, depending upon heat or vitrification for a bond. Materials of this class must be made to bind or fuse at approximately the same temperature at which the furnaces are run, or no bond is effected, in other words, a cement which is good for a low temperature annealing furnace is not good for a high temperature forging furnace, or vice versa. Such mixtures are subject to the same surface bonding result as fire clay.

Thirdly, some cements in order to hold the component parts together depend upon a fibrous structure which shrinks and eventually loses its binding value as soon as subjected to any considerable degree of heat. Such cements must lose their effectiveness as the temperature increases.

An Ideal Cement

Finally, to be universal in its application, a cement should air set and not depend upon heat for creating the bond in order to form a union throughout the structure. It must be passed through a very fine mesh sieve so as not to contain coarse particles which would tend to create voids between the brick which it is used to bind. It should not shrink when subjected to heat. It should be a material which can be used as a binder with crushed fire brick, old crucibles, fire sand or fire clay, ganisters, and for making rammed-in linings, and doing repair work, hot or cold. And, furthermore, its composition should be such that it can be used in neat form for making small hot patches and repairs.

The principal essential of a refractory cement is that it should have at various temperatures the same co-efficient of expansion, as nearly as possible, as the materials with which it is used for bonding. Refractories themselves differ in expansion co-efficient, as in the case of fire-clay brick and silica brick, where the former has 0.075-inch and the latter 0.175-inch per foot at 2,200 degs. Fahr. Yet a cement with a co-efficient which lies between these two could be advantageously used with both refractories.

The difference in the cost between fire clay and high temperature cements must be justified by the difference in the results obtained.

WELDING CASTINGS OF DIFFERENT METALS AND DIFFERENT SECTIONS

By George B. Malone, Bayonne, N.J.

To be able to weld castings of different metals is one of the most important acomplishments a foundryman can possess to-day. A great many times it is possible to salvage an expensive casting by welding, which was unheard of a few years ago. During the war period welding came into use more than ever before, principally on account of the need for all types and classes of castings. Millions of pounds of castings were salvaged in this manner and were accepted by the government officials as being perfect in every particular. To illustrate this, in one of the large industrial plants the writer salvaged upwards of 2,000,000 pieces, the aggregate saving to the firm being $13,000 per week. A large number of foundrymen have yet to learn that castings can be salvaged by welding instead of consigning them to the scrap heap with resultant total loss.

A large pump concern with which the writer is very familiar would not accept the welding process until a few years ago. Instead, when a pump cylinder was slightly porous, they would send it out and insist that it be brazed. If the brazing concern was lucky enough to save this cylinder, it would be camouflaged by painting, etc., and forwarded to the customer. While this practice is very common, the writer wishes to say that brazing should not be employed except for minor repairs on castings. In the first place, upon microscopic examination, it will be noted that fine hair line cracks are easily discernible. All the time and labor that was spent in preparing the casting for brazing will be lost in a great many cases.

Well, Don't Braze

The proper way to prepare a cylinder casting, particularly, is to preheat it and then weld, not braze. In passing, in order to explain just what is meant by preheating intelligently, I might say that the temperature to which any piece should be preheated depends upon the metal of which it is made, its shape, size and the purpose of the preheating. To illustrate the differences in preheating temperatures, consider first a heavy piece of cast iron the shape of which should not produce any shrinkage strains when cooling, and on the other hand a light, complicated casting such as an automobile cylinder. In the first case it is very evident that the purpose of preheating is largely to save gas and labor and that the preheating can be carried to as high a temperature as a cherry red because there will be no danger from distortion or cracking. In the second case the conditions are entirely different. The preheating must not be carried to so high a degree as to warp the cylinder and still it must be carried high enough to permit contraction without cracking when cooling. In this case, of course, the amount of gas saved by preheating is very small. In the first case, the temperature may vary from 1,200 to 1,500 degress Fahr., while in the second case it should never exceed 800 degrees. In other cases, where the style or type of cylinder is quite simple, a low temperature is sufficient. The writer would suggest that instruments be used to measure the heat such as thermocouples. In welding hollow castings that might have small blow holes, such as water backs, radiator castings, etc., great care must be taken. It is very important that these castings should be preheated first. There are no special instructions that can be given in these cases other than that an intelligent welder use precaution.

Welding Large Steel Castings

Large steel castings may be welded where wear is not a factor without preheating, but it is preferable in all cases particularly where iron or steel castings lie in a damp place or where they are subjected to intense cold, that they be brought to the welding temperature slowly. The reason for this is, as soon as the welding torch is applied to a cold casting the chances for crystallization are good and not only will a poor weld result but in a great many cases the casting will be rendered unfit for use.

The salvage of small castings by the welding process is something that should be considered more by the foundryman than it is at the present time. It is a well known fact that certain foundries do figure a certain percentage of loss. This loss can be reduced to a minimum by the welding process, if the writer's advice is taken into consideration, and large savings in money are assured to the foundryman who will install welding equipment. In the writer's opinion, the foundryman who has not as yet installed a welding outfit is as far behind the times as the printer who is using an old-fashioned hand press.

Welding Nonferrous Castings

In the salvaging of brass and bronze castings by welding great care must be exercised. As an illustration of the need of care in welding brass and bronze the following incident, which took place in a plant where the writer was interested in the salvaging of castings for pistols to be used by the government in trench warfare, may be cited. All of the pistol grips were made of bronze. The need for the pistols at the time was very great. The maker was at his wit's end to know how to reclaim castings which were found to contain sand holes when received. The writer was consulted and upon a visit to the plant he found that the tool department, which had control of the welding outfits, was using Tobin-bronze rod in trying to salvage the pistol grips. When they were polished they showed a bright yellow, or in some cases a gold streak where the grip was welded. Of course the government inspector would not pass them, and hundreds were rejected. The writer immediately straightened out this difficulty by analysis; that is, he secured from a rolling mill a welding rod with a higher copper content than that in the metal constituting the grip casting itself, and after welding ten grips himself he had them forwarded to the polishing department and from there to the government inspector, who passed them without comment. The writer wishes to impress upon foundrymen at large that when it is necessary to weld, first consider the casting to be welded and then endeavor to secure a welding rod of an analysis similar to the casting. You will then find very little difficulty in salvaging castings and saving a great many dollars. This is particularly true in welding brass or bronze castings which may have to be polished and will show a different color at the weld.

Welding Monel Metal

A great many foundrymen have experienced difficulty in welding Monel-metal castings. Monel-metal castings are really not any harder to weld than the ordinary iron castings if the proper procedure is followed. The analysis of Monel metal shows a large nickel content and a nickel casting cannot be welded without preheating. On account of the combination of copper with the nickel in Monel metal it is easy to see that both must be brought to a rather high preheating temperature, say 1,600 degrees Fahr., before the weld is attempted. After the casting is welded it should be brought again to approximately 1,500 degrees and placed in hydrated lime in order to prevent any air getting access to it. Now this same principle applies to practically every type of casting.

The average foundryman will tell you than when the weld was made the casting looked first rate, but ten minutes afterward it was all cracked. The reason for this is that proper care was not taken with the casting after the weld was made. The casting should have been allowed to cool slowly and hydrated lime is the best substance that the writer is acquainted with for cooling castings slowly.

A NEW FILLING METAL

There are frequent calls for a filling material to repair cracks and small holes in very light castings, which cannot well be welded. Various methods have been used for this purpose, but the latest is in the nature of a metal having a very low fusion point, and a comparatively high tensile strength. The new metal is known by the name "Metaloid." The composition of the metal is a trade secret, but in appearance it is about the color of solder, but is remarkably light in weight, being of less specific gravity than aluminum. In making a repair, the casting is heated to a temperature of 200 degrees Fahrenheit, and the bar of "Metaloid" is rubbed over the part to be repaired. It adheres closely to the casting, and makes a strong and satisfactory repair. The "Metaloid" requires no heating, and it also provides a guide to the correct temperature of the casting. If the latter is too hot, the "Metaloid" will give off a blue flame when applied to it. If too cold, the "Metaloid" will not run at all, while at the correct temperature it flows quite readily with no sign of burning. Holes in castings have been filled, and the casting afterwards subjected to 300 lbs. per square inch water pressure, the "Metaloid" showing no signs of leakage. The new metal has been largely used in the repairing of crank cases and radiators of automobiles, and should be of great use in the general engineering field. At the present time it is being tested out by the engineering department of a large Canadian sulphite mill with a view to determine its acid resisting qualities.

"Metaloid" is handled in Canada by Messrs. Kennedy & Kennedy, Tyrrell Building, King Street E., Toronto.

BETTER THAN CASTING

The good that comes out of evil is illustrated by the fact that during the recent moulders' strike in Great Britain many engineering firms, unable to obtain castings, were stimulated to develop alternative methods of producing the parts they required. One large firm, for example, was in urgent need of large pipes, and it set to work to build up pipes of the required shape from steel plates by welding together suitably formed pieces. Excellent results were obtained, even with complicated shapes, the surface being as smooth as a fine casting. The expense proved to be much about the same as casting, but in the case of special work the labor and material involved in making patterns (which might never be used again) were saved.

CONDENSED ADVERTISEMENTS

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$51.00	
Lake Superior charcoal, Chicago	58.50	
Standard low phosphorus, Phila.	65.00	
Basic, Valley furnace	51.50	
Canadian Foundry Pig—		
	Mont.	Tor.
No. 1	59.00	60.00
No. 2	57.00	58.00

NEW METALS

	Mont.	Tor.
Lake copper	$25.00	$24.00
Electro copper	24.50	24.00
Casting copper	24.00	24.00
Tin	72.00	65.00
Zinc	12.00	12.00
Lead	11.50	11.00
Antimony	14.50	14.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$15.00	$14.00
Copper, crucible	18.00	18.00
Copper, heavy	18.00	18.00
Copper, wire	18.00	18.00
No. 1 mach. comp	16.00	17.00
New brass cuttings	11.00	11.75
Red brass cuttings	14.00	15.75
Yellow brass cuttings	9.00	9.50
Light brass	7.00	7.00
Medium brass	8.00	7.75
Scrap zinc	6.50	6.00
Heavy lead	7.50	7.75
Tea lead	4.50	5.00
Aluminum	19.00	20.00
	Per gross ton	
Heavy melting steel	20.00	18.00
Boiler plate	15.50	15.00
Axles (wrought iron)	30.00	28.00
Rails	23.00	22.00
Malleable scrap	26.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	12.00	12.00
Car wheels	33.00	....
Steel axles	25.00	21.00
Machine shop turnings	11.00	11.00
Stove Plate	26.50	25.00
Cast borings	14.00	14.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04
Acid, nitric	.11
Acid, sulphuric	.04
Ammonia, aqua	.15
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.14
Copper, carbonate, anhy.	.41
Copper, sulphate	.16
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.22
Potassium Sulphide (substitute)	.42
Silver chloride (per oz.)	1.30
Silver nitrate (per oz.)	1.25
Sodium bisulphate	.14
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite, per cwt.	8.00
Sodium phosphate	.15
Tin Chloride	.80
Zinc Chloride C.P.	.30
Zinc sulphate	.10

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.60
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.09
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09
Crocus composition	.12
Emery composition	.10
Rouge, silver	.60
Rouge, powder, nickel	.45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$42.50	$43.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	49.00	48.00
Copper sheet, tinned, 14x 60, 14-oz.	52.00	49.00
Copper sheet, planished, 16 oz. base	56.00	55.00
Braziers', in sheets, 6x4 base	48.00	46.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$11.50	$14.50
Sheets, 3½ lbs. sq. ft.	11.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	11.00	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 23	$12.00	$12.10
Sheets, black, No. 10	9.50	9.60
Can. plates, dull, 53 sheets	13.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	13.50	....
Fleur-de-Lis, 28 B.W.G.	13.00	....
Zinc sheets	16.50	20.00

BUSINESS GETTING DOWN TO NORMAL

With the Exception of Car Shortage the Pig Iron Business Has Assumed a State Where Orders Can be Filled

Toronto.—The scarcity of rolling stock is still a drawback to the trade, but beyond this it is quite possible to get prompt acceptance of pig iron orders for immediate delivery, and with the new rate allowed to the railroads the car shortage should grow less acute. Labor troubles are no longer a menace, but a high rate of pay is still required to sustain life, and any reduction in this quarter is not probable in the near future. But whether from the high rate of wages or the increased rate of freight, or from whatever cause, the price of pig iron has taken a sharp advance and is now hovering around the $60 mark.

While the railroad rates will undoubtedly be blamed for much of the increase, the general consensus of opinion is that if properly expended it will more than justify itself in the increased efficiency of the service. With proper transportation facilities and a reasonably prompt response from the furnace men, the foundries are facing a season of prosperity equal to any yet experienced.

The Coke Situation

The condition of the coke market has not yet assumed quite as normal a state as might be desired but is righting itself. Dissatisfaction at the mines in the United States makes stability impossible and shipments unsatisfactory.

Business in General

On the whole the situation is promising, and foundrymen, while only ordering supplies in small lots, are installing modern equipment and preparing to do business in a businesslike way. Improvised and make-shift appliances are no longer being tolerated. The foundry business which for so long has been looked upon as a necessary nuisance in connection with the plant, is now assuming its proper role and taking its proper place among the manufacturing industries of the country.

The American Markets

From Pittsburgh the report comes that shipments as well as production of pig iron increased in August as compared with July and the increase in merchant output was particularly sharp, being 6.7 per cent. The August rate of output was barely a shade under the rate last March, and otherwise was easily the heaviest rate shown by the merchant furnaces in a year and a half.

Insanity to Cover One More Sin

The House of Lords contemplates making insanity a cause for divorce. Hitherto it has only been recognized as a cause of marriage.

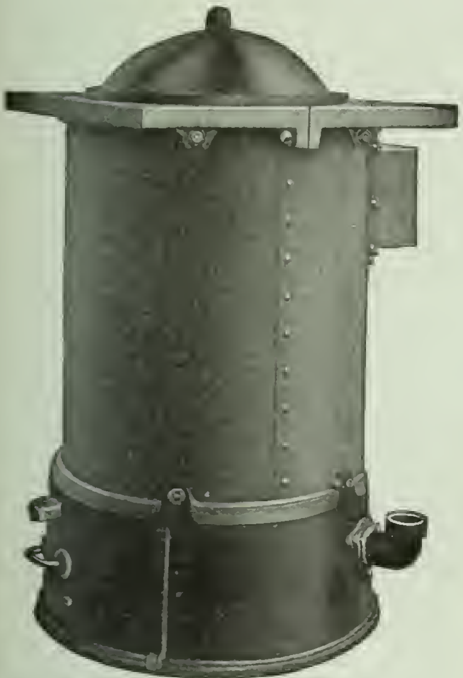
—London Opinion.

And Still Doing It

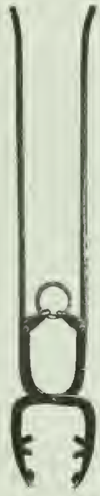
A man in Abingdon was fined by a magistrate for sleeping and snoring in church. Nothing was done to the clergyman for putting him to sleep.—Richmond Dispatch, May 17, 1870.

Brass Foundry Equipment

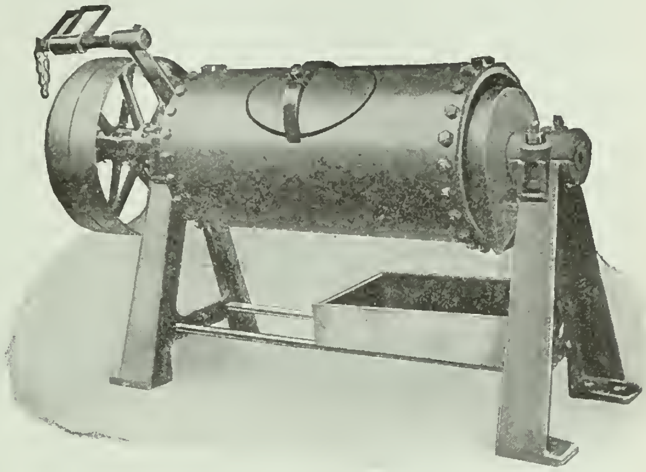
We are prepared to give complete estimates on the above. If interested, write us for prices and particulars.



The above are supplied in different sizes for forced or natural draft.



Crucible Tongs of all sizes.



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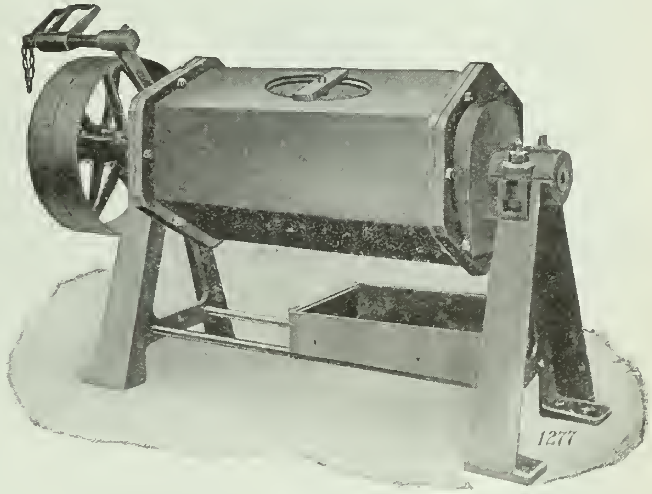
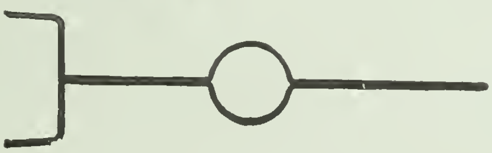


Wet or dry in two sizes same as above.



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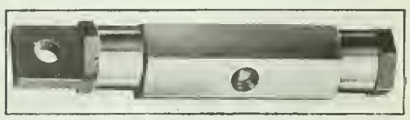

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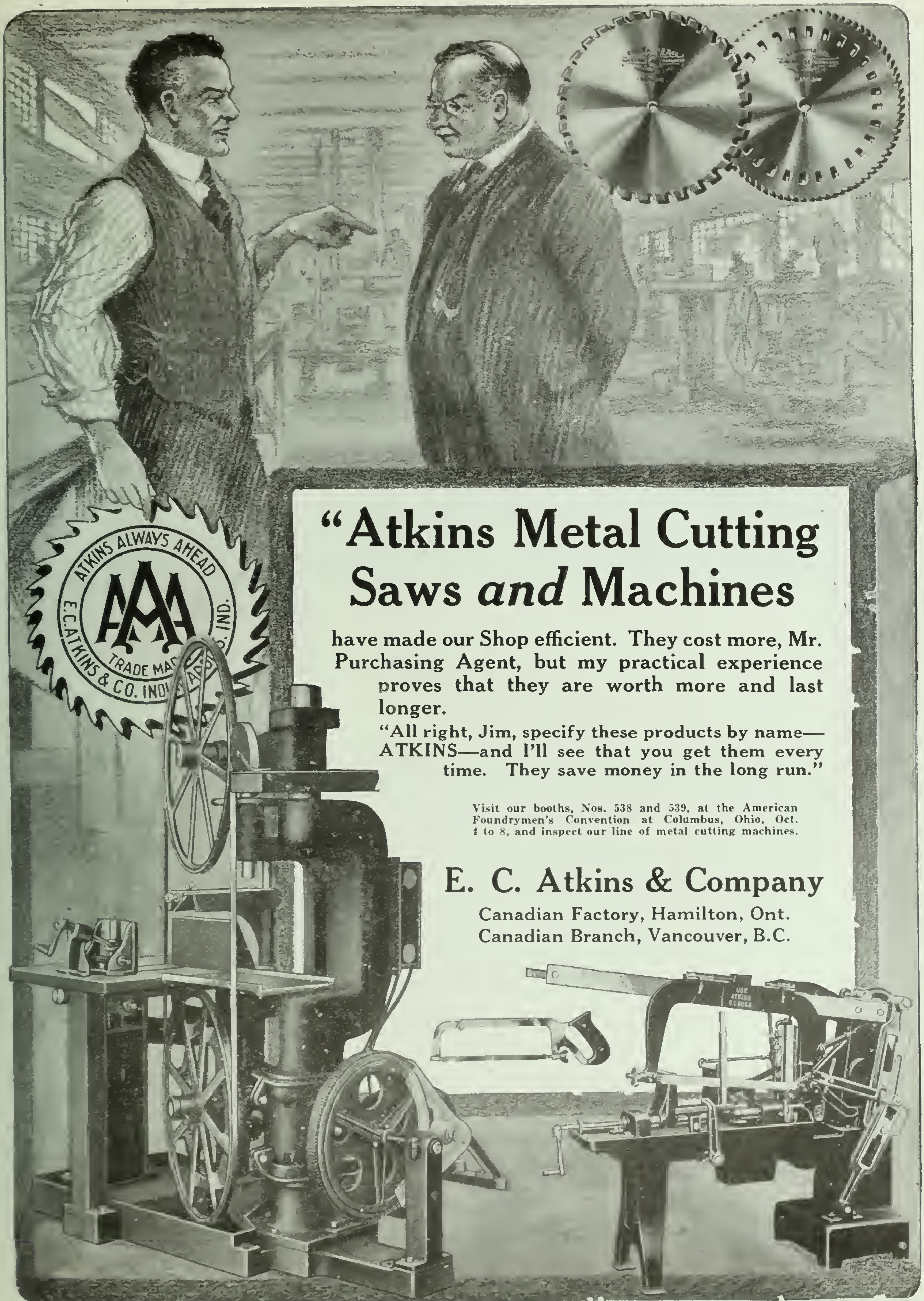
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Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CABINETS, SANDBLAST
Frederic B. Stevens, Detroit, Michigan.

CALKING HAMMERS
Holden Co., Ltd., The, Montreal.

CARBON BLACKING
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison Co., E. J., Toronto.

CARS, CORE OVEN AND FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CAR LIGHTING EQUIPMENT
Holden Co., Ltd., The, Montreal.

CAR MOVERS
Holden Co., Ltd., The, Montreal.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CASE HARDENING
General Combustion Co., Montreal.

CERAMIC KILNS
General Combustion Co., Montreal.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Chaplet & Mfg. Co., Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Lindsay Chaplet & Mfg. Co., Philadelphia.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.

CHIPPING HAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CHISEL BLANKS
Holden Co., Ltd., The, Montreal.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Preston Woodworking Machy. Co., Preston, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

CLAMPS, FLASK
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CONTRACTORS' STORES
Ministry of Munitions, London, England.

CONVERTER BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOXES (STEEL AND WOOD)
Woodison Co., E. J., Toronto.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.
CRANES, HAND TRAVELLING
Curtis Pneumatic Machy. Co., St. Louis, Mo.
CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City N.J.
Woodison, E. J., Co., Toronto, Ont.
DRAINAGE FITTINGS
Crane Ltd., Montreal.
DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.
DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.
DRINKING FOUNTAINS
Crane Ltd., Montreal.
DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.
DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.
DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.
DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.
DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
ELECTRIC DRILLS
Holden Co., Ltd., The, Montreal.
ELECTRIC FURNACES
Electric Furnace Construction Co.
ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.
ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.
ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Henson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
EMERY WHEELS—SEE WHEELS
ENAMELWARE
Crane Ltd., Montreal.
ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.
ENGINES, OIL, GAS AND STEAM
Holden Co., Ltd., The, Montreal.
ENGINES, STEAM
Ministry of Munitions, London, England.
ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.
ENGINEERS, INDUSTRIAL
H. M. Lane Co., Ltd., Detroit, Mich.
ENGINEERS (FOUNDRY)
H. M. Lane Co, The.
FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.
FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.
FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.
FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.
FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fury. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.
FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.
FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FITTINGS
Crane Ltd., Montreal.
FITTINGS, CAST IRON
Crane Ltd., Montreal.
FITTINGS, FLANGED
Crane Ltd., Montreal.
FITTINGS, MALLEABLE
Crane Ltd., Montreal.
FITTINGS, SCREWED
Crane Ltd., Montreal.
FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
FLEXIBLE JOINTS
Holden Co., Ltd., The, Montreal.
FORGINGS
General Combustion Co., Montreal.
FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.
FOUNDRY EQUIPMENT
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Woodison Co., E. J., Toronto.
FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY MIXERS
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY PRACTICE
McLain's System, Inc., Milwaukee, Wis.
FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.
FOUNDRY SUPPLIES
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Woodison Co., E. J., Toronto.
FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Caward Gaskill Furnace Corp., Chicago, U.S.A.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.
FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.
FURNACES, ELECTRIC
Electric Furnace Construction Co.
FURNACES, STEEL
Caward Gaskill Furnace Corp., Chicago, U.S.A.
ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.
GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.
GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.
GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.
GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.
GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.
HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.
HEAT TREATING
General Combustion Co., Montreal.
HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can Hansen & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.
HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.
INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOURNAL BOXES
Holden Co., Ltd., The, Montreal.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
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As every foundryman knows, when making a follow-board he must first get his permanent patterns prepared, usually in aluminum or metal of some sort. The molder then rams up the bottom half of a mold with the pattern in its proper place and after getting the parting ready, instead of ramming up the cope, he puts a frame around the pattern and either rams it full of oil-sand compound and screws a board onto the back or else fastens the board on first and pours the plaster through an opening. In the course of a few hours this sets and only requires to be cleaned up a bit to be a finished follow-board fitted to the pattern.

This was all right in its day, and was considered as a great achievement, but it is only suited to hand work.

In machine molding, particularly on roll-over draw type of machine, it is required that two half patterns be mounted on the machines so arranged that they exactly match each other.

To accomplish this the molder begins as before and after getting his parting ready, instead of making the follow-board he rams up the cope and lifts it off and places it on its back. He then proceeds to draw the pattern and cut the gate unless a gate pattern has been provided. In fact he does everything which he would have done if making an ordinary mold. When both halves are properly finished he puts a frame on each and mixes "Menco" to the consistency of mortar and fills both parts and levels them off. When the mixture begins to get sluggish the boards are screwed onto the frames and the whole thing allowed to stand for about fifteen hours, when it will be found to be sufficiently hard to handle with safety.

After washing it clean, place it in a warm spot for a few days to dry, keeping the surface moist until the inside is dried out. After it is thoroughly dry it may be polished with a piece of very fine sand paper and given a good coating of shellac, when it will be ready to mount on the machine. Patterns of this kind are known as "mounts," and as will be seen they are a combination follow-board and pattern in one piece, and by making them in this way a great saving is accomplished.—"Canadian Foundryman," August, 1920.

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Stevens' King Kore Kompound, a black dry powder, but containing two adhesives, one to bind the green cores, so that when cores are not backed promptly the strength of the green core permits handling without injury; another that develops its strength under heat of core ovens. The ideal combination. It is used successfully when making large heavy Grey Iron cores — sometimes called "chunky" or "blocky"—also for engine beds, machine tools, railway equipment, and cores for steel castings of all descriptions. One Detroit Foundry—a large one—reported a saving of sixteen dollars per day after ceasing old methods and when using King Kore Kompound with Glutrin—not a necessary but a good combination.

STEVENS' CORE GUM.

Another dry binder but not of black color. A real artist might call it "mouse-tint," but we will call it "gray" in color but a shiner in effect. It is used for small intricate cores, where Linseed Oil was once thought necessary and with great success. Its greater victories are with the small delicate cores where nothing but pure linseed has been considered before; none of these Compounds are noisy with odor. They are well behaved from start to finish.

STEVENS' CORE PASTE

The only substitute for high-grade flour; not the flour that has masqueraded when mixed with plaster, Silica, etc., as flour, but the real hot biscuit raw material. Of course it contains no flour, but you wouldn't know that, so well does it take its place. Here is still a stock of Dextrine, Rosin, and Molasses (New Orleans black strap). The wand of the fairy is liable to touch their prices every day—get in early.

LIQUID CORE BINDERS

Stevens' Core Oils wherever used are a synonym for Core qualities; strength, sharp edges, durability, quick baking and quick removal from casting

Stevens' Gargara Emery

The superiority of this emery lies in its practical results. It acts as an abrasive, it exercises its cutting qualities, then crushes and polishes. Two services are thus rendered with but one material. Stevens' Gargara Emery gives the results desired. All numbers. In kegs of 350 lbs.

Buffing Compositions

Some of the things required by stove makers, brass plants and others

STEVENS' WHITE ROSE BUFFING COMPOSITION

For "coloring up" cutlery of all kinds and all light steel castings WHITE ROSE is beyond comparison.

Also for buffing brass or nickel the results obtained are a delight to the eye.

The beauty of nickel or brass is brought out to the greatest advantage. Wherever a brilliant finish is required, it is unexcelled, especially where deep backgrounds are liable to be filled. Particles left in the work are easily washed out.

Put up in airtight hermetically sealed cans. Samples free.

STEVENS' "ZZZ" COLORING COMPOSITION

For coloring copper and brass castings, or plated work, such as valves, fittings—spun brass or cast brass—use my "ZZZ" Coloring Composition.

Contains no unsaponifiable material, does not smear the work, gives a lustrous finish, cleans quickly.

It gives to brass the glory of gold.

Equally as good on copper.

Sample for trial free.

STEVENS' "UNION MAID" WHITE POLISH

A superior lime composition for coloring **all kinds** of nickel plated work.

Imparts that beautiful blue-white finish — the looking glass lustre.

Work is economically cleaned—for "UNION MAID" is fine in grain and will easily wash out of deep backgrounds.

Sample on request.

Buffing Wheels

Three Great Values:

STEVENS' SPANISH FELT WHEELS

From the highest grade selected wool, light in weight and superfine in quality. Let me quote prices.

STEVENS' LIBERTY FELT WHEELS

Same as Spanish Felts but a trifle coarser wool. But for many uses just as good. Reasonably cheap in price.

STEVENS' FELT-SUB WHEELS

Cost half the price of Spanish Felts and wear several times as long. Save glue and emery. Used by stove, automobile and brass manufacturers. One brass manufacturer says the men prefer them to the felt wheel. He has purchased 78 of them in a few months. One automobile manufacturer has bought 500 from me since January first.

Samples of any wheels on order. Give size and number desired.

FREDERIC B. STEVENS

Manufacturer of Foundry and Electro-Plating Supplies and Equipment

DETROIT, MICH.

Order from the nearest branch

EXPORT WAREHOUSE: Windsor, Ont. EASTERN SELLING AGENTS, Standard Machinery & Supplies, Co., Montreal, Quebec

Convention Number

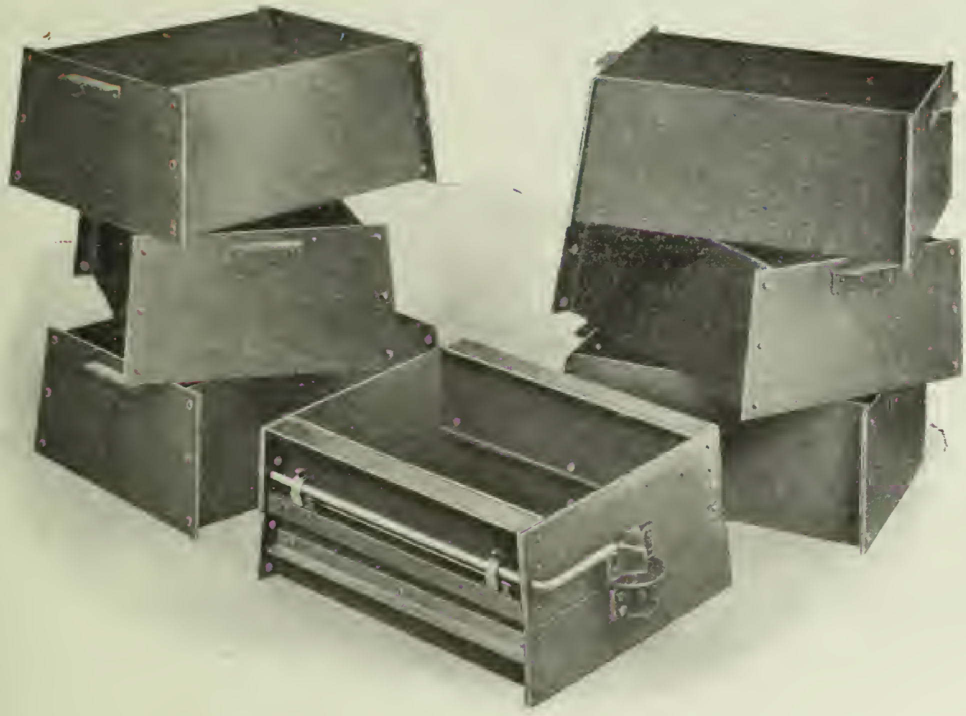
CANADIAN FOUNDRYMAN
and Metal Industry News

Volume XI. Number 10

Publication Office, Toronto
October, 1920

Oliver Steel Snap Flasks

For Bench or Machine Molding



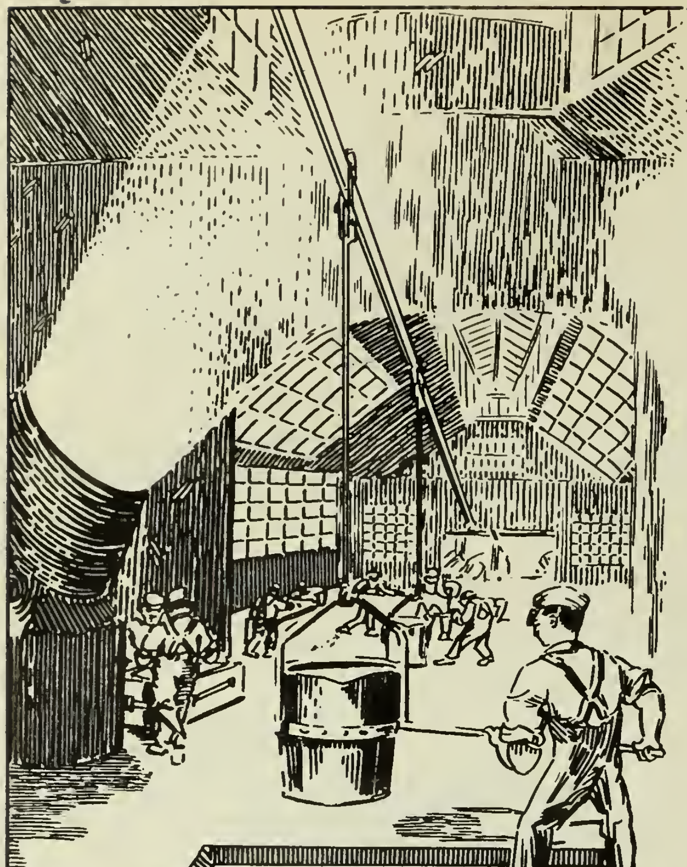
The Oliver Snap Flask is all-steel, self-releasing and made tapered. Note the sand supports within the flask at parting line and lever connection for operating. Jackets are tapered to match the mold made by flask.

Oliver Snap Flasks are rapid and do accurate work. Molders like them because they are light and convenient. They reduce the cost of molding by increasing the production. They reduce the cost of flasks, being strong and durable. They save storage room.

Send for Full Description

Oliver Machinery Company

Grand Rapids, Mich., U.S.A.



Kawin Service

Cupola Experts
Metallurgists
Chemists
Foundry Engineers
Expert Foundrymen
Design and Construction of Foundries
Development of Production
Expert Assistance in All Branches of the Plant

Is Every Department of Your Foundry Producing Up to the Mark?

Is the work of each department accomplished smoothly, efficiently? Do all the departments work hand in hand to secure the best results? Is your cupola practice or molding troublesome or unduly expensive?

Kawin service not only finds the weak spots in production, but suggests a remedy. The Kawin staff includes experts in every branch of foundry work and they *guarantee* to get paying results!

Let us know the most convenient time to have our representative call and discuss fully the benefit of Kawin service to you.

Charles C. Kawin Co.

110 Pearl St.	431 So. Dearborn	156 Yonge St.	222 W. Fourth St.
Buffalo, N.Y.	Chicago, Ill.	Toronto	Cincinnati, Ohio

KAWIN SERVICE

MADE IN CANADA GOODS

WOODISON

BUY IN CANADA SAVE EXCHANGE

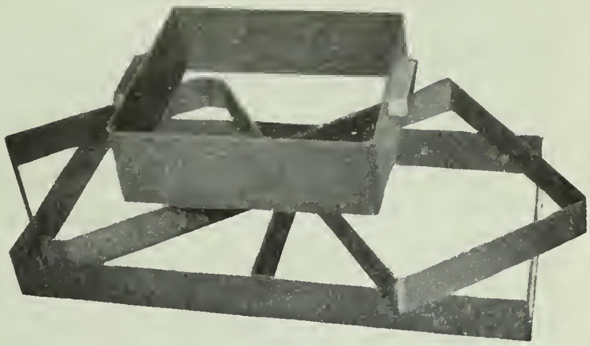
FOUNDRY EQUIPMENT AND SUPPLIES

Sold on a Service Basis, Guaranteed to Make Good.

In selecting Foundry Equipment and Supplies **reputation for service** should be a big consideration. First cost is but a secondary consideration, although it is a point that cannot be overlooked. Every Woodison product is sold on a service basis and is guaranteed to make good. Being entirely Canadian products, their first price is lower than imported goods, there are no exchange rates to pay and no duty charges to be added. When you buy Woodison Foundry Products you also get the benefits of buying direct from the manufacturer. **Adopt Woodison's products—it pays.**

Steel Bands

The steel bands shown in illustration are rammed up in the mold. In ordering, give size of flask at parting, and our standard is to make the outside of the bank 1/8th smaller. This allows it to drop easily and will ram out tight against the flask and hold it.



Standard Core Ovens

A Time and Fuel Saver for Small Work

Reflect a minute on your core-making costs. Are you using a Core Oven unsuited in size to the work? If so, you are wasting valuable time and money. By using our Standard Core Ovens for your small work you not only effect a great saving in time but also insure a great saving in fuel.

Heated by Gas, Coke or Coal

The Standard is heated by gas, coke or coal without extra charge. Shelves are specially designed for small work and open or close without jarring. Baffle plate at the back of the shelf closes automatically, so that while the cores are being examined or changed, the heat loss is reduced to a minimum.

The Standard is made in other types besides the one shown. Write for further information and prices.

The E. J. Woodison
Company, Limited
Fire Brick and Foundry Requisites,
Toronto, Ontario

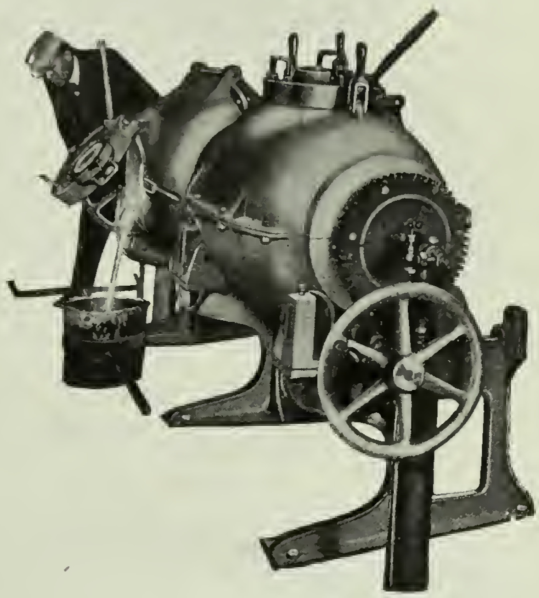
CANADIAN FOUNDRYMAN, October, 1920. Vol. XI., No. 10. Published monthly, at 143-153 University Ave., Toronto, Can. Subscription price in Canada, $2.00: in the United States, $2.50. Entered as second-class matter July 1st, 1912, at the Post Office at Buffalo, under Act of March 3rd, 1879, and at the Post Office Department, Ottawa, Canada.

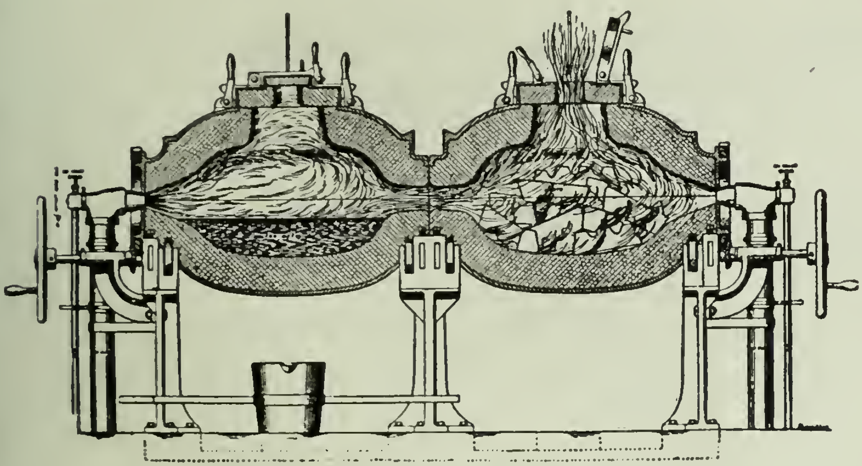
Monarch Furnaces

How Large a Toll Are You Paying?

What is the toll of **waste time** and **waste fuel** in your metal melting?

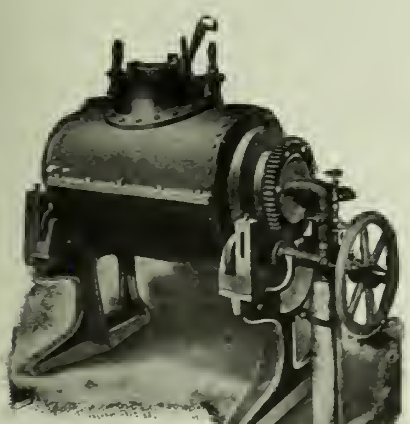
Doesn't a furnace with the features of the Monarch Double Chamber Furnace—features which mean as great a saving as 100 per cent.—warrant your careful consideration?





ACTION OF HEAT
Double Chamber Melting Furnace—Oil and Gas

The Monarch Double Chamber Furnace will melt twice as much metal without additional fuel in the time required by any other furnace. Monarch Furnaces are reliable. The saving which they make now, they will continue to make for years.



Monarch Rockwell Single Chamber Furnace—"Simplex"

A furnace which will save fuel and time and exact nothing for upkeep, and nothing but ordinary care in operating, merits your attention before waste takes another week's toll from your profits.

Write to-day; each of our several types of furnaces for coal, coke, oil and gas are described in our catalog.

The Monarch Engineering & Manufacturing Co.

1206 American Bldg. Baltimore, Md., U.S.A.
SHOPS AT CURTIS BAY, MD.

"It's the only coupling, boys!"

THIS man knows what he's talking about because the coupling is a "Chicago Universal!"

Neither half is male nor female at the connection end, but a combination of both—thus any size hose can be coupled to any other size. Same way with pipe, as Chicago Couplings are also made for standard thread pipe sizes.

Chicago Couplings are *time* and *air* savers—and here's why—

A one-quarter turn instantly connects or disconnects a joint. The construction is such that every joint *must* be completely tight and free from leaks that waste air and reduce line pressure. The gaskets used are of pure rubber. They cannot blow or fall out. Result—no time lost hunting for washers. The weather and moisture-proof rugged bronze construction prevents corroding.

Chicago Universal Couplings are made in ¼ to ½-inch male or female thread pipe sizes and in ⅜ to 1-inch hose sizes. Prompt delivery from Branch stocks. Use "Chicagos" and watch *your* men grin with satisfaction.

Other C-P Accessories for Pneumatic Tool users

- Boyer Rivet Sets
- Boyer Chisel Blanks
- C-P Cord Air Hose
- Airoilene Lubricants
- Automatic Oilers and Grease Machines
- Hose Clamps and Hose Clamp Tools

Write for descriptive literature

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The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

P-88-II

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

CANADIAN CP PNEUMATIC

CHICAGO PNEUMATIC

Depend upon that Name

THOUSANDS OF FOUNDRYMEN HAD VISIBLE PROOF OF WHAT McLAIN'S SYSTEM DOES

Thousands of foundrymen who attended the convention at Columbus had the opportunity of comparing castings made from semi-steel with those made from gray iron in their shop. They saw the advantage of **lighter section—lighter weight—and the greater tensile strength of semi-steel.** Many of them only needed this visible proof to convince them that

McLAIN'S SYSTEM

was just what they needed in their foundry. Many more will arrive at the same conclusion when they get back home and start in again in the old way, after having seen the better way.

WHY STICK TO STRAIGHT GRAY IRON MIXTURES WHEN A PERCENTAGE OF STEEL SCRAP SCIENTIFICALLY MELTED PRODUCES MORE AND BETTER CASTINGS?

Make every car of coke and pig produce more—lower your costs—increase your production and your profits.

McLAIN'S SYSTEM is now recognized as standard foundry practice throughout the foundry world—its practical value, whether used for study or as a check-up on foundry practice, is INDISPENSABLE.

Semi-Steel Booklet for the asking.

Auto Piston
20% Steel
Cast 5/32-inch thick—machined to 3/32

Bushing Casting
50% Steel

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INC.

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Milwaukee, Wis.

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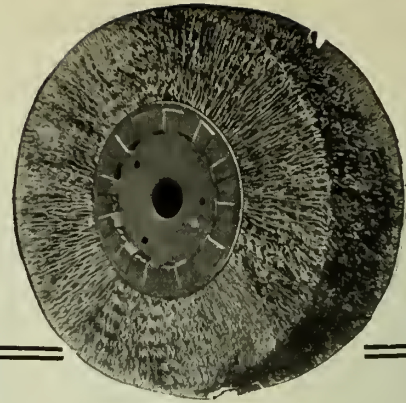
"SAMSON"

Wire Wheel Brush Sections



No Hub or Holder Required

For removing scales from hot forgings, axes, shovels and other tools; for cleaning brass castings, sheet brass and copper.

"Samson" Wire Wheel Brush Sections are made to be mounted with ease and quickness. The metal disc centre is punched to fit any size of spindle. Each section is a brush in itself, making a convenient and practical method of building a wheel any desired width of face.

A trial order will convince you that "Samson" scratch wheels are the most efficient and economical brushes you can secure. Write for catalog and full information.

The Manufacturers Brush Co., Cleveland, Ohio

111 Reade Street, New York

Tumbling Barrels

Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD

LIMITED

Hamilton, Ontario

FUEL OIL AT 10c GAL.

This is substantially what you pay when you use "OILGAS" furnaces and save one-half the fuel consumed in ordinary non-recuperative type furnaces.

John D.'s edicts have no terrors for users of "OILGAS" furnaces. The higher he shoves the price of oil, the greater their advantage over their competitors.

Furnaces for every heat operation.

General Combustion Company of Canada

Limited

619-623 New Birks Bldg., Montreal

Our Canadian Visitors at the Foundry Show Had Lots of Nice Things to Say About Our Silica Products

FLINT SHOT
TRADE MARK - REGISTERED

FLINT
STEEL MOLDING SAND
SILICA

FLINT
CORE SAND
SILICA

THEY told us of the great economy of FLINT SHOT in sand blasting, even after paying the freight from Ottawa, Illinois—because Flint Shot lasts so much longer and does so much faster, better work than the best natural sand.

The Steel Founders reported remarkably fine results from the use of FLINT SILICA steel MOLDING sand, because of its very high refractory properties, its entire freedom from natural bond and the uniform size and smooth roundness of its granules.

And many Canadian foundrymen working in grey iron, malleable iron, steel, and non-ferrous metals, reported that they had adopted our FLINT SILICA CORE SAND for making oil cores and were using our formula of mixing the oil with the dry sand before tempering; and that they secured strong, open cores that played a major part in producing castings free from scabs or blows.

It was a truly great show; and we wish to compliment our Canadian cousins on the large delegation that they sent to Columbus.

UNITED STATES SILICA COMPANY

"Sole Makers of Flint Shot"

CHICAGO, ILLINOIS, U.S.A.

Thor

One **Thor** More **Thors**

Pneumatic Chipping Hammer

Notice the Construction of this Hammer

Then You Will Realize Why It Is in Such Widespread Use

THE main valve is large and durable, being of the balanced type and having a bearing surface of three square inches.

Two square inches of the bearing surface retain the lubrication constantly, as no air passes over to blow the oil off.

The barrel and all working parts are hardened and ground, and the hammer is practically free from vibration.

The handle is equipped with a self-seating throttle valve which eliminates all leaks and is a decided improvement over the piston type of throttle.

Write to-day for the full details

Independent Pneumatic Tool Co.

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KELLER-MADE
MASTER-BUILT

Keller-Master
Foundry Chipping Hammer
SURE-LOX TYPE

KELLER-MASTER

Chipping Hammers
Valveless Drills
Grinders
Riveting Hammers
Sand Rammers
Corliss Valve Drills
Rivet Busters
Accessories

Keller-Made Master-Built pneumatic tools—designed and built by an organization of Master Workmen, all recognized experts in compressed air and its applications—have set new standards for performance, smooth operation and long life, in leading foundries, shipyards, railroad shops, machine shops, etc. Their capacity for remarkable resistance to wear is built into them in brains, experience, labor and material. There is a Keller-Master pneumatic tool for every purpose—and every Keller-Master pneumatic tool is the best for that purpose.

Catalogue, Prices and Terms on Request

KELLER PNEUMATIC TOOL COMPANY

Grand Haven, Michigan

High-grade Bronzes
for
Engineering Purposes

CASTINGS
INGOTS
FORGINGS
RODS
ROLLS
SHAPES

"WRITE FOR COMPLETE CATALOG"

American Manganese Bronze Co.

Holmesburg, Phila., Pa.

Let the

OSBORN ENGINEERING COMPANY

design your new plant

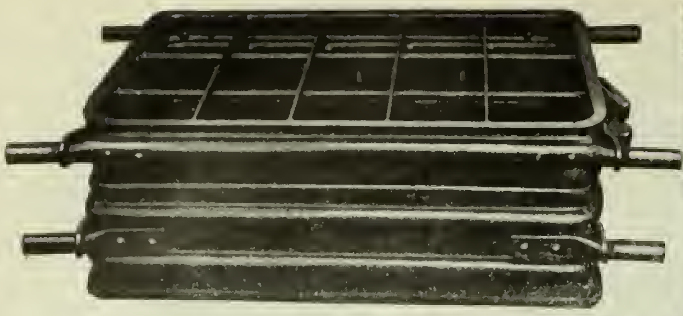
Whatever the nature of your work may be, we are sure that you will want your buildings to be thoroughly modern—to incorporate the latest engineering ideas—to provide for production with a minimum of lost motion—to insure the utilization of labor to the best possible advantage.

The Osborn Engineering Company has a number of experts on its staff who have made foundry design their specialty.

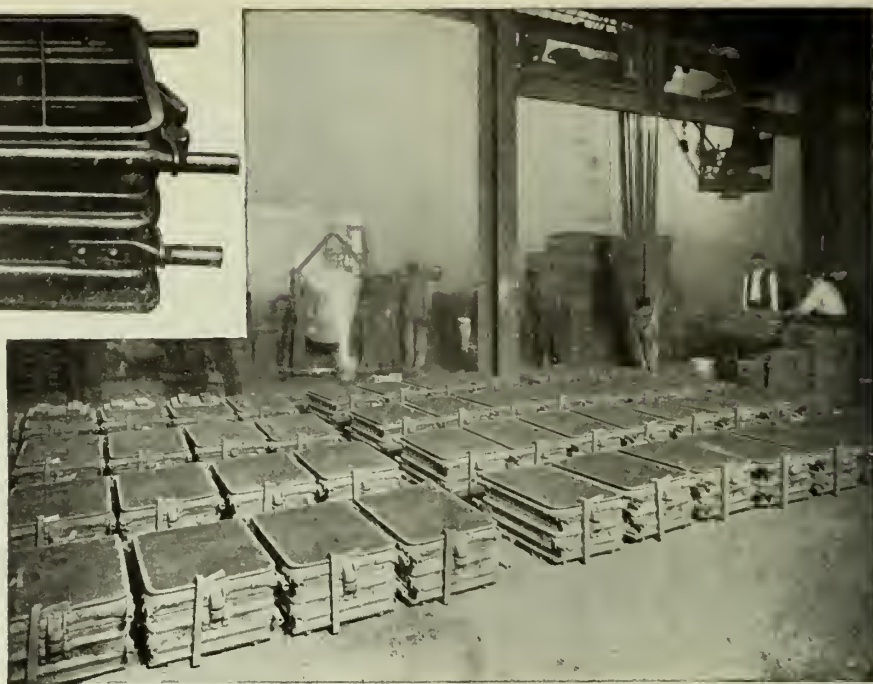
Our record is one of success—may we serve you?

The Osborn Engineering Co.
Cleveland, Ohio, U.S.A.

We plan
for
Efficiency
plus
Economy



(Patent Applied For)



TRUSCON FLASK

Dimensions 16½" x 26"
Cope 6½" Drag 3½"

Pouring Truscon Flasks in Foundry of Allyne Ryan Foundry Co., Cleveland, Ohio

Photo by courtesy Allyne Ryan Foundry Co.

DESIGNED FOR THE JOB—

Just as made to measure clothes better fit the man, so TRUSCON Flasks, designed for the job, better fit the job.

The advantages of TRUSCON designed-for-the-job Flasks not only keep the weight of the Flasks at a minimum, consistent with foundry usage, but also make possible a saving in the amount of sand required.

The weight of a TRUSCON Flask is often as much as forty per cent. less than a cast iron flask and the savings in the sand required range from ten to fifty pounds per casting, depending upon the size of the Flask.

Write for complete information and estimates.

Special Construction of Truscon Flasks

Truscon Flasks are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. Each rib and flange runs full depth around the corners and reinforces the steel to withstand all strains and stresses to which Flasks are liable on the foundry floor.

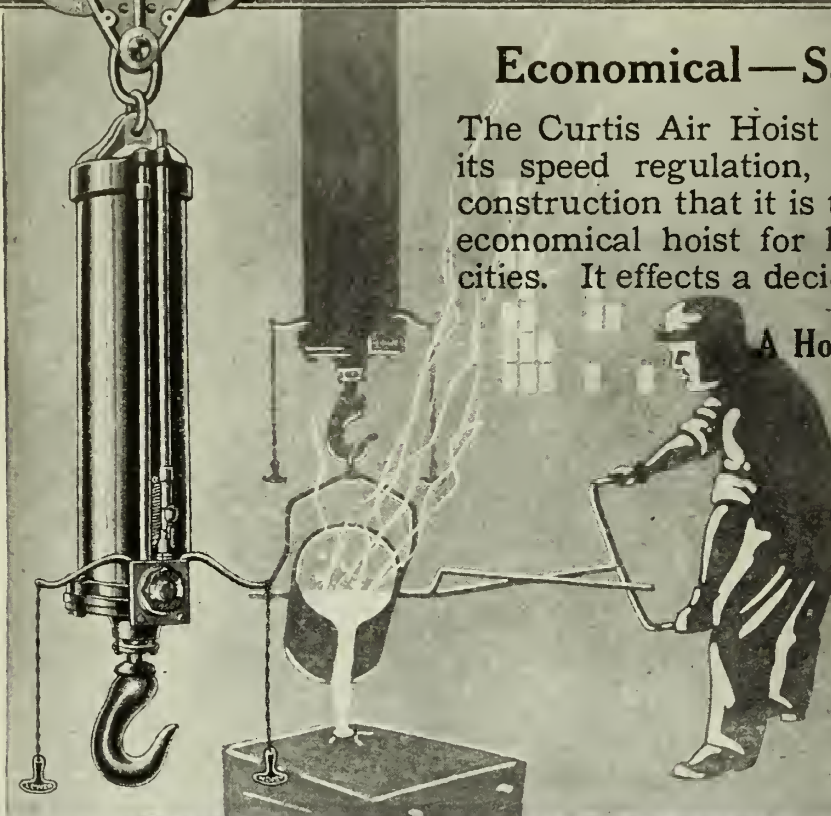
Truscon cross bars are formed from steel plates also. They are furnished bolted, welded or riveted to the walls of the Flask as desired.

TRUSCON STEEL CO. TRUSCON PRESSED STEEL

TRUSCON STEEL CO., Youngstown, O.

Warehouses and Representatives
in Principal Cities

TRUSCON FOUNDRY FLASKS




ATKINS
METAL CUTTING SAWS
SINCE your return from the American Foundrymen's exhibition at Columbus, haven't you noticed many sawing operations in your shop which could have been more efficiently, more economically handled by Atkins Metal Cutting Saws?
Do you remember the great variety of the demonstrations of Atkins Saws? The late model No. 3 Metal Cutting Band Saw Machine for cutting all kinds of metals at high speed? The No. 7 Kwik-Kut Power Hack Saw, the machine which uses the full cutting edge of the blade at each stroke? And our complete lines of A A A Hack Saw Frames and Blades, Circular Metal Saws, Hand Saws and other equipment for metal cutting of all kinds.
Bear those demonstrations in mind and take note of the service which Atkins Metal Sawing Equipment can render in your shop.
E. C. ATKINS & CO.
Established 1857
"The Sterling Quality Saw People"
Factory: HAMILTON, ONT.
Branch: VANCOUVER, B.C.
E.C. ATKINS & CO.
INDIANAPOLIS, IND.
THE FINEST ON EARTH

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

The Foundrymen's Convention at Columbus, Ohio

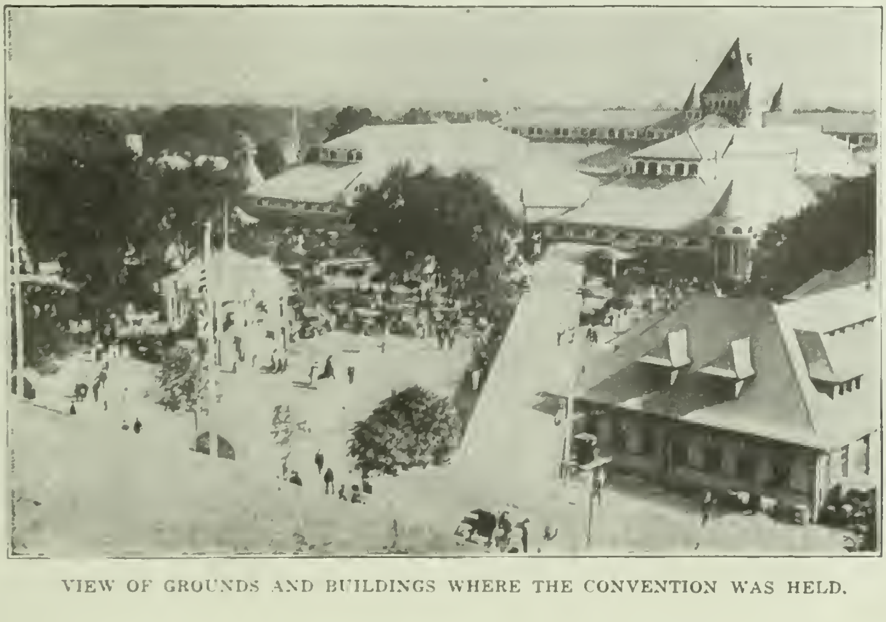
Ideal Weather Combined with Ideal Conditions in General Make the 25th Annual Convention of the American Foundrymen's Association a Decided Success.

THE twenty-fifth annual convention of the American Foundrymen's Association which has just passed into history was, true to prediction, the biggest and best in the history of the organization. The papers which were read, the variety and volume of the subjects treated on, and the discussions which followed were far in excess of anything heretofore achieved, while the exhibits in the various buildings were in equally increased proportions.

The buildings of the Ohio State Fair at Columbus where the convention and exhibition were held were admirably adapted to the occasion and all told everything worked toward the success of the event.

The weather of the preceding week was unpleasant and seemed to presage a bad spell for the foundrymen, but during the week of the convention it was ideal and a record attendance was the result. At the registration booth four thousand badges were given out to those who registered, but in spite of the fact that the registration booth was right at the main entrance and everyone was asked to register, hundreds passed by without bothering, making it impossible to give a correct estimate of the attendance. We are, however, within the limit when we say that between four and five thousand attended the convention, making a record which has not been approached by any former gathering since the inception of the American Foundrymen's Association twenty-four years ago.

The number of exhibits was also away above the past record. Two hundred and thirty-five exhibits were distributed over the seven spacious buildings of the exhibition grounds, and included everything which could be of any possible use in a foundry. Those who were fortunate enough to be present had the opportunity of seeing many things which heretofore they had not seen used in the foundry, and those who were absent, of course, missed this opportunity.


VIEW OF GROUNDS AND BUILDINGS WHERE THE CONVENTION WAS HELD.

Some of the Exhibits

Among the exhibits which would most likely interest foundrymen of Canada are the following:

American Foundry Equipment Co., New York.—Sandcutting machine for cutting over the sand heap without the aid of the shovel, core making machines, sand-blast equipment, annealing oven trucks, molding machines, flasks, etc.

American Molding Machine Co., Terre Haute, Ind.—Full line of molding machines.

Arcade Manufacturing Co., Freeport, Ill.—Three types of molding machines, plain jolters, jolt strippers, and jolt squeezers. Also the Brillion device for pouring molds without the unpleasantness of holding up the weight of the metal.

E. C. Atkins & Co., Indianapolis, Ind., Hamilton, Ont.—Metal cutting band saw machines, power hack saw machines, circular metal-saws, hack saw blades and frames, screw slotting saws, milling saws, foundry plates, etc.

Bacharach Industrial Instrument Co., Pittsburgh, Pa.—Indicating and recording meters for measuring the pressure and volume of air delivered to the foundry cupola.

Bassic Mineral Co., Pittsburgh, Pa.—Demonstrating C. M. Miller's fluxes, for purifying the melted metal in either iron or non-ferrous foundries.

A. E. Bauer & Son, Chicago, Ill.—Revolving knife wood trimmer. This is an instrument which takes the place of the straight-knife wood trimmer used in mitering, etc., and is an excellent pattern-maker's tool.

Berkshire Mfg. Co., Cleveland, Ohio.—Automatic molding machines, air squeezer molding machines, vibrators and flasks. The automatic machine was shown taking the sand from the pile and delivering the finished mold.

Blystone Mfg. Co., Cambridge Springs, Pa.—Demonstrating the Blystone sand mixer equipped with screen, power discharge and motor. This machine sifts and mixes facing sand, core sand, etc.

Champion Foundry & Machine Co., Chicago, Ill.—Showing the Champion electric sand riddle in operation, also their jolt roll-over molding machine.

Chicago Pneumatic Tool Co., New York City. — Air compressors, Boyer riveting, chipping and caulking hammers, Keller sand rammers, Little Giant air drills and grinders, and casting cleaners, Little Giant electric drill and grinders, Little Giant geared air hoists.

Cleveland Pneumatic Tool Co., Cleveland, Ohio.—Full line of air tools and accessories, sand rammers, core breakers, chipping hammers, riveting hammers, emery grinders, valve grinders, air hose couplings, pressure seated air valves, Y fittings, hose clamps and air hose.

Chicago Moulding Machine Co., Chicago, Ill.—Hand portable squeezer molding machine with electric riddle attachment.

Caward Gaskill Furnace Corporation.—Three types of oil-fired furnaces: oscillating type open flame furnace where the flame enters the chamber in which the metal is contained, tilting type furnace where metal is melted in the crucible and poured from same without removing by tilting the crucible with the furnace, stationary type where metal is melted in crucible which is afterwards lifted from furnace for pouring.

Curtis Pneumatic Machinery Co., St. Louis, Mo.—Double cylinder, single acting, water cooled air compressor, bridge cranes, bracket jib cranes, foundry controlled air hoists.

Corn Products Refining Co., New York—Demonstrating the uses of Kordec core compound, including preparation and baking of cores.

Combined Supply & Equipment Co., Inc., Buffalo, N.Y.—Showing their lines of double angle and angle stem chaplets dandy perforated skim gates.

Cleveland Flux Co., Cleveland, Ohio.—A complete line of Cornell fluxes for all metals, the actual size packages of fluxes and kinds being on display.

Clark Tructractor Co., Buchanan, Michigan.—Four different models of gasoline propelled vehicles for industrial haulage.

Charles J. Clark Blast-meter Co., Gladbrook, Louisiana. — Demonstrating the Clark volume meter and the Clark mercury pressure gauge. Showing how the two worked in conjunction will tell accurately what amount of oxygen enters the cupola.

Detroit Soluble Oil Co., Detroit, Mich.—Core oils and core compounds. Miniature core oven drying the cores which were given away as souvenirs.

Diamond Oil Co., Inc.—Core oil, especially designed for radiator and cylinder cores and for steel foundry cover cores.

W. R. BEAN,
The newly elected President.

Diamond Clamp & Flask Co., Richmond, Ind.—Diamond snap molding flasks, steel jackets and bands, perfecting type wood core boxes, pattern makers' benches, flask fittings, foundry hard wood wedges, varnish cans, rapping plates, pinch dogs, steel bottom plates, clamps, dowell pins.

Joseph Dixon Crucible Co.—Crucibles and graphite materials.

Dings Magnetic Separator Co., Milwaukee, Wis.—Three types of magnetic separator. Type O2 separator with feeding skip and air hoist for reclaiming iron from foundry refuse. Type B2 cross belt type for brass bearings and turnings. Magnetic pulleys type separator. All motor driven.

Detroit Electric Furnace Co., Detroit, Mich.—Rocking electric furnace for nonferrous metals. The one on exhibition was of the type C 2,000 lbs. 300 K.V.A. Various articles manufactured by users of the furnace were shown.

Davenport Machine Foundry Co., Davenport, Iowa.—Full line of molding machines, including jolt rollover, jolt stripper, and jolt squeezer machines.

Electric Furnace Co., Alliance, Ohio.—Exhibit of Bailey electric furnaces for melting brass and aluminum, together with transformer, switch and other parts. Samples of casting also shown.

Electric Welding Machine Co., Detroit, Mich.—Equipment for welding by electricity. Demonstrating how the "Weldite" welders are used.

Fanner Mfg. Co., Cleveland, Ohio.—All kinds of foundry chaplets and tumbling-mill stars.

H. K. Ferguson Co., Cleveland, Ohio.—Models of buildings for foundry and other purposes.

Foundry Equipment Co., Cleveland, Ohio.—Coleman core and mold ovens, illustrating rolling-drawer, car, shelf and portable rack types of oven.

Federal Foundry Supply Co., Cleveland, Ohio. — Combination jolt and squeeze molding machines and plain jolt machines, also Federal Holt-tite adjustable flask clasps.

Federal Malleable Co., West Allis, Wis.—Different types of molding machines, including the rapid air squeezers and rapid jolt squeezers.

General Electric Company, Schenectady, N.Y.—Electrically-driven air compressors for cupola blowing, also electric arc welding with a constant energy welding set.

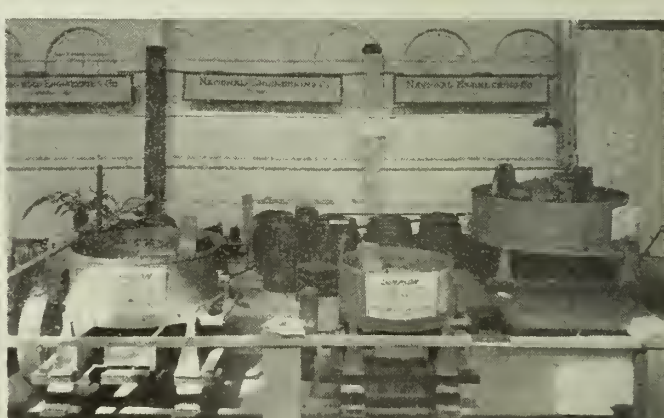
Geist Mfg. Co., Atlantic City, N.J.—Preheating furnaces for preheating all kinds of castings prior to welding.

Great Western Mfg. Co., Leavenworth, Kansas.—Gyratory foundry riddles, also renewable bottom sieves. Machines were in operation demonstrating method of operation.

Grimes Molding Machine Co., Detroit, Mich.—Grimes line of molding machines, including hand-rammed roll-over machines, jar rammed roll-over machines and quick pattern changing device.

Holland Core Oil Co., Chicago,—Core oils, parting compound and dry core compounds.

FOUNDRY SUPPLIES OF EVERY DESCRIPTION ARE HERE SHOWN.



SAND, TO GIVE THE MAXIMUM OF EFFICIENCY, MUST BE PROPERLY MIXED.

Robert Gordon, Inc.—Heating system for foundry and other buildings. Showing method of ventilating the foundry and carrying away the foul air by means of arrangement in the heating system.

C. O. Bartlett & Snow Co., Cleveland, Ohio.—Conveying machinery for handling sand in the foundry, for continuous molding and pouring foundries and where any quantity of sand is being handled. Illustrations of various installation now in use.

Herman Pneumatic Machine Co., Pittsburgh, Pa.—41-inch diameter table plate car wheel jar stripping plate machines.

Hcevel Mfg. Co., Jersey City, N.J.—Sand-blast barrel machine, sand-blast table machine and sand-blast room.

Hayward Company, New York City.—Hayward orange peel, clam shell and electric motor clam shell buckets.

Interstate Sand Co., Zanesville, Ohio.—Molding sands for steel and iron purposes.

Independent Pneumatic Tool Co., Chicago, Ill.—"Thor" pneumatic tools and electric tools, including chipping hammers, sand rammers, portable grinders and motor driven hoists for foundry service.

Industrial Electric Furnace Co., Chicago, Ill.—New repelling arc furnace which can be operated on any 220V motor circuit without transformer. It can be operated on either three phase or single phase or direct current for melting either ferrous or non-ferrous metal.

Ingersoll-Rand Company, New York City.—Imperial type air compressor, sand rammer, chipping and riveting hammers, pneumatic grinders, core breakers, motor hoists and drills.

International Molding Machine Co., Chicago, Ill.—Hand and power turn-over machines, combination turn-overs, plain jolt rammers, combination jolt strippers, stripping plate machines, plain squeezers, combination squeezers and core making machines.

Chas. C. Kawin Co., Chicago and Toronto.—Foundry engineering service, foundry chemists and metallurgists.

T. P. Kelly & Co., Inc., New York City.—Foundry supplies.

F. W. King Optical Co., Cleveland, Ohio.—Safety goggles, safety equipment. Goggles with colored glass reinforced with plain glass which can be replaced if damaged while the more expensive colored glass is protected against damage.

C. E. Knoeppel & Co., Inc., New York City.—Industrial engineers, consulting specialists for foundries in organization work, production control, cost accounting, improvement of operations and industrial relations, etc.

C. S. KOCH.
The Retiring President.

Keller Pneumatic Tool Co., Grand Haven, Mich.—Keller master pneumatic foundry hammers, sand rammers, floor and bench types, valveless and Corliss valve pneumatic drills and grinders.

King Refractories Co., Inc., Buffalo, N.Y.—High temperature refractory cement, etc.

H. M. Lane Co., Detroit, Mich., and Windsor, Ont.—Foundry engineers, photographs and drawings of foundries designed and improved.

Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.—Crucibles for melting all kinds of metals.

Lindsay Chaplet & Mfg. Co., Philadelphia, Pa.—Showing samples of foundry chaplets especially adapted to railroad, pump, engine and tractor castings.

David Lupton's Sons Co., Philadelphia, Pa.—Foundry designs for natural light and ventilation, steel sash, doors and partitions, Pond continuous sash and operating device.

Link Belt Co., Chicago and Toronto.—Electric hoists in operation. Rapid molding sand revivifier in operation.

Lewis-Shepard Co., Boston, Mass.—Jacklift elevator trucks for foundry use in handling core racks and castings, charging cupolas, etc.

Louden Machinery Co., Fairfield, Iowa, and Guelph, Ont.—Overhead trolley systems for foundry use, special hoists, swinging cranes, travelling cranes, etc.

Kilbourne & Jacobs Mfg. Co., Columbus, Ohio.—Motor truck bodies and hoists, electric tractors and trailors, wheelbarrows, factory trucks and industrial cars.

Manefee Foundry Co., Fort Wayne, Ind.—A practical demonstration, showing how to make Menco pattern mounts for use on roll-over draw molding machines.

Mumford Molding Machine Co.. Hanna Engineering Works, Chicago, Ill.—Rock-over molding machine, air jolt squeeze split pattern machine, high trunnion jolt squeeze machine, vibrators, trolleys, pneumatic hoists, suction oiler, small tripod shaker.

Malleable Iron Fittings Co., Branford, Conn.—Branford vibrators, vibrator core bench, buggy ladle, and miscellaneous sample vibrators and accessories.

McLain's System, Inc., Milwaukee, Wis.—Demonstrating the McLain system of cupola practice, melting and mixing of iron and semi-steel; showing semi-steel Liberty motor, gas and oil-engine pistons and cylinders containing 20 to 50 per cent. steel. Also showing steel castings made in McLain-Carter furnace.

Marden, Orth & Hastings Co., Inc., New York.—Samples of dry and liquid Mohtan sand binders. Also samples of cores bound with this binder.

J. S. McCormick Co., Pittsburgh, Pa.—Electric magnetic separator, sand mixer, pneumatic blacking mixer and a loam-mold made from material mixed by these machines.

Macleod Co., Cincinnati, Ohio.—Sand-blast equipment—hose machines, tables,

COKE HAS BEEN HARD TO GET, BUT HERE IS A HOUSE BUILT FROM THIS MATERIAL.

MELTING FURNACES OF EVERY DECRIPTION ARE IN ABUNDANCE barrels, cabinets and dust arresters. Oil burners of every description.

Magnetic Manufacturing Co., Milwaukee, Wis.—Magnetic separators and magnetic pulleys for use in grey iron, malleable iron, steel, brass and aluminum foundries.

Mahr Mfg. Co., Minneapolis, Minn.—The Mahruel line of oil burning foundry equipment, torches for mold drying, cupola lighting, etc. Rivet forges and ladle heaters and driers.

Maxon Furnace & Engineering Co., Muncie, Ind.—Fume-proof cover brass furnaces, furnace linings, Maxon Premix burners, oil burners and oil pumps.

Monarch Engineering & Mfg. Co., Baltimore, Md.—Melting furnaces, with and without crucibles for melting ferrous and non-ferrous metals; core ovens, ladle heaters, etc.

National Engineering Co., Chicago.—Exhibiting three sizes of company's Simpson sand mixer for all kinds of foundry sand mixtures in foundries producing gray iron, steel, malleable, brass core ovens, sprue cutters, bellows, shovels, tumbling barrels, brass furnaces and many other articles used in the foundry.

Ohio Body & Blower Co., Cleveland, Ohio.—Electric baking oven, core racks, gas-oil burners, air traps, air separator, ventilators.

George Oldham & Sons Co., Baltimore, Md. — Pneumatic tools, including chipping hammers, foundry rammers, scalers, core busters, pattern gaugers, riveting hammers, holders-on, and jam riveters.

Oliver Machinery Co., Grand Rapids, Mich.—Woodworking machinery, pattern shop equipment for making practically everything in the way of patterns and core-boxes by machinery. Also engine lathes and snap flasks.

Oxwell Acetylene Co., Chicago, Ill.—Oxwell low pressure duplex type acetylene generator, welding and cutting apparatus.

Osborne Manufacturing Co., Cleveland, Ohio.—Direct draw roll-over jolt machines, combination power jolt stripper squeezer machines (large type), combination jolt stripper machines (small type) not power driven, plain air squeezer machines, air squeezer jolt machine, Little Wonder roll-over machines.

Paine & Co., Wilkes-Barre, Pa.—Samples of core oil with oven and demonstration of Peffer core oil in its actual baking process.

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.—Metallic sand-blast abrasives, chilled shot, globular or round abrasive.

Pittsburgh Electric Furnace Corporation, Pittsburgh, Pa.—Exhibition of electric furnaces and samples of electric furnace products.

Panghorn Corporation, Hagerstown, Ind.—Operating demonstration sandblast and allied equipment in hygienic types and sizes for cleaning metals of every character, size and shape.

Quigley Furnace Specialties Co., Inc., New York City.—Hytempite—high temperature refractory cement for bonding fire brick and granular refractory materials. Carbosand, powdered coal equipment for boilers and furnaces.

Dwight P. Robinson & Co., Inc., New York.—Engineers and constructors, consolidated with Westinghouse, Church, Kerr & Co., Inc. Photographs of iron, steel, brass and aluminum foundries.

Richard-Wilcox Mfg. Co., Aurora, Ill. and London, Ont.—Overway conveying equipment, both trolley and I-beam types, travelling cranes, trolleys, switches, cross-overs, turntables, chain hoists, etc.

P. H. & F. M. Roots Co., Connersville, Ind.—Display of rotary positive blowers and gas pumps. An interesting feature of this exhibit was the original blower built by this company sixty-one years ago.

Safety Equipment Service Co., Cleveland, Ohio.—Safety clothing, goggles, hospital equipment, sanitary drinking fountains, wash stands, lavatories and washroom supplies.

R. P. Smith & Sons, Chicago, Ill.—Safety shoes for molders and foundrymen.

PNEUMATIC TOOLS ARE AN ESSENTIAL IN MODERN FOUNDRY PRACTICE.

PROPER METHODS OF MELTING AND MIXING IRON AND STEEL ARE DEMANDED NOWADAYS.

and aluminum castings; three sizes include the company's No. 0 mixer with 3-foot diameter pan; No. 1 mixer with 4-foot diameter pan, and No. 2 mixer with 6-foot diameter pan. Also the Simpson bucket loader to be used with the Simpson mixer.

Norton Co., Worcester, Mass., and Hamilton, Ont. Alundum grinding wheels, Crystolon grinding wheels, polishing grain and bricks, refractory ware and grinding machinery.

William H. Nichols Co., New York.—Different types of molding machines, including jolt and power squeezers. Also motion pictures of machines in operation.

Ohio Equipment Co., Cleveland, Ohio.—Labor-saving handling machines, Steubling lift trucks, core racks, shop mule, Kron scales, Zering trucks and trailers, and counting scales.

S. Obermayer Co., Chicago, Ill.—Hott Patch furnace cement, ladles, riddles,

Warner G. Smith Co., Cleveland, Ohio.—Samples of Linoil and other core oils; specimen cores made with these oils and castings in which the cores were used.

Stein-Hall Mfg. Co., Chicago, Ill.—Foundry dextrines and core binders, Calumet core binder and special foundry dextrines.

Superior Sand Co., Cleveland, Ohio.—Molding sand for brass, bronze and aluminum castings, light and heavy castings, car wheels and automobile cylinders.

Frederick B. Stevens, Detroit, Mich., and Windsor, Ont.—Foundry supplies including practically everything which goes to make up foundry equipment.

Standard Equipment Co., New Haven, Conn.—Standard radial blast barrels, Standard cinder and metal reclaiming mill.

Sterling Wheelbarrow Co., West Allis, Wis.—Wheelbarrows, steel flasks and foundry specialties, featuring some Sterling veterans (old flasks which have been in use over five years).

Sullivan Machinery Co., Chicago, Ill.—Angle compound belt-driven air compressor, single stage belt-driven air compressor, forge hammer, compressed air core breaker.

Sabin Machine Co., Cleveland, Ohio.—New style barrel trucks and steel barrels for foundry use.

Standard Sand & Machine Co., Cleveland, Ohio.—No. 3 Standard core and facing sand mixer.

Spencer Kellogg & Sons, Inc., Buffalo, N.Y.—Core oil, showing complete mold inside and outside for three-cylinder aeroplane engine made up from cores in which this company's core oil was used.

Truscon Steel Co., Youngstown, Ohio.—Pressed steel foundry flasks, pressed steel lift truck platforms, and a full line of pressed steel stampings.

Tabor Manufacturing Co., Philadelphia, Pa.—Representing the Tabor molding machines, squeezers, jolters, and other types of machine.

R. J. Teetor Co., Muskegon, Mich.—How suspended molding machines, How pivotal bull ladle trucks.

United Compound Co., Buffalo, N.Y.—Buffalo brand vent wax and pattern wax.

United States Graphite Co., Saginaw, Mich.—Graphite and graphite products for the foundry trade, including Mexican graphite foundry facing.

United States Silica Co., Chicago, Ill.—Flint shot for sand blasting and Flint silica for steel molding and core making.

U. S. Smelting Furnace Co., Belleville, Ill.—U. S. rotary melting furnaces for brass foundry, smelting plant and enamel melter.

U. S. Molding Machine Co., Cleveland, Ohio.—Jar squeeze, pattern draw, stripping plate machines, plain jolt machines, air squeezer.

Vibrating Machinery Co., Chicago, Ill.—Sand hog electric sand sifter, model 1920, in operation.

Westinghouse Traction Brake Co., Pittsburgh, Pa.—Air compressors, motor and steam driven; pressure governors, cutout cocks, operating and control valves, air reservoirs, etc.

Wadsworth Core Machine & Equipment Co., Akron, Ohio. — Three-spindle motor-driven core-making machines, core cutting off and coning machine, Wadsworth all-steel core drying plates and bottom plates.

Whitehead Brothers Co., Buffalo, N.Y.—Foundry sands, supplies and equipment, Kaolin cupola and ladle daubing.

T. B. Wood's Sons Co., Chambersburg, Pa.—Peerless tapered snap flasks, automatic adjustable jacket.

Wayne Oil Tank & Pump Co., Fort Wayne, Ind.—Tilting crucible and no-crucible furnaces for melting and non-ferrous metals.

F. H. Wheeler Mfg. Co., Chicago, Ill.—Protective apparel, leggings, gloves, mittens, aprons, coats, pants and helmets.

Whiting Foundry Equipment Co., Harvey, Ill.—Two-ton worm geared crane ladle, 2-ton iron charging car, 30 x 28 class "A" tumbling mill, operating model of crane trolley; photographs, drawings and catalogues of the other equipment manufactured by this company.

Wright Mfg. Co., Lisbon, Ohio.—High speed hoists, standard screw hoists, steel plate trolleys.

E. J. Woodison.—Core making machines, crucible and iron pouring devices, foundry facings and supplies, platers' and polishers' supplies, woodseed core oil, etc.

Young Brothers Co., Detroit, Mich.—Two compartment core oven, rack type for gas, oil and electric heating, positive temperature control and ventilation.

These are taken at random through the various buildings, but serve to show the interest taken in displaying modern equipment and also the interesting display which foundrymen were permitted to view. In addition to these were various displays of non-ferrous metals, coke, iron, steel, refractories, etc., which were well worth seeing.

Machine Tools

The exhibit of machine tools was of considerable magnitude and showed many model devices for increasing the quality as well as the quantity of the machine shop production. Drilling competitions to demonstrate the depth of hole drilled in a given time marked one phase of this exhibition.

Pattern Making Machines

One department of foundry practice which must not be overlooked, and which is not overlooked at the convention is that of pattern making. While pattern making will always be more or less of a hand operation there are many things which can be done by machinery. Here we see gear cutters making patterns for gearing, pneumatic tools gouging out core boxes, and innumerable other operations in wood which have formerly been confined to the metal workers' field.

Other Exhibits

All told the exhibit included about everything used in manufacturing, such as pneumatic, hydraulic, electric and steam driven appliances, oxyacetylene and electric arc welding, safety-first devices, etc.

The Technical Sessions

While the exhibits were undoubtedly of most interest to the prospective buyer the technical sessions were equally as interesting to the man who is up against the problem of management, the foundry superintendent and the foreman. Here interesting papers on every subject connected with the business were read and discussed.

The programme of the sessions was published in our last issue and will not require repeating. The papers will be published from time to time in our columns and will make interesting reading for those who were not in attendance.

Other Attractions

The convention and exhibition did not cover the entire programme for the week by a long way. A banquet, a ball, a smoker, a golf tournament, an automobile ride, several guessing contests and an all-round good time were also included in the real programme.

The Banquet

On Wednesday evening some five hundred guests sat down to a sumptuous banquet at the Hotel Deshler, where ample justice was done, after which the speakers of the evening were introduced by the chairman, who also gave an interesting address. The speakers for the evening were Mr. Edward Ford, of New York, and Hon. Dr. Simeon D. Fess, Member of Congress for Ohio.

Mr. Ford was the first speaker, and kept the audience in a healthy state of mind such as is necessary after a banquet, in order that the over-indulgence of the inner man may not turn into dyspepsia. His remarks might be termed witticisms interspersed with some sound logic. The second speaker, Hon. Dr. Fess, did not aim so much at wit, although he did not give it the go by. His discourse consisted of sound logic interspersed with some humor. Dr. Fess, being a member of the American Government, was in a position to know how some things came about which the ordinary individual could not be expected to know. He was also in a position to give some sound advice on how to right things. The war had made necessary many extravagant movements in order to hasten production, but now that the war is over and the world is burdened with expensive living, the Government, which, like all Governments, is wickedly extravagant, might dispense with the bulk of the leeches who bleed the public treasury and set them to work where they would be of some use and in so doing set a pace which the public at large could follow and bring conditions back to normal. The same advice might be of use elsewhere than in the United States.

After the Banquet

At the conclusion of the banquet and addresses the room was cleared, and those who enjoy tripping the light fantastic toe were permitted to indulge themselves to their heart's content.

On Wednesday and Thursday afternoons those who so wished were shown through the foundries of Columbus. An automobile trip for the ladies was an enjoyable event as was also the golf tournament, but what was probably enjoyed to the greatest extent by at least some of the visitors was the informal smoker and buffet lunch at the Elks' Club on Thursday night. The hall had a seating capacity for one thousand and there were no vacant seats. The table had a capacity capable of feeding an army, and the cigar boxes were in abundance, so that this part of the programme was a decided success.

Entertainment Features

A first class orchestra was in attendance, and in addition to this the Republican choir enlivened the occasion with various selections. Apart from the short business meeting in which the retiring president, Mr. C. S. Koch, read his annual address, the evening was given over to amusements. Edgar A. Guest, Detroit, newspaper man and poet, entertained the guests by reciting some of his original poems.

Counting the Ballots

During the evening the ballots for the candidates were counted and the results of the various contests were given out.

W. R. Bean, of the Eastern Malleable Iron Co., Nagatuck, Conn., who has been acting the part of vice-president during the past year, was elected president for the ensuing year.

C. R. Messinger, of Sivyer Steel Co., Milwaukee, was chosen as vice-president, and C. E. Hoyt, of Chicago, was reappointed secretary-treasurer.

W. H. Burchere, of Pittsburgh, won the first prize, and Peter E. Boucher, of Reading, Pa., the second in the golf tournament.

At the exhibition some guessing contests took place and the results were also announced, John Bibby, foundry foreman at the Anthes Foundry, Toronto, was the best guesser in calculating the number of bricks used in lining a 72-inch cupola with 4½ by 9 in. bricks and reinforcing this with a lining of 2½ by 9 in. bricks. John guessed 4,800, whereas 4,850 was the correct number.

Mrs. Fred. A. Cowan of Detroit was the prize for guessing 950 pounds as the weight of sand in a ladle which contained 951½ pounds.

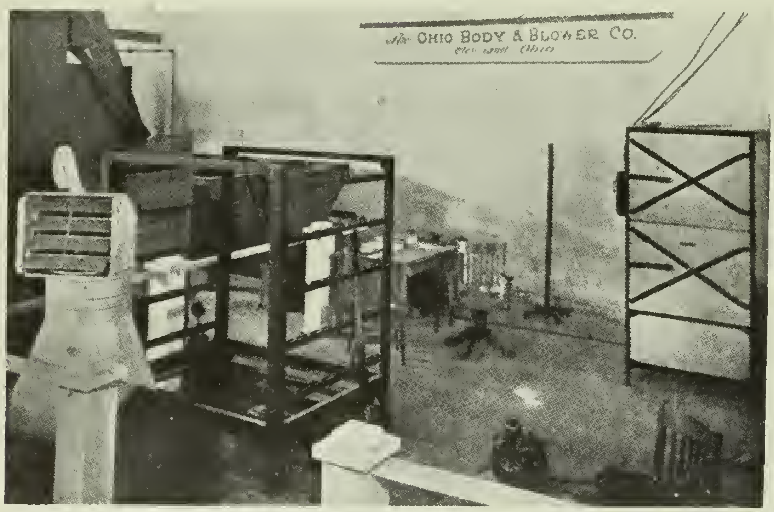
L. B. Stockwell guessed 4,467 as the number of stars in a container holding 4,466.

As the evening progressed everything got perceptibly livelier although nothing stronger than coffee was served. It was just down right enthusiasm. Everybody was happy and wanted to see everybody else happy. The concertina music on the platform became so enlivening that even the colored waiters at the table had to cease waiting and give vent to their feelings. All told it was a most enjoyable evening.

The Real Banquet

The two banquets already spoken of were notable features of the convention, but there was another one which we must not omit to mention, viz., that of the Alumni of the McLain System, Milwaukee, Wis.

The Alumni have a membership running up into the thousands, all of whom of course were not present, but several hundred of them sat down to a good chicken dinner at the banquet hall in connection with the exhibition grounds, after which a group photograph was taken. We do not belong to the Alumni, but if we were in the foundry business again we certainly would do so; however, we were honored with a complimentary ticket and hastened to make use of it. To sit at the table with members of the McLain Alumni is a real pleasure because we know that they are real foundrymen or they would not be there.



ELECTRICALLY HEATED CORE OVENS ARE AMONG THE LATEST INNOVATIONS IN THE FOUNDRY.

Canadian Foundryman's Booth

The Canadian Foundryman booth was, as usual, the headquarters for Canadians, and incidentally for many others. Canadian flag badges were given to those who registered, but like the main registration booth, some slipped by without getting their badges. Among those who registered were the following: Emile Drolet, Quebec; John Donaldson, Montreal; R. L. Lindstrom, Montreal; G. L. Havil, Montreal; Frank Mercer, St. Marys, Ont.; J. P. Pero, Montreal; S. Halfyard, Kitchener, Ont.; E. Clarke, Kitchener, Ont.; H. R. Evans, Montreal, Que.; Captain A. E. Cambridge, Toronto, Ont.; R. J. Hopper, Brantford, Ont.; E. B. Fleury, Toronto, Ont.; A. G. Storey and ladies, Oshawa, Ont.; E. J. Goodman, Oshawa, Ont.; T. Ben. Bennett and Mrs. Bennett, St. Marys, Ont.; Dr. Claude Patterson, Smith's Falls, Ont.; George B. Frost, Smith's Falls, Ont.; L. Edwards, Walkerville, Ont.; George Hyde, Montreal, Que.; Wm. Beatty, Fergus, Ont.; J. L. Tracey, Montreal, Que.; F. W. Hall, London, Ont.; J. K. Moffat, Weston, Ont.; Jno. A. Taylor, Montreal, Que.; A. Mullen, Montreal; Wm. Maybank, Toronto; S. F. Woodison, Toronto; E. B. Rour, Montreal; Charles Garner, Toronto; J. F. Kelley, Montreal; S. C. Hatch, Whitby, Ont.; Charles V. Barton, Whitby, Ont.; H. V. Lingell, Ottawa, Ont.; Fred Wedlake, Brantford, Ont.; H. Chittenden, Brantford, Ont.; S. B. Chadsey, Brantford; R. W. Gifford, Toronto; C. R. Seabrook, Windsor, Ont.; Wm. Ruddy, Toronto; Daniel Bell, Glace Bay, N.S.; F. J. Ross, Toronto; G. H. Hammond, Guelph, Ont.; John A. McEwan, Galt, Ont.; Robert Hunter, Galt, Ont.; W. Cornish, Toronto; John Munro, Brantford, Ont.; Maurice J. Cahill, Montreal; Leo. Rockwell, Amherst, N.S.; S. T. Fisher, Brockville, Ont.; J. Grewer, Montreal; G. D. Ellis, Cowansville, Que.; James Allan, Hamilton, Ont.; W. J. Dalgleish, Galt, Ont.; Wm. Kay, Toronto; W. A. Hastings, Hamilton; D. W. Davis, Fort William, Ont.; D. J. Peake, Three Rivers, Que.; W. J. Christie, Owen Sound; C. J. Palmer, London, Ont.; A. J. Creighton, Owen Sound; J. W. Archer, Galt, Ont.; Robert Clark, Galt, Ont.; H. V. Kinnerson, London, Ont.; John C. Moor, London, Ont.; Arthur Pethick, Toronto, Ont.; McIntyre and Taylor, Toronto; J. Bibbey, Toronto; A. C. Pipher, Port Hope, Ont.; E. W. Gilbert, Hamilton, Ont.; George Allan, Hamilton, Ont.

Guests From Abroad

In addition to the above we were honored with guests from outside points, among whom were Mr. Max Vollenweider and Mr. Fred Steck, foundry engineers for Sulzer Bros., a Swiss foundry employing some twelve thousand hands. Three interesting British foundrymen, Mr. James Chadwick, of James Chadwick, Ironfounders, Ltd., School Hill Iron Works, Bolton, Lancashire, Eng.; Mr. R. H. Pickles, of T. H. Pickles & Sons, manufacturers and foundrymen, Mytholmroyd, near Halifax, England, and Rowland P. Hirst, of B. Hirst & Sons, iron founders and engineers, Halifax, Eng. We were also favored with visits from Mr. Thomas W. Turner, of New York, and Mr. W. E. B. Partridge, Los Angeles, California, both Canadian well-wishers.

Self-control will succeed with one talent where self-indulgence will fail with ten.

—New Success.

Says Foundry is the Boy's Best Opportunity

ANYONE connected with actual mechanical work in these days cannot help wondering why more boys don't go in the foundry work. Some authorities claim that there is more chance for advancement and ultimate big money in the foundry than in the machine shop, but though it is fairly easy to get boys for the latter, they scorn the job offered in the foundry. There are three reasons for this state of affairs, i.e., snobbishness, love of things moving, and lack of education as to the foundry's place in the industrial structure.

Parents are partly to blame for snobbishness. They don't want their boy to work in the dirt or to do manual labor; they want him "to take a better place" in the community than his father, through having a more genteel job. This idea is fostered in our schools where the whole trend is to look forward to "higher education," and to view "going to work" as almost a disgrace, or at best a loss of caste. The very thought of working in dirty black sand would be abhorrent.

Most red-blooded boys have a fondness for machinery in any form, from the automobile down. This makes the machine shop an attractive place and is a drawing card that overbalances the dirt and grease of the job. Hence the machine shops in normal times can usually get the right kind of boys. But when they find that there is a great deal of hand work to do, in fact, that the highest degree of skill is hand work, then they somewhat lose in enthusiasm and they do their best to become machine hands rather than bench hands. The lack of machinery in a foundry and the seeming excess of physical exertion required for the work put molding in a class lower than the bench worker of the machine shop.

The foundry itself is also partly to blame. It needs to advertise. Foundry work constitutes a basic trade. Besides molding and core work, there is mixing, cupola practice, pattern work, cleaning and finishing. As to molding, there is the wide variety offered by bench and floor and loam work. Then there are the various molding machines, which offer some opportunity to do machine work, and, more important, to get familiar with manufacturing work. A study of the best way to mount and arrange patterns for machine molding and the getting of multiple patterns and cores generally will occupy the most ambitious one for some years. Taken altogether, there is as much variety in foundry work as in any of the other mechanical trades, considering shop practice alone, and if one wishes to get into the theoretical end he will find material for endless study.

Will this effort be worth while? There is not the slightest doubt of it, if a person is ambitious either as a matter of self-attainment or to rise in the profession. With the automobile calling for more and better castings than any ever before produced in quantities, it is no wonder that foundries in other lines feel the scarcity of experienced men, and of new blood. The chances in the foundry for boys who are energetic and studious are unusual, even for these times, because of the demand for workmen and executives, and because the foundry has attracted an average grade of help lower than in lines that did not offer so much "dirty work."

One foundry owner was bemoaning the lack of boys. His men were all piece workers and made as much money as they liked but there was a noticeable dearth of young men about the place. "If I could get three or four boys to stick until they had learned the trade thoroughly, then to go around in other plants for a couple of years—why, I could guarantee them $8,000 to $10,000 a year in ten years," said he. And that is big money in these days of high wages.

Another foundryman told the same tale. "I had one boy that was unusually bright, and had been with me two years. He had taken out a correspondence course and I had hopes of landing him in the office in the distant future. But he suddenly gave up his job and went over to Dexter's machine shop to work. I had a few words with him, advising him to be serious-minded and stick now that he had secured a more congenial place. But it was a matter of three months before I saw him working at the Bon Ton Garage, so I suppose he wanted less exacting work, more chance to sneak out for a smoke and the hurrah boys that is usually found around garages. I blame the automobile and the movies for the lack of application and the disinclination to work so marked to-day. It affects parents first, then the children, and the result is that foundry work is rated as beyond the pale for anyone except dago boys."

Still another foundryman bewailed the loss of competent executives and engineers. "If there were only enough bright fellows coming along to fill the salaried positions acceptably, we could stand the lack of skilled help," said this man, "for we can subdivide our work into simple operations within the ability of the foreign labor to be had—and this is the only labor that will do physical work these days. The men we have to promote are not possessed of the education to make a success of their positions as they should; the college trained men we get are all right on theory but they lack first-hand knowledge of the money-producing end of the business and they are too afraid of the dirt to spend a year out in the plant with overalls on. These college men would make the finest kind of department heads if they had the practical knowledge or, barring that, the molding room perspective; but, if I had to take my choice, I would prefer the man who has learned the trade in all its branches and has studied nights—he can get all the theory that he can ever use in just that way."

This brings us back to the claim that there is the biggest kind of a chance for boys right now in the foundries of the country. Ask the machine shop man what his greatest concern is, aside from dealing with his men, and nine out of ten will say, "Getting castings," or "Getting good castings." Go to a general machine shop and find out the percentage of work they throw away—then go to a general foundry and get the same information — a comparison will show whether or not there is a field for better methods and skilled men in the foundry.

If a boy has ambitions toward going into business for himself, he must select some business; why not make it the the side of the furnace. May I not draw foundry? It is assumed that he will work as an apprentice or a clerk to learn the minutiae of the business, then await an opportunity to embark in a small way on his savings or with borrowed capital. The foundry requires no more capital than business in other trades or in mercantile lines—less, if anything. A large part of the capital is tied up in "liquid assets" of the non-perishable kind, such as sand and pig iron and coke, commodities that have an immediate resale value at current market prices—business men in scores of other lines would rejoice if they were similarly situated. And there is no fear of a foundry lacking work. The writer lives a hundred miles from one of the great cities of the country—one that is not noted for manufactures in iron and steel—yet for the last six years there has not passed a week when there were less than three men from the big city, out on a regular tour of trying to place contracts with the country foundries within that hundred mile radius — and contracts at any price the foundries might name.

Some new records in shaft sinking are said to have been made recently in South Africa. The south shaft of the New State Areas was sunk 270 ft. in a month and the north shaft 245 ft. The shafts are rectangular, and measure 28 ft. 9 in. by 13 ft. 9 in. About the same time a cross-cut at the Sub Nigel, measuring 12 ft. by 8 ft., was extended 343 ft. 6 in. in the north.

Use High Grade Iron for Milling Machine Tables

The Methods Employed in Pattern Designing, Molding, Gating, Pouring, Mixing and Melting Are Those Adopted by One of America's Leading Machine-Tool Establishments.

By LEROY M. SHERWIN

THE exacting service requirements for milling machine tables, both from a standpoint of quality and of workmanship, are very severe. These castings must be made from a good mixture of iron composed of pig iron and scrap of high grade.

When a milling machine is assembled and ready for shipment, the table casting must be close in grain, giving what is called a steely appearance, must be free from external or internal porosity, and must be hard and still be machinable. These castings must not only be of a fine finish, but must be capable of withstanding the great amount of wear, as well as the heavy or severe strains to which they are subjected.

There are three problems connected with the successful manufacture of the castings which are important. First is the pattern, second the molding, and third the melting practice, including cupola operations, mixing of the metal, etc.

How Pattern Is Designed

The pattern is arranged so that the molds can be made in two parts, all of the pattern being in the drag portion of the flasks. At one time the V ways and the oil ways were made of green sand, but proved to be unsuccessful, as it was almost impossible to prevent the green sand from cutting and washing. Consequently, core prints were placed on the pattern, as shown in Fig. 1, and core boxes made, so that at the present time all of the table castings have the oil and V ways cast in a core.

The pattern is made of strips of pine glued solidly, and all outstanding edges are faced with cherry. The core boxes also are made of pine and cherry, with steel strip on all of the surfaces surrounding the openings. This enables the operators to use the boxes often and for a long period of time without making repairs.

The molding, although apparently simple at the present time, has been worked out after considerable thought and experimenting. The mold proper is made of green sand, as is indicated in Figs. 2 and 3. Fig. 2 shows the mold before the cores have been placed, while Fig. 3 shows the cores in position. To be successful with green sand for this class of work, it was necessary to make a careful selection of the molding sands used. The mold is faced with a sand and sea coal mixture composed of New Jersey green molding sand, new, medium molding sand, used molding sand and sea coal. The proportion of sea coal to sand is 1 to 7. This mixture is as fine as is practical to secure the best results and still coarse enough to allow for venting and other foundry requirements.

Green Sand Molds Prove Satisfactory

There has been some contention that castings of this nature should be made in dry sand, but the defective castings record on these particular tables is low, and the requirements are so exceedingly rigid the conclusion is that green sand for these molds is less expensive and just as satisfactory.

Fig. 4 shows the rough casting with the gates attached and risers in position, while Fig. 5 shows the reverse side of the castings where T slots eventually are cut. Of several gates tried none have proven so successful as the horn sprues. The molten metal enters the mold through two sprues on each end, entering at the bottom and gradually filling the interior. The two risers are located at equal distances from the center of the casting, as shown in Fig. 5.

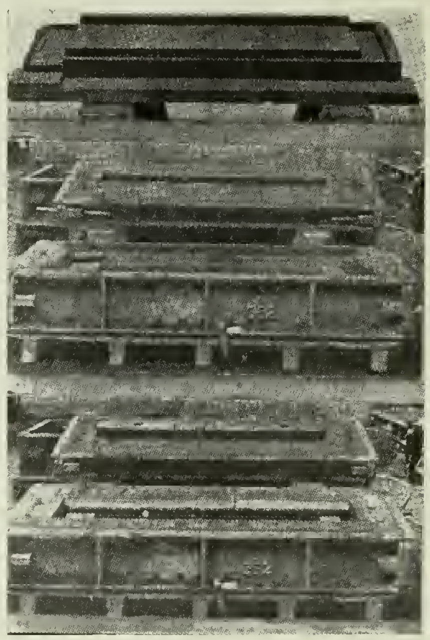


FIG. 1 PATTERN OF MILLING MACHINE TABLE.
FIG. 2 MOLD RAMMED AND READY FOR CORES.
FIG. 3 MOLD WITH CORE IN POSITION.

After these castings have been milled and planed on one side, there are several T slots cut from the solid metal, as shown in Fig. 6. Due to melting practice, the mixture and risers, the castings seldom, if ever, show any internal porosity.

In making up the mixture for the castings as good coke pig iron as possible is secured. It not only is necessary to have a good grade of material, but also the best of melting conditions must obtain. An analysis is taken of each car of pig iron, and this particular iron is kept separate from the remainder of the irons. An analysis is also taken of the steel, cast iron and car wheel scrap.

The mixture is calculated from the analysis of the various cars of pig iron, steel scrap, car wheel scrap and cast iron scrap used, and is based on a 2000-pound charge. However, 3000-pound charges are used throughout the heat for the melt in the cupola.

How Charge Is Made Up

The charges contain 1000 pounds of pig iron (300 pounds eastern Pennsylvania low silicon, 400 northern and 300 southern), 250 pounds of steel scrap, 250 pounds of car wheels and 500 pounds of return sprues and scrap. This combination seems to work out nicely. The steel scrap used is of a very good quality and low in carbon (0.16 per cent.). It was found that by additions of steel, strength was given to the mixture, 12½ per cent. being the most satisfactory in securing the best results. The car wheels give the mixture an additional hardness, which seems to be quite necessary. The steel is of a uniform size, and the car wheels are broken to as nearly uniform size as is practical.

A close check is kept on the ultimate analysis, so that the mixture from day to day is kept nearly constant. This is very necessary on account of hardness on the one hand and open grain structure on the other. If the mixture is too hard the castings will chill, and if any of these castings should reach the milling operations, the high speed cutter would be ruined very readily. The inspection is particularly rigid, and castings showing any signs of being porous or open grained on the outside surfaces are immediately rejected. As will be noticed in Fig. 6, the castings are finished all over.

Description of Cupola

The cupola in which the iron for these tables is produced is lined to 54 inches inside diameter and an average of 10.5 tons of iron per hour is melted. The height of the charging door from the bottom of the cupola is 17 feet, and it has been found that this height works out very well in securing results. This has a tendency to allow the waste gases to heat the charges before reaching the melting zone, thereby increasing the cupola efficiency. The tuyeres are nearly continuous and have a ratio of 6 to 1; that is to say, the area of the cross section of the cupola is six times greater than the combined tuyere area. The air is delivered to the cupola from a positive pressure blower at the rate of about

5300 cubic feet of air per minute. This figure is checked from time to time with the use of a blast meter, on which "volume of air delivered" is registered. Another check used occasionally is to determine the speed at which the blower is operating. The revolutions per minute times the amount of air delivered per revolution minus the air lost by friction, etc., gives a good relative idea of the amount of air being blown into the cupola.

The coke bed is measured daily so that an average of approximately 26 inches of coke above the top of the tuyeres is maintained. The measurement is taken as the last of the bed coke is being placed in the cupola, so that the exact amount can be determined.

If the fuel bed is too high an excessive amount of coke is consumed, and although this does no harm unless very high, the economy of the operation is destroyed. On the other hand, if the bed is too low the iron becomes oxidized and subsequently makes defective work. Oxidized iron in milling machine tables causes much trouble, and every precaution possible should be taken to avoid it. Everything is done to have the zone of melting where the oxygen of the blast has been entirely consumed, and the combustion is as nearly complete as possible, working always for a minimum amount of carbon monoxide gas and as high a temperature as possible.

TESTS OF IRON FOR MILLING MACHINE TABLES

Analysis of Iron

	Per Cent.
Silicon	1.300
Sulphur	0.115
Phosphorus	0.440
Manganese	0.550
Combined Carbon	0.760
Graphitic Carbon	2.540
Total Carbon	3.300

Tensile Test—Turned Specimens

Diameter Inches	Area Square Inches	Strength Pounds per Square Inch	Average Number of Bars
0.799	0.501	36,000	4

Transverse Test—Central Load

Span inches	Specimen shape	Area square ins.	Break'g load lbs.	Modulus of Rupture lbs. per square inch
10	square	1.00	4000	60,000
12	square	1.00	3600	64,800
12	round	1.20	4000	70,700

Extra Coke Is Added

In order to get the best results with a hard steel mixture it is necessary to add extra coke to the charges, about 350 pounds of coke is being used to melt the charges of 3000 pounds of iron and scrap. This, along with the fact that the cupola, after being charged to the door, is allowed to stand for two hours before the wind is put on, insures good metal at the very beginning of the heat.

The charging floor is exceptionally large and airy, permitting the weighing and the other work in connection with the compounding of the mixtures to be performed with the proper regard for obtaining the best results. Fig. 7 shows a very small portion of the charging floor, but gives an idea of some of the equipment and illustrates a portion of one of the 3000-pound charges. The additional steel is in a wheelbarrow shown at the lower right hand corner of the illustration.

The charging of the cupola is done by hand. The steel scrap is placed on top of the coke and the pig iron then is scattered over the entire area, but not entirely around the lining. The car wheel scrap is distributed around the pig iron, and then the cast iron scrap is placed over these materials.

The production of good castings is the first consideration and large coke ratios which interfere with this production are not used. In other words, plenty of coke to insure hot, clean iron is used.

All sprues and scrap which are being used in the mixture are rattled, thereby eliminating any clay which adheres to the sprues in the form of burnt sand. All coke is stored in a covered shed to insure a coke bed which is dry. Most of the pig iron and scrap also are under cover.

FIG. 4 ROUGH CASTING SHOWING METHOD OF GATING.
FIG. 5 ROUGH CASTING SHOWING REVERSE SIDE.
FIG. 6—CASTING, AFTER BEING MACHINED SHOWING "T" SLOTS WHICH HAVE BEEN MILLED FROM SOLID METAL.

Mixing Ladle Always Is Used

At the beginning of the heat as much iron as is practical is accumulated in the basin to help secure a uniformity of the mixture. Most of this mixing, however, is done with the aid of the mixing ladle, which is located beneath the cupola spout as shown in Fig. 8. The molten iron always passes into the mixing ladle before going into the large ladles, or even bull ladles, when they are used.

If a good pattern is used and good rigging and molding practice is followed, along with the proper melting, mixing and pouring, there is no reason why these tables or any castings of the same requirements should not be made entirely satisfactory to all concerned.

ZIRCONIUM IN CAST IRON

By Richard Moldenke

To the list of deoxidizers useful for the purification of cast iron there has been added another ferroalloy, namely, that of zirconium. As the list of elements ordinarily in or added to cast iron grows larger a more thorough understanding of the functions of each one of them, particularly those more rarely met with, becomes of increasing importance. We are all familiar with the action of silicon, carbon, phosphorus, manganese and sulphur, but know very little about the special effects of vanadium, titanium, cerium, copper, nickel, chromium, etc. Year by year more of the rarer elements come into daily use, and as they become more reasonable in price through quantity production, the iron industry experiences a corresponding expansion into new fields of usefulness.

Removal of Elements by Oxidation

For cast iron the elements involved seem to be divided into two groups. The first is made up of those not readily removed by oxidation in ordinary good foundry melting practice. The second consists of the elements readily oxidized under conditions involving the presence of oxygen in the molten metal. The two groups shade into each other to some extent, depending upon the degree of skill possessed by the foundryman in handling his cupola or furnace.

The above will be better understood when such elements as sulphur and phosphorus are considered. Both are increased in melting practice by concentration, as they are not oxidized out. Only the action of a basic hearth in openhearth or electric furnace practice will reduce these elements in quantity, and only through chemical reactions of a more or less complicated nature. On the other hand, it is known that silicon and manganese undergo definite losses in the melting operation, and mixtures are made up with this situation in view. The behavior of carbon and iron itself is less certain. Both oxidize under conditions of high heat and the absence of a sufficiency of manganese and silicon to protect them. Most foundrymen have seen the brown smoke emanating from a cupola indicating a low bed and burned iron, when the silicon of the mixture was below one per cent. and manganese nearly all gone. In air furnace practice the reduction of carbon is well known, and in long heats there is enough iron oxide in the bath to yield defective castings.

Grading Elements According to Ease in Oxidizing

For the group of the less easily oxidized elements in cast iron, where melting is carried on under the best possible conditions of air supply to the fuel to prevent undue oxidation, the following list may serve. It is thought that the order given may be that of the most stable first and so on to the middle ground. This order may be phosphorus, sulphur, iron, copper, nickel, tungsten, molybdenum and carbon. Then from carbon as ready to be oxidized or remain unaffected, depending upon the care taken in melting in cupola or furnace, the order of the elements readily oxidized may be carbon, chromium, zirconium, silicon, manganese, vanadium, aluminum, magnesium, titanium and cerium. The last named is probably the one most easily oxidized.

The order above given is practically guessed at, as there is no definite information available on the subject. The writer has an intuitive feeling that it is so from the practical observations made when handling the elements in question in the ferroalloys. It would be interesting to subject iron alloyed with all of these elements to a very slow oxidizing atmosphere while in the molten state, and make continued analyses to observe the rate of elimination of each as the test progressed. This should give the order of removal and by inference, the degree of efficacy for purposes of deoxidation in cast iron.

From the many tests made by the author of deoxidizers of cast iron, it seems that the first effect is the removal of oxygen present in combination with the iron. This eliminates just the amount of the element in question necessary for that laudable purpose. If the alloy added brings in more than enough for this deoxidation, the balance of the element remains in the cast iron and exerts its particular function upon the properties of the casting. Thus, the addition of say 0.1 per cent. titanium may remove all the oxygen present in a ladle of molten iron and yield results that are practically as good as if 0.2 titanium had been used. It is the removal of oxygen—the weakening factor in the molten metal—that permits it to come out with its natural strength due to its composition. It seems as if the crystals adhere more firmly and are given the chance they should have for strength due to a good analysis. If these crystals are of finer quality as the result of added nickel or molybdenum, and if the graphite crystals are small and not too large in number, the product should be a pretty high class metal. Many claims are made for vanadium and other of the rare elements for cast iron and doubtless there is much to the subject. Fundamentally, however, the less oxygen present in the metal before the ferroalloy addition, the more characteristic the effect. Hence the soundness of the policy of devoting every attention to good melting practice so that but little of an expensive alloy need be added to attain a desired effect.

One of the difficulties found with the deoxidation of cast iron is the degree of heat involved. It is well known that the hotter the metal the better the effect of manganese added to heats with high steel percentages. Indeed, to get a high steel scrap heat safe for pouring molds, it is necessary to use a good fuel percentage. The higher actual temperature of the molten metal resulting promotes the union of oxygen and manganese, and the result is a casting free from blowholes. With ordinary cast iron the added manganese, instead of going into the slag, will be found in the metal; possibly partly in combination with sulphur, but having exerted little or no deoxidizing effect. The temperature was not high enough for the reaction.

The consequence of the above is that such metals as aluminum, cerium and magnesium are easily taken up in molten cast iron, whereas titanium and zirconium take more time and heat for the best results.

Large Percentage of Zirconium Chills Metal

In making tests with ferrozirconium, an alloy containing 30.6 per cent. zirconium was used. It was noticed that for the smaller percentages the metal behaved nicely in melting and indicated a purifying action, for the slag came up and collected for easy removal. The larger percentages gave more trouble and chilled the metal considerably so that it was difficult to pour successfully. Unquestionably the alloy will do better service in steel than in cast iron.

Two sets of transverse tests were made. One with a gray iron mixture and the other with car wheel scrap, thus obtaining results for gray and for white iron.

Gray Iron Mixture

Pig 60 per cent., gray scrap 40 per cent.
Average of three bars each.

Breaking Strength pounds	Deflection inch	Zirconium added per cent.
2,700	0.10	none
2,920	0.11	0.05
2,900	0.11	0.10
3,050	0.11	0.15

White Iron Mixture

Scrap car wheels 60 per cent., white iron scrap 40 per cent.
Average of three bars each.

Breaking Strength pounds	Deflection inch	Zirconium added per cent.
2,640	0.10	none
2,790	0.10	0.05
2,880	0.11	0.10
2,940	0.11	0.15

As the usual element addition for deoxidation purposes is 0.10 per cent. it will be noticed that the strength increase is 6 and 9 per cent. respectively. Undoubtedly where large steel scrap percentages are used, this increase will be greater as the oxidation will have been more serious and the temperature of the molten metal higher, making for a better reaction. Further tests in this direction would seem advisable, for the world's supply of zirconium is quite extensive and it should be converted to the ferroalloy as cheaply as titanium.

The above data are given at this time in order that those who are interested may be advised. The tests were made over a year ago.

TODAY AND IN THE NEAR FUTURE

By H. R. Atwater

How to increase production is the great problem of the foundry today. If a careful investigation were to be made it undoubtedly would establish the fact that no industry in a period of time comparable to the past two years has ever invested as large a sum of money in labor saving devices as has been expended by the foundries of this country to increase production and make use of the labor available. Yet this development is still far short of the needs of the times. The demand for every kind of castings has been such that if a foundry could make delivery it could demand almost any price it wished to ask. The foundry has been one of the cramped "bottle-necks" of the country's industry.

Old foundries and new additions to foundries have been equipped with the most modern labor saving devices, and the writer believes we are just fairly started in this business of rebuilding or revamping the equipment and methods of foundries. The next five years must see this development continued and speeded up.

High Wages Is Influence

Unquestionably, when farm hands can get $7 a day agricultural implements are in great demand; likewise when the wages of ditch diggers reach $10 a day and they are still hard to get, machinery to increase their effectiveness will be demanded and used. The same rule applies to the foundry. As yet, only a small percentage of the foundries have installed modern equipment, but it will have to be installed, for labor will not be available at a much lower figure for a very considerable time to come, and under competitive conditions the plant with the intelligently selected equipment will have the best of it. It has been well said that—"When life is easy we take things easy. When human labor is cheap we use only human labor and are content. When life becomes more difficult and labor more expensive men use their brains and that means progress."

The last sentence deserves re-reading and careful consideration—"When life becomes more difficult and labor more expensive, men use their brains and that means progress!" To each of us that means, "Will I be progressive and do the thinking, or will I let my neighbor do it and leave me far behind?"

Old Equipment Is Handicap

In a paper read at the Boston meeting of this association in 1917 the writer expressed the opinion that foundries operated entirely by hand power would feel the handicap so severely under the wages demanded that they could not stay in the business and compete at a profit against the foundry fully equipped with labor saving devices. Observation of plants and what they have been doing since the time of that meeting confirms the prediction. Wholesale changes are everywhere under way in every phase of equipment and method of production.

The difficulties that the foundrymen have had to contend with during the past three years have been many. Probably the greatest has been the securing of sufficient labor to operate equipment. The unwillingness of available labor to work in a foundry when there has been a wide choice of other kinds of work offered in which the wage paid was large, has made it difficult to man foundries properly. This has been particularly true in many plants that are not of modern construction and where sanitary conditions have not been of the best. It is particularly true that the best individual workers have been especially careful in selecting the best surroundings.

A Test for Your Plant

This brings up for consideration some very vital questions, which might be headed as follows. Not one of these questions is so unimportant that a foundry owner can afford to ignore it or fail to answer it fairly.

Is my business properly housed? Are the various processes in production located and routed so as to necessitate the fewest waste steps.

Are my buildings as pleasant places in which to work as those of neighboring plants? Is the heating right? Are they ventilated to remove disagreeable dust and gases? Are sanitary conditions good; for instance, are the toilets and the rest room for the women in the core room sufficient and are they properly segregated?

Have I competent foundry foremen and superintendents backed by the necessary mechanical training and skill to recognize, install properly and operate the many labor saving devices used by most progressive competitors?

Are these men actually leaders of my manpower? Are they in the true sense managers? Albert Atwood has expressed it in a recent issue of the Saturday Evening Post:

"What does all this mean, except that organizing, that managing ability is very scarce? We talk about organization in a very matter-of-fact, offhand manner, as if it were an easy, simple thing. But we cannot have the goods and service upon which our lives depend without organization, yet how very few of us indeed have the capacity for it!

"Human beings, materials, tools, equipment, working space and appurtenances must be combined. They must be brought together systematically and coordinated effectively to accomplish the desired object of providing what the world needs. The human beings in the organizations are always the most important and difficult problem. Yet they are useless without tools and equipment, and the mechanism cannot function and does not function until that force which we call management leads, guides and directs the whole combination, or organization. Management has to pull the lever, and nothing starts until there is a management which creates a spirit, an atmosphere, a set of ideals, enthusiasm, inspiration, a loyalty, orderliness and discipline."

In these times very high wages must be paid even for the most ordinary labor. In many places plants bid actively against each other for such available labor as can and will work in a foundry. For instance, a large portion of the molding machine equipment which has been installed during the past several years from necessity has had to be operated by what has been usually termed common labor.

Equipment Is Neglected

Waste and inefficiency are prevalent in many plants due to lack of proper mechanically trained men to take care of foundry equipment. It is a fact that in many plants where thousands of dollars have been invested in equipment it is allowed to operate in dirt and sand, to become rusty from lack of lubrication, or is left standing with very little or no attention in exposed places. It is a wonder that in some plants any operation at all is possible. This criticism is not confined to individual cases; in fact so general is the lack of care of equipment in the industry that the Foundry Equipment Manufacturers' Association has taken up the matter and is sending out monthly bulletins in an endeavor to educate men to properly care for equipment. We criticize the farmer who leaves expensive machinery in the open, unpainted, at the mercy of the sun, wind, frost and rain, yet we can find equally wasteful habits in our own plants.

The ability to produce castings on modern type machines with the class of help available requires able instructors with mechanical ability, first to rig the equipment properly, and second to operate it effectively. There is a great lack of the right kind of men trained in the use of equipment and pattern rigging and with proper mechanical training to install and instruct others in the working of equipment. Muscle and machinery are useless without brains, not only in the front office and at the superintendent's desk but down on the foundry floor. It is the writer's opinion that we are face to face with one of the greatest needs of the industry at this time. This opinion is based upon the many calls that are made upon equipment manufacturers to recommend and find competent men to handle modern equipment and who can get consistent results day after day, in producing good castings and in producing more castings. Men of this type are not running around loose. Good teachers are far less common than good operators. Furthermore we may as well recognize the fact that men skilled along the lines mentioned are not being trained in sufficient numbers to meet the demand. This is a serious matter. The time is opportune to suggest to this organization that it could confer no greater benefit upon the foundry industry of the world than to establish a modern school of foundry practice where men who wish to take up the practical and mechanical work of the present day foundry may be sent to be educated and schooled in the matter of proper rigging, handling of equipment, cost accounting, etc. In such a school standardized practices could be taught that could be outlined by a faculty of foundrymen to be chosen by this organization.

Operate Plant as a School

The writer believes that a plant organized and operated as a school to which prospective foremen or plant engineers could be sent to serve a definite apprenticeship and turned out with a certificate or diploma, would bring a very large field of employment. This would go a long way towards supplying a very great need in the industry, a need that will be felt more keenly and to a greater degree as competitive conditions bring about a still larger use of machines and various labor saving devices in the foundry. Any step which tends to make an industry more productive and less wasteful of man power is a national service. For that reason the writer feels that we could put our shoulders to the wheel on such a project.

BIG MARKER FOR CANADIAN ORE

British Interests May Have to Look to Canada for Their Supply

A London despatch says that despite the denial by the United States Steel Corporation of its reported agreement with the French and German interests to exclude British steel makers from contracts in connection with European reconstruction and its formation of the Anstea concern in Germany, British steelmakers are taking the report very seriously. Sir William Beardmore, one of the best known figures in the industry in Great Britain, states that the latter is taking steps to make itself self-contained, which will be achieved largely through the formation of the British Empire Corporation, with which he and other large steel interests are identified. Through it there will be available from the standpoints of the British steelmakers the largest deposits of iron ore and coal in the world.

It was stated that over 60 per cent. of the ore used in Great Britain was of foreign extraction, but the furnaces at Sydney would make them independent, and enable the British finishing mills to operate to full capacity. It was also stated that the Canadian coal miners produced almost double the amount of coal per man as compared with British workers.

A by-law was passed recently by a large majority granting certain concessions to the Canada Cement Company for the erection of a plant at Lakefield, Ont. It is said this plant will be the second largest of its kind in Canada.

Cleaning Castings in a Steel Foundry

The Author Believes in Making Working Conditions Pleasant as Well as Having Modern Equipment.

By A. W. GREGG

IN THE majority of steel foundries it costs as much or more to clean the castings and prepare them for the shipping platform as it does for the molding and coremaking. The finishing department is usually a source of continual worry to the foundry superintendent and is the place where delays are most apt to occur. It is easier to get a casting molded and poured than it is to get it through the finishing department, but in many shops there is a tendency to feel that the job is out as soon as the molds are poured, in spite of the fact that an uncleaned casting is of no more use to the machine shop or customer than the mold in which it was cast.

Cleaning Room Labor Is Scarce

Probably the greatest problem which the finishing department is called upon to solve lies in securing labor. The work is hard and disagreeable under the very best of conditions, and the class of labor which can stand the wear and tear of a steel foundry finishing department is always scarce, especially so with the present restricted immigration. The remedy obviously lies in making the surroundings as pleasant as the nature of the work will permit and in using all the labor saving machinery which the market affords. The day has passed when men will put up with dusty, unsanitary conditions even for exorbitant rates of pay. Fortunately, the machinery in the modern chipping room is infinitely better than it was ten or fifteen years ago. The old sand-blast room was a man killer which only the hardiest might survive, and the old-fashioned stave tumbling barrel with its lack of an exhaust system made its entire vicinity a dusty misery. Even grinding wheels are now connected with an exhaust system and tuberculosis is no longer a necessary or even prevalent disease among foundry operatives.

Lighting, heating and ventilation in a great many foundries have not received the attention which their importance merits, but it is more generally recognized every day that the foundry should not be, and is not necessarily, a dirty, dusty, ill-lighted place where a man works because he cannot find any more congenial occupation.

Kind of Floor Is Important Factor

The kind of floor and the method of transportation for castings in the finishing department require careful study. In this connection the class of work is the important factor to be considered. Where the work is light enough to be handled by hand, creosoted wood block makes the best floor which can be put down. With a good floor it is possible to use the lifting truck for transportation and this is the neatest and cheapest method which has ever been devised for handling small steel castings. Where heavy castings are produced they must be handled with a crane and the floor in ths case is not of such great importance.

In a steel foundry of any size proper organization demands that departmental lines be strictly drawn. Following the natural classification of the work, the operating departments are:

1. Metal department.
2. Molding and coremaking departments.
3. Finishing department.

Each of these departments has numerous subdivisions. The metal department's responsibility ends with the delivery of sufficient molten metal of proper composition and temperature to the molding department. The molding department is held responsible for setting up the molds pouring into them the molten metal, shaking out the castings and delivering them to a definite location in the finishing department. It is very essential that each department be held to strict accountability for definite and well defined operations.

The system of subdividing the work should be followed in each department, and a great deal of confusion and waste of labor is avoided if a very definite plan of operations be adopted. Especially is this true of the finishing department which at its best appears to the layman as a very disorderly place indeed, and perhaps a good many of them are open to this reproach. One steel foundry with which the author is familiar adheres so rigidly to a definite plan of operation that all castings are put through the sand blast whether necessary or not; the claim being made that it is less expensive to sand blast than to sort out and short-cut the occasional castings which peel out sufficiently clean to make the sand blast operation unnecessary.

Routing Work Is Important

It is impossible to lay out a system of routing which will be best for all conditions, but the following probably will satisfactorily meet the conditions found in most steel foundries. We will assume that the molding department is held responsible to shake out the castings, knock off the loose sand, and deliver them to a definite location in the finishing department.

First operation, flogging. Gates and light risers are broken off with a sledge, first being nicked with a chipping hammer. Large cores are knocked out or loosened up on the flogging floor preferably with a heavy pneumatic chipping hammer used with a long chisel. If the castings are light enough to be handled by hand a sprue cutter is a great labor saver. The gates and scrap which accumulate from the flogging operation and the sprue cutter should not be thrown upon the floor, but collected in boxes. If a charging machine is used at the furnace, the charging boxes should be used, if not, dump buckets which can be handled by the crane and readily transferred to the stock yard or charging platfom. This saves one handling of scrap material and prevents a mussy accumulation which is a waste of floor space.

Second operation, and blasting. The sand blast equipment should be carefully selected to conform to the class of work. Great improvements have been made in sand blasting machinery in the last few years and the foundry now has a selection of several different types adapted for light or heavy work. All modern sand blast rooms have an exhaust system which changes the air four to five times per minute. The sand falls through the grating in the floor, is automatically elevated, screened and returned to the pressure tank. It is important to secure the proper quality of sand, and attention should be given to the use of the proper sized nozzle. Compressed air is expensive and its consumption should be carefully watched.

Cutting Risers With Torch

Third operation, flame cutting risers. After sand blasting the risers are removed with the flame cutter. The oxy-acetylene torch is used almost universally for cutting risers and heavy gates from steel castings. This can become a very expensive operation if the consumption of oxygen and acetylene is not given careful attention. The natural tendency of the operator is to use a larger tip and a higher pressure on the gas than is necessary, for this makes the cutting easier and more rapid. A small bonus to the operator based on economy in the consumption of gas is usually very beneficial. Some foundries prefer to cut the risers from castings before sand blasting to economize room on the sand blast car or table. When this is done a chipper must remove sand where the cutting is to be done, as the operation of the torch is interfered with by the sand adhering to the risers.

Fourth operation, welding. If welding is necessary it should be done at this point. The electric arc welder and the oxy-acetylene welding outfit are to be found in most steel foundries, although not given especial prominence when visitors are taken through the shop. The electric weld is made more rapidly and at considerably less cost than the gas weld, although the gas weld when carefully made is considered somewhat more reliable. No welding should be allowed except by instructions from the inspection department and should always be followed by annealing to remove internal strains caused by the high local heat of welding.

Fifth operation, annealing. The castings are now ready for the annealing furnace. Practically all foundries are now using oil-fired annealing furnaces of the car type, although coal and gas-fired furnaces are in use in many foundries and powdered coal and producer gas are used to some extent. All steel castings without exception should be annealed, and the proper temperature, length of time and manner of cooling should be adapted to the composition of the steel under the supervision of a competent metallurgist. A reliable pyrometer installation is essential. The use of cast iron or steel grids increases the capacity of the annealing furnace by allowing the castings to be unloaded while still too hot to be handled in any other way, and the next charge being ready on another set of grids allows the furnace to be recharged at once, thereby saving considerable fuel. Careful attention to the type of oil burner and economy in the use of oil is very essential in these days of high priced fuel. The annealing furnace should be so designed that the flame does not impinge directly on the castings and so that it is possible to heat uniformly all parts of the annealing furnace. An oxidizing flame should be avoided as it causes excessive scaling.

Sixth operation, sawing risers. This operation has been eliminated by the flame cutter in the majority of foundries but where heavy castings with large risers are produced saws are used for their removal. When this is the case the risers are sawed off after annealing. This is especially necessary where high carbon or alloy steel castings are manufactured. When the flame cutter is used the risers are removed before annealing to economize room and oil in the annealing operation.

Seventh operation, chipping. The castings are next delivered to the chippers who remove fins and lumps with pneumatic chipping hammers. Small castings are chipped on benches equipped with vises to hold the work in place. Larger castings are chipped on the floor or on horses.

Eighth operation, grinding. The lumps usually left where the risers have been burned or sawed off, and where the gates have been broken, are removed on the grinders. Swing grinders are essential for large castings and stand grinders are used for the lighter work. In order to economize in the use of grinding wheels it is well to have two or three different rates of speed for the grinders, the new wheels being used with the slowest speed and moved to the grinders with higher speeds as the wheels wear down. This also promotes grinding efficiency by maintaining a relatively uniform peripheral speed as the diameter of the wheel is reduced in grinding.

Ninth operation, tumbling. The final operation in the finishing department should be to tumble all castings whose size permits them to go into the tumbling barrel. This removes annealing scale and produces a bright clean surface on the castings. Castings too large for the tumbler should be sand blasted. The tumbler, however, furnishes a much more presentable casting and tumbling is a far cheaper operation than sand blasting. In some foundries where the nature of the work permits, the tumbler can replace sand blasting.

The castings are now ready for final inspection, sorting and weighing. Inspection at every operation is a very important part of finishing department work. First inspection should be made on the flogging floor and castings which are obviously defective rejected at this point. It is hardly necessary to state that the inspection department should endeavor to reject imperfect castings before much work has been done upon them. Some defects do not show up until after sand blasting, so an inspection is necessary after the castings leave the sand blast. At this point also the castings on which welding is necessary and allowable are marked by the inspector.

The foundry foreman should be constantly in touch with the inspection department and the foreman of the finishing department, not only for information concerning defective castings, but also to study the possibilities of decreasing labor in the finishing department by changes in gating, elimination of unnecessary fins, and to observe how the facing is peeling from the castings. Here an ounce of prevention is worth many pounds of cure. It is often cheaper to scrap a casting than to clean it up.

Without doubt the finishing department is the most difficult part of the foundry in which to introduce a piece work or bonus system of payment. The amount of work to be done on castings from the same pattern varies from day to day with the condition of the molding and core sands, and the care taken by the molders. Especially in the foundry which produces a wide range of castings is the task of setting rates extremely difficult. The writer has tried day work, premium system, piece work, and various bonus systems. Some conditions demand a combination of all of them. There is no department in the foundry where a system of bonus payment or piece work is so necessary, for the output of a man working day work is invariably doubled when he is given a rate. In the writer's experience, piece work based upon the tonnage of castings handled produces the best results. A liberal rate is better than one which is too close and some flexibility in the rates must be allowed to provide for faulty conditions of facing sand and molding practice which cause extra work in cleaning the castings.

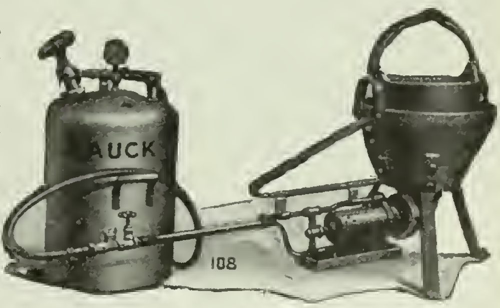
Piece rate systems of payment in the finishing department have a very salutory effect on the molding and coremaking departments, for the chopping room boss will certainly make a first-class pest of himself when castings come to him with an unusual amount of fins, scabs or lumps or when the cores are too hard. When the chippers have difficulty to make their day's pay the rest of the shop is sure to hear all about it. When the piece rate system is introduced it is necessary to tighten up on inspection at once, and the inspector should be called upon to O. K. the piece workers' earnings.

A finishing department of any size should have its own tool and store room. Grinding wheels, hose, sand-blast nozzles, saw teeth, waste and lubricants should be stored here. Very few chippers are capable of properly grinding their own chisels and a supply of ground chisels ready for use should be kept on hand. All pneumatic chipping hammers should be returned to the tool room every night and given a kerosene bath. The cutting torches, regulators and hose should also be in the tool room when not in use.

This paper is not written with the idea that it contains anything which is particularly new to the steel foundryman. It is hoped, however, that it will be a stimulant to thought and direct some attention to the department which the writer has found to be the most troublesome in the steel foundry.

COMBINATION MELTING FURNACE

The Canadian Hauck Burner Co., Port Hope, Ont., have improved their combination melting furnaces in many ways, and for readers' benefit who may not know the particulars of this style of furnace, we append the following information. Their uses are varied, and they are adapted wherever lead and other soft metals have to be melted.



GENERAL VIEW OF THE OUTFIT.

The illustration shows clearly the idea. It is actually two outfits in one, a melting furnace, and a portable oil burner. The burner can be instantly detached if desired and used for a wide variety of purposes, such as melting babbitt out of bearings, heating bearings for rebabbitting, expanding to shrink fits, melting lead out of pipes, fitting joints, preheating for welding, etc., etc.

The furnace illustrated is the smallest size with a 125 pound pot. This melts 100 pounds of lead in 14 minutes. The burner consumes 3 pints of kerosene per hour. With the larger furnaces 200 pounds of lead can be melted in 15 minutes, and 450 pounds in 20 minutes.

Molding an Annealing Barrel on End

Demonstrating How a More Satisfactory Job Can Be Done by Molding This Way Than by Lying on Its Side

By M. E. DUGGAN

The following deals with a moulding proposition in which the production of a casting for the rotary annealing barrel shown in Fig. 1 is involved. The casting contains no openings at either end but has an opening, 5 by 24 inches, at the side, for charging the barrel. As first planned the pattern was made split

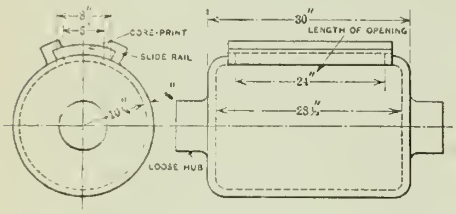


FIG. 1 SHOWING ANNEALING BARREL.

through the centre, to be moulded on its side. For the production of the body core a skeleton core-box was furnished. This method of moulding was deemed inefficient by the foreman of the foundry, with the result that the problem was handled in a radically different way.

The pattern was made solid so as to mould it on end, and the skeleton core-box was changed to a regular half core-box. The asembled core weighed 575 pounds, and in moulding, the pattern had to be supported on four chaplets, which are shown in Fig. 2, resting on the slab cores F. These cores were rammed in the bottom of the mould directly under and next to the pattern. The thickness of the walls of the barrel was ¾ inch, so that by using three wooden strips of this thickness the core was centred

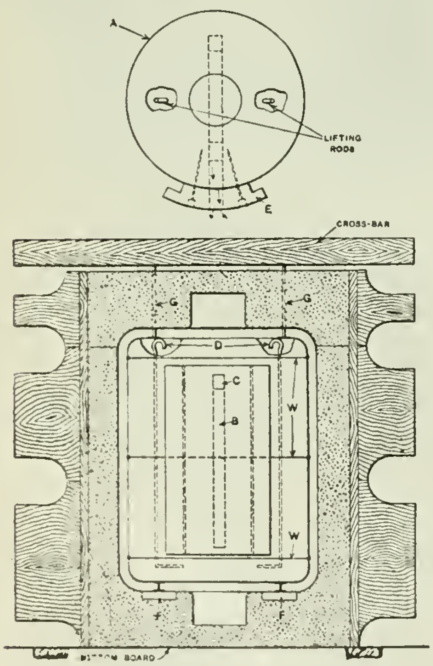


FIG. 2 SHOWING MOLD WITH CORE IN POSITION.

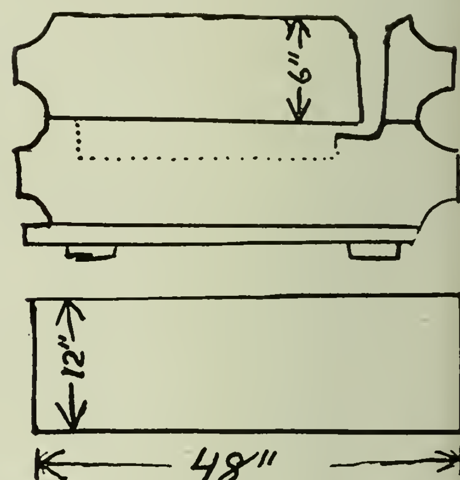
in the mould. The core was held down and secured at the top by means of the four chaplets G, which press down on the core, their stems passing up through the cope and against a wooden cross-bar secured to the cope flask. An air vent was made consisting of two vertical channels B, which were connected by a cross-channel C located near the top of the core. This cross-channel continued on out through the core E, thence into the moulding sand and up to the top of the mould. The slab core E, provided for the charging door in the side of the casting, was fastened to the body core A by five 20-penny nails. In using nails to hold this core to the body core, it was necessary to drill holes in the cores. Five holes were drilled with a piece of core wire through the slab core, these holes being used to locate those in the body core. The slab core was then pasted in position and nailed securely in place. The two half cores, after being pasted together, were reinforced by three binding wires W. Two lifting rods D were provided in the heavy core for lifting it from the mould.

The advantage gained by moulding this pattern by the method just described is that only two and one-half hours is required to make the core with the half core-box, whereas four hours was required when using the skeleton core-box. In addition to this, the core made from a skeleton box is not as satisfactory as when made in a regular half core-box.

PRESSURE OR LIFTING FORCE OF MOLTEN IRON

Editor,—Referring to your article in the September issue of the Canadian Foundryman on pressure or lifting force of molten iron in foundry practice, I will say that figures in connection with same won't lie. By referring to the very crude sketches here shown you will readily understand a rule the writer never had fail in regard to the amount of weight required to hold copes or covers absolutely secure. In connection with this I will say that the rule is so simple that it is very poor foundry practice to resort to guessing and getting the guess too light or too heavy when a little figuring will give absolute results. Take for instance twenty-five or thirty years ago when bolting down floors were an exception to the general rule now in vogue; a foundry foreman who guessed at all the various weights required for the different jobs would have had much more peace of mind by using the rule here given. This rule will apply to any shape of casting. But I will admit that the rule here given leaves a big margin of safety on some particular patterns that may be made in a heavy iron flask and of comparatively surface area. But generally speaking it is a safe rule. The sketch represents a simple job in a mould with a cope six inches in depth. The lower part is the top surface of pattern and is 12 by 48 inches in dimensions. To figure the lifting force the rule which I have used is as follows: $48 \times 12 = 576$ square inches of surface area; multiply this by the height of the cope, $576 \times 6 = 3456$. Multiply this by .26, which is the weight of a cubic inch of iron, $3456 \times .26 = 898.96$.

C. O. V., Sterling, Ill.



TOP VIEW SHOWS MOLD. BOTTOM VIEW SHOWS TOP SURFACE OF PATTERN.

Editor's Comments

To be mathematically correct the .26 should have been multiplied by 6, which would have given the pressure per square inch on the surface area, and by multiplying this by 576 would have brought the same answer, but it should be a little more easily understood. If one inch of iron weighs .26 pound, 6 inches will weigh six times as much, which will be the pressure per square inch. If this is multiplied by the number of inches on the surface area we get the amount of weight, which is required to hold against it, viz.: 898.56 pounds. If the 12×48 inch plate had been open work the upward force would have been calculated by the amount of surface, which is actually on the casting. However, the rule laid down by G. O. V. will invariably bring the correct answer, subject of course to the latitude which he allows for on account of the pattern having less surface in which the weight could be reduced proportionately.

Every time you crowd into the memory what you do not expect it to retain you weaken its powers, and you lose your authority to command its services.

* * *

The whole face puts on mourning for the death of self-respect.

* * *

Your ambition, not our worded prayer, is your real creed.

Practical Hints for the Brass Founder

NUMBER TWELVE ALUMINUM ALLOY

In a paper recently read before the American Society of Mechanical Engineers, it is stated that the principal aluminum alloy used for castings in the United States consists of about 92 per cent. aluminum and 8 per cent. copper. This composition is generally known as the No. 12 alloy of the Aluminum Co. of America, or as the Society of Automotive Engineers' specification No. 30. When a ½ inch testing bar is cast in green sand from this alloy and tested without machining off the skin, an average tensile strength of approximately 20,000 pounds per square inch and an average elongation of about 1.5 per cent. in two inches will be obtained. A modification of this alloy having somewhat better physical properties is now being used to some extent in the production of castings for the automotive industry. This alloy has an analysis of 7.5 per cent. copper, 1.5 per cent. zinc, and 1.2 per cent. iron, and the remainder aluminum. The tensile strength averages about 21,000 pounds per square inch, and the elongation is somewhat greater than that of the No. 12 alloy.

CASTING MUNTZ METAL IN IRON MOULDS

Editor, Canadian Foundryman,—Is it possible to successfully cast Muntz metal in an iron mould? I am doing a line of work by the extrusion process and am having the best of success. I have my composition correct and the extruded pieces are perfect, but I am using sand moulds to make the castings and desire to make them in permanent iron moulds and have tried it without success; the zinc in the alloy separates itself from the alloy and fuses into the iron mould, thereby preventing the casting from being removed. Can you tell me how to prevent this? Is there any coating which can be put on to the surface of the mould which will separate it from the melted metal, or is there any substantial material other than iron from which I can make the permanent mould?

Answer.—These are questions which I would rather not answer until I hear from some of our readers. Are there any of our readers who have had experience in this line and who would care to impart the required information? Talc, soapstone, graphite, etc., are substances which should be effectual, but my personal experience is not back of them and I would prefer to have further suggestions.

TROUBLE WITH PROPELLER BLADES

Editor, Canadian Foundryman,—Some time ago you published in the Canadian Foundryman some mixtures for brass bearing metals, etc. I make a few flanges or blades for reversible propeller wheels, and am having trouble getting a proper mixture of brass for them. I get them either so soft that if the wheel strikes a log or stone they double up past straightening, or so hard that they snap right off at the small part, where the blade screws into the hub of the wheel. Can you suggest a mixture of brass that will be a happy medium?

Answer.—60 of copper and 40 of zinc is the universally accepted composition for propellers. It is hard and strong and at the same time is inexpensive; 9 of copper and 1 of tin is strong and elastic, but is more expensive and has no advantages for propeller work. The copper and zinc mixture can be improved by the addition of about one half of one per cent. of aluminum and an equal amount of manganese. Aluminum can be stirred through after the metal is melted, but manganese is introduced in the form of manganese copper or manganese tin, which can be bought from foundry supply houses.

CORE SAND STICKS TO DRYER

Editor, Canadian Foundryman,—Could you give me any information as to what will make cores part clean from a metal core box? I am making cylinder cores on a dryer but cannot get the cores to part clean when dried. We are using dry core compound in our core mixture and are having good results otherwise.

Answer.—Always keep a can of coal oil, a small paint brush, and some waste handy, keep the core box clean with the coal oil. The paint brush is the handiest thing for getting into corners where core sand might lodge. Wipe the box out clean with the waste and the little bit of oil which remains will assist in separating the core from the box. Don't work the core mixture too wet, and of course don't be extravagant in the use of the binder. When using half the box for a dryer it can be well coal-oiled, which will prevent sticking. If it is desired to put a black washed core into a dryer, use machine oil on the dryer and the black wash will not stick to the dryer.

DIE CASTING

The majority of castings over a pound or two in weight are made in moulds of sand and loam, which gives them a more or less rough surface. Where accurate fitting is needed the contact surfaces must be machined. The war created a demand for small articles, such as fuse, bomb and magneto parts, in quantities so enormous that neither casting in sand nor machining from the solid could cope with it. This gave die-casting a chance which British manufacturers have taken full advantage of, though in pre-war days this process enjoyed small favor there as compared with its vogue in the United States. The process is limited to small parts and is suitable only for the softer metals such as zinc, lead, tin, aluminum and their alloys. The die is machined out of steel to the exact dimensions required, and the molten metal is forced into it under high pressure by a pump. The comparatively cool surface of the die chills the metal at once, while its comparative smoothness gives a surface equal to that produced by machining. In this way an almost infinite variety of small parts can be turned out at great speed and low cost, though accurate in dimensions to the thousandth part of an inch. If the die be correct the casting is correct also. Careful design and construction make it possible to cast parts of the most intricate outline, with screw-threaded surfaces, without trace of a join mark. In one case that has come under our notice the cost of manufacture was reduced by 80 per cent. and the rate of production increased enormously, as skilled labor could be dispensed with entirely for the actual casting.

Manganese bronze may be made, according to Mr. P. E. McKinney, metallurgist of the Naval Gun Factory, Washington, without resorting to the use of high-grade virgin metals. The alloy has been produced in a reverberatory furnace from materials which were of low grade, such as yellow brass machine-shop turnings, zinc dross from galvanising pots, aluminum turnings, old zinc scrap, foundry floor scrap and skimmings and scrap copper.

It is claimed that a satisfactory substitute for copper, bronze, and brass has been devised by adding not more than 4 per cent. of manganese to zinc. The resulting metal is claimed to be about twice as hard as zinc and to have far greater resistance to impact. It is said to be possible to forge the new alloy when warm and also to stamp and roll it.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

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A. R. KENNEDY, Managing Editor. F. H. BELL, Editor.

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THE PRINCIPAL CONTENTS

The Columbus Convention

THE foundrymen's convention is again a thing of the past, being the twenty-fifth successful effort of the American Foundrymen's Association. The one which has just closed was undoubtedly the most successful of any from most any point of view. The transient visitors who just call once or twice were perhaps not quite so numerous as was the case when the convention was held in larger cities, but otherwise it surpassed all previous conventions. The membership is greater; the number who registered at the registration booth was greater; the amount of floor space sold was greater; the number of exhibits was greater, and, incidentally, the receipts were greater than any heretofore, so that, all things considered, the convention and exhibition of the American Foundrymen's Association, held at Columbus, Ohio, in Oct., 1920, will go down in history as the greatest and most successful of any to date. Where the next convention will be held has not yet been decided, nor very seriously considered, for various reasons. Some think that a Canadian city should be chosen, as we are entitled to about one out of a dozen, and it is twelve years since the convention was held in Toronto. Others consider that the annual convention and exhibit has become such an all-important event that the time has arrived when a permanent location should be selected and the convention held in the same place each year. This idea would have some advantages, as foundations could be built for the machines and used from year to year, but it would have its disadvantages, for the reason that each exhibitor would, in all probability, occupy the same space each year, and by having permanent foundations would most likely exhibit machines which would fit these foundations, which is to say the exhibits would be practically the same each year.

The convention has been a success so far, and will continue to be a success so long as carried on along lines similar to those so far adhered to. Every one has surpassed the preceding one and next year's will surpass this year's, but it is doubtful if a permanent location will draw the attendance, and if the attendance falls off the convention will follow suit. Many people attend the convention for the sake of the trip and they would not want the same trip continuously. Better continue along lines known to be acceptable and the convention will continue to be an event looked forward to.

Who Said Montreal?

IT is not the rank and file of the members and guests who select the location for the convention, but if it were the consensus of opinion and the almost unanimous vote would appear to favor Montreal, as the location for the next convention. Montreal has certainly become popular with the Americans, and a great many American conventions have already been held there, but it is doubtful if Americans find Montreal to be what they expect it to be. Liberty loving Americans try to make themselves feel that their liberty has been tampered with through prohibition legislation and that in Canada they will find things more to their liking on that one point, but they are only joking; they don't want to see the bar-room in their midst again and they will not see it in Montreal. From the booze point of view Toronto would be an ideal place. We have the best exhibition buildings on the continent and the hotel accommodation would be of secondary consideration, as billeting would be more popular with the cellar at the disposal of the guests. But what's the use of talking? Foundrymen don't want booze, but talk is cheap.

Boosting the Advertisers

THE question frequently arises whether or not it is good policy for an editor to make reference to the advertising columns of the paper. The editor, it is argued, should devote his entire time to making his part of the publication of sufficient interest to the readers to hold them as subscribers, thereby keeping the circulation great enough to merit the patronage of those who would take advantage of it as an advertising medium. This argument is certainly based on sound common-sense ground, as nobody wants to spend his good money in advertising only to find the editor putting in an occasional word for one of his competitors. While we realize all of this and know that we can not boost one without boosting them all and that by drawing the reader's attention to advertisements we place him in the position of one who had not the good judgment to think for himself and read what interested him most, we have to admit that there are times when a writer can best arrive at his desired point by referring to some line of goods which is being advertised, and unless it is too flagrant, the editor does not feel like rejecting it. In our own case we frequently have subjects brought up which are baffling. Take, for instance, the matter of dirty castings, such as engine cylinders. A few months ago we mentioned the trouble experienced in securing good cylinders. We might have mentioned that we saw a pile in one shop which the superintendent informed us represented twenty thousand dollars, and these were as pretty castings as anyone could wish to see, demonstrating that the moulders had done their part right, but the castings were defective and could not pass inspection. We might also have mentioned that in another shop we visited, they were having the best of success on the same line of work. Now, where does the trouble lie? We could put our finger on advertisements in this or any issue of Canadian Foundryman which would tell the story.

The things depicted in these advertisements are the things which brought success to those who were successful, but as we have pointed out we can not discriminate and can only ask the reader to read all the advertisements and he will be surprised at what he learns. There are means practised by successful foundrymen in securing good castings and the unsuccessful ones might as well get the habit.

Next Month's Special

SPECIAL editions of a magazine are, by many people, compared to bargain days in a store—more of a joke than a special—but this is not the proper attitude to take, as bargain days are not necessarily jokes, and a special edition of a magazine can be made of especial interest to the reader by devoting extra effort to some particular subject. This is the policy which we aim to pursue in the future, and while every issue will contain the regular run of information which has always characterized this publication, we will, in addition, run a special article on some feature of foundry equipment. Canada is just entering into an era of prominence, in fact, without over-indulging our patriotic zeal we feel justified in asserting that she has the most promising future for some years to come of any nation in the world.

In preparing for the business which will invariably come our way, our industries should be equipped with the most approved devices for attending to it, and this will be our aim—to introduce to the reader what the most up-to-date foundrymen are doing in the matter of production.

In the issue of November we will endeavor to describe what can be done with the aid of compressed air—showing the power of air when properly harnessed—how even hydraulic machinery is sometimes dependent on air—how air can be made to do almost everything which is done in the foundry—in fact an interesting and instructive composition on pneumatics written in plain English and free from unintelligible technical terms.

Guaranteeing the Price

THE practice of cutting rates in piece-work shops is coming to be one of the things that will soon be known only as a memory. It was done in many places. One job comes up from years past of a plow factory where the rate had been set at "so much per" on the polishing operation. Polishing plows is not easy work, at least it was a husky man's calling at that time. When the boys in the polishing room had dusted off enough shares and consumed enough dust to chalk up around $2.25 per day, the new price schedule was posted on the wall, and it became apparent that $1.85 was the limit.

It was another way of punishing a man for working hard.

Under that system the wise piece worker got a job and knew when he was at the limit. He jogged along, killed time and at the end of the day had an output that could be cashed in for $2, or thereabouts. It was encouraging laziness on the part of the men.

All over the country we have shops now where the prices are fixed after a careful study—they are guaranteed for a given period or until such time as there may be an alteration in the operation itself. Production men claim they are getting better results this way than from any other system they have tried.

Market Conditions and Inclinations

MARKET quotations are to-day more uncertain than at any time in some months. Normal conditions have been slowly but surely coming around, but so far no assumption is safe. What effect the unrest in Great Britain will have in Canada remains to be seen, so that on the whole there is no use attempting to prognosticate what is in store for the near future. If sugar is to be taken as an example, it would appear that the tendency is downward, but iron and coal, the staple material for foundry operation, were, unlike sugar, high in price on account of a real shortage, and this shortage has not yet been overcome, but most of the foundries are still filled with orders and the iron market, while keeping up to the demand, is not getting much ahead of the demand. Coal and coke are still hard to get, but judging from appearances here and over the line, one is tempted to predict that in the near future things will be a little easier. Nobody wants to think of slumps or panics, but business is more satisfactory for everyone concerned when the supply and demand balance fairly even.

We have been asked what would be advisable to do in the way of buying ahead on pig iron at its present price. We can only say that if we were doing it on our own account we would stick pretty close to the hand-to-mouth method for a while yet, as there is no good reason why prices of any commodity should go any higher.

There is no doubt but some manufacturers will intentionally hold back work which might be gone on with in order to bring the labor situation to a more stable condition. This might have some effect, but it is to be hoped that with the opening of another season, Canada at least will make some attempt to keep to work. The day of ill-will between employer and employee should be at an end, and if both sides will use some sound common-sense and try to agree, there is no reason under the sun why Canada is not in for a long spell of prosperity.

The Descent.
—Lecocq in the Portland (Ore.) "Telegram."

Pattern Making and Castings for Condensor

Being Continuation of Article Appearing in Last Issue of Canadian Foundryman

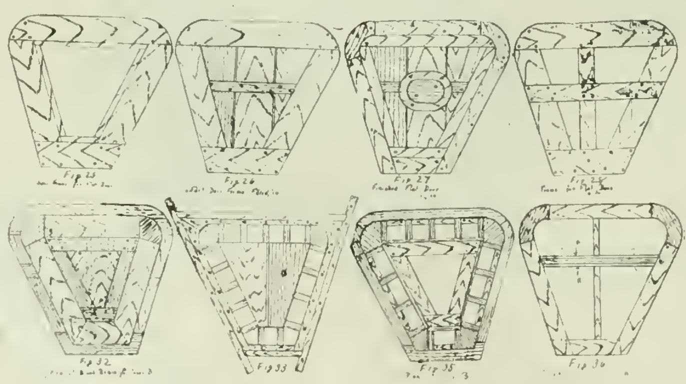
By BEN SHAW AND JAMES EDGAR

IN OUR last article we described the pattern making on a condensor such as is used in connection with the steam engine on a modern ship. As Canada is becoming a ship-building nation of no small magnitude, the question of power equipment is of importance to engineering plants, and the pattern making and molding will of course be of interest to readers of this publication.

In this issue we publish a continuation of the same article, in which the pattern making on the doors and waterend are described. In the November issue we will show how the molding and casting are done on all the patterns described in these two articles. The article will be profusely illustrated and will be exceptionally interesting to all those who follow the foundry business.—Editor.

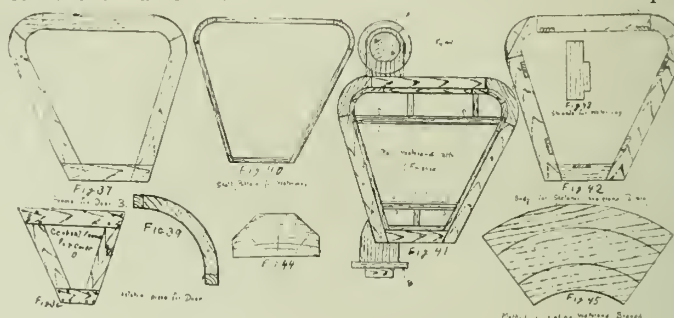
The Doors and Waterend

The door and the waterend are smaller patterns and easier to handle but they are not any easier to make. There is more choice however in the methods that may be employed and the one chosen ought to depend upon whether one or many castings are needed. It is sheer waste to make a solid standard pattern if it will be only used once, and just as foolish to make a shoddy pattern and expect it to stand moulding many times. Let us consider the flat door (A Fig. 2) which covers the waterend. It is just a large plate with facings on either side, and Fig. 5 is a view of it. The cheapest pattern is constructed by simply placing boards side by side and checking cross battens in. The great drawback of course to this pattern is that it cannot be relied upon to keep its shape in the foundry. A much better job is obtained by making a half lapped frame like Fig. 25. On the inside of each piece of timber a check as shown in the sketch can be cut out at the saw and the centre filled in with boards (Fig. 26). It may



be as well to inset a batten across the boards if the job is very large. Fig. 27 shows the door quite finished with the facings and the sight hole print screwed on. Another method, and quite a good one, is to make a frame like Fig. 28 and leave the spaces to be strickled out by the moulder, or they may be fitted in with timber in a similar fashion to the last described way. Such a pattern will stand any number off it.

The saucer-shaped door, B, at the other end of the condensor from the waterend, is more difficult. Three



methods are possible, a block pattern with a corebox may be made, or a shell pattern is possible, but the way usually preferred is the skeleton principle of construction. If a standard pattern were required the block pattern is certainly the best, and we shall consider it first. A half-lapped frame similar to Fig. 28 is the foundation, but the cross centre battens may have to be measured in, so that they will support the structure. The size of the top frame, Fig. 29, is determined by the size of the radius of the curve, which connects the top plate with the flange. The top plate can sit on supports the necessary width, which are screwed to the flange and are shown dotted in the sketch of the finished pattern, Fig. 32, and at A, Fig. 30. Four pieces have to be made for the curve, and to reduce the timber cost grounds ought to be used with a face piece screwed on (Fig. 31). The corners are best fitted in solid, and when this is done the pattern is complete except for the print, which need not be more than ¾ in. or 1 in. thick, as it is merely a guide for setting the core. This makes a really strong and light pattern.

The core box for a solid door takes a good deal of timber. A bottom is necessary and an outer frame is necessary, inside which the core shape can be found. Fig. 33 is a suitable box. It is a skeleton box and does not need much explaining. The depth of the sides should be at least ½ in. deeper than the core, so that the centrepiece C ½ in. thick can be fixed on the bottom. This obviates feather edges, and it is easier for the moulder to make up the box with sand. The grounds may be cut from a template and the joint resting on the grounds should be about ¾ in. thick. If a solid box were demanded in the foundry the most practical way of making it would be to fill in with pieces like Fig. 34 and in the long run this would prove a cheaper box than that made skeleton.

A shell pattern may be ruled out because of the difficulty of ramming it in the sand, as a pattern it would not be durable, but a really good skeleton pattern can be made which would stand moulding many times, and it has the big advantage over a block pattern that the thickness of metal is assured. Fig. 35 is a plan of a skeleton pattern and Fig. 36 is a view looking on the inside, but not showing the skeleton work, but merely the ribs with the loose pieces wired instead of screwed on, as there is not much danger of them being knocked off. The flange ought to be built of two thicknesses, Fig. 37, and an open frame, Fig. 38, made for the top. The skeleton pieces, which should be about 2 ins. thick and 3 ins. or 4 ins. apart, should be screwed on runners, Fig. 39, which makes accuracy less a matter of chance in building, and makes rebuilding the pattern an easy matter if the moulder wants to take any part of it to pieces. The corners are best cut from solid timber. When all the parts have been made the flange ought to be set to centre lines on a flat building board or on the foor, and screwed down. The top frame, which may rest on temporary supports, should be squared into position, when it is a very easy matter to screw the skeleton sections in their places. The spaces between the skeleton pieces will be strickled out by the moulder. Usually lifting lugs are cast on these days, but they will give no trouble. The ribs on the inside are best screwed from the outside of the pattern so that the moulder will have no difficulty in loosening off.

The side strips (AA Fig. 36) can be drawn into the rib. A pattern thus made will be found to be very rigid. The shape of these doors is not always as regular as in this case, and sometimes the cost of making a block pattern and corebox would be quite prohibitive. An improvement would be effected by making the strips or runners to which section pieces are screwed of hard wood, so that they will not get worn by repeatedly being unscrewed.

The only remaining casting, apart from the sight hole doors, which need no explaining, is the waterend or waterway, as it is sometimes called, with two branches, an inlet and and outlet. Like the saucer shaped door it may be made in a variety of ways. Sometimes when they are very large and the metal is thin a block pattern is made and the mould is wood thicknessed. The construction of the pattern in such a case is identical with the construction of the condenser pattern. Although the size of the work ought to determine to a very great extent the way in which it is to be made, the judgment of the craftsman has to be exercised and he has to take into consideration as well as size the

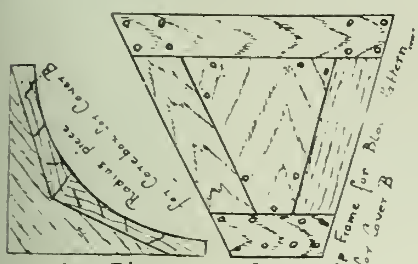


Fig 34 Fig 29

thickness of the metal and the quality of the pattern necessary. For a condenser of the size we are considering, and of which the metal would be ¾ in. or so thick, it is as well to make a skeleton pattern, always providing that a large number of castings are not wanted. If so, then a block pattern ought to be made, and for that matter, a corebox. In passing it may be said that the corebox would be made in a very similar fashion to the skeleton pattern which we are about to consider. Flanges of two thicknesses would be made with stays between, and the inside would have to be lagged with ¾ in. or ⅞ in. timber. Of course it is necessary to leave taper, and one great advantage of the skeleton pattern is that no taper is necessary. The first step is to make two flanges. and these are connected by means of stays checked into them and which are the thickness of the metal. A ¼ in. shoulder on these pieces will keep the flanges the correct distance apart. It will probably be necessary to put more stays than are shown in the sketch (Fig. 42) to support the branches. The moulder would complete the mould with the aid of a strickle like Fig. 43. Skeleton patterns are invariably sent away from the patternshop without any provision being made for strickling the spaces, and so it falls to the moulder either to improvise or to get the foundry patternmaker on the job to make suitable strickles. One good thing about this neglect of pattern makers is that the whim of the moulder can be satisfied, because a strickle that would please one moulder would be condemned by another as quite unsuitable.

Another form of construction, which is more suitable for smaller patterns, is to make a shell pattern an exact model of the required casting except for the branches, and these must of course be cored out. Fig. 40 illustrates the best way of making up the sides of the pattern, and though they can be screwed together it is advisable to build two thickness section pieces for the corners, which can be set in top and bottom. The bottom flange ought to be made in pieces so that it can be drawn into the mould, but the top flange is better built of two thicknesses, thus helping to hold the framework of the pattern together. The internal ribs are easily fitted, the loose pieces being wired on in the same way as those in the cover.

The branches are sometimes very awkward. These in this job are simple. Very often they are shaped from a large diameter on the outside to a rectangular shape, breaking through the metal of the waterway, which necessitates very great care when making the corebox. Sometimes when the shape is very irregular, the patternmaker gets out of the difficulty of making a corebox by leaving the moulder to clay or sand thickness the mould. Wood thicknessing is of course only practicable on flat faces. The craftsman, however, who does not make a corebox because he is afraid of not getting the correct thickness of metal, betrays gross and inexcusable inefficiency. The branches under consideration are easily made. In the case of branch A, the face of the flange will be at the bottom of the mould and the flange, as will be seen from the sketch, is made so that it can be drawn into the branch. The branch B may be made solid with the flange and print in halves. The branches are frequently made square between the flanges, to obviate the awkward corners and thick metal resulting from a diameter breaking through between parallel flanges, and this modification does not affect the efficiency of the casting. The best way and the quickest of finishing a circular bend is to plane the wood to a parallel thickness, grind it to lines inside and out and then pare from sides to top at an angle of 45 degrees (Figs. 44 and 45). Most large pattern shops have nowadays a woodworking machine on which bends can easily be shaped. It is an advantage to fit prints inside the waterway to help the moulder setting his cores. If the boxes were large, skeleton boxes might be made for them, but when they are as small as those we are considering it is as well to make them solid.

The patternmaker's work is not yet finished. It is probable that when the patterns go to the foundry that frequent calls will be made upon him, and it is his job to thickness moulds with timber and make sure that the thickness of metal is correct. In work of this kind the moulder and the patternmaker must have a good understanding between them to ensure successful working.

TRADE GOSSIP

More Coal Coming.—It was stated by an authority this week that coal would probably be more plentiful next month with the closing of navigation on the upper lakes. At present the mines are sending the largest portion of their output to Western Canada while they can take advantage of cheaper freight rates by water. With the closing of navigation in the near future, Toronto and central Ontario district will come in for its share of attention.

Germany Gets Order.—Canada has lost the order for 2,400 steel railway cars which the Belgian Government, through the Canadian Trade Commission, sought to place with manufacturers in this country. Instead of "made in Canada" cars, the Belgians will ride in coaches of the "made in Germany" variety when the order is filled. Advices to the Trade Commission are to the effect that the Belgians have placed the order with Germans and will pay for the railway material with foodstuffs which are to be supplied to Germany.

Plate Mill Record.—The new plate record of the Dominion Iron and Steel Company, at Sydney, broke all previous records for production when 260 tons of plates were rolled in one day. The regular daily production of the mill is about 200 tons a day. About two months ago the 240-ton mark was reached. Last week the mill ran without a hitch of any kind, resulting in the establishment of the new 260-ton record. The greater part of the plates which are being run at the present time are being shipped to Halifax, Montreal and other Canadian cities. As yet no further foreign orders have been received.

Locating in Toronto.—West Toronto's building operations include another large factory, which will employ a large staff. Grinnell and Company, of Canada, situated near Bloor street on Dundas street, having decided to manufacture in Canada are putting up large machine shops and foundry adjoining their present office building. The work is now well in hand, and the buildings, which will stand upon about two and a half acres of land, are to be of reinforced concrete, and will extend from Dundas street right back to the railway tracks. The machine shops will be 180 by 52 feet, and the foundry 210 by 100.

Who Did This?—Trailers purchased by the Ontario Power Commission for service on Windsor Street Railway System cannot be used until extensive alterations have been made. According to an employe of the Commission, it has been found impossible to keep the cars on the rails, because the wheels are one inch narrower than those in use. It will cost several thousand dollars to make the necessary changes.

Scraps from the Foundry Scrap Pile

The Vancouver Engineering Works, Vancouver, B.C., have recently installed and successfully tried out a new Grieves-Etchells electric furnace in their foundry in that city.

Hamilton, Ont. The Carr Pattern & Tool Co. is a new concern which has been incorporated in this city to manufacture, patterns, tools, etc. John Carr, Robert Christie, John A. Robertson and others. It is capitalized at $40,000.

The Boundary Iron Works, Grand Forks, British Columbia, will begin at once the erection of a large modern foundry to replace the one recently destroyed by fire. John McKie is business manager of the concern.

The Electric Furnace Construction Co., 908 Chestnut Street, Phila., beg to advise that their first electrically-heated core and mould drying oven has been put into operation at the Emery Steel Castings Co., Baltimore, Md. Details of this installation will be given in a later issue.

The Canadian Abrasive Company, Limited, under the management of J. L. Near, will erect a plant at Vancouver, B.C., to manufacture sandpaper and other abrasive papers. The British Columbia Department of Industries have granted a loan to assist in getting the enterprise under way.

Chester, Nova Scotia.—The plant of the Hawbolt Gas Engines, Ltd., of this town, has been destroyed by fire, entailing a loss of from thirty to forty thousand dollars. It is anticipated that the company will rebuild at once, and that the new plant will be ready for occupation before the end of the year.

Maxwell's, Ltd., St. Marys, Ont., have recently made considerable additions to their plant. A fair-sized extension has been made to the moulding shop and a new pattern storage building has been erected and the building formerly used for pattern storage has been converted into a tinning department. Extensive alterations and additions to the machine shop will be proceeded with.

Change of Address.—The National Engineering Company, manufacturers of the Simpson sand mixer for foundry purposes, announce that their New York office has been moved from 15 East 40th Street to 248 Fulton Street, in charge of their eastern sales manager, Mr. S. H. Cleland.

Magnolia Metal Company of Canada, will increase the capacity of its Montreal plant to three times its present capacity by the addition of buildings estimated to cost twenty-five thousand dollars, exclusive of machinery and equipment. The increased demand on the company for their output warrants this increase and it is hoped to have the new addition in operation this fall.

Robert MacGilchrist, who for a number of years has owned and conducted the West Toronto Foundry at the corner of Mulock Street and Junction Road, Toronto, has decided, on account ill health, to dispose of his business and seek a more congenial climate in the sunny South. Mr. MacGilchrist has enjoyed a good trade and we regret to loose him, but trust that a change of climate may bring him a return of his former good health. The West Toronto Foundry offers a good opportunity to some enterprising foundryman.

CATALOGUES

Wm. H. Nichols Company, Inc., 2-10 College Place, Brooklyn, N.Y., are giving out an interesting catalogue of their molding machines. It is designated as No. 10 and describes and illustrates their split-pattern plate machine with drawing device, combination jolt and squeezer machine, plain power squeezers, combination jolt and power squeezer with pattern stripping device, jolt squeezer with roll-over and drawing device, electric pattern-drying attachment. The catalogue is mailed on request.

The Bastian Blessing Co., West Austin Ave. at Lasalle Street, Chicago, Ill., have just received from the press and are giving to the trade their catalogue No. 20 describing their Rego welding and cutting equipment. The line of equipment described is of particular interest to foundry owners as a great deal of acetylene cutting and welding is done in the foundry of late. The book describes in detail the various devices supplied by this company, which include torches, oxygen regulators, acetylene regulators, high-pressure hose, goggles which entirely protect the eyes, pyro lighter, wrenches, hose connections, pressure chart, etc., together with photographic views of actual operations. All the different parts are shown in detail and a description of how to proceed is well gone into. The catalogue is well worth asking for as the work done by this class of tool is of vital importance in modern foundry practice.

Oliver Machinery Co., Grand Rapids, Mich., are giving away some interesting literature on their Metcalf grinding wheel dresser. The illustrations and descriptive matter show how one wheel can be trued by the use of another wheel which has been especially made for the purpose. Different types of machine are shown, together with views of different jobs which are done on a grinding wheel and the style of machine most suited to the work of keeping the grinding wheel in proper condition.

The C. O. Bartlett & Snow Co., Cleveland, Ohio, are issuing an interesting publication, called "Ideas," for the man who wants to make his foundry more profitable, more productive and more human. The contents show the modern methods of storing, handling and conveying of sand; sand screen device for putting under the foundry floor, for the sand to fall into when shaking out the molds, and from which it is conveyed to overhead storage to be fed from chutes to the foundry. Other equipment for smaller parts is also shown. The idea of saving hand labor and increasing production is emphasized all through the book.

The F. W. King Optical Co., Cleveland, Ohio, manufacturers of safety goggles and other safety devices for protecting eyes, and incidentally the heads of industrial workers, are giving to the public their "Handbook of Safety Equipment," in which is described the various lines manufactured by this company. In addition to its advertising space it has considerable space given over to protection pointers, in which much valuable information is given. Babbitting masks, sand blast masks, etc., are among the devices shown.

"American Foundry Flasks" is the title of a neat catalogue being distributed by the American Foundry Equipment Co., 366 Madison Ave., New York City. The illustrated and descriptive contents show the various lines of flasks carried by this company, which include corrugated steel flasks, flask bars, taper snap flasks, snap mould jackets, cast bottom plates, mounting frames, and also their pattern mounting compound, round and square matching pins, etc.

Catalogue No. 10, first edition, treating on foundry moulding machines, and published by the Hanna Engineering Works, 1765 Elston Ave., Chicago, U.S., distributors for the Mumford Molding Machine Co., illustrates and describes these machines, which are built to meet the practical needs of the foundry. The contents include air squeeze machines, air-jolt-squeeze machines, split pattern machines, etc., with either high or low trunnion to suit the work to be done. Vibrators and vibrator frames and other details are thoroughly attended to.

PITTSBURGH MARKETS

PITTSBURGH, Oct. 21.—The iron and steel markets continue stagnant.

Strip steel shows particular weakening; cold finished steel bars and sheets are easier. Structural steel is lower and plates have declined and pig iron is slumping.

The attitude of buyers is one of indifference. Consumption has decreased but little, but deliveries are being made on previous purchases and demand is so light that real selling prices are not readily available.

Expectations are that prices will continue weakening until the independents' prices are down to the Steel Corporation's level, and whether they will hold together is considered doubtful.

PITTSBURGH, October 21.—The iron and steel markets continue stagnant, as is naturally to be expected. When dull times have prevailed for some time there is necessarily some business being done, but in the early part of a generally dull period there is particularly little business because buyers are getting deliveries on previous purchases. Conditions to-day show that buyers have done what they usually do in an active period when material appears scarce, they have overbought. It looks as though consumption had greatly decreased, because the same buyers who a couple of months and more ago were importuning producers for heavier shipments are now acting as if they were receiving too much material. Consumption, however, has decreased very little. The main change is a change in the mental attitude of buyers. Such changes frequently occur almost overnight.

Pig Iron Slumping

Whatever may have been true of the advances in pig iron prior to the sharp advancing movement of last August, there was no difficulty in seeing last August that the advances made in that month were ill-timed. The volume of buying was very small, much less than is usually required to send prices upwards, and it looked very much as if the advances were based upon little more than a whim of the furnacemen to get pig iron up to the interesting objective of $50. The course of affairs now in the pig iron market reflects the artificial character of the latest of the advances, for pig iron instead of declining is slumping. A difficulty is that inquiry is so light that sometimes the prices at which producers would really be willing to sell are not disclosed. Thus Bessemer iron is still quotable nominally at $48.50, valley, the price to which it advanced in August, although it is certain that furnaces would sell at less. It requires a precise quotation, or an actual sale, to develop the price at which furnaces really would sell.

In the case of basic iron there are clear cut developments. Basic had also advanced in August to $48.50, valley, and during September the market remained, nominally at least, at that figure. Since the beginning of this month it has been clear that some furnaces would be glad to sell at less. A couple of weeks ago a middle interest was understood to have bought 3,000 tons at $45, valley, then selling 1,000 tons to a consumer at $46. Since then there has been further weakening. It is thoroughly established that several sellers have quoted $42, valley, without effecting sales. In the case of one consumer at least, the reason they did not sell was that the consumer got the iron he needed, 1,500 tons, from a middleman at $40, valley, and the middleman had offered 3,500 tons, so that it looks as though there is 2,000 tons ready for some one to buy at $40. According to common practice in quoting the pig iron market, transactions in which a middle interest figures are not regarded as setting market prices, hence the quotable market to-day on basic iron is $42, valley, a price at which iron has been offered, with no takers, representing a decline of $6.50. It was early last February, on the advancing market, that basic got up to $42, and thus the market has declined as much in about three weeks as it had advanced in six or seven months. Usually the market declines at about the same rate as that at which it had previously advanced, and the more rapid decline this time confirms views entertained previously by many in the trade that the advance was partly artificial, and not well based.

As to foundry iron, it is in the same class, marketwise, as Bessemer, not enough business having been done to show where values really stand. The trade calls the foundry iron market nominal at $47, valley, or $3 under the price attained in the August advance. Doubtless on an attractive inquiry furnaces would quote considerably less than $47.

Attitude of Steel Producers

In past times when the steel market became quiet the mills would hold together in the matter of prices, keeping up their quotations until they had delivered most of their contract tonnage. There was no advantage in reducing prices to effect a few fresh sales if thereby cancellation of existing contracts would be invited. At those times, however, the independents and the Steel Corporation were together. Now the independents have to play their game alone, and it is a question whether they will hold together. Some steel makers profess confidence that they will do so, and that production will be allowed to decline and decline again before mills reduce their quotations to the Steel Corporation level, which common opinion has it is the ultimate objective. Not a few observers expect prices to continue to weaken as they have been doing in the past few weeks, and if they continue the pace set thus far it will be only a few weeks, or two or three months at most, until the independents with few exceptions are down to the Steel Corporation level. Some observers even profess doubt whether, even if the independents adhered to their present quotations, the demands on their contracts would be sufficient to enable them to keep above a 60 per cent. rate of operation in the winter.

Steel Prices

There has been particular weakening in strip steel. While the automobile industry does not consume any large part of the steel output as a whole, say 4 or 5 per cent., averaging the year as a whole, they do use a great deal of strip steel and thus their light operation at this time is reflected in the strip market. Last August, when independent prices were well established at 5.50c for hot rolled and 8.50c for cold rolled, there were predictions that the market would go up half a cent, but instead of doing so it has been declining, and it is probable that one could buy now at about 5c for hot rolled and 8c for cold rolled. Cold finished steel bars are easier, there being little difficulty in buying at 4.25c, while a few weeks ago sales at 4.25c were rare. In plates 3.25c is now the top of the market instead of the bottom, single carloads being available at that figure, while attractive inquiries bring out quotations down to 3.10c, and 3c has been done in at least one case. In structural shapes there is conflicting testimony. The independent price had been 3.10c, against the Steel Corporation's 2.45c. Some interests claim 3.10c is being adhered to, while others report transactions at 3c and under, down possibly to 2.70c.

Sterling Wheelbarrow Co., Milwaukee, Wis., have issued a most interesting catalogue of their foundry barrows and trucks, steel flasks with solid reinforced ribs, flask pins, and self-lubricating wheels. The descriptive matter and illustrations are profuse, and show coke barrows, pig iron barrows, charging carts, slag buggies, general purpose foundry hardware, core barrows, core trucks, pig iron trucks, ladle buggies, dolly trucks, casting carts, tot boxes, skimming gates, inside and outside snap jackets, truck castors, etc., as well as every shape and size of steel flasks, with loose or permanent bars, clams, wedges and gate pins, flask handles, etc. The company is represented in Canada by Mussen's, Ltd., Montreal and Toronto.

A Lunch Hour Chat With Our Friend Abe Winters

Being a Continuation of the Chat Which Appeared in Sept. Issue of Canadian Foundryman

EVERY plater who has thoughtfully attended to the filtering of nickel solutions and the cleaning of nickel anodes has observed that a thick layer of carbon remains attached to the nickel remnant. This layer of carbon is sometimes very soft, free from grit, and while moist is quite compact. Again, the coating is found to be coarse, gritty, and falls away from the nickel stub as it is removed from the bath. Here are two examples of anode waste taken from the same bath, but from different lots of anodes. The carbon in a nickel anode does not disintegrate, the nickel dissolves and passes into the solution, the carbon is left and gradually forms a blanket of a graphitic nature over the remaining nickel. In the first case mentioned above the carbon residue is soft and free from grit, the nickel remaining in the carbon coating is extremely fine and if left undisturbed would dissolve satisfactorily and eventually reach the cathode. In the second case, the carbon residue contains coarse, gritty material. If this grit is separated from the carbon we find it is coarse grains of nickel, as the finer grains dissolve and leave the anode and the carbon coating becomes increasingly heavy with the remaining coarse grains, the carbon coat breaks from the anode proper and falls to the bottom of the tank. If this happens while a batch of work is being placed in the bath, or shortly after, the conditions are made favorable for a ruined batch of work, or at least a very badly "sanded" batch, as a result of the distribution of solid material through the solution. In my experience I have never had a batch of work "sanded" by falling carbon coating from the soft, grit-free type of nickel anode; on the other hand, I have seen two-hour deposits which were otherwise perfect so badly "sanded" in a nickel solution containing anodes of the coarse gritty type that an attempt to save the plate by oil wheel application simply resulted in tearing the abrasive from the wheel.

Now the power factor has a very important bearing on the practical economic value which may be attached to the practice of cleaning nickel anodes in ordinary commercial electro-nickeling. If you have a generator with a total ampere capacity of 2,000 amperes at 6 volts and have a maximum flow of 1,200 to 1,500 amperes with an average tank voltage of 2 volts, the soft, grit-free nickel anode may be permitted to remain absolutely undisturbed in the nickel solution for at least 9 months if proper anode surface is used, and very often 12 months can be allowed to pass without cleaning the anode, depending on the amount of work plated in the bath and the attention given the current. The voltage will naturally require attention from time to time and if gradually increased the anodes will function very satisfactorily until practically consumed, if the voltage remains at 2 volts and the carbon coating increases in thickness, the anode rapidly loses its efficiency as the source of metal supply.

As the anode disintegrates and the carbon coating thickens, the power required to convert the metallic nickel into nickel ions increases because the graphitic film is of higher electrical resistance than either the nickel or the solution with which the film is saturated.

If you are using the maximum capacity of your generator and have no appreciable surface current, it would be advisable to clean the anodes at least once every three months, using care in handling and avoiding the use of either brush or scraper in any form.

Weekly removal of nickel anodes is utterly useless and extremely bad practice; nickel which is just loosened and in condition to enter the solution is wasted. An old nickel anode scraped or brushed down to a smooth hard surface, then washed and replaced in the bath will not give up nickel freely for several days. Therefore, it is obvious that frequent disturbance of the anodes is very good business for the supply house, but expensive practice for the consumer.

A bath equipped with the coarse, gritty type of nickel anode will not give equal satisfaction over long periods of employment unless the anodes are more frequently inspected and carefully attended than would be necessary in the case of finer grained anodes.

Furthermore, it is not advisable to attempt to operate a nickel solution containing the coarse grained type of anode at a voltage exceeding 2½ volts. The higher the voltage the greater the loss in metal. The grains will separate from the carbon and fall to the bottom of the tank, forming cone shaped piles beneath each anode. I have removed 8 pounds of scrap metal from beneath a single 20-inch nickel anode which originally weighed 18 pounds 7 ounces. Sodium chloride in excess of 1 oz. per gallon has invariably proven unsatisfactory in nickel solutions we have operated with this latter type of anode.

The consistent regular addition of hydrofluoric acid to the solution has resulted in greater satisfaction than any other method tried thus far. One bath containing 4 oz. boric acid (powdered) per gallon, and to which was added ⅛ oz. (per gallon) of 30-deg. hydrofluoric acid each Saturday, produced satisfactory deposits with less attention to anodes, which were of the coarse, gritty type, until the original anodes were worn away. The tank was then emptied and the slime was very thin and contained less than one-fourth the usual solid matter. No granular nickel was present in piles. The slime was washed by spraying water over it while contained in a very fine mesh wire bottomed box. In this way 3 lbs. of the coarse nickel grains were collected as waste from a total original weight of 311 lbs. of anodes. Naturally, we must admit a small percentage of these residues as being foreign matter and the actual weight of metal waste as less than indicated in either case.

Some authorities claim that a certain percentage of carbon is essential in all nickel anodes. "Its presence facilitates the disintegration of the nickel under the action of the electric current." My note book contains a few items with reference to nickel anodes I have used, which make interesting examples of what carbon and iron in a nickel anode really amounts to as an aid to disintegration.

Sample No. 1—Nickel, 83.89 per cent.; iron, 13.29 per cent.; carbon, 1.22 per cent. Anode wore away satisfactorily in simple double sulphate nickel solution. Samples of same consignment used in simple double sulphate nickel solution containing 1 per cent. sodium chloride wore away in less time, and with great waste in form of scrap at bottom of tank.

Sample No. 2—Nickel, 98.09 per cent.; iron, 0.94 per cent.; carbon, 0.06 per cent. manganese, 0.46 per cent. Anode did not wear noticeably in double sulphate nickel solution during three months constant use of bath. Surface scarcely attacked. Transferred anode to single sulphate nickel solution operated with one-third greater voltage and appreciable wear was apparent after third day's operation of bath.

Sample No. 3—Nickel, 81.66 per cent.; iron, 16.20 per cent.; carbon, 0.49. Anode broke in two pieces when thrown on concrete floor. Remnants were cut easily with chisel and chips were fine and brittle. These pieces were suspended in double sulphate nickel solution and wore away very readily but with great waste from blow holes.

Sample No. 4—Nickel, 96.95 per cent.; iron, 0.88 per cent.; carbon, 1.39 per cent. Anode withstood 6 violent impacts with concrete floor. Severe hammering did not produce slightest evidence of crack. Was cut with chisel only by unusual force, chips curled up, did not separate from casting, chips malleable and were pounded back into hole. Did not wear away satisfactorily in double sulphate nickel bath, operated slightly acid to litmus. Acidity and metal strength of bath increased by addition of nickel sulphate and bath operated at one-third greater voltage. This sample then wore away splendidly with clean surface practically free from usual coating of graphitic nature.

From these four examples the reader may be able to form some idea of the actual practical value of iron and carbon in a nickel anode. Electrolytic nickel anodes respond very readily to the action of the electrolyte if the voltage at the tank is increased from one-third to one-half the voltage ordinarily used for cast anodes and a suitable electrolyte employed. There is no doubt about the practical advantage of cast nickel anodes for certain classes of work, but we do contend that pure nickel anodes may be economically employed for many lines of work which are now being carelessly coated by the use of low percentage nickel anodes.

It is a remarkable fact that many platers calculate their anode requirements in pounds. Any piece of metal used as a soluble anode in an electrolyte gives up its metal from the surface, and in many plants the effective anode surface is very small because the tanks are equipped with so many pounds of nickel anodes regardless of the effective anode surface presented to the bath. "The discharge of metal is a function of the surface and not of the weight of the anode."

In practical electro-plating the weight of the anode has no direct bearing upon the actual efficiency of the anode in the bath. In all plating operations we arrive at our current density values by knowing our cathode areas, we do not consider anode weight. The cathode area must be in proper proportion to the anode area in order to operate the bath efficiently and economically. Thus it is obvious that the effective anode surface instead of the anode weight concerns us where results are of first importance. An anode 5 inches by 1 inch by 14 inches would weigh approximately double that of an anode 2½ inches by 1 inch by 14 inches, but the latter would present 66 square inches of effective anode surface, while the former would present only 103 square inches of effective anode surface, and owing to greater width would not deposit uniformly over cathodes such as rods, tubes, etc., of small diameter suspended perpendicular in the bath.

Nickel anodes containing from 5 per cent. to 15 per cent. of iron are not economical in the long run. Progressive platers are now using purest grade of nickel anode obtainable. Pure nickel anode would not corrode properly in the old time tested double sulphate solution, therefore iron was introduced and some anode makers added small percentages of tin. The iron and tin was intended to whiten the nickel deposit as well as aid in anode corrosion, so the plater was told. Now the facts are that pure nickel anodes produce whiter deposits than the alloy. The iron fouls the nickel solution, and with a fouled solution it was, and is now, impossible to produce perfect deposits rapidly. Deposits containing even small percentages of iron are not as resistant to corrosion from atmospheric influences as pure nickel deposits. The solution cannot be self-sustaining. The bulk of the iron is precipitated to the bottom of the tank and is thrown away.

The manufacturer pays for nickel,—why buy iron at the price of nickel, to contaminate the plating bath and nickel deposits, then eventually throw the material down the sewer (as it is useless as slime). We do not alloy our gold anodes to produce good gold deposits, and the same is true of silver, copper, zinc or tin anodes. It is equally as unnecessary in the case of nickel.

Pure nickel anodes wear away uniformly to mere nothing, the average waste being less than 3 per cent. of the original weight, and this waste is in a saleable form. Impure nickel anodes very frequently present a waste amounting to 15 per cent. of the original weight, this waste usually being of an unsaleable character. Such physical properties as hardness, ductility, firmness and great density may be regarded as very valuable qualities of thin coatings. These may be attributed largely to the homogeneous nature of the deposited film. When iron is introduced into the nickel anode the value of the nickel as a plating material is greatly curtailed.

Furthermore, the efficiency of the nickel bath is lessened. Comment here relative to shape of anode is unnecessary as all anode makers now ship the narrow anodes in either elliptic, diamond or round form, unless the flat anode is ordered. Freak shapes should be avoided.

Copper, Brass and Zinc Anodes

In plating solutions such as copper, silver, zinc, etc., which corrode the anode easily, we may use anodes of larger dimensions than is now deemed practical in nickel plating. It is an undeniable fact, however, that narrow anodes will feed a plating solution more rapidly and with greater uniformity of distribution than will anodes of considerable width. All anodes disintegrate from the edges faster than from the centres, and the greater the number of edges naturally the greater number of anodes and points of contact, or suspension, and corresponding increase in cross-sectional area of anode hooks per given effective anode surface.

The principal features respecting copper anodes, which should receive the plater's attention are the purity of metal and the type. The electrolytic copper anode is purest, most soluble and easily disintegrated type of copper anode obtainable for either acid or cyanide solutions. They feed the solution liberally with less power than is possible with either rolled or cast copper.

It is advisable to keep the anode rods of the plating tank hanging well equipped with anodes. An excess of anode surface is conducive to good results and freedom from trouble.

Brass anodes are obtainable either rolled or cast and should contain approximately 60 per cent pure copper and 40 per cent. zinc. We advise the narrow form in brass anodes. Personally we prefer to operate a brass solution with copper and zinc anodes in the proportion of two anodes of copper to one anode of zinc. In our experience covering very strenuous periods we found the separate metal anode less productive of irregularities than the more generally favored method of using an anode of brass alloy.

Zinc anodes are invariably cast and in order to insure good zinc deposits the plater is advised to give special consideration to the quality of all zinc anodes received. Analyze borings from each consignment and satisfy yourself that you have the best.

Zinc anodes should be cast from pure soft sheet zinc rather than from spelter in order to minimize the percentage of impurities and to facilitate easy disintegration in the plating bath. A narrow form is advisable; if flat, the width should not exceed 4 inches.

Bronze anodes may be regarded as being in the same class as brass anodes and therefore no further mention of them is necessary.

Silver anodes should be .999 fine, and may be obtained in widths up to about 6 inches, generally about 1-9 inch thick, although thinner anodes are furnished by most dealers if required. As the silver anode gives up its metal very freely under the action of the electric current, it is not necessary to equip the plating bath with same proportion of anode surface as compared to cathode surface as is the case with copper, brass, nickel and zinc. A silver anode 6 inches wide by 8 inches long by ⅛ inch thick will weigh approximately 34 oz. and usually the price is based on the Troy ounce of 20 pennyweight, or 480 grains. The silver anode should become grey during the operation of the solution. If the anode remains white during periods of plating it usually indicates an excess of cyanide. Naturally, much depends on manner in which bath is operated. Some plates will successfully operate a silver bath with larger free cyanide content than others.

Platers differ greatly in their opinions respecting the economy of platinum substitute for pure gold as anodes in gilding solutions. It is reasonable to believe that the use of gold anodes is best practice for such a wide range of work as pure gold is productive of finer tones of color than is ordinarily obtained by the average plater with platinum anodes.

In conclusion, we wish to impress the plater with the importance of studying the various characteristics of the anodes used under his supervision, and the results obtained from the different consignments. Anodes differ with regard to their source and the only safe method of inspection is the careful determination of actual contents by analysis. Anodes claim first place in cost of plating materials and by virtue of their importance, merit greater interest on the part of the foreman plater than they usually obtain.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—In books written relative to electro-plating I have read that low voltage is advisable for zinc plating. Now I have been operating a zinc solution with a voltage ranging from two volts to four volts, and as far as I can judge there is very little difference in the deposit. I shall appreciate your opinion respecting this question. What do you consider proper voltage for a zinc plating solution?

Answer.—It would be useless for us to make any positive statement relative to proper voltage for zinc plating. A low voltage produces soft, tough deposits which give very satisfactory protection to steel and iron, even though the coating is quite thin; when heavy coatings are required a low voltage is actually necessary for the production of smooth coatings of any commercial value. Very much depends on the size and shape of the article to be plated, also the nature of the solution and the capacity of tank used, temperature of solution. etc. Large work requires higher voltage than small work, usually on account of increase in resistance due to electrode distance and size of tank. For small light pieces some platers use two volts, while other platers use four volts on the same class of work. The four-volt deposit is usually rougher than the two-volt deposit, but, owing to increased current density the time required for given thickness of plate is greatly reduced. A rough zinc deposit is not as durable as a smooth deposit of less weight. The only advantage of a heavy zinc plate is that it wears longer than a thin deposit if smooth. For ordinary purposes where the article is subjected to atmospheric conditions and only a small amount of moisture is the sole exciting liquid, the galvanic action, which always sets up between the zinc and steel is very slight, and a very thin coating of zinc protects the steel for a long time. Acid zinc baths often yield splendid coatings with four to six volts, and ten to sixty-five amperes per square foot of cathode surface. Grape sugar, glycerine, and dextrine are used to prevent rough deposits. Acid baths produce spongy deposits when the solution becomes too near neutral point.

* * *

Question.—I have recently seen some very beautiful enameled microscope frames and would like to learn how the finish is obtained and what material to use. The finish resembled crystalized lacquer, some specimens having a larger crystal than others. I am informed that the process is simple and the finish quite durable. If convenient will you kindly publish sufficient information relative to the process to permit me making a trial of the method?

Answer.—The finish you refer to is obtained by the application of a specially prepared lacquer or enamel. The lacquer is manufactured by several lacquer and varnish firms, and is sold under various trade names, some of the more common of which are "Frostine," "Crystol," and "Alligatorized Finish." Each manufacturer sends out specific instructions for applying his particular lacquer. We find that usually the consumer eventually adopts a line of procedure quite different to the advice of the makers before obtaining thoroughly satisfactory results. One large manufacturer using the finish on iron and steel goods, sand blasts the metal prior to application of the lacquer, then they apply a coat of boiled linseed oil and bake it; the oil is applied to protect the metal and give the lacquer an elastic base to adhere to. This method has the disadvantage of liability of air bubbles forming in the oil, necessitating the application of sand paper to produce a smooth surface upon which to apply the lacquer. Another firm zinc plates the iron or steel and oxidizes the zinc and applies the crystal lacquer. This method proves very effective and has the advantage of being extra durable owing to the presence of the zinc coating. The ordinary instructions for application of the crystallizing lacquer are as follows: Apply one coat of dull black japan, bake hard, then apply one coat of the crystal lacquer, place in an oven at a temperature of 100 deg. Fahr. and keep at this temperature until crystals are formed. Usually this requires about three-quarters of an hour. During this period all air vents to oven are kept closed and the oven kept dark. After the crystals are formed the vents may be opened and the lacquer should be baked hard at any temperature up to 250 deg. Fahr. for two hours, or at 350 deg. Fahr. for half an hour. Work with freshly coated surfaces should not be placed too close together in the oven. If fine crystals are desired, apply a thin coating of lacquer; heavy coating produces large crystals. The lacquer may be applied by either brushing, spraying or dipping according to shape or size of article or facilities at hand. Benzine is used as a thinner when dipping or spraying. On black iron it is sometimes possible to omit the undercoat for certain grades of work. A black leather grain enamel, when dry, has a surface effect similar to pebbled leather and is particularly adapted to coating cases for thermos bottles, cameras, eyeglasses, etc. It is not as attractive as the crystal finish and cannot be applied by dipping or brushing. It requires 250 deg. Fahr. for three hours to bake, and a heavy coating produces a larger figure than a thin coat. High spots are lightly sanded after final baking. These lacquers may be obtained from any of the well-known varnish and enamel manufacturers in the United States. Crystal finish is becoming very popular for many purposes.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

* * *

Question.—Will you please publish one or two formulas for black nickel as obtained by the more generally used methods. Some of our products are made of brass, others are sheet steel; we wish to finish certain quantities of each in black nickel and have been informed that the different metals required different solutions for best results.

Answer.—A good black nickel solution will suffice both brass and steel articles; it is not necessary to use separate solutions for first-class results on the two metals. Double nickel salts, 8 ozs.; potassium sulpho cyanide, 2 ozs.; zinc sulphate, 1 oz.; water 1 gallon, will furnish you a black nickel solution capable of very fine deposits. Keep the solution neutral, use very weak current, not over 1 volt. Strong current acid solution will cause deposit to be grey or streaked. Use carbonate of nickel to neutralize acidity. Can be used cold or heated to 100 deg. Fahr. Another formula which has many admirers is single nickel salts, 5 ozs.; sal ammoniac, 3 ozs.; potassium sulpho cyanide, 2½ ozs.; sodium bisulphite, ½ oz.; water 1 gallon. Do not use zinc with this as it injures the lustre of deposit. Use current strength equivalent to that used in ordinary nickel-plating. If deposit is too dark add nickel sulphate and a little ammonia. If deposit is too light add more sulpho cyanide. Use brass anode for this solution and old nickel anodes for the first mentioned solution. A very simple solution which is very effective for some classes of work is made by dissolving 14 ozs. of powdered white arsenic in a solution made of 8 ozs. of caustic soda and half a gallon of boiling water. When cool make up to 1 gallon with water. Anodes of wrought iron are used. Use same current as in white nickeling. All black nickel deposits should be protected by coat of transparent lacquer.

Americanizing the Foreign Born Citizen

This Paper, Read at the Foundrymen's Convention by a Member of the Safety Institute of America Can Be Made Equally Applicable to Canadianizing.

By R. M. LITTLE

AMERICANISM means certain fundamental concepts of American life. It is a word of at least four dimensions, signifying equality, liberty, opportunity and justice. Perhaps first of all Americanism means a profound belief in the worth of human life. America is a great human venture. Human life, human interests, human rights, human justice, human relations, human activities, human aspirations, human hope and human faith are the central ideas in Americanism. This nation was founded in this belief—not that we believe that all men are created equal as to their talents but that they are equal as to their rights, particularly their rights in relationship to government, their rights in relationship to the economic order, the social order, as to education and religion.

Root Ideas•

We will touch only a few of the root ideas of our conception. Let us look at Americanism first from the governmental point of view. American people believe their government rests upon the consent of the governed. The declaration of independence, the federal constitution and all state constitutions have been established by a majority vote of the electors. The laws are enacted and administered upon the same principle. "The people" now means the men and women 21 years of age and over who are citizens. Electors include both male and female. Government resting upon the consent of the people, therefore, it is by the people and for their welfare that it exists. We believe that all men are endowed with certain inalienable rights, and among these are life, liberty and the pursuit of happiness. These inalienable rights are to be granted to all of the people who live in our country. This is a root idea of Americanism from the governmental point of view. The government is to be preserved by the people for the welfare of the individual citizen and for groups of citizens. They are assured a certain equality before the law, in the schools, in industry and in social development. They are assured certain opportunities for self-development and self-realization, that they may enjoy the richness of life. These are governmental principles in our conception of Americanism.

Many Nationalities

Does Americanism mean the Anglo-Saxon type of national life? Perhaps most people think that it does. The Anglo-Saxons colonized the United States and led in the development of the national government, institutions, laws, manners and customs. The Anglo-Saxons are the dominant influence in the nation. In view of our national development, however, and the many types of people who have become citizens, we should not aver that Americanism is synonymous with the Anglo-Saxon conception of life. This conception may be the dominant one, but it is certainly being modified by many other types. It seems to the writer that Americanism means something broader and more inclusive than that type of life which first obtained in New England and Virginia. America is not only for the Anglo-Saxon people, but also for the liberty-loving people of other nationalities and races. If we were to resolve the question of Americanism upon the rights of priority, the Indian tribes would be more entitled to call this land their own than any of the rest of us.

This recalls an illustration of Americanism that I learned one day on the Pacific coast. We were engaged in a baseball game with an Indian tribe. I made a base hit and was attempting to steal second. The pitcher tried to catch me at the base, but I was safe. The first baseman and the pitcher were exchanging some Indian jargon as well as the ball, and I said to the baseman, "Why do you not talk the American language?" He retorted, "Why don't you?" My language was the English language; his was the original American.

Americanism Is Broad

So when we discuss the question of Americanism and what America stands for, we should not say that it is represented by the Puritans of New England alone, nor by the Cavaliers of Virginia, nor by the descendants of both these types living about the Great Lakes, nor by the "Forty-niners" and their descendants who went to the Pacific coast. The Indians are not typical Americans! neither are the descendants of the Spaniards and Mexicans; nor are the negroes who were brought here as slaves, or the recent immigrants from south Europe. Americanism is broad enough to include the value of all these nationalities and strains of the human family. America is not for one race or one tongue, or one type of people alone. Our country is too great in its possibilities and opportunities and too inspiring in its principles and ideals to be limited to any national characteristic of the rest of the world. With a substantial basis of Anglo-Saxon ideals and principles, love of liberty, justice, morality and truth, we are developing a great nation which is to invoke and develop the highest qualities of many peoples and fuse them together with one spirit and one great purpose, but with many diversities of customs and manners.

In Drinkwater's dramatization of Lincoln there is one scene which is most impressive—that where the great American is standing looking at a map of the United States. The extent of our physical domain is the basis for empire like unto which no other people enjoys, and the other nations of the world have been pouring their life-blood into this great empire or republic. As Americans we are building stronger mansions for our souls, and all people who share in our national life are going through a process of self-realization and self-development under equal rights, equal laws and equal opportunities for the development of the larger meaning of human life. America is in the vanguard of human progress and will be for generations and perhaps centuries yet to come.

Small Americans

There have been many attempts through provincialism to limit the conception of Americanism. There has been the cry of "America for the Americans!" The Know-Nothing party of half a century ago had this limited conception. There have been recurrent attempts to define Americanism according to certain colonial types. These ideas still persist and not a few seriously wish that none but Anglo-Saxons and their close kinsmen should be welcomed to our shores. This is hardly true to the genesis of Americanism. Our national life cannot be thus confined. It will not be so limited. Because of its fundamental conception of human nature, Americanism is not selfish, unjust or illiberal. Americanism is something that is deep and broad with height and reach for all of humanity. Let us free our minds, therefore, at the outset of our discussion from any petty small ideas of our country or of the people who live here, and strive together in the making of a great republic of men. An expanding view of our national life needs to be emphasized in these times, because we hear the voices of the descendants of the Puritans talking in a very small way about America and Americanism. We hear the voices of certain descendants of the old Cavaliers talking in an unworthy way of the principles of this country and its development and destiny. I am not unmindful of the great contribution which our forefathers made to America, but from my point of view I cannot think of an illiberal, selfish, exclusive America; nor do I believe in an isolated America which shall not participate in the whole life of the world. We may be properly concerned to safeguard our inheritance, conserve our strength and defend our interests, but our inheritance and our strength and our interests are not such as to cause us to be afraid to do our part among the nations of the world, to insure a larger liberty and a more complete justice and a fuller life for all other nations. The world grows and moves on and we must move forward with the tide of the world life. World events have drawn us out of our isolation and America now must play a leading part in the further progress and development of the world. Our manifest destiny is partnership and service, and we will best develop our own national life, conserve our inheritance and develop our strength, by co-operative service with other peoples.

A Nation of Pioneers

The poet of our democracy, Walt Whitman, saw America as a nation of tan-faced children, strong and venturesome, on the march, bearing the brunt of danger, nothing daunted, nothing fearing, the youthful sinewy races, and all the races of us depending as a nation of pioneers!

"O you youths, western youths,
So impatient, full of action, full of manly pride and friendship,
Plain I see you, western youths, see you tramping with the foremost,
Pioneers! O pioneers!

Have the elder races halted?
Do they droop and end their lesson, wearied, over there beyond the seas?
We take up the task eternal, and the burden, and the lesson,
Pioneers! O pioneers!"

Typical Americans

America is still in the making, but we have had and now have many men and women who typify the principles and ideals of our country. I think of myself only as an American. My forefathers fought in the Revolutionary war in the Carolinas and Georgia. They moved north of the Mason and Dixon line because of slavery. I was born in southern Ohio, educated there and in Illinois. I have lived on the Pacific coast and on the Great Lakes, at the confluence of the Allegheny and Monongahela rivers, and near Independence Hall. I have been a sojourner in the national capital and I am now a resident of the metropolis. I see very real Americans in New York; I meet them in New England; I know many of them in western Pennsylvania; they thrive in Chicago; they are numerous in Portland and San Francisco; and I have fellowshipped with them in Jacksonville and Memphis. They are all over our country, men and women who are typical Americans, of the same stuff that was in Abraham Lincoln and John Hay, Ulysses S. Grant and Grover Cleveland, Horace Greeley and Henry W. Grady, Ralph Waldo Emerson and Sidney Lanier, Samuel F. B. Morse and John A. Brashear, Frances E. Willard and Anna B. Shaw, Cyrus W. Field and James J. Hill, Horace Mann and William R. Harper, Booker T. Washington and John Mitchell, Henry Ward Beecher and Theodore Roosevelt. It has been an inspiration and a delight to meet the men and women throughout our country, who share in the same principles and ideals of life which is best described by the word, Americanism. Their minds and hearts are a veritable source of truth, liberty, justice, morality and the passionate aspiration for all those values which make life sweet and satisfactory. I like to recall these splendid men and women of our country who were so rich in their sympathies, broad in their reason, energetic in their spirit, forward-looking in their endeavors, and who helped to build our national life.

Americanism and Americanization

Only as we have clear ideas of Americanism, however, can we intelligently consider Americanization. Americanization is a popular subject of the hour. It is being much discussed and many plans and methods evolved for its development. The subject is of great importance because of the large number of people who were foreign-born. According to the census we have now in the United States some fifteen million people of foreign birth, one-half of whom have not yet been naturalized and about one-half of whom do not speak the English language. They live for the most part in our large cities and industrial centres and are spread widely over the northern part of our country. The question of their Americanization presses upon us in our schools, in our politics, in our government, in our religious life, and particularly in our industries.

In short, Americanization means making good, loyal American citizens out of those in our midst who are foreign-born and many of whom speak only foreign languages. This is what we are aiming at by Americanization. The problem of Americanization is being approached from a great many different angles and by many methods. With characteristic hurry and impatience we are attempting to accomplish the task speedily, but we often fail to remember the history, the traditions, the characteristics and the instincts of the people we would Americanize. We approach people of foreign birth and try to put a placard upon them, to perform an outward operation, that will turn them into American citizens as by magic. We proceed to try to Americanize the foreign-born with a specially thought-out stereotyped process, but without fully considering the fundamental factors involved. We Americanize them by teaching them the English language. We would Americanize them by having them drop their national customs and manners and adopting our own. We think they would be Americans if they were just like we are.

But something more comprehensive and fundamental is involved in the process of Americanization of people of foreign birth and speech than is attempted by any ofthese methods. Let us not forget that America herself has been in the process of formation since the time that the Puritan forefathers landed on Plymouth Rock. Our country is still in the making. All people who live here are changing, varied in their characteristics, although sharing certain great fundamental things together. Those who have come in recent years, whether they have been naturalized or not, have entered our country to share its life, to imbibe its spirit, and they are becoming Americans by the processes of life, assimilation, adaptation and ambition. The first step in their Americanization was their decision to come to America. This decision marked an epoch in their lives. Through many influences they learned to believe in America; to believe in it as a land of opportunity. America appealed to their imagination as a land of freedom, of hope and of promise. When they acted upon this decision and belief, they left the lands of their birth and came here, most of them to stay, and only a few hundred thousand ever to return. This was the first step in their Americanization. This step put them in a continuing process of growth and adaptation into our political activities, our principles and ideals, our institutions, customs and laws. They are here sharing in our national life and they feel the formative influences which are nation-wide in their extent, tremendous forces which affect the thought, feeling and action of foreign-born men and women when they step upon the shores of America. Our national life appeals to them as nothing else ever did, and most of them respond to this appeal whole-heartedly and with promise. This applies, of course, to the normal men and women, not to the criminals, nor to the imbeciles and the incompetents, which are inconsiderable in number. Perhaps the administration of our immigration laws should be more rigid that all undesirable immigrants might be excluded. But their number is inconsiderable as compared to the fifteen million of foreign-born people who are now in America and who have entered into the process of becoming genuine Americans.

Right Attitude Towards Foreign-Born

What shall be the attitude of America toward the people of foreign birth? Shall it continue to be an attitude of questioning? If we expect to Americanize them we must believe in them. They believed in America and now it behooves those of us who make up the majority of the citizenship of America to believe in people of foreign birth. How can we do otherwise? Just at present it is not popular to champion their cause for the reason that the foreigner, so-called, is accused of a great deal of the public irritation and disturbance. No doubt they are unjustly accused in a great many cases. It is popular to make the foreign-born the scapegoat. But if we will carefully investigate the facts and analyze the conditions we will frequently

find that it is not people of foreign birth and tongue so much as other forces which have raised the disturbance. Quite true, there are a few thousand agitators, radicals, and revolutionists and bolsheviks who are attracting a great deal of attention and most of them merit the treatment they are receiving. But what are a few thousand in comparison to the nearly fifteen million law-abiding, industrious and loyal men and women from other lands who are in our midst. They are sharing our national life and doing much of our work, and in many respects they represent the youth, virility and stength of the countries from which they came. They came as vigorous young men and women to use their muscles and their brains in our industries, and while they are concerned for their own advancement, they make a contibution to our national life which is rich with the tradition of many centuries. They came not only to do our work, but also to help sing our songs, to write our literature, to please us with their music, their manners and their customs. They help to enrich our national life and we ought to believe in them and their possibilities. Americanism first of all means a certain attitude towards human life and there has not been anything in the past of these people of foreign birth to cause us to turn aside and say that they are unworthy of belief.

There is one beautiful little spot in Washington along Pennsylvania Avenue in front of the White House called Lafayette Square. In one corner of this charming park is a statue of the Marquis of Lafayette. In another there is a statue of Kosciusko, a liberty-loving Pole, and in another a statue of Baron von Steuben, a liberty-loving German; and as you go on through the park and look at the various statues you will see typified in heroic form the men of foreign birth who fought valiantly for the foundation of America and the descendants of these patriots have largely followed in their footsteps. Let us believe in them. Furthermore, we, and all the people of the old American stock should divest our minds of a certain attitude of contempt for the foreigner. This is all too prevalent with us and it is being accentuated at the present time. Looking down upon the man of foreign birth ill-becomes an American who believes in liberty, equality, fraternity and square dealing. We bemean ourselves when we treat those of foreign birth and speech with contempt. We reveal our provincialism and narrowness of mind by such an attitude.

Our laws and their administration are an important factor in Americanization. The substance of our laws is just and right, but the administration of our laws is frequently not as well wrought out as the substance. The declaration of independence, the federal constitution and the constitutions of our various states and nearly all our statutes have been conceived in justice and in fairness for all the people. The foreign-born is frequently at a loss to understand the disparity between the principles and ideals of our substantive law and the action of our police departments, police and magistrate's courts and the courts of record, nor do they well understand our legislative processes. If this is a land of liberty and justice, why is he so often treated as he is by the police and the minor courts? Why can he not more readily and cheaply secure redress from the wrongs by his landlord and his employer, or by his fellow-countryman? The processes of our courts are not adjusted to the needs of the poor man, though he is an American; much less are they adjusted to the needs of the foreign-born. There is a great national task before us to make the administration of law as just and adaptable to the needs of life as the fundamental conceptions of law are to the needs of all people. It is only within the last few years that there has been established in any place a workingman's court where he can secure substantial justice. He had always had the police court and the magistrate's court, but they are not courts of record, nor have they always been courts of justice for the poor and disadvantaged citizen. The municipal court of Chicago, the county court at Pittsburgh, the court of domestic relations at Philadelphia, and some of the courts in New York City approximate the needs of a poor man's court. But throughout the country the workingman and the foreign-speaking man is often deprived of substantial justice, even though the laws underlying the courts were framed in a spirit of justice and fair dealing. If you will read the recent report issued by the Carnegie Corporation on "Justice and the Poor," you will be convinced of the fairness of this criticism.

Often the foreign-born is confused by our practical political methods. He thoroughly believes in our fundamental conceptions of government, but he does not understand the way we do things politically. Of course we do not have an ideal government and it is always a party government. It does not matter which party is in power or which one is seeking to come into power. As a result the foreign-born get tangled up in our politics and they are often misused and exploited, and as a result they have a wrong conception of our government. Who is to blame? Are they, or are we Americans? Should we leave them to be instructed as to the principles and methods of our government and our politics by political workers, or should we open night schools for them where they can be instructed in civics and in our political methods?

One of the greatest influences to Americanize the people of foreign birth that we have is our schools. The problem of

Americanization does not apply so much to children of school age as it does to adults. Their children in the public schools have the finest influences about them for Americanization that there is in our country. There is something like democracy, liberty and fraternity in the school room. One of the wonders is the way the children of the foreign-born respond to the opportunities of the public schools.

An Opportunity for the Churches

What are the churches doing towards Americanizing the foreign-born? Most of them are impelled by pious wishes and good intentions, but do not understand the task they have undertaken to perform. Unfortunately, many of the churches have a narrow and sectarian view of the matter. They fail to recognize the traditions and the aptitudes of many people who come to our shores. Church organizations, as such, are not effective agencies for Americanization, except as the people of foreign birth naturally become members of these church organizations. The attempt of Protestant churches to Americanize the foreign-born from south European countries who belong to the Roman Catholic chuch or to the Greek Orthodox church is rarely successful. It seems to me that it would be much better to encourage the people of foreign birth to establish their own churches and to be loyal to their own religious traditions, beliefs and associations, than to try to win them to a form of church organization and worship which is to them strange and non-appealing. In America the church and the state are independent of each other. It is one of our fundamental convictions that they should be separated and that all citizens should be free to worship God according to the dictates of their consciences without anyone to molest them, and, as our Puritan forefathers and the Cavaliers contended for this right for themselves, America should conserve this right for all people who come to this country from other lands. It is better for America that these religious units should not be meddled with and broken up. Not to welcome their loyalty to their church, their creed, their worship and their priests is a mistake.

Americanization in Industry

How can our industries help to Americanize the people of foreign birth? Work is the major interest of life; eight hours per day, at least, and often more, is the daily task of these people of foreign birth as well as for the rest of us. Where can they find what America is, and where can they find their self-realization in America if not at their jobs in our factories, in our mills, in our mines and our transportation companies? Foreign labor is indispensable to the continued growth and development of the industries of America. As their labor is indispensable it behooves the industries to give them a square deal and not exploit them, to see that they have equal treatment with everybody else. This is what they expect. Do not play upon their ignorance or fears or their prejudices, but treat them as men and women wothy of their hire and of self-respect. The industrial attitude toward the foreign-born should be one of kindness and considerate and intelligent treatment. Americanization in industry is a mutual process of give and take. We take from them and give to them; they give to us and take from us. The process is as reciprocal as life itself and is an important factor in the building up of our industries. Industrially we must understand them, believe in them and sympathize with them.

This is not always the attitude of our American industries towards the foreign-born. There comes to my mind a remark of an official in a South Chicago steel mill who said to me some time since, "I cannot do anything with these 'hunkies' unless I swear at them and occasionally throw brick bats at them." Lamentable, but true, that often the first words which the foreign-born workman has learned in a factory or mill have been words of obscenity and profanity. Who is a "hunkey"? He may be a John Huss. Who is a "dago"? He may be a Savonarola. Oh, these epithets of contempt! In our industries let us give them a fair deal, pay them a living wage, be patient with them, try to understand them and always treat them fairly.

Many of our industries are doing a fine service in teaching the foreign-born the English language. This is an important factor in their Americanization, and one which I would emphasize and not minimize. We should not forget, however, that learning to speak the English language does not mean complete Americanization. They should learn the common language of the land where they live and work, as means of communication, a vehicle of thought, that mind may understand mind and that work may go along more smoothly. The teaching of English is of high importance in this respect, but I am thinking of something more fundamental than acquiring a language. The process of Americanization should mean for the foreign-born the question of a new point of view, the sharing of our national life, the development of a greater loyalty to our country, its institutions, its laws and purposes. It is quite possible for them to learn the English language and yet not be Americans in this full sense. I plead, therefore, that in our attempt to Americanize the foreign-born we try to wed them to the highest conception of Americanism.

Loyalty of Foreign-born

Some of you may think that I have been too much the champion of the foreign-born and foreign-speaking people. Let me call your attention to the fact that they have been splendid in these years of stress. True, the newspaper headlines often give them a rather sinister aspect, but newspaper headlines do not tell the whole story. What did the foreign-born do in the Liberty loan campaigns? The treasury department reports that in every Liberty loan the foreign-born fully subscribed their quota, and in the fourth Liberty loan, the foreign-born and children of the foreign-born subscribed 16 per cent. of the loan and 46½ per cent. of the subscriptions. Where a man's treasure is, there his heart is also. The hearts of fifteen million foreign-born and foreign-speaking people were unanimously with America in the world struggle. What sort of soldiers did they make? Ask any of the young officers who were in France and in the thick of the fight. The foreign-born soldier did his part as a brave, loyal American.

Pardon a personal reference. My son started as a lieutenant in the battle of the Argonne with a company of 250 men, many of whom were foreign-born and who could not speak the English language when they went to the camps. He returned after five days' fierce fighting with but 50 per cent. of his men, but never once was a foreign-born soldier a quitter. He went east of the Meuse and was engaged in the final drive with a company of 175 men until 11:15 on Armistice day; standing before a strong German position with many of his men dead and wounded about him and others still fighting, but not once did a foreign-born soldier falter or fail to do his duty. Get the inside stories from the young officers who were on the firing line and you will be thrilled with the bravery and heroism of the Italians, Hungarians, Greeks, and Poles who fought under the star spangled banner because they believed in America. We need the foreign-born people in our country and they need to imbibe the ideals and principles of our land. We need them in our social, school and religious life, and in our industrial service. There is good human stuff in them and they will make loyal and dependable Americans, as patriotic and devoted to the interests and destiny of our land as any of the rest of us. Let us try to understand and respect them, and treat them with that consideration which is in harmony with the fundamental principles of Americanism. Show to them kindness and sympathy in all the affairs of life, in our courts and in our politics, in our schools and in our industries, and then we will help to make a larger, grander and finer American nation.

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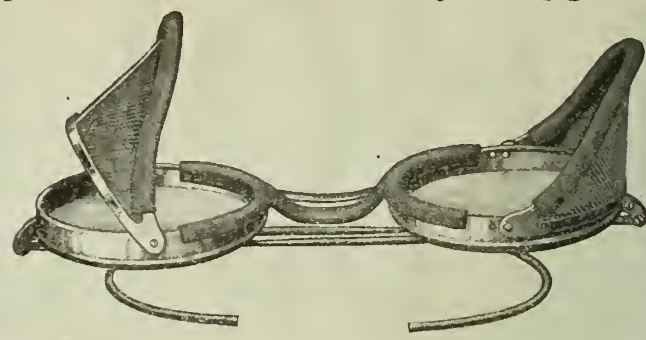

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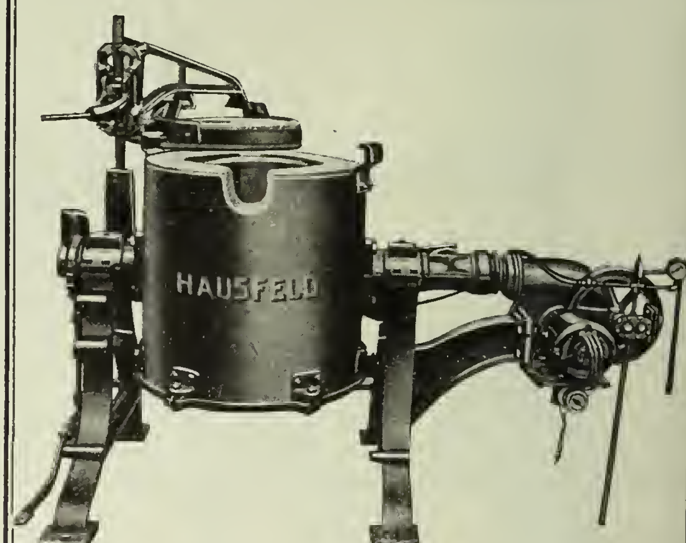

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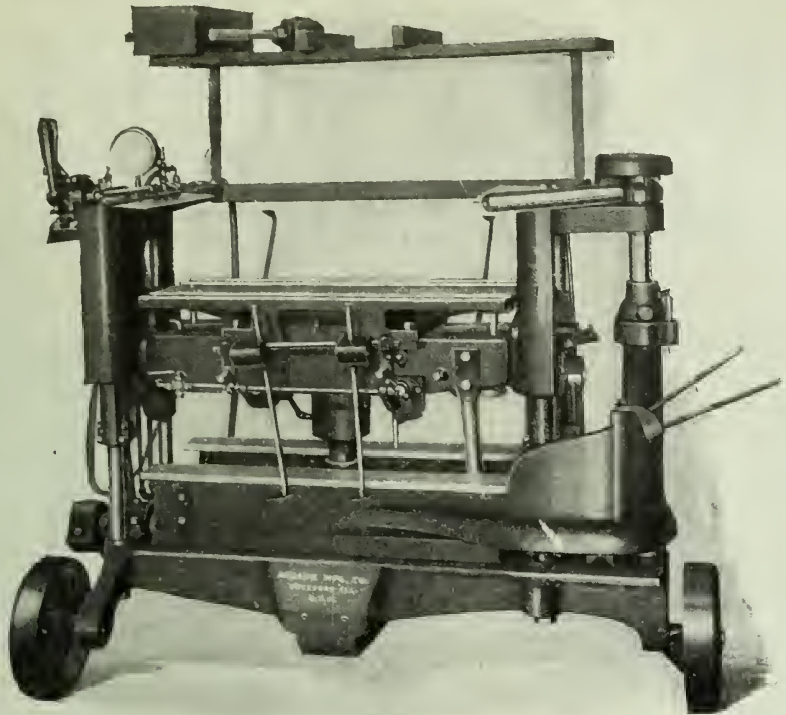

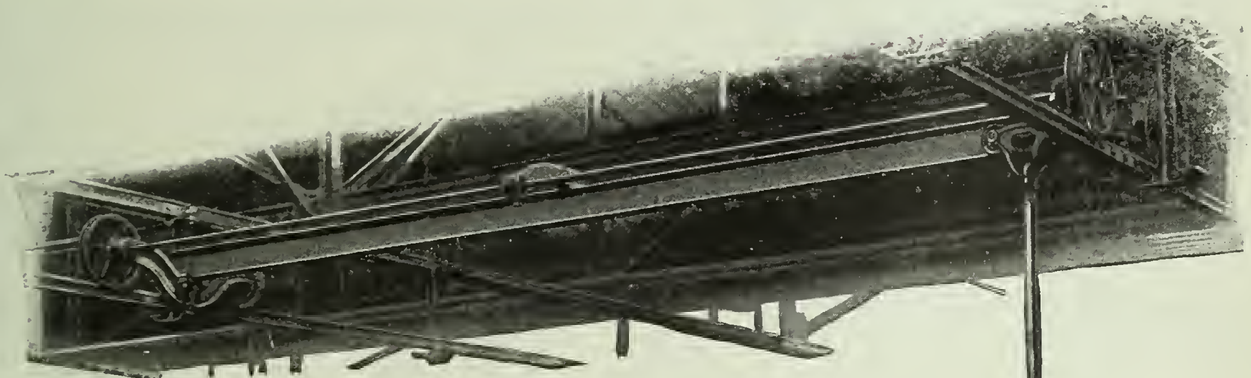

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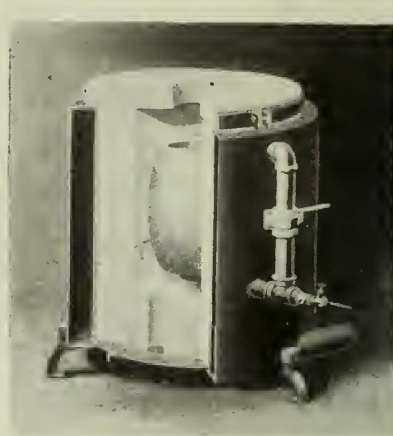

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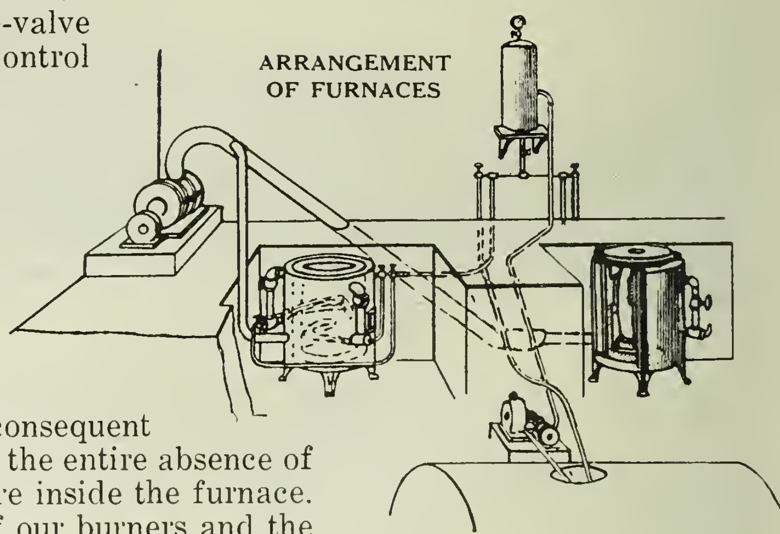

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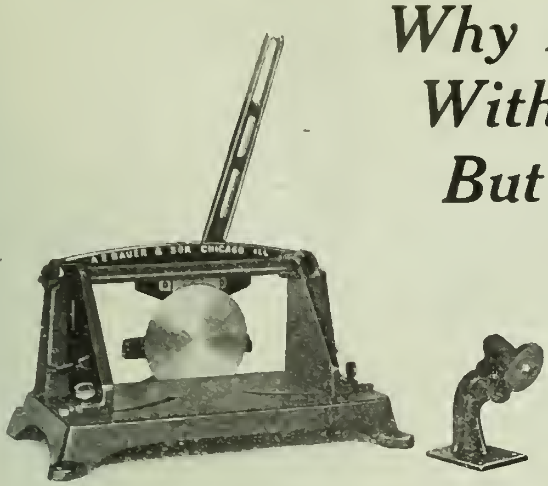

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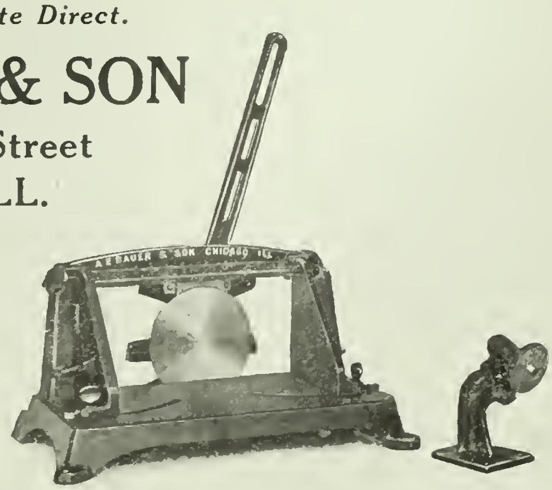

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Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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OILSTONE GRINDERS
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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PATTERN WAX
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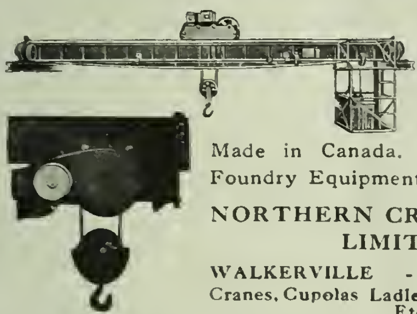

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Is Absolutely Uniform

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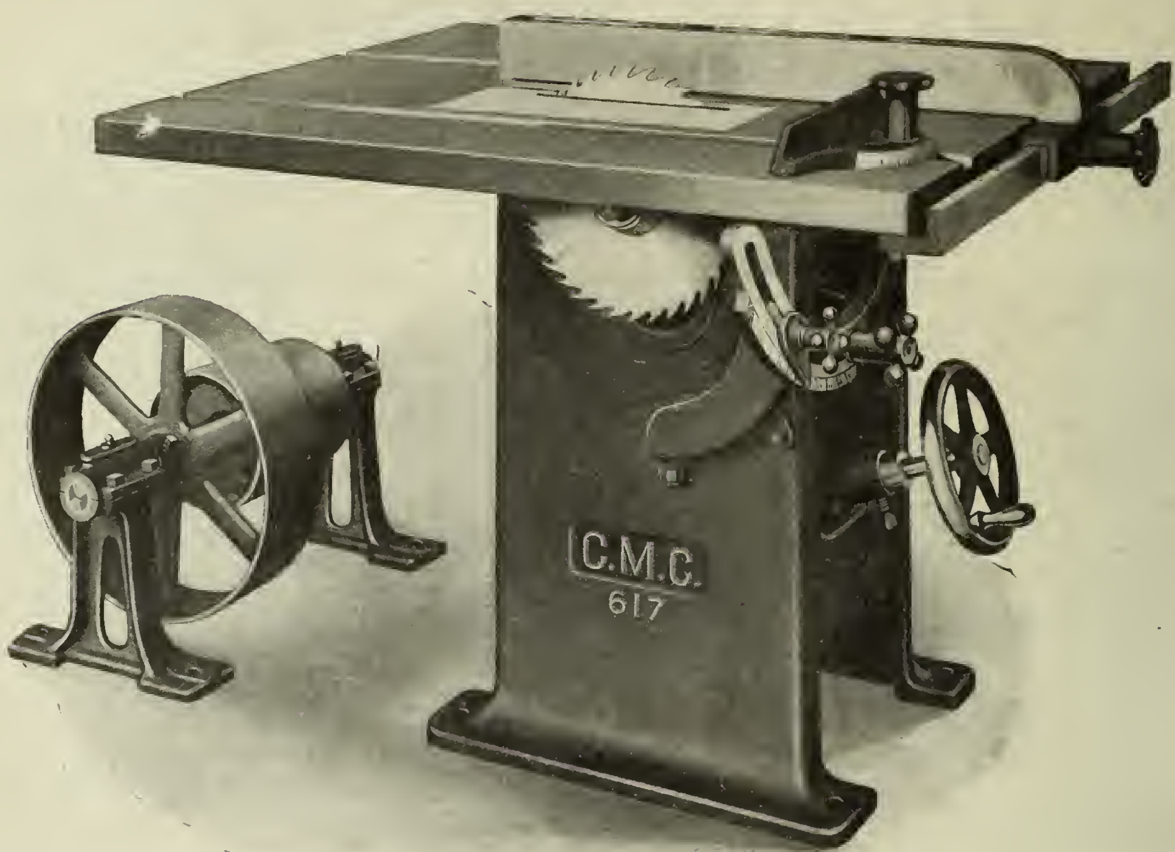
C.M.C.
617

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XI. PUBLICATION OFFICE, TORONTO, NOVEMBER, 1920 No. 11

WOODISON

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Prompter Deliveries

By purchasing your foundry supplies from **Woodison** you are assured of quality equal to the best imported lines and you save duty and exchange.

Further, prompt service is not to be forgotten while transportation difficulties in getting shipments across the line remain as they are at present.

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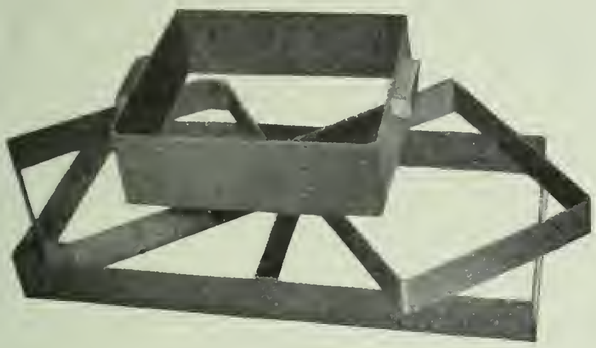
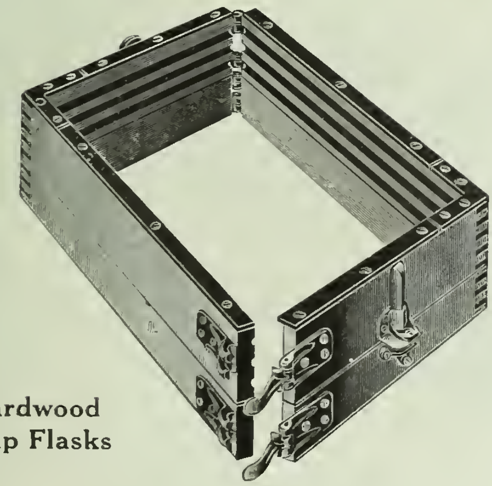


Steel Bands



Hardwood Snap Flasks

The three products here illustrated are added to the Woodison list of made-in-Canada foundry equipment.

Steel Slipover Jacket

For use in ramming inside snap flask. Can be furnished in any size, without handle if desired. In ordering give the exact size of inside of flasks and state whether straight or tapered.

Steel Bands

The steel bands are for ramming up in the mold. In ordering give size of flask parting. Our standard is to make the outside of the band 1/8th smaller. This allows it to drop easily and ram out tight against the flask and hold it.

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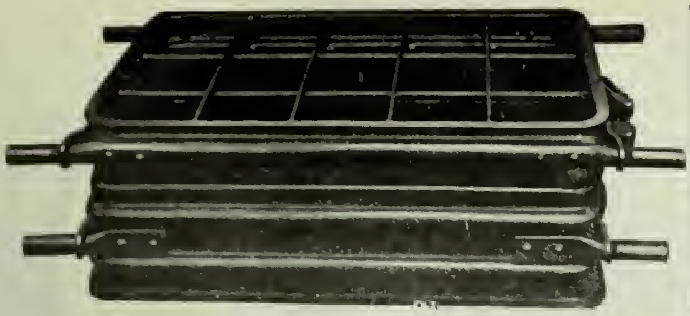
Write for quotations.

The E. J. Woodison Company, Limited

Foundry Supplies and Fire Brick

TORONTO ONTARIO

CANADIAN FOUNDRYMAN, November, 1920. Vol. XI., No. 11. Published monthly, at 143-153 University Ave., Toronto, Can. Subscription price in Canada, $2.00; in the United States, $2.50. Entered as second-class matter July 1st, 1912, at the Post Office at Buffalo, under Act of March 3rd, 1879, and at the Post Office Department, Ottawa, Canada.



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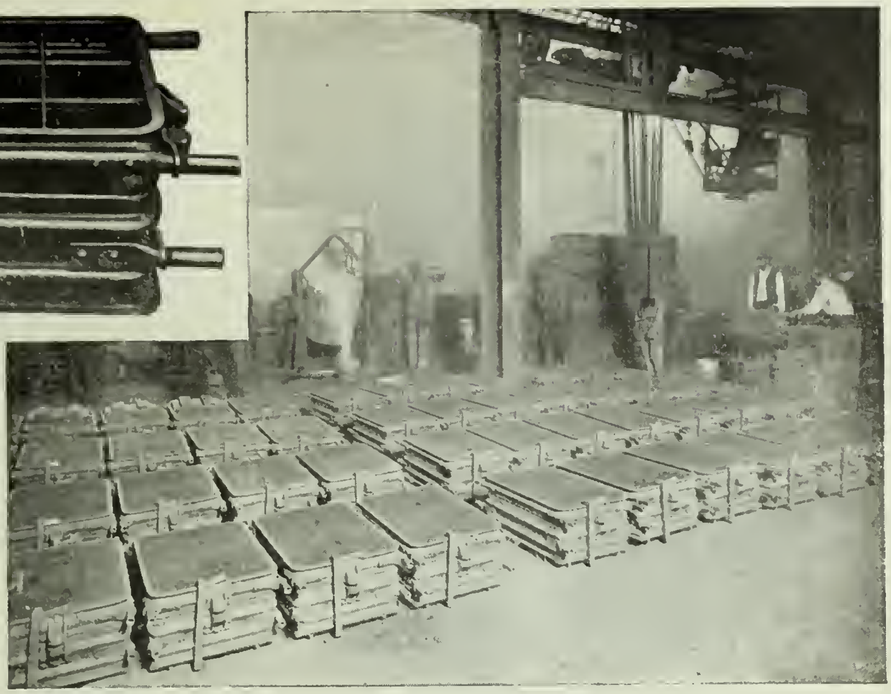

TRUSCON FLASK

Dimensions 16½-in. x 26-in.
Cope 6½-in. Drag 3½-in.

Pouring Truscon Flasks in Foundry of Allyne Ryan Foundry Co., Cleveland, Ohio

Photo by courtesy Allyne Ryan Foundry Co.

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Just as made to measure clothes better fit the man, so TRUSCON Flasks, designed for the job, better fit the job.

The advantages of TRUSCON designed-for-the-job Flasks not only keep the weight of the Flasks at a minimum, consistent with foundry usage, but also make possible a saving in the amount of sand required.

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Write for complete information and estimates.

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Truscon Flasks are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. Each rib and flange runs full depth around the corners and reinforces the steel to withstand all strains and stresses to which Flasks are liable on the foundry floor.

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TRUSCON STEEL CO., Youngstown, O.

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in Principal Cities

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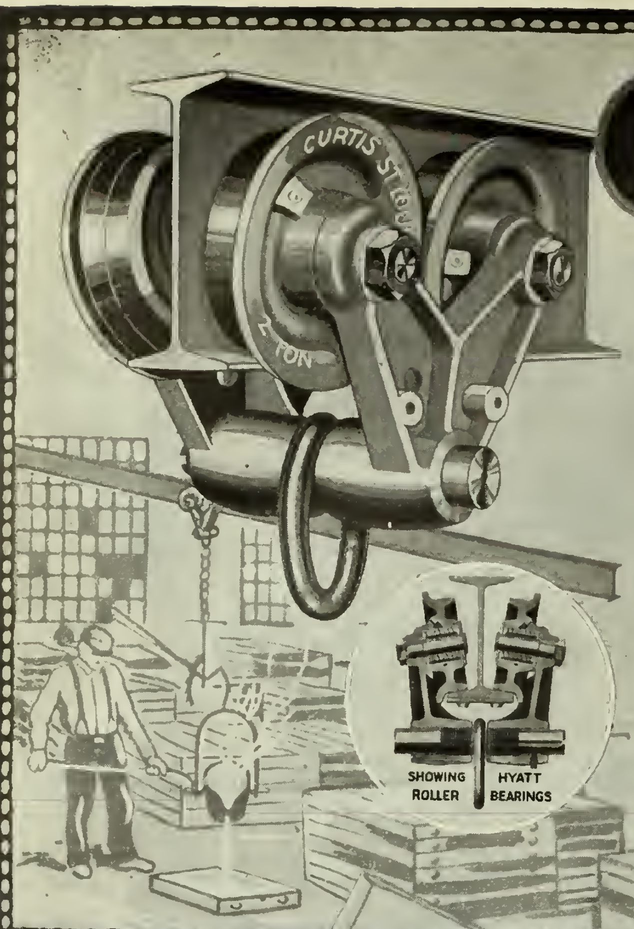

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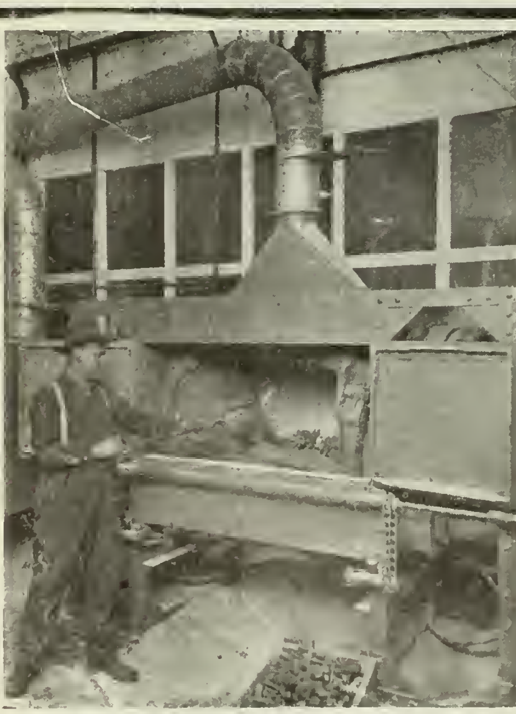

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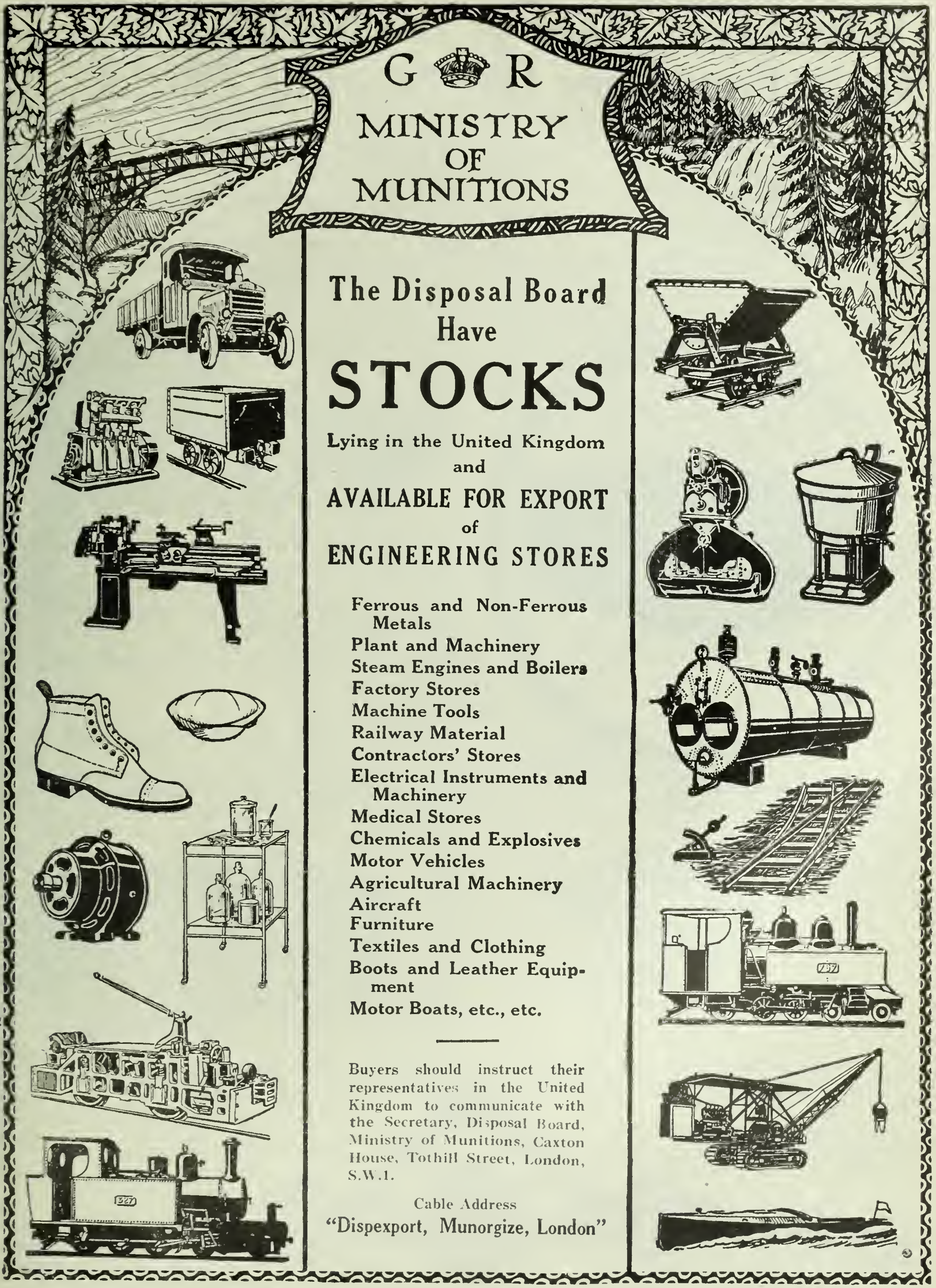
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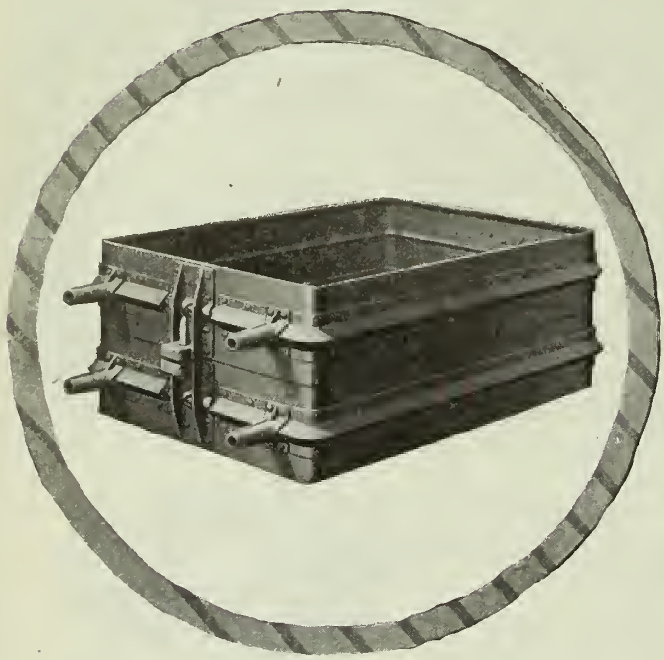

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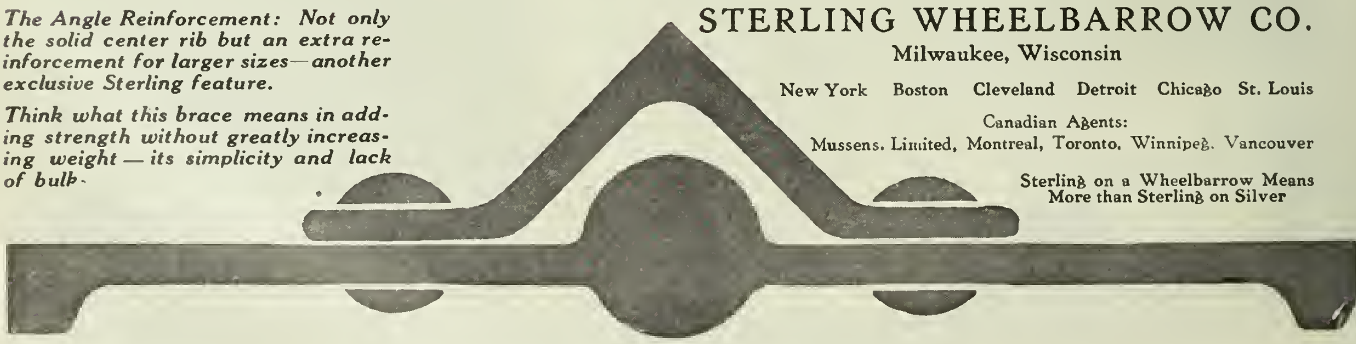

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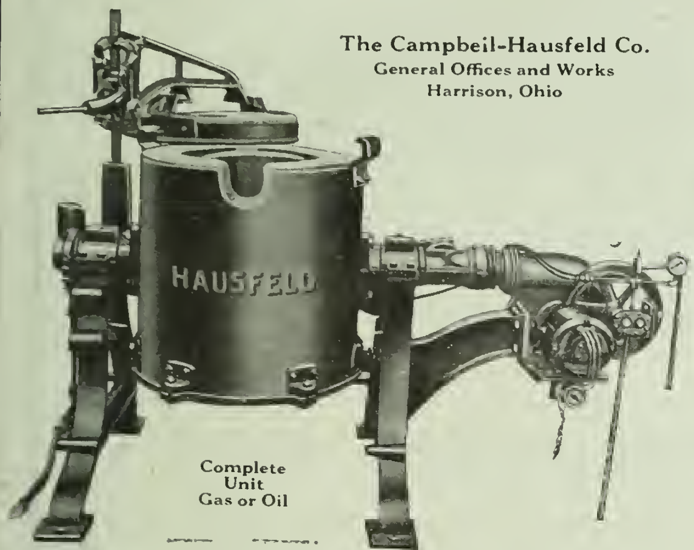

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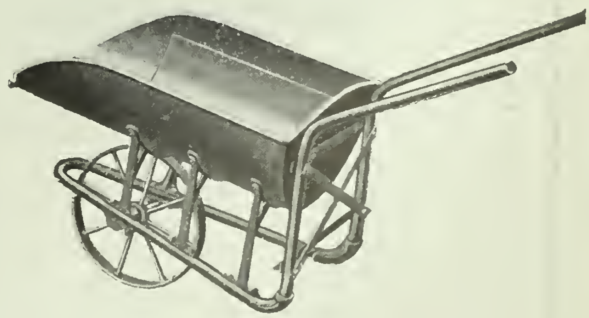

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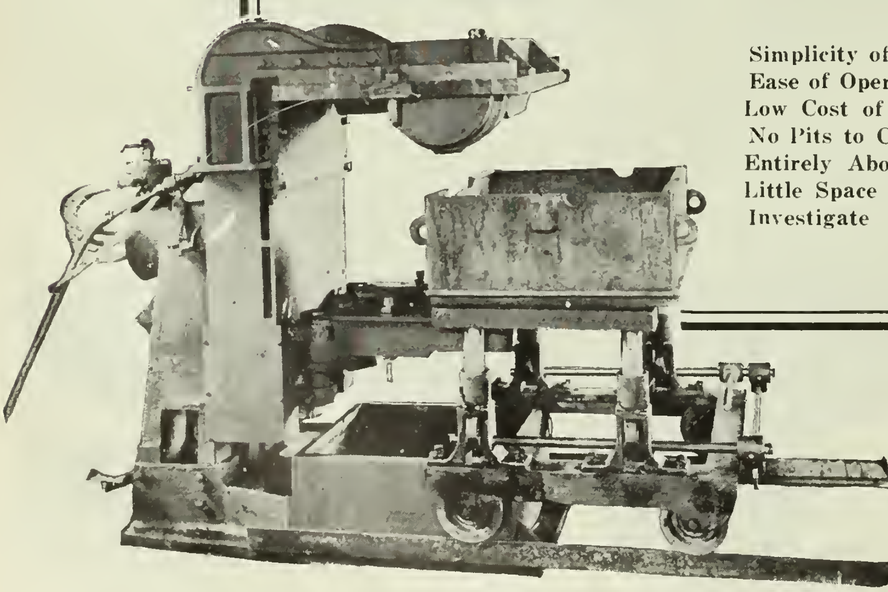

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In the insert the drag pattern is shown mounted on the machine at the right and the cope pattern is shown on the machine at the left. These machines operate portably and follow the sand pile. This is a large production job and the castings produced are uniform as to size and weight.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Established 1909 Published Monthly

The Moulding and Casting of Condenser Parts

Showing Method of Molding the Patterns Described in Former Issues of This Publication, Being Condenser for Modern Steam-Ship Engine.

By BEN. SHAW and JAMES EDGAR

THE introduction of this type of condenser in marine work has been productive of quite a variety of means to ensure sound castings. The older type for triple or quadruple expansion engine usually carried the back columns for supporting the cylinders and supplying the crosshead guides, and the general form limited the molder in his choice, when deciding the method adopted in the construction of the mold. Casting on end being impracticable, it was necessary to prepare the mold for casting horizontally, and since the guides on the columns were required to be very sound, they were invariably cast down. The "round" condenser, another type so frequently used, though sometimes preferred riveted together, is often supplied in cast iron, and the comparatively simple nature of the cylindrical castings lends itself to being prepared and cast in a vertical direction. In the uniflux type, a greater variety of methods are at the disposal of the founder, providing the pattern work allows the necessary scope. When a new form of casting of such dimensions is required, it is necessary to have the opinion of the molder, as frequently much time and labor can be saved. The pattern construction can be varied to suit whatever available tackle the foundry may possess. Providing suitable boxes are in stock, the most profitable means of producing the main casting is to prepare the mold horizontally, adopting the roll-over process to consolidate the sand to regular density in the drag. It is rarely indeed however that jobbing foundries have such large boxes at hand for such work, and since it is rarely that quantities are required, the expense of preparing suitable molding types would be prohibitive. Some foundries have given considerable attention to the construction of molding boxes standardizing the sizes, so that they can be built up to accommodate a

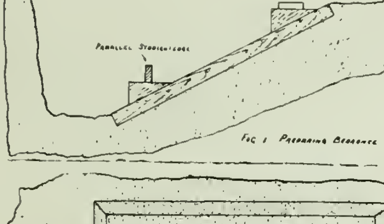


Fig 1 Preparing Bearance

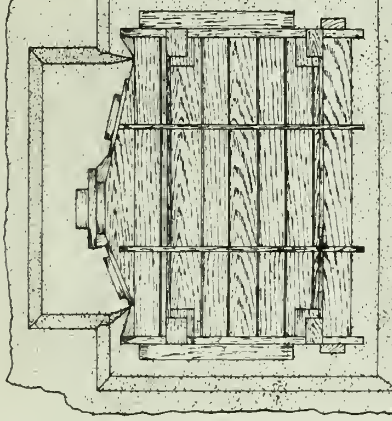


Fig 2 Pattern Bedded in & Joints Prepared

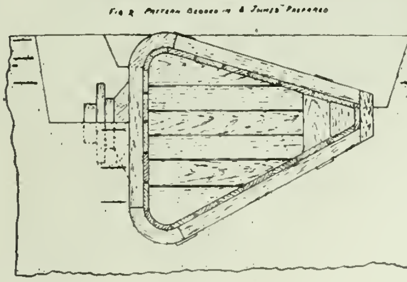


Fig 3 Section Showing First Joints

wider variety of work. The method is to be recommended, since many more sizes can be stocked, taking up very much less space than is required for the customary solid box. Stock bars, either single or double, are introduced to suit any given job when the box is assembled. The majority of foundries, however, reduce their expenditure on box parts by making use of the molding floor, and either sink large boxes or cases until their top flanges are flush with the floor level or simply dig a pit to suit the work required. In each case the process of bedding in is resorted to, and necessitates the mold being prepared in its final position for receiving the metal. Other foundries make a specialty of loam molding for which a cheaper pattern will suffice. Not infrequently a skeleton pattern is supplied, from which the main core as well as the mold can be made. A considerable amount of tackle is required when the mold for such a casting as is under consideration is prepared in this manner, and as a rule its preparation occupies more time than when a dry sand mold is prepared, and the main core made separately. Generally speaking, the majority of foundries prepare such molds in dry sand and make use of a pit or case to take the work horizontally or vertically. When the former method is decided upon considerable care must be given to the bed upon which the pattern is set. The bottom of the mold being inaccessible for ramming when the pattern is in position, it is preferable to prepare a special bed upon which the main part of the pattern will rest. In this case it necessitates a bed being prepared at an angle with the floor level, and at a distance below it which will allow the ordinary type of solid cope box being used, which frequently means that the highest part of the pattern will be just about floor level.

Difficulty is sometimes experienced in dealing with a raking bearance and with a pattern other than rigid, the resulting casting may be twisted. It is not a difficult matter to prepare a level bearance, and if the same principle is adopted in setting the logs for a raking bearance there will be less possibility of it being winding. To set the logs accurately have pieces fixed to them temporarily, out to the rake necessary, so that when the

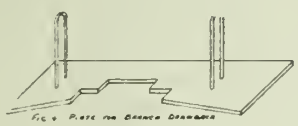


Fig 4 Plate for Bearance Drawback

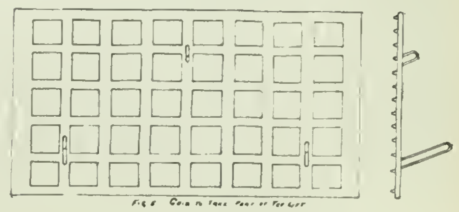


Fig 6 Grid to Take Part of Top Cope

logs are bedded in, the surface edges of these pieces will be parallel to the floor level. The method is illustrated in Fig. 1, whereby a spirit level is used on the top edge of the pieces, to set the logs with the requisite rake, and then they act as a support for a parallel straight-edge which can be tested with the spirit

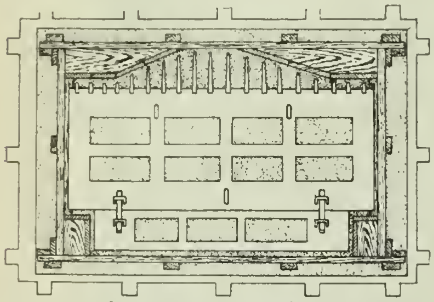


Fig 6 Method of Constructing Main Core

level until the logs are out of winding with each other, when the bed can be rammed up and strickled off. This provides quite reliable bearance for the body of the pattern. When the logs are removed and the surface made up the pattern needs to be lowered to get an impression of the end flanges and the ribs. On the pattern being raised, the positions for these are loosened, some sand

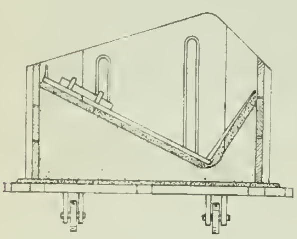


Fig 7 Section Shewing Bearance Prepared in Box

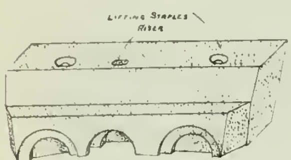


Fig 9 Pictorial View of Branch Drawback

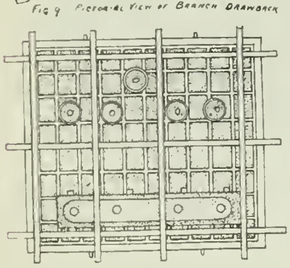


Fig 11 Ready to Receive the Metal

Fig 12

being removed and the pattern again lowered. This procedure usually gives a sufficiently definite impression of the projecting parts to allow the pieces being unscrewed from the pattern, then it is again lifted and made up in its respective position in the bed, the pattern being located by the end flanges when finally lowered. With the pattern set in position, the sand should be rammed up along the deep side to avoid any movement along the rake of the bearance. It is well to remember that when forming vertical sides of deep molds it is better to strengthen the sand by means of rods set at intervals of about three or four inches and at right angles to the side of the pattern.

The first joint formed is that about the horizontal centre of the branch and it should be large enough to give a reasonable bearance for a drawback, which will take the impression of the upper half of the branch. Once this joint has been defined, ramming can proceed and a joint formed off the highest part of the pattern and prints through which the whole pattern could be withdrawn. A plan showing the joint made up is shown in Fig. 2, a section through the centre of the mold being illustrated in Fig. 3. All joints should be given a good level bearance, and tapered well back to the floor level.

A plate is required to take the weight of the drawback over the branch when lifting. Such a one as is shown in Fig. 4 would answer the purpose satisfactorily, having a number of dabbers cast on the bottom and a couple of staples for lifting. It is good practice to bed this plate into a covering of loam when commencing to make up the drawback. Ram up to the floor level with sand, stiffening it over the branch by introducing a light semi-circular grid, and making up the joint to coincide with the top joint already formed. The joint indicated would necessitate a considerable lift if carried in the top box, the alternative is to prepare another drawback to reduce the amount of lift, and to give better facilities when closing the mold for casting. The whole of the cover need not be taken with this drawback, but only sufficient to render the top lift comparatively simple. Again the practice of giving a covering of loam can be resorted to, and the grid shown in Fig. 5 bedded into it. The dabbers in this case can be a bit longer to carry the depth of loam from the pattern body to the outside of the flanges and ribs. When this drawback is rammed up and a joint formed approximately in the position shown by the dotted line in Fig. 3, the cope box can be set in position, staked, and a commencement made on the cover. Either small grids, secured to the box or gaggers alone may be used to carry the sand forming the lift, and the whole rammed up. Probably the most convenient method of running such a job is by means of a spray along the narrow side of the condenser, risers being drawn from the highest points of the ribs and flanges, including the branch flange. This method has given satisfactory results, but whichever method is adopted must of necessity be provided for when preparing the drawbacks and cope. When the cover is completely rammed and the gate sticks withdrawn, it is necessary to dissemble it, in order to remove the pattern. Having examined the stakes to make sure that there will be no difficulty in locating the box accurately, it can be lifted and supported on standards for convenience in cleaning.

The cover drawbacks will then be lifted and supported temporarily. Providing the precaution has been taken to remove the screws, the section of pattern work such as the flanges, ribs and feet will be lifted in each case.

The branch drawback, when lifted, will carry the top half of the branch pattern

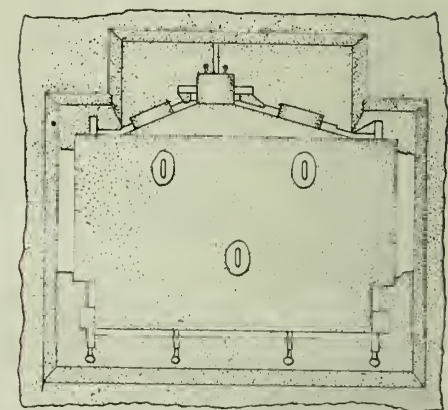


Fig 8 Assembling The Mould

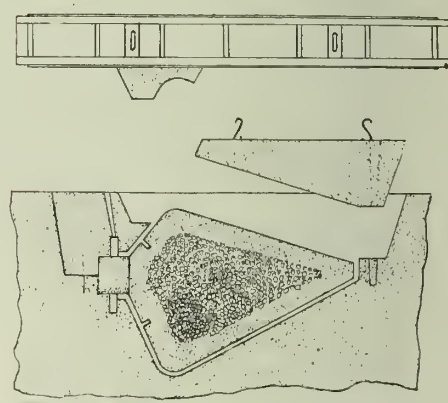


Fig 10 Section Shewing The Relationship Between Parts of the Mould

and subsidiary portions from the main body. The boxed section of the pattern is then clear, and preparation is then made for its withdrawal. It is customary to introduce lifting plates during the construction of the pattern at convenient places. Either tapped plates for lifting screws, or those having rectangular holes through, suitable for tee lifting irons are required for this purpose and they should be secured on the bottom or very near it for patterns of this character, so that the framework will take the strain when lifting. All subsidiary parts will be left in the mold, only the boxed section being removed in the first

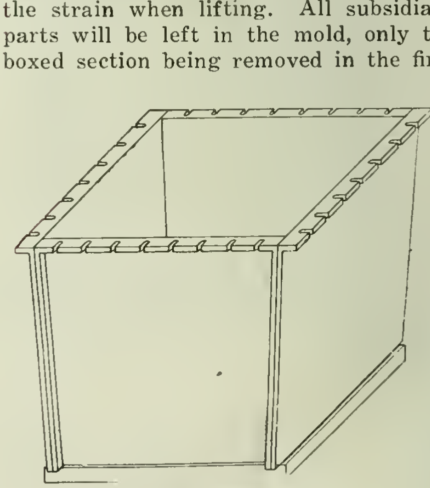


FIG. 13—CASE FOR BEDDING INTO FLOOR.

place. When this has been accomplished the whole mold requires to be carefully sleeked up, the sand cut away to form fillets about the ribs and flanges and the small sections of pattern-work withdrawn. Parts of the mold forming fairly sharp corners of sand should be well nailed to give strength. The same procedure is adopted in connection with the drawbacks and cover. The runners require cutting and the whole generally cleaned up preparatory to drying. In work of this kind, which must be dried in place, the drawbacks can be returned, and the cover box supported over the mold so that whatever method of drying is adopted can be used for all parts.

While the mold has been in progress the cores required will have been receiving attention, usually by another set of workmen. When the work can be so arranged, it is to be preferred, since castings can be produced more quickly, the object being to have both mold and cores ready for closing almost simultaneously.

The main core requires considerable preparation. A grid or plate is necessary, to give support to this core, and since the weight of it when completed is considerable, the strength of the plate must be such as will render lifting quite safe. Snugs can be carried on at each end of the plate to project beyond the ends of the core. This enables the molder to give additional support to the core when closing, relieving the pressure on the prints. Such a method, however, necessitates cutting the core box, and since it can be avoided in this instance, without detriment to the resulting casting, the method is not illustrated in the sketches. A suitable type of plate for this core is shown in Fig. 6. It is made in two parts, which are secured by means of a wedged bar passed through staples. Those bars can be conveniently removed, and the plates drawn out singly when the casting is being cleaned. Cores of this description are usually made on a special core floor adjoining a large core oven, and to facilitate the transfer of the core to the oven it is frequently made upon a bogie plate as shown in Fig. 7. A loam bearance, usually dried, is prepared for setting the core box level. Owing to the particular shape of the required core, it is necessary to strickle up a bearance after the core box is set on the bogie, and for this purpose the loose parts inside the box are removed temporarily, leaving the guide pieces for shaping the bearance or cup for the core. The major part is made up with bricks, and these are surfaced with ordinary floor sand, being strickled off to coincide with the guides attached to each end of the box. When this has been prepared the construction of the core can proceed. The bearance is given a good thickness of loam into which the clay-washed plate is bedded. Bricks and loam can be used to form the shape, but if long prods or gaggers project from the outside of the plate and follow the contour of the core required, the bricks can be discarded, and loam merely used to form an outside shell, introducing hard loam to stiffen the whole. Fairly larger sized ashes require to be well rammed into the centre of the core, and the top made up to a depth of about 5 inches or 6 inches with loam. It is the usual custom to leave the loam above the shape determined by the corebox, until the whole becomes stiffened, when it is strickled off to the core box ends. Fig. 6 gives a general plan of the core box set on the bogie plate, the bottom shape of the core having been made up and the core plate bedded into its position, the loose parts of the core box having been returned to their respective positions. A section through the branch connection is illustrated in Fig. 7. When this core has been strickled off clearance is cut about the top of the lifting staples, and a commencement made to remove the woodwork. Providing the loam is stiff enough, all the various parts of the core box can be stripped from the core. The whole weight is taken by the shaped bearance upon which it is dried. During the

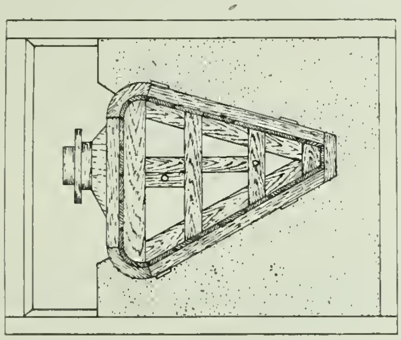


Fig 15 Formation of Joint for Drawback

process of stripping, the core should be sleeked over and corners rounded off where necessary. The smaller cores including those for the foot branch manholes, and the two loose cores necessary for each end of the condenser are also prepared and transferred to the stove for drying.

When both mold and cores are dry all parts with which the molten metal comes into contact are washed with blacking to prevent the metal fusing with the sand and give a good skin to the casting. Considerable skill is required in the process to prevent the blacking peeling when sleeking over. Special attention is given to the runners and risers and the whole job thoroughly dried again. It is necessary to prepare runner and riser basins, in order that they will be in readiness when the mold is fitted together finally.

The most convenient form of runner is one which will feed all the gates together, and since the metal is comparatively thin and covering a fairly large surface, it is preferable to prepare this runner so that stoppers can be used to prevent the mold obtaining metal until the runner is full. The riser basins can be separate, ordinary circular boxes being used. In both cases these should be prepared and dried, and then washed with blacking, but not infrequently they are black washed directly they are made, and then dried, a good surface not being quite so important as with the mold.

When all the parts are thoroughly dried the operation of coring up can be carried on. The small cores lightening out the back of the feet in the bottom are first located and then secured with nails to prevent movement, and as these cores do not cut through, as a precaution against lifting a double chaplet should be nailed to each core. The manhole core in the bottom is more easily secured to the mold, and it should project just the thickness of metal. To ensure accuracy it should be tested. The main core can now be lowered into position, the ends of which should be free to the ashes, and the mold eased away at the large prints for more ashes, to enable the gases generated when casting to escape easily. When this core is in its relative position, the branch core can be set in. If this core is a neat fit no other support need be given to it, other than that which is supplied by the print. A contact can be made between the branch core and the vent of the main core. The other cores which can be set from the joint, and indicated in the plan view Fig. 8, need no special fastening, but the small cores for the top feet required to be wired through the drawback, so that their position will be maintained in an inverted position. It is necessary to make up the main core about the lifting staples, and care should be taken to insure the sand being dried. Both drawbacks, one of which is illustrated in Fig. 9, can now be set, the runners tested to make sure they are clear, and then the cover box lowered. A section of the mold during the process of closing is shown in Fig. 10.

When the job is closed the runner and riser basins require to be grouted into position, and the whole box weighted down preparatory to casting the metal. A general view of the method adopted is shown in Fig. 11. When a cast iron case is used for bedding in such a job additional means are adopted to restrain the lift of the cover box when casting by clamping the joint flanges or better still when the flanges have a series of equidistant slots, they can be bolted. The form of stopper used to cover the gates during the time of filling up the runner is shown in Fig. 12.

While the general form of the condenser lends itself to being cast in the manner indicated, many foundries prefer casting them vertically, and this preference is more in evidence in those foundries having what might be termed special cylinder cases, bedded into the foundry floor. The greatest difficulty experienced is in the formation of the main core, since it cannot be conveniently made on its side and then turned up on end, and it is rather a risky undertaking to make it on end in the ordinary way, that is on a bogie, as previously explained. It can, however, be made nearer the foundry floor with a different form of core box, and having a full bottom plate introduced by which the core, built up in the same manner as a cylindrical core, can be lifted after the loam has stiffened sufficiently.

The making of the main core box can, however, be avoided by what is known as thicknessing in the mold and forming the core inside. The method has the advantage of giving a more regular thickness of metal to an irregular shaped casting, and can be applied to a condenser of this type. From an economical point of view, the casting can be made cheaper when only one or two are required, but more time is occupied in the preparation of the mold for casting, since

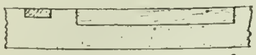
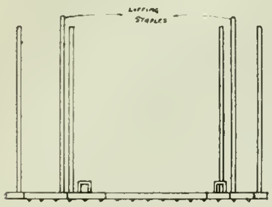


Fig 14 Clearance Prepared at Bottom of Case



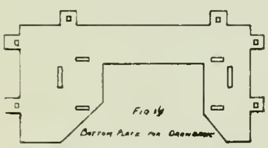


Fig 16 Bottom Plate for Drawback

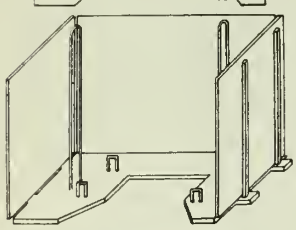


Fig 18 Plates Assembled for Drawback

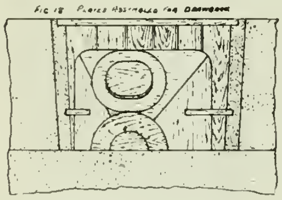


Fig 19 Elevation Showing Drawback [illegible]

the same number of men employed in the method previously described cannot conveniently work when the core is made in the mold.

The type of case which is suitable for taking such a job vertically is illustrated in Fig. 13. It consists of four sides bolted together, let into a bottom having an external flange, which can be sealed and made watertight by ramming sal ammoniac and iron filings between the box sides and the bottom flange. The best type has tapered sides, so that the withdrawal of castings is not restricted. A stiff top flange is cast about the top, having a number of slot holes cast through as shown. A level bed is prepared at a depth from the top of the case, equal to the height of the condenser body, and the pattern is lowered to get an impression of the prints. It is better if these prints are dowelled on, as when their position has been located they can be bedded in separately, as shown in Fig. 14, and the pattern replaced upon them—Fig. 20. The bottom flanges can be loosened and simply laid on the bed, and against the body of the pattern, and a commencement made with the ramming up of the sand, the screws being removed from sections of pattern as the ramming proceeds. It is necessary to rod the sand directly over the bottom flange, and over the horizontal ribs which surround the pattern. The sand can be rammed up in this way the full height of the job, and almost all round the pattern, the exception being the branch. A joint is required to allow for the withdrawal of the pattern and to enable the core being placed. It is better to level off the sand at the height of the branch centre over the full end of the case, and taper off the side joints as shown in Figs. 15 and 19. This enables the drawback being made with the minimum contact with the mold. The type of carrying plate for such a drawback is shown in Fig. 16, having staples cast in for lifting,

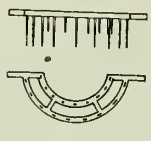


FIG. 17.

and also wrought iron rods cast in snugs for supporting side plates, as shown in Fig. 18. The back and side plates shown make the drawback independent of the mold excepting at the face and bottom.

To carry the sand over the branch flange an additional grid, shown in Fig. 17, is secured to the bottom plate. In commencing the drawback, a bed of loam is applied to the joint, and the bottom plate set into it. Loam is also applied to the tapered joints at each side to maintain a parting and prevent injury with the rammer. When the side plates are fixed up against their supports the drawback can be rammed up, a small riser being introduced from the bottom of the flange. Small projecting parts of the rib, cutting through into the drawback require to be cut for convenience in drawing. The cope in this instance is flat, and provision is made for pouring the metal directly into the mold. When the cover box and the drawback have been removed the body of the pattern can be withdrawn, the subsidiary parts remaining until the core is made. Strips of wood, equal in thickness to the metal required, are temporarily attached to the flanges and ribs and running the depth of the mold, the drawback is replaced, leaving the branch pattern in the mold. Ordinary floor sand is used to fill up the space between the strips and the main print is withdrawn. The whole then provides the core box in which a satisfactory core can be made. Besides the lifting plate at the bottom, a couple of ring plates should be used to strengthen the loam and bricks as the distance from the bottom increases. The centre of the core is left open until the mold is fitted together for casting, when it is lightly rammed with floor sand and when the drawback is finally placed in position the intervening space between it and the case is also filled with sand and rammed.

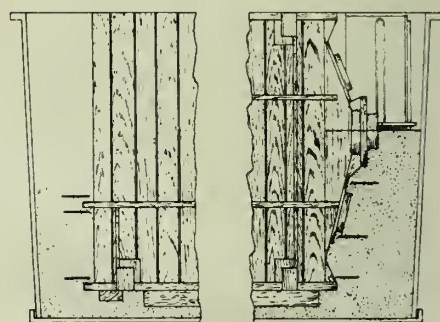


Fig 20. Part Views Showing Construction [illegible]

In preparing the mold for the cover the method adopted depends largely upon the style of box available. As a rule, when it is possible the flange is cast down, the pattern being bedded into the foundry floor until the uppermost part is flush with the floor level or merely bedding the flange into the floor as indicated in Fig. 21. When prepared in this way for casting, a bed of ashes must be formed under the job to allow for ease in venting. The skeleton construction of the pattern allows the ramming of the core to be done quite satisfactorily, the sand being carried to the outside of the pattern and strickled off After the cope has been rammed, making suitable allowance for runners and risers, and removed, the surplus sand making up the pattern can be strickled out and the pattern wthdrawn.

The core carried in the drag requires to be well sleeked over, the sharp corners of sand removed at each side of the ribs to form a fillet, then the ribs can be withdrawn and the facings drawn into the impression. A reasonable amount of care must be exercised in the withdrawal

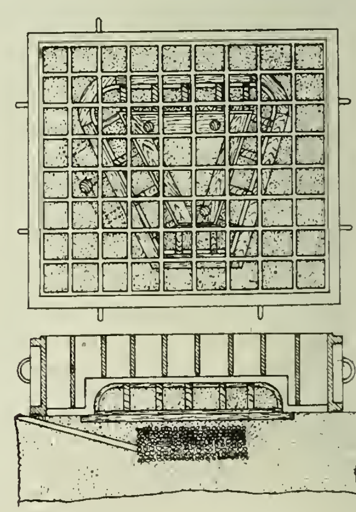
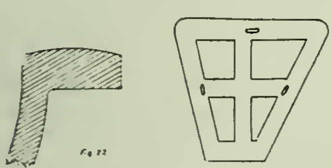


Fig 21 Preparation of Mold for Cover

of these ribs and the facings since the bottom is not accessible for patching. Some molders prefer to cast the flanges uppermost, bedding the pattern into the floor until the top of the flange is flush with the floor level. This method necessitates a considerable lift in the cope, a grid usually being fixed to the cope box to carry it. Dirty metal has a tendency to collect on the face of the flange when the casting is poured in this way, and since it is to be machined the difficulty is overcome considerably by shaping the flange as indicated in Fig. 22.

The making of the mold for the water end is a much more difficult job. When the pattern for the main part is made similar to the required casting, the method described in this article, the method of constructing the top and bottom flanges usually decides the molder on his choice. When both flanges are framed and used as a support to the shell pattern, obviously they cannot be drawn into the mold, hence a joint must be made at both flanges and the middle part either lifted in a box or taken away as a drawback. Even if the bottom flange is cut in such a manner as will allow for drawing in, the method can still be



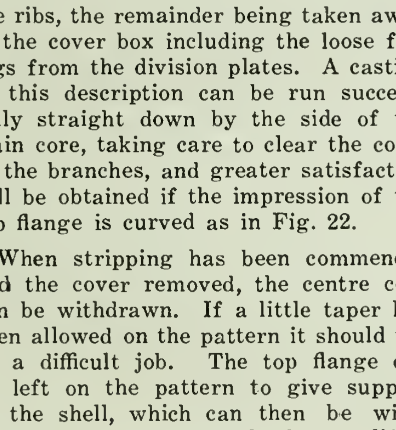
FIGS. 22 AND 24.

adopted. The core would then be left in the drag. While this method is used it entails more work in providing a suitable mold, since a special large plate is required to carry the drawback or a special type of box part must be used, and grids are equally essential to strengthen the core as it is divided into so many parts by the division plates and ribs. When the pattern work forming the bottom flange is in convenient sections, an alternative method of producing the mold can be adopted, and, since less tackle is involved, resulting in a more profitable casting, more consideration is given to the procedure adopted.

When the foundry floor is used, as is usual in such instances, a shallow pit is required having a depth which will allow a reasonable body of sand over the inlet and outlet branches.

The bed should be levelled off to allow the bottom flange to rest flat upon it. This necessitates the core print of one of the branches being bedded in. The division plates and ribs are temporarily removed from the pattern to allow a print being formed to conform to the internal contour and having a depth of at least 2 inches, as shown in Fig. 23. The cope remaining stationary, apart from drawbacks over the branches, the core must of necessity be made loose and since it is not desirable that it should be divided into as many pieces as are indicated by the ribs, the print is made deep enough to take a lifting plate over the whole area and strong enough to support the whole as one core. When the print has been cut out, loam is applied to the bottom and a plate, shown in Fig. 24, bedded in. The ribs and division plates can be returned to their former position and small grids inserted when the ramming up of the core can be proceeded with. All loose parts fastened from the inside must of course be detached as the work is proceeding. The outer part of the mold can also be rammed up, forming joints about the back of the flange on one branch and along the horizontal centre of the other branch, tapering them up to the floor level after forming a good bearance, in a manner shown in Figs. 23 and 25. When making the two drawbacks it is convenient to bed suitable grids in loam, and loam can be applied to the sand sides with advantage, because careless ramming sometimes injures these sides and interferes with the lift. The core will follow the lines of the ribs, the remainder being taken away in the cover box including the loose facings from the division plates. A casting of this description can be run successfully straight down by the side of the main core, taking care to clear the cores of the branches, and greater satisfaction will be obtained if the impression of the top flange is curved as in Fig. 22.

When stripping has been commenced and the cover removed, the centre core can be withdrawn. If a little taper has been allowed on the pattern it should not be a difficult job. The top flange can be left on the pattern to give support to the shell, which can then be withdrawn. When the drawbacks are lifted the final stripping can be made and the mold sleeked up. The molds for both the cover and the water end are more satisfactorily made in dry sand, hence both molds require to be dried and blackened for receiving the metal. With the exception of the cover for the water end,



which should be at least skin dried, the remainder of the small casting necessary to complete the job can be made in green sand. They are, however, comparatively simple and do not need description here.

HYGIENIC, SANITARY SAND-BLAST EQUIPMENT

It is now generally understood that in sand-blast practice economy of operation comes only with application of the right devices to the work in hand. This has forced the more progressive manufacturers of sand-blast equipment to an extension of their lines to meet this principle, so too has the demand for hygienic automatic equipment extended the range of design of these devices to meet the increased application of sand-blasting with highest efficiency.

The Rotary Automatic Table Sand-Blast in the initial designs was limited in range of work. Its manifold advantages of continuous operation with large output, minimum labor requirements and removal of the operator from unsanitary conditions, have made this type of sand-blast a prime favorite.

The wide popularity is due undoubtedly to the fact that it is now available in many variations, in fact in no less than three systems of blasting action and five sizes being produced by one manufacturer.

For the most difficult cleaned and larger character of work the direct pressure system is used with the blasting action supplied by a direct pressure hose blast and equipped with elevator and separator, using both mechanical and exhaust means for reclamation and separation of the abrasive for re-use. The reclaimed abrasive is accumulated in storage bins from which the hose blast is instantly refilled through a quick acting valve that makes the operation practically continuous.

For work less difficult to clean or where the intensive action of the direct pressure is unnecessary the gravity feed type is equally efficient and permits of an entirely self-contained machine. Mechanical and exhaust action is used for reclamation and handling of the abrasive, which is fed by gravity in a continuous cycle to the nozzles, where the full force of the air is exerted to the propulsion of the abrasive. Like the direct pressure, the blasting action is entirely confined and movement of the nozzles covers every portion of the work within the closed zone.

For the cleaning of lighter work and requirements of refinishing, etc., the self-contained suction feed type provides a small compact machine that adapts itself to every shop condition.

The used abrasive is reclaimed through screens and the handling is without elevator use. The cleaned abrasive is carried continuously by suction or syphon to the nozzles.

Foundry Engineering on an Efficiency Basis

Showing the Difference Between the So-Called and the Real Efficiency Engineer.

A FEW years ago this country awoke to the necessity of increased efficiency in all lines of industrial and manufacturing activities, whereupon efficiency engineers sprung into being and for several years this country was inundated with them. The efficiency engineer of ten years ago was a novel proposition and he got away with it beautifully. The average manufacturer was convinced by the technical matter appearing in the trade papers that he was absolutely incompetent to run his plant and he wondered how he had ever succeeded in getting along for years without the aid of an efficiency engineer. Thereupon he employed one to tell him that he know nothing about plant operation, and to take over his plant and run it as it should be run. The efficiency engineer had a glorious career for a short time, but in the course of a few years thousands of plants which had employed so-called efficiency engineers were able to recover from the effects of their employment and went back to manufacturing on a safe and sane basis.

Influence of Efficiency Engineers

It is needless to say that many efficiency engineers were really efficient and effected enormous economies in plant operation and in countless instances where the methods of the efficiency engineer were not entirely a success their efforts to improve conditions at least succeeded in arousing the interest of the manufacturer to the possibilities of improved methods. In reality, vast good has been done to industry in this country through the activity of the efficiency engineer. Today almost every large plant has its production engineers who give scientific study to production problems and the efficiency of production of manufacturing plants of this country has vastly increased, and we can thank the efficiency engineer, regardless of his work, for the change.

The efficiency engineer's activity was largely confined to production, and during the past few years we have had another cycle of engineering activity, known as industrial engineering. When the writer went into business for himself ten years ago, after having had ten years of experience in handling industrial and railroad buildings, he recognized the necessity of scientific analysis of the problems of plant layout and design to the end that a plant would be so built that it would fit its requirements. This involves study and analysis of the manufacturing process with reference to plant layout, present and future; co-ordinating departments; anticipating expansion; introducing special equipment and labor saving mechanism; and a proper consideration of general phases, such as the proper location of a plant with reference to the supply of raw materials, supply of labor, transportation of labor, shipment and handling of raw materials and finished product, and a market for the manufactured articles. All of the problems of plant location and design require analysis with reference to efficient and economical operation, and this means with a view toward maximum profits when the books are balanced and all the factors taken into account.

The Debut of Industrial Engineer

The handling of a proposition of this sort is a real man's job, and the necessity of the proper handling of it has appealed to the manufacturers just as the efficiency engineer's plea for increased production appealed to them. The result has been that in the last three, four or five years another profession has grown up called industrial engineering. Architects who find business dull because of building costs or war conditions, engineers whose special fields of endeavor have diminished, factory superintendents who are out of a job, machinery salesmen, and in fact almost anyone who has in any way been connected with the factory, are now terming themselves industrial engineers, and every phase of manufacturing activity is being handled by the new profession. The profession has become so big and so expert in so many lines, and has so many representatives who can do so many things, that I am of the opinion that the industrial engineer is going to follow in the footsteps of his predecessor, the efficiency engineer, and into disrepute and oblivion.

Foundry engineering threatens to go through the same cycle of need, exploitation, acceptance and discredit, because the opportunity is here now for the remodeling of many old plants, the construction of many new plants, in fact, the rejuvenation of the entire industry, and men are not slow to seize the opportunity for service in this field. The trade paper advertising again is the evidence of this fact, and we have today not only industrial engineers by the thousand, but we have foundry engineers galore.

And this is with justification, for the foundry industry needs engineering. Foundrymen the country over admit that today the foundry industry is at the threshold of a great era of development. It is quite evident that all of the problems which we, as engineers, apply to the location, layout, design and equipment of a manufacturing plant can and must be applied to the foundry. This is a specialized phase of engineering and may very aptly be termed "foundry engineering."

The Foundry Needs Engineering

Machine shops, steel mills, and light or heavy manufacturing plants do not present the same combination of operations and characteristics. Where else is the production of an article requiring some skill dependent on the use of a shovel? Machine perfection has advanced, quantity production in the automotive industries has brought about improvements in machine design and cutting speeds, and the output per man has been enormously increased, but in the main, the increase in the foundry has fallen far behind. There has been only a part of the corresponding improvement.

In the average machining operation it it is the speed of the machine which determines the operator's output. In the foundry, the number of molds a man puts up per day is more often a matter of physical fatigue and not the limitations of a particular machine, but the time requirements of all the operations until a completed mold is placed on the floor ready to pour. Every thinking foundryman is aware of the time and energy-consuming elements of making a mold; and that the best in molding machines still leaves a large part of the task up to the molder. This is but one operation in the making of a casting, and, without dwelling on the others, is not the point well taken that foundries are not keeping pace with the strides in other industries?

Disregarding the post-war conditions, several reasons may be found for this. One is beyond question in the general inertia of the operating foundryman. Troubles are frequently difficult to explain and correct, and experiments are more often costly and not productive of definite unqualified deductions and results. Too intimate association with problems narrows vision and curbs imagination, and the average foundryman is usually too involved in maintaining his established production standards to be receptive to new ideas or to have the time in which to thoroughly analyze his possibilities.

Why Improvements Develop Slowly

Another reason more generally applies, namely, that foundry production, melting, molding, coremaking, pouring and cleaning, is so closely related to the physical limitations of a plant that the individuals most concerned or responsible very naturally do not conceive the possibilities of improvement which could be carried out under somewhat different conditions.

The lack of proportionate improvement alone, in foundry practices or production, ought to indicate that something is wrong and is being overlooked. Fortunately, present day conditions are necessitating in themselves some departures from established methods, directing attention and stimulating inquiry into improvements.

The small amount of study that has been given to the subject has made it clear that a properly designed foundry cannot be a conventional or standard structure with sidewalls and a roof under which equipment is placed, but essentially an equipment layout without restricting elevations and structural details, housed in such a manner as to afford an essential amount of natural light and fresh air.

Making the Foundry Attractive to Workers

The poorest, unskilled laborer is receptive to agreeable working conditions. Air and light mean health. A man's attitude toward his job is in a great measure a reflection of his physical condition and the quality and quantity of his work is fundamentally related to it. Disagreeable and unhealthful working conditions mean higher wages, dissatisfied employees, and increased labor turnovers. There is nothing new in this contention, but the foundries have been woefully backward in appreciating its significance and correcting the situation.

Conceding that competent engineers and architects can design buildings which will meet the requirements of satisfactory working conditions, this element represents only part of what is needed in the layout of a foundry designed and equipped so as to accomplish the economies which are possible, and which are being overlooked in the usual present plant construction. It is essential that every production possibility in all departments be developed to its utmost. This means an intelligent study and analysis of every production element and a comprehensive provision for the use of labor-displacing equipment which will result in a maximum output per man.

This contention may be illustrated by specific examples in every phase of foundry operation, from the receipt of raw materials to the shipping of the finished casting. In the case of the gray iron foundry, a typical example can be found in the methods with which raw materials are handled from the cars and charges from the yard to the cupolas. In general, the same methods are in vogue since the first foundry was built. Shovels and wheelbarrows have persisted, and there has been no improvement in the design of either of these two pieces of indispensably considered equipment. Pig iron and scrap is in most cases man-handled all the way from the cars to the cupolas. In many cases the small tonnages involved do not justify equipment which will effect improvements over old methods, but where the volume of material does warrant mechanical equipment, the possibilities have only been touched. On the foundry floor where any quantity of heavy flasks or castings are to be handled, a crane is immediately thought of. How much consideration has been given to the use of a crane serving a charging floor where it could be used as a charging machine and to eliminate the labor of moving loaded cars or boxes? It would give a flexibility not attainable in the usual charging floor layout, even thought it be provided with industrial tracks and ball bearing charging cars.

Handling Costs Are High

In the average foundry the handling of pig iron, scrap, coal, coke and sand from cars to yard and later to their points of consumption costs from 60 cents to $1 or more per ton, depending upon weather and the particular conditions about the plant. The sand, coke and coal are usually distributed by means of wheelbarrows negotiating a plank. Pig, piece by piece, is tossed on the ground and laboriously stacked, or use is made of a gravity conveyor or skid which still necessitates hand handling at each end.

The making up of charges and the reclaiming of coal, coke and sand from the yard to the foundry is the more expensive element of the operation. Rain, snow and ice foul the turntables, transfer cars and industrial tracks. The cars themselves are seldom kept properly lubricated and in good condition. When such a system is used, it is seldom that the track layout is sufficiently comprehensive; it only serves an area immediately adjacent to it, and necessitates the bringing, usually by hand, of all material from the piles to the cars. It has its value, but only partly meets the requirements.

Where the total quantity of raw material handled warrants the expenditure, the most economical arrangement is a travelling crane supplemented by a magnet, grab or dump bucket and most important of all, a co-ordinated bin arrangement, the details of which can be so designed as to reduce to a minimum all handling by hand. Where a crane is not a good investment, there can be worked up combinations of relatively inexpensive stock equipment, the money-saving possibilities of which are extremely attractive.

The electric or gas tractor is a modern method of transporting practically every material in the foundry, even to hot iron. Its use is becoming more general, and some of our largest foundry layouts are developed around the tractor as the means of handling materials from one point to another throughout the entire plant.

Design of Plant Affects Costs

Lack of foresight in the beginning is responsible for the present material handling costs of many plants. The foundry has developed and tonnages have increased until the quantity of materials handled daily in the yard alone would make a heavy investment in cranes, bins and other equipment extremely profitable, but through lack of foresight, conditions have been allowed to develop which make it impractical, all things considered, to do anything but continue as in the past. The demands for expansion and improvement become so acute that not infrequently they result in a decision to abandon the plant and build anew. Such a decision is sometimes an unfortunate one, and the engineer who combines the knowledge of building design with a knowledge of foundry operations can frequently save the old plant by making changes which will serve almost as well as the erection of a new building. It is astonishing what can be accomplished in the way of remodeling an old foundry. Sometimes even new buildings have to be modified in order to accommodate increased production or secure proper working conditions. There is no greater field for the ingenuity of the engineer than in studying the possibilities of increased production and bettered conditions in the remodeling of old plants. The reader is familiar with any number of cases of this kind.

Growing Popularity of Electric Furnace

The consideration of melting equipment includes blowers, burners, furnaces and fuels. Like everything else, these are undergoing constant improvements, and some types are increasing in their range of application. Fuel costs are being readjusted. The electric furnace, primarily considered in the foundry as a steelmaker, is now being used for non-ferrous metals, malleable and gray iron for high pressure, and rigid specification work. With power at 1 cent per kilowatt-hour, steel castings can be made cheaper in the electric furnace than with the converter. The determining factor is largely the price of pig and scrap. Malleable practice and air furnace melting has made little progress toward economies, with the exception of the recent success with powdered coal, which has been long in forthcoming. Is it not surprising that the rigid requirements of malleable melting and hot metal handling have not been more generally met by the electric furnace, the more so, when it has been demonstrated that the usual 45 per cent. pig charge for air furnaces can be reduced to 10 per cent. in the electric furnace?

With current at 1 cent per kilowatt-hour, assuming 650 kilowatt-hours per ton, there is a direct fuel charge of $6.50 per ton of metal melted. With a 2 to 1 air furnace melting ratio and a cost of coal into the furnace of $7.50, there is a difference of $2.75 per ton on fuel in favor of the air furnace. However, a 45 per cent. pig charge at $45 per ton can be replaced by 10 per cent. pig and 35 per cent. of scrap at $30 per ton. The fuel saving of $2.75 for the air furnace is offset by a saving of $4.75 in the cost of the charge for the electric furnace, or, for these two items there is a net difference of $2 per ton of melt in favor of the electric furnace. For a strict comparison of the two methods, all the items must be taken into account, but the foregoing and most important are given to indicate that electric furnace malleable has economical possibilities which have not been generally appreciated. Consider further with the electric furnace the possibilities of using cupola metal in reducing the fuel or energy cost, together with the higher temperatures and more uniform analysis obtainable with it. There are districts where conditions now are such that the costs for electric malleable would compare favorably with the air furnace for malleable, this comparison disregarding the possible savings of a duplex or triplex process which may possibly be developed to show still lower costs for the electric furnace. Some recent successes of powdered coal for malleable melting are showing substantial savings over hand firing, and it is an interesting fact that in most cases where the performance has been satisfactory, the results have been due largely to the efforts of ex-foundrymen, or malleable men who have become interested in the subject.

It is not in the scope of this paper to discuss in detail any of these subjects, but is not the point apparent that here again is an instance where the intelligent handling of the problem is beyond the capabilities of a pure foundryman or a combustion engineer? Beyond question the work is best covered by the term "foundry engineering."

Cutting Down Molding Costs

The heart of production lies in molding. Here if anywhere in the foundry, we should expect to find a proper degree of progress over the methods in use 15 years ago. But this is true only to a limited extent in the foundries making automobile castings or other specialties in quantities. In general, it is only the heavier tonnages in specialties which make possible and economical the installations of sand handling and mold conveying equipment on a large scale, but there are feasible a number of other combinations of less expensive equipment which can be used to reduce the labor of shoveling and cutting sand and handling flasks to, and molds from, machines. It goes without saying that the last mentioned elements do not apply to snap or other small flask work, but any foundryman will admit that in general the usual main crane equipment is not sufficient to enable molders to work without tie-ups waiting for lifts and to close.

The complaint of every foundryman nowadays is that good mechanics, all-around molders, etc., are not to be had, and yet an attempt is made to obtain production according to the old methods. Molding is ceasing to be a highly skilled trade. The average shop does not have a number of all-around molders who can be depended upon to turn out a good casting from any pattern given them. The time was when a shoemaker or a cabinet maker made a finished article from his raw materials, but modern production has no place for such methods. Wherever possible, each man now performs his own particular operation. The analogy is admittedly not rigid for the molder and foundry, but it is proper to question some current foundry practices in the light of what is being done in other manufacturing lines.

Increasing Capacity of Molding Floors

Bear in mind that in making a casting there is the preparation of a drag, a cope, finishing, setting of cores, closing and pouring and sometimes the molder assists in shaking out and cuts part of his own sand. In most cases, particularly for gray iron and malleable, all molding ceases when the first iron comes off, and the molders use an amount of productive time which might be cut in one-third if all could be kept busy at the operation, or if a separate crew performed the task. Closing up is often delayed waiting for the crane, and the usual hunt at the expense of molders' time, takes place for clamps and wedges. And it is the molders who are scarce and whose daily output largely determines production! The inference is obvious, but it must not be inferred that it is claimed that a splitting up of operations is applicable to all classes of work and conditions. There are, however, any number of instances where improvements in this direction can be made. Some of them when tonnages are sufficient, necessitate or make possible continuous pouring. This operation requires careful analysis of methods of mechanical handling.

Here again the opportunities for the utilization of old plants are practically unlimited. We recently estimated that in a gray iron foundry in New York state, now running on a basis of pouring once a day, a change to continuous pouring is entirely feasible owing to the uniformity of the work, and that by the installation of the continuous pouring operation with practically no increased costs of equipment, building area or capacity, an increased profit of approximately $200,000 per year could be earned. The total expense to obtain this was perhaps $25,000. Further comment is unnecessary.

Where the several operations may be split up, frequently the pouring itself may be divorced from the molder, but there must be worked out a plan whereby the responsibility for scrap is fixed, particularly when the shop is being run on a piece-work basis. Continuous pouring, to be carried out most advantageously, precludes the facilities for the removal of hot castings, and it necessitates a type of building construction which will adequately remove the resulting smoke and fumes and maintain a sufficiently cool, working temperature. Monitor, saw-tooth, A-frame, or a Pond truss type of roof construction can not accomplish the desired results unless designed in accordance with heat producing zones, with proper appreciation of the conditions which will exist at all points in the building. Hot, gas-laden air cannot be removed from the structure unless cool air can be admitted in its place. Forced ventilation is to natural ventilation as artificial light is to sunlight. It is more expensive and a poor substitute; so again in the foundry proper, or molding area, we have a large production problem involving the immediate installation of a variety of mechanical equipment, or provision for it in the future, and the whole housed in such a manner as to provide a maximum of daylight and fresh air. Cannot the problem best be handled by an organization in which has been brought together foundrymen, architectural, structural and mechanical engineers, whose services may rightly be called "foundry engineering"?

Conserving Labor in Cleaning Room

The cleaning room of most plants is another indication of the extent to which old methods have persisted. The time required for a batch of castings in a tumbling barrel is half consumed by the loading and unloading operations. Castings, piece by piece, or by means of a shovel for the smaller ones, are laboriously raised from the floors and deposited into the mills, and the unloading operation shows a small improvement. There are obvious economies possible in many cases with barrels which are elevated and served by a platform at mill height, from which a mill may be quickly loaded and emptied frequently direct into the boxes under the mill, without additional handling of each piece or the use of a shovel. But as in the other cases, the usual building elevations, allowable truss loads, etc., do not permit of such arrangements because the structure was not designed primarily to fit the operations.

There is some argument about the relative merits of one and two storey foundries. This is a matter which is not particularly difficult to determine, because each case must be handled on its merits and what fits one plant will not fit another. There are too many factors which vary.

Consider Welfare of Men

The proper type of building not only guarantees good light and ventilation where the wrong type makes the building a difficult one to hold good men, but many other items of men's welfare must be considered. There are few industries which offer more unattractive surroundings to labor than the foundry plant. This does not mean unhealthy surroundings, because foundry work is extremely healthy with the exception of inhuman sand-blast rooms which still exist in some instances. The time has come, whether we are willing to admit it or not, that decent accommodations must be provided for working men. There is much argument as to whether or not improved conditions are appreciated, whether they pay and all that sort of thing, but the fact remains that men are entitled to better conditions than most of them get today, and that they are going to have them. In my opinion it is better to give it to them and educate them to appreciate better conditions, thereby making them better men and citizens. This matter of employees' welfare is a life study in itself. The providing of proper wash rooms, locker rooms, toilet rooms, rest and eating rooms are all a part of the engineer's job.

Time permits the mentioning of but a few of the instances wherein details of foundry construction and methods are not what they should be. This is again unfortunate, because in a few words it is not possible to discuss specifically the conditions to which some of the criticisms apply, and the statements may seem to be too broad and sweeping, and operating men will take issue with them.

Need All-Around Experience

It is becoming more and more evident to those who are in constant contact with problems of economical foundry layout that intelligent handling of the subject calls for a combination of experience and intimate knowledge of foundry practices, together with structural and architectural design, which is beyond the province of one man, but can only be provided by a combination of men or an organization which has been built up to meet these specialized requirements.

The underlying requirement, however, in detail, design and location is a first-hand knowledge from the foundry standpoint of the conditions involved; a broad familiarity with equipment, characteristics and possibilities; and the two co-ordinated in an engineering organization, which, functioning as a whole, can make the most of the opportunities. The individual efforts of a contractor, an architect and a foundryman, joined for a short time only, can rarely produce a foundry of economical design and good operating efficiency.

The subject has been touched upon broadly and it is assumed that the contentions will be so interpreted. What is held to be impossible today will be accomplished tomorrow. Many of these accomplishments are past due, and the next few years will witness some marked improvements in foundry design, methods and operation, and foundry engineers will have had no small part in bringing them about.

LIGHT PORTABLE ROTARY PNEUMATIC GRINDER

A new and distinctly different type of Pneumatic Grinder is being put on the market by The Roto Pneumatic Company, of 4700 Train Ave., Cleveland, Ohio.

The claims made by the manufacturers are that it represents simplicity of design and construction and has but three moving parts, being made up of pistons rigidly mounted on a straight shaft, constituting a single rotating member. This, together with two self-sealing sliding valves, constitute the only moving parts in the motor.

The necessary air enters the machine through the control handle and is applied to the pistons in the direction in which the shaft rotates, eliminating all crank shafts and connecting rods, thus avoiding friction and maintenance coincident therewith. Furthermore, by dispensing with these moving parts, such as connecting rods and crank shafts, the vibration of the motor is entirely eliminated. You have a smooth and even running motor, on par with any electric motor. The turn handle air control of this motor is self-sealing, absolutely balanced and the throttle will stay in any position that it is placed until moved by the operator. This control valve will throttle to zero without causing any intermittent jerking and assures even power at the wheel when in operation.

The air port areas are large, thus affording full power of the machine when needed.

The housing of this motor is made of bronze, and bronze bearings are used throughout the machine, as they have been found by test to give the best results when subjected to the severe shock of pneumatic tools. In this method of application of bronze bearings, the maintenance cost is much lower than that of any other type of bearing that could be used.

The motor bearings are thoroughly lubricated through the center of the shaft from an oil reservoir at the back of the case. The extended shaft bearings are lubricated from a reservoir in the handle of the motor. The lubrication of the cylinders and valves is accomplished automatically by the pumping of a limited amount of oil through them under pressure at every revolution of the shaft. Each oiling of the Roto motor supplies sufficient lubrication for five hours of continuous operation.

This machine has a perfect throttle control, and as previously pointed out, eliminates vibration and reduces friction to a minimum, thus enabling the operator to get the greatest amount of grinding power from the air consumed. Under average conditions, about 15 to 20 cubic feet of air per minute under 80 pounds are consumed. When very heavy duty is required, the full power of the machine is readily at the operator's disposal by further opening of the throttle. The motor valves automatically release themselves when the air is turned off, thus allowing the motor to idle and slow down very gradually.

A safety provision has also been made by so arranging the air ports so as to prevent the grinder from running at a speed which would be sufficient to explode the wheel. Another very practical feature is the direction of rotation of this grinder, which is such that the sparks and chips are thrown away from the operator and the load of grinding toward him.

The weight of this machine complete does not exceed 14 pounds and will swing either a 6 inch or an 8 inch wheel.

As a summary of the above-mentioned advantages, we obtain maximum efficiency and horsepower from a minmum supply of air used, accuracy, simplicity, light weight, absolute lack of vibration, perfect control of speed at all times, and handle grips so arranged as to keep the operator's arm in a natural position and thus produce a maximum amount of work with the least effort. All working parts can be reached by removing 5 bolts.

RANDOM SNAP-SHOTS OF BOOTHS AT FOUNDRYMEN'S CONVENTION, COLUMBUS, OHIO, SHOWING A FEW OF THE 235 EXHIBITS WHICH WERE TO BE SEEN AND WHICH SHOWED EVERY PHASE OF FOUNDRY LIFE.

Some Pattern-Making Ideas and Suggestions

Describing and Illustrating Some Points Well Understood But Usually Neglected.

SMALL WHEEL PATTERNS

By James Edgar

Small-tooth wheels are usually cast blank and the teeth machine cut, but not always. A train of wheel patterns with the teeth cast has sometimes to be made for various reasons. We had such a job in our shop recently. There were eight wheels, the smallest one being 3.25 P.C.D., and the largest one 8.25 P.C.D. A cheap job had to be made, and it may help others to describe how it can be done.

The wheels should be turned from hard wood to the diameter at the root of the teeth. If there are lightning holes in the central plates they should not be cut out till all the teeth have been fixed on, as the pattern is stronger uncut and will stand the tapping of a hammer.

The periphery must be turned dead square as the slightest inaccuracy will spoil the gear. The patterns should be varnished immediately they are turned to prevent warping. The centre prints may be turned in a length, and dowelled to fit holes in the wheel bosses. This is a better way than paring prints and nailing them in position and the holes in the bosses are a convenience for trying the wheels in gear before they are sent to the foundry.

We shall not consider designing the form of tooth here but simply the construction of the wheels. The workman will draw the teeth geometrically or with an odontograph according to his skill. It is advisable, however, to make two testing templates of thin wood before making the teeth. If the centres are marked on a board, and pins inserted, one template will move the other easily and truly if the design is good.

The peripheries or rims should be carefully divided, first into large divisions and then these large divisions may be subdivided. If there are 75 teeth then it would be best to divide the rim into five, after which each of the five divisions could be divided into five, when the final division is easy. This method is quicker than dividing into the exact number of teeth at one operation. With large wheels a simple calculation will give a setting for the dividers, but with very small wheels division can only be by trial. The lines can be squared across the rim on a surface table or with an ordinary square.

The teeth being very short should be made three or four in a length. They

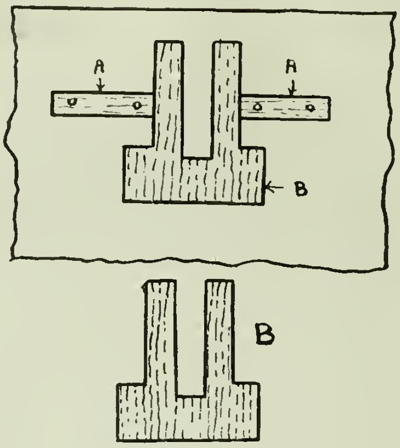


FIG. 2.

are so narrow that it is not necessary to plane or gouge the bottoms concave. The strips of timber can be run off at a small dimension saw, very slightly larger than the finished tooth. It takes considerable time to plane wheel teeth especially if they are so small, and it is not necessary. A box or jig like Fig. 1 should be made. The sketches explain it. The space in the centre is for the teeth. They should be a tight fit and pressed on

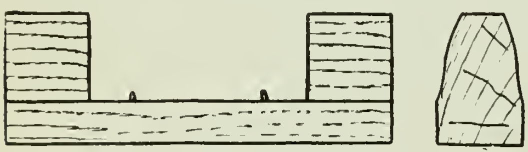


FIG. 1.

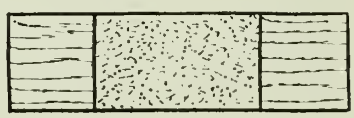


FIG. 3.

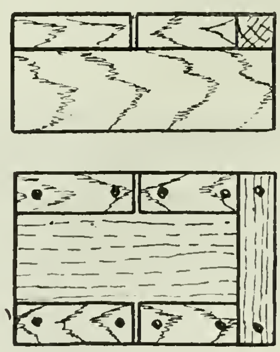


FIG. 4.

to the projecting pin points. If a jig like Fig. 2 is made on the grinding disc table the tooth lengths can be ground to a length quicker and more accurately than if pared with the chisel. A wooden table can be improvised by clamping a board to the iron table. The pieces A are stops for the tooth holder B. The tooth lengths are simply dropped into the slots in the holder and the holder then pushed against the disc. The stops regulate the length of the tooth strips.

To finish the teeth a roller like Fig. 3 may be turned. There is a recess in the centre just deep enough to take sandpaper, which is glued to it, as shown in the sketch, so that when it is revolving between the centres and the tooth jig pressed against it, the tooth will be ground to shape on the sandpaper, while those parts of the jig which only press against the ends of the roller beyond the sandpaper are not worn at all. When all the lengths have been ground they must be sawn to just larger than the finished tooth length and ground in another jig on the grinding table. They can be sawn in a jig like Fig. 4 at the bench, or with a guide at the bandsaw.

Very good glue should be used for fixing the teeth to the rims. It is best to glue them all first and after the glue has set to nail them. If care is not taken the teeth will split when boring for panel pins. If there is not a boring machine a pin should be driven into a faceplate on a fast lathe and filed off sharp (Fig. 5). The teeth can then be pressed on this pin and safely bored. The pin must of course be dead centre of the face-plate.

A final word as to testing the wheels before they are sent to the foundry. The holes which were turned for the prints come in useful now. The centre of the wheels are marked on a suitable board, and thin washers of the same diameters as the holes in the wheels are made and pinned on the board. The wheels can now be set on the washers, and there should be no jarring. It is better, in-

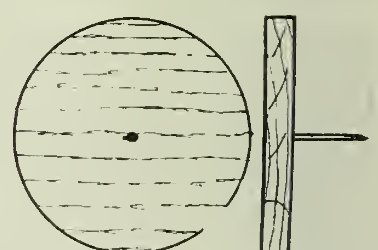


FIG. 5.

deed, that there should be sufficient clearance, as cast teeth are always larger than the pattern which is accounted for by the moulder rapping to get a good draw. Some long teeth lengths should be supplied to the moulder for making up broken teeth.

SYSTEM IN MAKING PATTERNS

By J. L. Gard.

On large work, or even on some that is not large, costs can be greatly reduced by a systematic handling of the work. Almost every piece of a pattern must be made for that particular job, little can be used from stock except prints, dowels, or fillets. I will describe a recent job and how it was dissected and systematized. First, taking the drawing and deciding how it was to be made. I made a list of all the core prints needed and told the boy to find as many as possible from stock, and what he could not find to saw out material for, and get it ready for the lathe. Next rough pencil sketches were made of all the hubs and bosses. One sketch for each size and the number wanted marked on sketch. These were given to the same boy to saw out material for and get ready for the lathe. Like sketches were made for each size of rib and the lengths wanted marked on each sketch. Parts that were turned had a sketch for each piece just as it was made in the lathe, without any other piece attached. These pieces were cut out or glued up ready for turning, one man doing all of them. One was put on the lathe and kept there till all the turning was done. He did nothing but turn, all his material being ready for him. The sketch for each piece was attached to it with a thumb tack, so that as the man took up a piece he knew what to make out of it and how big it was to be.

Sketches were made for each piece, or where it was a plain square piece just the dimensions were given. Another man was at work on these getting out and gluing up. I laid out most of the material because, knowing how it was to be made and where joints were to be, I could make the marks quicker than telling where they should be. Where ribs were to join or where posts were to fit together they were cut a bit over size. Where two pieces were to fit together the second one was fitted to the first one made, or if two pieces were called for four inches long they were cut together. One was not a shade over size and the other a bit under. If there was any variation it was all the same way. Several pieces of the same size were cut to gauges. After all material was cut out as near to finished size as possible, we began to assemble and it was surprising how that pattern grew.

The first few days we seemed to be making little progress, but made good when we began to assemble. There was little of the cut and try method. All joints were sawed or trimmed to the proper angle. After we had it all together, we smothered off joints, trimmed it up and rounded corners. By rounding corners last, there was nothing rounded that should have been left square. After all the cutting was done, sandpapering was started, no piece being sandpapered before it was put in place that could be reached afterward.

Fillets were put in and after a final checking up of dimensions, etc., the pattern was ready to varnish. All dimensions of each piece were carefully checked, before that piece was put in the pattern, the idea being to prevent errors, not to correct them. Having used a system like this, I can commend it to progressive establishments, if they have a thorough man to do the leading.

It is rather difficult to go more into details without becoming tiresome. And again the details of each job would be different and must be planned accordingly, although the same principle will apply. The way of making patterns that I have often seen practised, by making a piece and putting it in place and then another and placing that, and so on, is something like building a house by making a brick and carrying it up and placing it, then coming down and making another, taking it up and placing that and so on. The job will be done some day, but the cost of it will make you shudder, and the useless labor performed in doing it. Wasted time costs as much per hour as productive labor. As wastes are kept down, profits go up. It is waste of time and material that drives many a concern to the wall.

PATTERN MAKER SHOULD USE JUDGMENT

While a good pattern shop foreman will usually try to keep in touch with the foundry foreman and arrange the pattern design so as to mold to the best advantage there is one feature which is frequently overlooked, viz., the grain of the lumber. No matter how carefully the pattern is made it will not draw out of the sand as satisfactorily with the grain of the wood running lengthwise, or, more properly speaking, lying on its side, as it would if the grain of the wood is from top to bottom of the pattern. I have in mind a small job which I had to mold quite frequently and which had this particular drawback. It was what is known as the apron of an iron lathe and was practically flat on the outside face and all full of pockets and projections on the inside. It was a simple job to mold with the face up, but from the point of view of the molder's pride it should be clean on that face even though a dirty face would not affect the working qualities of the casting when on the machine. We used whirl gates in order to have the metal properly skimmed before entering the mold, and then when the casting was cleaned up it would, in all probability, have a corner or two which had floated from one or more of these pockets down below. Everything imaginable was done to prevent this but it was next to impossible. One place in particular had two flanges which extended downward about four inches and about an inch apart, and the grain of the wood, which was of the coarse variety, was horizontal and when we tucked in a number of spikes with the little bit of sand which would go in this space it was no small matter to have it secured to the spikes without having it equally as secure into the roughness of the grain of the wood. If this grain had been perpendicular the roughness would have been of small concern as it would have drawn easily. As it was the sand would be loosened and every molder knows that the more he patches and fools with a place like that the worse is gets. Too much water and to much sleeking either picks or washes.

NATURE, THE SHOPKEEPER

Nature is the great shopkeeper. For every need of life you must deal with her. Nothing is given away. Everything is purchased at a price. She does a strictly "cash and carry" business with no charge accounts.

If you want Good Health, Nature has a big supply of it on hand at all times, and the price tag reads, "Plain Living."

If you want Success, Nature will give it to you at the very reasonable price of "Brains, Hard Work and Square Dealing."

If you want Happiness, again you must deal with Nature. She can supply Happiness in any quantity at the cost of "Love, Kindliness, anl Good Fellowship."

Nature also conducts a Bargain Basement, where you can get a big assortment of Failure, Disease, Unhappiness and Poverty, all marked very cheaply.

Perhaps you wonder how Nature can do any business in her Bargain Basement since all the Good Things are on sale above.

So do I wonder. But she does, just the same!

IRON FOUNDRIES IN GREAT BRITAIN

The following list of British foundries will probably include some very large ones, but as regards numbers it does not surpass Canada, when we compare the populations of the two countries:

There are at present 2796 iron foundries in Great Britain and Ireland, divided as follows: England: North counties (Northumberland, Cumberland, Durham, Westmoreland, Lancashire, Yorkshire), 881; Midland counties (Staffordshire, Worcestershire, Warwickshire, Leicestershire, Derbyshire, Nottinghamshire, Northamptonshire), 828; west counties (Wales 84, Cheshire, Salop, Herefordshire, Monmouthshire, Gloucestershire, Somerset, Devonshire, Cornwall), 321; east counties (Lincolnshire, Norfolk, Cambridgeshire, Huntingdonshire, Suffolk, Essex, Bedfordshire, Buckinghamshire, Hertfordshire), 174; south counties (Berkshire, Wiltshire, Dorsetshire, Hampshire, Sussex, Surrey, Kent, Middlesex, Oxfordshire), 137; London, 98; Scotland, 305; Ireland, 52. The largest single town foundry area is Birmingham, with 118 foundries, and the largest single county foundry area is Yorkshire, with 408.

Successfully Welding Gray Iron Castings

The Following is an Abstract from a Paper Read Before the American Welding Society by C. K. Bryce, of the Oxweld Acetylene Company.

THE introduction of oxy-acetylene welding first brought out the possibilities of cast iron as a weldable metal. The previously established methods, namely, compression or forge welding, were not applicable because of the nature of cast iron, both when cold and at temperatures commonly employed for welding. It was immediately seen that a welding process which followed so closely the metallurgy of its formation gave every indication of practicability.

The first attempts at welding were very crude. The welds were hard and brittle, possessing little strength. They served to demonstrate the fusing power of the flame rather than the true welding of the metal. Even these efforts created considerable interest in the foundry field, but like all innovations in an old-established industry, skepticism existed. Gradually the economic possibilities of welding outweighed trade conservatism and the progressive foundries ventured into it. Intelligent co-operation and research have produced a welding procedure that gives results of the greatest metallurgical soundness and are restricted in application only by the confidence of the welder in his ability and such mechanical limitations as facilities for proper handling of the work.

There are many grades of cast iron placed before the welder. They range from the crudest, just a step removed from pig iron, to the finest grained grey and white iron.

Grey iron castings are by far the most common type met by the welder. Occasionally white iron is encountered, but not enough to be of importance in welding considerations.

Grey iron differs decidedly from white iron in its physical properties—it is soft, tough, and easily machined. White iron is hard, brittle and machined with difficulty. The difference is due to the condition of the carbon present. Carbon is present in cast iron in two forms, in solution commonly called combined, and free as graphite. Grey iron has most of its carbon present as graphite and for practical purposes it can be considered as being composed of an impure steel matrix with minute particles of carbon imbedded in it. White iron holds most of the carbon in solution. Its fracture is silvery white and close grained, while that of grey iron is open grained and greyish.

The state of the carbon in the metal is dependent principally on the thermal treatment it receives. The relative percentage in which graphitic and combined carbon exist is influenced by the rate of cooling. If the cooling is slow, a great portion of the carbon separates as graphite. If the cooling is rapid, a higher proportion of the carbon remains in the combined state.

Silicon, sulphur, phosphorus, and manganese are always present in cast iron. They have effects on the properties of the iron and also directly, or indirectly, have an influence on the nature of the carbon present. Silicon tends to promote the formation of graphitic carbon while sulphur and manganese tend to keep it in combination. The function of these elements as well as the rate of cooling are fundamental factors in the welding process.

In preparing a casting for welding the edges to be welded are chipped out to an angle sufficient to allow thorough penetration of the blowpipe flame. The metal adjacent is chipped or scraped to prevent any dirt or scale getting into the weld. The casting is then ready for preheating.

Preheating is employed—first, because it effects a saving in oxygen and acetylene; secondly, and of greater importance, it a means of compensating for the expansion and contraction produced by the heat of welding.

The expanding forces are not usually of great concern to the welder. Contracting or shrinkage strains must be accommodated, otherwise they will cause it to fail outright. Preheating the entire casting, or those parts affected by the weld, will produce a general expansion that is sufficient to compensate the localized contraction of the weld.

The extent of preheating depends on the nature of the casting and the position of the weld. The temperatures involved range from a blue heat to a dull red. The commonest form of preheating is by the charcoal fire. This produces an even constant heat and does not require expensive equipment to apply it. Gas and oil burners have had limited success.

After the casting has been preheated, the blowpipe is applied and the actual welding started. When the melting point is approached its transition from the solid to the fused state is very rapid and when in the molten state the metal is very fluid. This fluidity has certain disadvantages. It facilitates the flowing ahead of the metal into the cooler edges of the joints and tends to produce adhesion and not welding. It is also difficult to handle except when the welding is in the horizontal plane. Inclined or vertical welding can be accomplished by the use of carbon blocks or paste.

Cast iron in fusion is covered with a film of oxide and this oxide melts at a higher temperature than the molten metal. It prevents homogeneous fusion and is often the cause of defective welds.

It is not desirable to break down this film of oxide mechanically, as it cannot be entirely removed in this manner. A fluxing material is used that will dissolve the oxide and float it to the surface. A flux is not used solely to counteract the presence of oxide. It serves as a cleanser for such impurities as sand, scale, dirt, etc. It also acts as a protecting coating to the molten metal and assists in the prevention of blowholes as well as the vaporization of the more volatile elements. Flux is added during the operation by dipping the hot rod in it and melting it in the weld.

Cast iron is sensitive to overheating and the fusion produced in welding is sufficient to vaporize certain constituents. The most volatile of these is silicon. The loss of silicon in the weld is overcome by the use of a welding rod having a sufficient excess of this element to equalize that volatilized. A correct welding rod is one of the most important factors in the execution of a weld and should always be used.

The blowpipe procedure follows the general methods employed in all fusion welding. The fluidity of the molten metal requires that the angle of the flame should be almost vertical. The welding rod is also held almost vertical and the flame played around it, but not in contact with it. The tip of the white cone does not come in contact with either the metal or the rod because the high temperature will affect the volatile constituents of the metal. It is held so as to be ⅛ inch to ⅜ inch above the surface.

After the weld is finished the surface is scraped whilst hot to remove the film of flux, scale, dirt, etc. A great number of welds have been condemned for hardness merely because this film was not removed.

After the weld is smoothed off the casting is annealed. Annealing produces two effects that are essential to good cast iron welding. It promotes the formation of grey iron and permits the distribution and elimination of internal strains, either previously existing or introduced by the contraction of the metal.

In small castings this annealing can be done with the blowpipe by raising the casting to a good red heat and then covering it with a good insulating material so that it will retain its heat and not be affected by draughts. In large castings the preheating device can be used for annealing. The casting should not be removed until it is quite cold and this sometimes takes from 12 to 24 hours. When the casting is cold it can be removed, cleaned up and in some cases the surface of the weld ground smooth. It is then ready for machining or service as the case may be.

The important factor in the handling of a casting for welding is that of properly laying out and setting up the job and the application of satisfactory preheating and annealing methods. The blowpipe difficulties can be overcome by intelligently grasping the principles involved. The remainder of the welding procedure requires a little experience and practice before it can be mastered. Owing to the varied nature of castings, as to quality, shape and size, no set rule of thumb can be employed. There is no doubt that the welding of cast iron is a process of great importance to the machinery and metal working field. Its limitations have not yet been reached.

Past performances of the welding blowpipe in this field prove conclusively that its application has been sound and that its present rapid growth is due solely to the merits of the process. Future expansion of its application at the same rate is assured.

A NOVEL CORE OVEN

By Stephen B. Phelps

Foundry superintendents in the past were not only expert in foundry practice but were required to have ability to design and construct their equipment as well. The present-day foundryman as a rule does not have to use his ingenuity in designing machines, ovens, etc., because the many equipment manufacturers with their numerous standardized designs can usually supply his needs from stock and thus allow him to concentrate on such matters as production and quality of castings. However, it sometimes happens because of lack of space, peculiar operating conditions, or immediate needs, that the foundryman still has to be his own engineer. Such was the case when the writer was called upon to replace an oven which had been blown up, due to the carelessness of the colored operator, shortly before the writer took charge of the shop.

Heat Warps Tracks and Trucks

One of the disadvantages of oil burning for baking cores—especially if, as in this case, there is not enough room for a well designed combustion chamber—is the intense heat developed which causes frequent relining of the combustion chamber. If the oven is of the truck style with wheels attached, and especially if the burner operates between two trucks, the rails, wheels and truck itself may be cracked and twisted out of shape by the heat.

Due to the lack of space the trucks in this oven were crowded too close together and the heat cracked the wheels, warped the truck frame and twisted the rails to such an extent that the repairs were very excessive. It frequently took about 20 men with chains and a man on each wheel with a bar to get the truck out and sometimes even this gang gave up. When properly lubricated the truck described below can be pulled out by two men.

A Novel Core Oven

The truck does not run on rails but is carried by trolleys which run on overhead I-beams. This novel idea eliminated the trouble in operating the trucks by placing the running gear and tracks where the heat could not affect them.

The new design besides giving quick service for cores, pays for itself in about two years by very greatly reducing the cost of repairs and the saving of the time of the excessive number of laborers and coremakers required to move the trucks.

The trucks are designed with the doors attached forming the end of the truck so that when one truck is drawn out for a new load, the back end of truck acts as a door and closes the oven, permitting access to one truck while the cores on the other truck are baking. This presented another problem in design as the trucks could not be drawn completely out of the oven and in this case it is not practical to build a longer oven or design another complete truck. In order to overcome this difficulty the writer designed two brackets for carrying the front end of the truck and a similar pair for the back end, but in this case the brackets and the trolleys extended through the rear wall, cast iron covers being designed to enclose them. This permitted the use of the entire oven space and the former truck frame which was designed with adjustable bars for carrying cores of different sizes.

Construction of Oven

The construction for the new oven for overhead travel consists of three columns erected along the side of the oven and three cross beams supported by the columns and the wall on the other side of the ovens. Four I-beams are suspended by turnbuckles from the cross beams to act as tracks for the trucks. The tracks are kept from swaying when the trucks are moved by braces connecting them with the columns and walls. Turnbuckles are used to suspend the tracks to insure their being level and to make them adjustable in case anything should throw them out of line. They are convenient but a less expensive hanger could be used. The three columns are tied together with a long angle and the same shapes are used as braces from the columns to the tie piece. The cross beams are tied to the wall with bolts.

It may be thought that these structural pieces were an additional expense aside from the building of the oven. However, it will be seen that in nearly each instance they or some other shape would be required if the usual type of oven were being built and some other pieces not required in this design would be used in addition. For instance, the overhead I-beams replace the tracks in the floor and do not require the customary metal ties or spreaders, nor the customary cement foundation which usually also means a cement floor. The columns replace the customary buckstays and the cross beams replace tie rods, although their costs no doubt are greater.

Three doors were hung on hinges on the walls of the oven to permit observation of the cores and the combustion. They also act as a vent so that the doors can blow open in case another careless operator causes an explosion. Standard trolleys were used in this case but they are not designed for such service and should be provided with special means for convenient lubrication in such close quarters.

NATURAL RESOURCES OF NOVA SCOTIA

A 70-page booklet entitled "Natural Resources of Nova Scotia" with 16 illustrations and a map has just been issued by the Natural Resources Intelligence Branch of the Department of the Interior, Ottawa. This is the latest of a series dealing with various sections of the Dominion, the booklets previously issued having dealt with New Brunswick, the Peace River, New Manitoba, Saskatchewan, etc.

The opening paragraph of Nova Scotia clearly indicates the object of the series when it says "The facts in this booklet are compiled for the use of the homeseeker, merchant, manufacturer, capitalist and visitor. They purpose to be up to date, authoritative, concise." Each booklet forms a basis of standard official information and is revised as each edition is exhausted.

In the booklet now before us a welcome absence of verbiage allows space for valuable specific facts. Thus there is a list of products reshipped from Halifax which could easily be manufactured in Canada; a special section on West Indian and British Guiana trade, details about oil-shale, coal, limestone and iron, aeronautics, merchant marine, clays, salt, land prices and wages—all subjects of present interest. Statistics are made palatable by an interesting style and suggestive touches.

Nova Scotia is crossing the threshold to great activities, and both to the many native born who left the land in the last generation and to the many about to sail from overseas the booklet will be a reminder that the chances in Nova Scotia now seem as bright as is its summer beauty.

The "Natural Resources of Nova Scotia" will be sent free by mail on application to The Superintendent, Natural Resources Intelligence Branch, Department of the Interior, Ottawa.

The class in natural history was reciting. Finally the teacher asked: "Where is the home of the swallow?"

Long silence; then a hand waved.

"Robert, you may answer."

"The home of the swallow is in the stomach," declared Robert, seriously.

Relation of Die-Casting to Foundry Practice

Although Admitting That Great Progress Has Been Made, the Author Believes that the Art of Metal Casting Has Not Kept Pace With Other Lines of Trade.

By CHARLES PACK

THE casting of metals in sand molds has been practised commercially for a period approximating 200 years. Darby and Raumer were early pioneers in this art and made many castings, both in ferrous and nonferrous alloys. Although the modern foundry would astonish the artisans of the eighteenth century, the fact remains that the general principles underlying the modern foundry practice have changed but slightly during the last two centuries. The foundry has progressed, it is true. The molding machine, to a large extent, has taken the place of the hand molder; match plates have taken the place of the crude patterns of old; and melting equipment has been perfected and made more efficient. Intricate core work has been made possible by the development of new sands and binders. Notwithstanding these developments, the writer is of the opinion that progress in the art of metal casting has not kept pace with the rapid strides of progress that have been made in the other arts of manufacture during the past two centuries.

Many Seek Permanent Mold

The "permanent" mold has been the dream of every ambitious foundryman. This everlasting search for a permanent mold finds justification in the fact that nearly all castings produced in the sand foundry require more or less machining. It is evident that by the use of a metallic or other "permanent" mold, castings having greater accuracy, and requiring less machining, could be obtained.

It is interesting to note that the use of the metal mold antedates that of the sand mold by two or three centuries. Metal molds were used by Gutenberg for casting type during the latter part of the fifteenth century. Metal molds also were used extensively before and during the colonial period for casting pewter pots and tableware. During the latter part of the seventeenth century, metal molds also were used for casting continuous lead pipe. The alloys used in these processes consisted of either tin or lead, hardened with varying amounts of antimony.

Metal molds were first used for casting machine parts during the latter part of the nineteenth century. The advent of the internal combustion engine created a demand for babbitt bearings and in 1877 C. and B. H. Dusenbury patented a machine designed particularly for this purpose. This machine consisted of a cast iron cylinder and piston immersed in a bath of molten metal. The piston was connected with a series of levers. The molten metal was forced into the metallic mold, or die, by the application of hand pressure to the lever.

This machine was one of the first to be used for the manufacture of so-called "die castings." Many later die-casting machines were constructed along the general principle of the Dusenbury machine and some machines of this type are in use at the present time.

It will be noted that in every instance cited, the use of the metal mold was limited to lead and tin base alloys, having melting points not exceeding 650 degrees Fahrenheit and exceedingly low tensile strength. The application of such castings in engineering practice was, of necessity, very limited and the die-casting manufacturer was confronted with the problem of developing an alloy of comparatively low melting point, but having strength and other physical properties comparing favorably with cast iron or brass.

Zinc Base Alloys Tried

This demand was partially met with by the introduction of a large number of zinc-base alloys. By adding aluminum and copper in varying proportions to zinc, alloys are produced that are comparatively hard and strong. The tensile strength of some of these alloys exceeded 40,000 pounds per square inch and the elongation of the alloy was controlled by the addition of varying amounts of tin.

It was mainly on these types of alloys that the die-casting industry was established as a commercial manufacturing process. Unfortunately many of these alloys were compounded with a healthy disregard of all metallurgical principles. The alloys were overadvertised and misrepresented. Many of them warped and disintegrated in service, thereby creating a strong prejudice against the use of die-castings that has tended to retard the growth of the industry.

A review of the situation confronting the die-casting industry in 1910 tended to emphasize the fact that in order to establish the process permanently it must be extended to the alloys of aluminum and copper. Die-castings made from zinc, tin and lead base alloys had a useful but limited field of application. The demand for aluminum and brass castings having a degree of accuracy approximating that of the zinc die-casting was apparent.

Experiment with Various Metals

The problem of developing a process for die-casting the alloys of aluminum and copper coincides with the problem that has engaged the attention of foundrymen for many years, namely, the development of the "permanent" mold. Whereas, the foundryman has been making aluminum and copper alloy castings in sand molds and has been trying to perfect the composition of his mold, the die-casting manufacturer has conducted his experiments with a steel mold and also has found that the solution of his problem lies in perfecting the composition of the mold or die. The foundryman and the die-casting manufacturer are both working toward the same goal, the commercial production of castings having a greater degree of accuracy than the modern foundry product, and the ultimate reduction of machining costs. The problem resolves itself into the possibility of obtaining a suitable material for a die or mold.

During the past five years the die-casting process has been developed sufficiently to cover the field of aluminum alloys. Many of the most useful alloys of aluminum, including the aluminum-copper series, can now be die-cast commercially. The problem of obtaining a suitable die material for casting aluminum alloys has been solved and 50,000 to 100,000 aluminum castings can now be made from any die before it begins to show any indication of wear. The process at the present time is limited to castings having an over-all length not exceeding 24 inches and weighing not over 10 pounds. However, it is safe to assume that the process will be gradually developed to include larger castings.

By the die-casting process, aluminum castings are now produced with a maximum variation of 0.0025-inch per inch of diameter or length. Holes having as small a diameter as 0.093-inch can be cast. Outside threads of moderate accuracy can be cast, and where extreme accuracy is desired the cast thread may be sized with a suitable chasing tool.

Relative Cost of Die-Castings

The initial cost of producing a die is generally much greater than the cost of making the patterns or a match plate for producing the castings in the foundry. This factor eliminates the die-casting process from consideration when only a small number of castings are required. As a general rule, die-casting cannot be considered as a manufacturing process where less than 5,000 castings are required.

[A number of aluminum die-castings, representative of the type of product obtained by the die-casting process and including cover for milk-pail, motorcycle carburetor, carburetor cover, pump impeller, brush holder, and magneto housings, were shown in the illustrations, demonstrating that aluminum castings can be successfully made by the die-casting process.—Editor.]

In addition to parts shown in the illustrations, aluminum die-castings are being used extensively for many parts of automobiles, aeroplanes, tractors, vacuum sweepers, typewriters, adding machines, hair clippers, heels for ladies' shoes, telephones, telegraphic devices, electrical instruments, photographic apparatus and for many other devices too numerous to mention here.

Many efforts have been made by both the foundryman and die-casting manufacturer to develop a process for casting brasses and bronzes in metal molds. Large sums of money have been spent in fruitless efforts to accomplish this result. At the present time, the writer is of the opinion that we are as far from a solution to this problem as we were 50 years ago. Despite the spasmodic advertisements appearing in the trade papers purporting to "have overcome the heretofore insurmountable difficulties in casting brass and bronze in metal molds," there is no indication at present that the sand mold is in any immediate danger of being replaced by the metal mold for the casting of brass and bronze.

The writer, in a paper read before the American Institute of Metals in 1914, outlined the necessary properties for a permanent mold material for casting brass and bronze. These properties, summarized briefly, are as follows:

Requisites of Permanent Molds

A. Heat Resistance. Material must not scale or oxidize at temperatures of 1,600 to 1,800 degrees Fahrenheit.

B. Expansion. Material must have a very low coefficient of expansion, since the unequal expansion induced by the severe service will otherwise tend to crack the material very rapidly.

C. Elastic Limit. Material must have high elastic limit, since otherwise the continued expansion and contraction of the surface will cause rupture of the material.

D. Conductivity. Low conductivity is desirable to enable the metal to fill the cavity of the mold without the use of excessive pressures.

E. Strength. Material must have exceedingly high tensile strength if small cores are to be cast. The writer has found in his experience that ½-inch cores made from alloy steels (exceeding 100,000 pounds per square inch tensile strength) would break in service, due to the high shrinkage of the metal around the cores. The cores would score and the sharp corners were eliminated when less than 100 castings were produced.

The writer is of the opinion that a material meeting the requirements outlined above is not available at the present time. In the absence of such material, the brass die-casting process must be classified with the foundryman's "permanent" mold, as merely a dream without any immediate prospects of realization.

SOME BRASS ORDER

The American must certainly intend to go into the marine business with a vengeance and the Hog Island Shipyard, which we described some years ago, must still be doing some business, judging from the following announcement, which, incidentally, is quite an item from a foundry point of view:

Announcement is made of the awarding to Doran Brass Foundry, Seattle, Wash., of a contract covering 60 bronze propellers for the Hog Island Shipyard. The contract involves $500,000 worth of work. Doran Brass Foundry Company competed against foundries all over the country for this order. In producing the 60 propellers approximately 1,400,000 pounds of manganese bronze will be cast, for there will be 300 blades. There will be 60 four-ton hubs produced in the production of which 480,000 pounds of iron will be cast. The wheels will be 17 feet in diameter.

SOMETHING ABOUT RADIUM

In an interesting letter sent out by the American Society for the Control of Cancer, Dr. Harvey R. Gaylord of Buffalo, N.Y., one of the directors of the Society and director of the State Institute for the Study of Malignant Diseases, Buffalo, gives out some information about this rare metal, which is at least interesting, if nothing more, to others than those of the medical fraternity, and those suffering from cancer. With the hope of relieving cancer sufferers, the State of New York has purchased 2¼ grammes of radium, for which they had to pay $225,000. One gramme is already refined and in safekeeping in the vaults of the Institute at Buffalo, and any citizen of the United States who requires the use of it is privileged to do so free of charge. This last clause can be accounted for by two very good reasons. Firstly, because at the price very few doctors would be apt to carry it in stock, and very few patients could afford to pay the price which would be required to pay the interest on the investment; and, secondly, because any more than one supply in a community would be superfluous for the reason that it never seems to wear out, no matter how many use it. Radium is the one known substance which will continue to throw out heat and light without apparently consuming itself. An idea of its cost and the reason for such a cost will be gleaned from the following: $225,000 for 2¼ grams means $100,000 for one gram. If we refer to the apothecary's table of weights, we see that there are three grams in a dram and eight drams in an ounce. We will not need to go any further because a pound would be out of the question. If there is an ounce of radium in existence it would cost $2,800,000 at these prices. The reason for the price will be appreciated when we consider that it is mined in Colorado and brought 2,900 miles across the continent in the form of 125 tons of carnotite ore to the extraction plant at Orange, N.J., where it is reduced by fractional crystallization and less than the twelfth part of an ounce of radium extracted from it.

The description of radium as given by chemical experts will read as follows: Radium is an intensely radioactive metallic element found (combined) in minute quantities in pitchblend, carnotite and other uranium minerals, symbol, Ra.; atomic weight, 226.4.

Radium was discovered by M. and Mme. Curie, of Paris, who in 1902 separated compounds of it by a tedious process from pitchblend. Its compound's color flames carmine and gives a characteristic spectrum. It resembles barium chemically. Radium preparations are remarkable for maintaining themselves at a higher temperature than their surroundings, and for their radiations, which are of three kinds: Alpha rays, beta rays and gamma rays. By reason of these rays they ionize gases, affect photographic plates, cause sores on the skin and produce many other striking effects. Their degree of activity depends on the proportion of radium present, but not on its state of chemical combination or on external conditions. The radioactivity of radium is, therefore, an atomic property, and is explained as resulting from a disintegration of the atom. This breaking up occurs in at least seven stages; the successive main products have been studied and are called radium emanation or exradio, radium A, radium B, radium C, etc. (The emanation is a heavy gas, the latter products are solids). These products are regarded as unstable elements, each with an atomic weight a little lower than its predecessor. It is possible that lead is the staple end product. At the same time the light gas helium is formed; it probably consists of the expelled alpha particles. The heat effect mentioned above is ascribed to the impacts of these particles. Radium, in turn, is believed to be formed indirectly by an almost immeasurably slow disintegration of uranium.

Looking Up

"So you want to marry my daughter. What are your prospects?"

"Well, sir, I have a wealthy bachelor uncle, sixty-five years old, who has just taken up aviation."—"Life."

* * *

There is always a Cape Horn in one's life that one weathers or wrecks one's self on.—Huxley.

* * *

It is easier to climb a mountain than to level it.—Bulwer.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

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Market Conditions and Tendencies

THE condition of the markets is about as unstable as it can possibly get, and any predictions as to tendencies would be of small value. Since 1914 the human mind has been prepared for most any eventuality and it would cause no shock to hear that prices had soared beyond reach or that the bottom had fallen out entirely, but on the whole the tendency at the present time is slightly toward decline. Iron and coal, the backbone of the foundry business, have not yet made any decided downward slide in price, and have not shown any very great surplus of stock, but the supply of pig iron has become such that it is quite possible for the furnaces to keep up to their orders. The coal situation is still unsatisfactory, and, while everybody seems to have some coal, it is difficult to get any ahead, so that, all told, there is not much which can be said about prospects for some time to come.

Must Prices Come Down?

THE question is frequently asked, What difference does it make about the price of an article if everything is based on the same standard of valuation? If the dollar has changed its value it simply takes a different number of dollars to fill the bill, so this theory runs, but such is not the case.

The farmer is the man who really brings the cash into Canada, and if farm produce can be bought in other markets for less money the Canadian farmer must lower his terms or lose the business. The Canadian farmer claims he can not sell below the present prices unless he can buy cheaper. Obviously, things must come to some kind of a level where they will balance properly over the whole world or trading can not be carried on in a satisfactory manner. We do not, however, want slumps or panics; we want conditions to gradually right themselves, and if the advice of Canadian Foundryman is of any value it is to keep the wheels of industry moving to as near full capacity as possible without actual loss and let prices come back to normal with as gradual a decline as possible and avoid the possibility of panic.

Foundrymen's Conventions

WHILE the convention is over for this year it must not be looked upon only in the light of an annual event, but as an all-year-round event. The work of preparing for it and the benefits to be derived from it are of twelve months' consideration, and it is to be hoped that those who spend their time in devising ways and means of making the convention a greater and still greater success each year will not be forgotten and that due respect will be given to them. The papers which were read at the technical sessions were most instructive and interesting and should be read by those who were unable to hear them. Some of them appeared in last month's Foundryman and some are published in the present issue, while others will appear from month to month. Some views of the exhibition are shown in this issue and some will be shown in the December issue, so that the convention will be kept fresh in the minds of our readers for the remainder of this year at least, and by January we should be able to give some light on the next year's meeting place and other items of interest in connection with the 1921 convention.

Hot Air, Not Compressed Air

IN our last issue we promised that this month's Foundryman would be especially devoted to the subject of compressed air, but for reasons beyond our control it is impossible to do justice to the subject in this issue and we therefore think our readers will be better pleased to have it held over for a month than to have it done in an unsatisfactory manner. However, in the next number of Canadian Foundryman we hope to show in a fairly comprehensive manner the various uses to which compressed air can be put in the foundry. We do not propose to show photographs of the appliances, but real detailed drawings of the inner workings of the standard machines, and in so doing hope to enlighten the reader on many points of interest.

But it must not be presumed that compressed air is going to monopolize the entire issue. Everything in connection with the foundry will be dealt with. The next issue being the last one for the year will be a real Christmas number and will be, to some extent, devoted to reviewing what has transpired during the year. In addition to this we will detail our plans for 1921 and will explain the manner in which we propose to make Canadian Foundryman a still more valuable and welcome source of education than heretofore.

Beginning with the January issue the Canadian Foundryman will have a section devoted entirely to technical education, as well as a separate and distinct section treating on some feature of modern foundry equipment, but for just now we will not dwell upon next year's programme. The programme for December will include an interesting article on pattern making, by Charles A. Otto, showing method of making necessary rigging for sweeping cylindrical moulds, in which the strickle and sweep play a prominent part. The moulding of these patterns will of necessity be shown. Interesting papers on malleable iron, steel, brass, and aluminum will be published, together with the plating and polishing and other regular material.

The Labor Situation

FOR the first time since 1914 the supply seems to be greater than the demand in the labor market and quite a number of workmen are looking for positions. Unfortunately, a lull hits all at the same time and when men are let go in one plant there is not much chance to get into another.

Fortunately, the working men had a good long spell of steady employment at good pay, which put them in fairly good condition for a short rest, but with living conditions as they have been it was no easy matter to lay by any fortune.

The unemployment question is, to our notion, the most serious question of any between capital and labor, and if capital and labor ever see fit to come together and try to be agreeable, this is the question of questions which should receive first consideration. No working man can take proper interest in his work and know that he is liable to be laid off at any minute. But then the employer has his side to the argument. He carries a big stock of goods ahead in order to prevent strikes or to carry him over in the event of a disagreement, and if he finds that he is overloaded he shuts down for a while, or lets a few men go until things right themselves. Thus the two sides conflict, instead of working together.

Lowering the Cost of Living

ORGANIZED labor, while realizing that prices must and will inevitably come down, objects to having the first slash come out of the working man's wages, and there are others who see things in the same light. If the working man is up against the problem of choosing between idleness and reduced wages, he may be forced to take a half loaf in preference to none, but this reacts against the employer, as the working man constitutes a big percentage of the consuming public, and if he requires his entire income to pay for the bare necessities of life, the manufacturers of such other lines as might be termed comforts and luxuries will experience a reduced market, which, again, brings in its wake a reduced possible expenditure and creates another vicious circle equally as aggravating as was experienced when the prices were soaring, finally resulting in a panic in which every class is a loser. It would certainly look the part of wisdom, even from a purely selfish, business standpoint, for the employer to keep the pay roll as high as he possibly can without acting the part of philanthropist, and let the price of commodities fade away slightly in advance of wages. There are other things to consider, however, which make hand-to-mouth methods necessary. If prices are on the wane a manufacturer would not appear wise if he paid high wages to men for working on high-priced raw material only to sell it in the form of a cheap finished article later on. All told, it is a ticklish question, and both parties should try to grasp the situation and work together.

These Changing Times

THE business community in Canada can well heed the remarks of many of the best thinkers on this continent who are trying to bring home the fact that there is a real and vital responsibility resting upon it right now in maintaining a substantial activity in operations during the period of price adjustment.

A policy of moderation and sympathy is needed. The forcing of any man or of any company to the wall should be avoided if there is any honorable way out of such a move.

Manufacturers of either raw, semi-finished or finished material should do their utmost to prevent unemployment, and in this they should have the co-operation of every employee.

The man in the shop should recognize that the management has a real problem on its hands now. Financing is not easy—it is hard, especially for firms that have not been in existence long. There are managers and presidents who are drawing hardly anything at all in the way of salaries at present. The business is simply taking it all, and their optimism for the future and their determination to participate in the development of months to come keep these men in a state of suspended, if not actual poverty.

Occasionally one hears a remark to the effect that "the worm has turned, and we—the management—are going to have our turn now. The men in the shop have run this place for the last four years and we are going to let them know now what a pinch feels like." This attitude is not general, but it exists in some places. Its application to shop management now would be the veriest nonsense.

Nursing a grudge is wasted energy—it will not turn out one extra casting in a year—it will not get any better results in the tool room or the machine shop—neither will it make any other department any more capable or efficient.

There should be a reasonable policy to bring about as much employment as possible. Unemployment is not desirable at any time—it strikes too quickly and too surely at the homes, at the wives and children.

The Canadian trade has so far kept its head fairly well in the matter of cancellations. It is highly desirable that this attitude should continue. An avalanche of cancellations, were they allowed, would start a circle of trouble so vicious that one could hardly measure the element of danger it contained.

All things considered, there is a fair volume of business passing in Canada. It is not to be expected that much expansion will take place until prices and values find new working levels.

The business community in Canada is going through these changing conditions successfully.

Common sense, confidence in the future, an honest day's work and a fair amount of actual and honorable sweat will put us across safely and give us a start on an era of development such as we have not witnessed heretofore.

—Knott in the Dallas "News."
The Optimist.

Scraps from the Foundry Scrap Pile

The Canadian Kron Scale Co., Ltd., has been incorporated at Montreal to manufacture scales, trucks, etc., with a capital stock of $150,000, by Shirley G. Dixon, R. E. Allan and C. Sinclair.

Quebec City.—Incorporation has been granted Adolph Huot, Ltd., to manufacture stoves, furnaces, heating appliances, radiators, etc., with a capital stock of $25,000, by Jeanne Morandat, Wilbrod Huot, Joseph Huot and others.

Brantford, Ont.—A new stock company consisting of Christopher Cook, W. T. Henderson, Albert H. Boddy and others has been incorporated to manufacture grinding wheels, machinery, tools, etc., with a capital of $600,000.

The Brantford Machine and Tool Co., Ltd., has been incorporated to manufacture machine tools and other lines of machinery at Brantford, Ont. The capital stock will be $50,000 and the leading men are Robert O. Cumback, Joseph H. Ham and William J. Ham.

The National Castings, Ltd., have been granted incorporation to manufacture iron, steel, and non-ferrous metal castings, etc., at Belleville, Ont., with a capital of $50,000. The incorporators are Fred Wheeler, Frederick Daniels, Norman L. Turner and others.

Thermoboard, Limited, is the name of a new concern which has recently been incorporated at Niagara Falls, Ont., to carry on an iron foundry business. The capitalization of the company is $250,000. Mr. F. W. Griffiths is the leading figure in the organization.

The Ruggles Motor Truck Co., Ltd., has been incorporated at London, Ont., to manufacture motor trucks, automobiles, tractors, etc., and will start immediately on the construction of a $250,000 plant. The men at the head of the enterprise consist of George M. Reid, John F. Grant, John C. Elliott and others, and the capitalization is $3,000,000.

London, Ont.—This city is to have another industry, the buildings for which will be gone on with at once. The institution will be started by Wm. J. Jarmain, Urban A. Buchner and Herbert J. Sutherland, and will manufacture a line of metal sash, building material, hardware, etc., under the name of Steel Sashes, Ltd. The capital stock will be $40,000.

The Britannia Foundry Company, Coventry, England, manufacturers of hand and power-driven molding machines, air compressors, match-plate apparatus, duplex centrifugal sand mixers, gate cutters, core ovens, and other foundries have established an agency in Toronto to supply the Canadian trade with their goods which were formerly sold through direct dealing at the head office. Albert Herbert, Ltd., 1-3 Jarvis Street, Toronto, will be their Canadian representatives.

Quebec City.—The Quebec Marine Works, Ltd., has been incorporated to manufacture engines, motors, machinery and heating appliances, with a capital of $25,000, by Albert Savigny, Simonne Boutet and others.

Montreal, Que. — Incorporation has been granted to Michael T. Burke, Donald W. Deeks, Walter M. Kavanagh and others to engage in the business of brass foundry, steel foundry, boiler works, tool works, etc., with a capital of $100,000 under the firm name of Hodgson, Freck, Limited.

Using New Metals.—A very significant hint was thrown out by the chairman of the Institute of Metals at a recent convention of that body. He pointed out that while the internal combustion engines used to drive merchant ships contained only 3 per cent. of metals other than iron and steel, the driving equipment of the latest British submarines (oil engines, steam turbines, and electrical machinery combined) showed a proportion as high as 37 per cent. Therefore the marine engineer would find in naval practice suggestions for increasing power and reducing weight by using some of the wonderfully strong yet light alloys which British metallurgists had developed.

CATALOGUES

Pneumatic Tools—Aids to Industry, is the title of Circular No. 34, publnshed by the Independent Pneumatic Tool Company, 600 West Jackson Boulevard, Chicago. The circular is just off the press, and is ready for distribution. It describes in detail the various lines of "Thor" air tools manufactured by this company, including Piston Air Drills, Thor Pneumatic Motor Hoist, One-man Stay Bolt Drill, Close Corner Drill, Wood Boring Machine, Turbine Air Drill, Breast and Screw Feed Drills, Portable Air Grinders, Molders' Bench and Floor Rammers, Pneumatic Holder-on for Bucking up Rivets, Chipping, Caulking and Flue-heading Hammers, Riveting, Scaling and Cleaning Hammers, and the Thor Moisture Separator.

The User's Experience Told by Himself, is the title of a booklet issued by the American Foundry Equipment Co., 366 Madison Avenue, New York City, showing letters received by this company from foundrymen who are using the Sand Cutting Machine manufactured by this company. Different illustrations are also shown of the machine in operation in the foundry cutting over sandy heaps. Descriptions of the working of the machine and other useful information are also given.

Foundries that Fit is the title of a neat booklet published by Frank D. Chase, Inc., Engineers, 645 North Michigan Ave., Chicago. The contents include various pictures of foundries designed and engineered by this company. The descriptions of the various shops show the trend of foundry construction in the direction of utilizing every inch of space, and constructing foundries so that waste space can be avoided. Convenience of handling material, health and comfort of the employees, heat, light, ventilation, etc., are also considerations dealt with.

The Booth Electric Furnace Co., 326 West Madison Street, Chicago, have just issued a beautifully illustrated catalogue of their Rotating Electric Furnace, showing the different types and capacities of furnaces manufactured by this company, together with a list of customers who are using their make of furnace and also some testimonials from users. The construction of the furnace is dealt with in detail and considerable valuable information is given. The furnaces are for melting steel, iron and non-porous metals.

The Canadian Blower & Forge Company, Limited, Kitchener, Ont., are distributing their General Catalogue, No. 19C, a book containing 186 pages of illustrated and descriptive material pertaining to their line of manufactured goods, which includes Foundry Cupola Blowers, Gate Valves, Heating and Ventilating Fans, Exhausters, etc., Blacksmith's Forges, Blowers, Shears, Benders, Upsetters, Drilling Machines and all other equipment for the blacksmith shop, together with larger sizes of Drilling Machines, Slotting Machines, Grinding Machines and various Machine Shop Tools. In the descriptive matter much valuable information is given along the line of oil burning, coke, coal, down draft and every type of forge, belt and electrically driven machinery. Tables, charts and drawings are also given, making the book a valuable addition to the library of the machine shop, blacksmith shop or foundry. The combination wood worker for pattern shop and flask repairing is also described in detail, showing twelve machines in one.

New Foundry of McIntyre and Taylor, Toronto

A Complete Self-Contained Foundry Which Has Just Opened Its Doors for Business

THE new foundry of McIntyre and Taylor, 503 Queen St. West, Toronto, is a model of completeness in every respect. The main building front is on Queen Street, but the plant extends through to Richmond Street, and is all under one roof, with the exception of the alleyway, which runs midway between Queen and Richmond Streets. The Queen Street front has been the headquarters of the company for some years, but the foundry, which backs up against Richmond Street, is the culmination of a long felt want.

The foundry building is one hundred feet square and is being equipped with the most modern appliances. Facing the cupola are six floor-molders' floors, and on each side of these are eleven bench floors, making twenty-eight floors all told. The cupola, manufactured by Sheldons, Limited, Galt, Ontario, is thirty-six inches inside the lining, and owing to the extremely high buildings in the immediate vicinity has a stack above the foundry roof; thus giving it first-class draft. The core-making department when completed will be a model of perfection.

On a level with the cupola charging floor is a gallery running the entire length of the building and connecting with the door leading to the alleyway. On this gallery are bins which hold all the pig iron, coke, molding sand, core sand, and general run-off supplies.

The presence of the alleyway through the plant makes it imperative that the two sections be connected by underground tunnel. This, however, has its advantages, as by digging the foundry floor down to a level with the bottom of the tunnel it brings the charging floor and its accompanying gallery at a proper level for loading or unloading wagons from the alley, while not making it low enough to prevent wagons from entering the foundry from the Richmond Street entrance. On this hundred foot gallery, where most of the raw material is stored, an unloading and conveying system is being installed at the end, over the core-making department, and it is the intention to instal a sand mixer and mix the core sand upstairs and deliver it through a chute to the coremakers downstairs.

The core oven is in two compartments. The one for heavy cores has core racks along both sides and has an end door. The other compartment is fitted with shelves and has doors along the side for the entire length. The oven is 10 x 14 feet, and is fired with coke, the fireplace being below the level of the floor with spacious ash pits and outside floor pit and grate for draft and cleaning purposes.

The scratch room equipment consists, when the installation is complete, of three grinding machines and three exhaust rumblers, all connected to dust-proof receptacles. Heat is supplied by electrically driven fan connected to hot air generator. Light is admitted through several rows of glass ventilators in the roof. All the power is generated by electric motors and the shop is also lit up by electric lights. A small machine shop is in connection for doing the work on the specialties manufactured by the company.

A novel feature is that yard room being scarce in this neighborhood, practically everything has to be kept indoors, but this is no handicap, but is rather an advantage. An overhead gallery on the opposite side from the cupola provides ample room for lavatory and washroom, as well as for storing flasks, while the basement under the main building furnishes abundance of room for other storage. Elevators are not required in the foundry, but an elevator connects different storeys of the main building.

Te foundry belongs to McIntyre and Ferguson, who have for years been in the business of stove repairs and heating systems and who held valuable patents on heating apparatus which they manufacture. These will now be cast in their own foundry and in addition outside orders will be accepted for repetition work of a similar kind. The shop when completed will be one of the best equipped foundries in the country for doing light and medium weight castings.

At this season of the year a plant doing this line of work could not be waiting for finishing touches, but enough of the equipment is in operation to enable the work to be turned out. In the course of a few weeks everything will be installed, when several molding machines will be included in the equipment. Mr. Albert Griffiths, who for several years was in charge of the Ontario foundry, is foundry foreman.

OLD BUT TRUE

That old saying, "A pleased customer is the best advertisement," is just as great a truth to-day as the day it was written. What can equal the trade-making value of a satisfied customer? What can equal the trade-killing power of a dissatisfied one? The man who is well pleased not only gives his own trade, but he influences business by telling others. This personal endorsement is what is needed in business. Advertising will attract people to a product, competent salesmen and satisfactory goods and prices will make the first sale, but a customer's good-will must be secured if the business is to be made a permanent success.

A VISIT FROM H. M. LANE

Mr. H. M. Lane, of the H. M. Lane Company, Detroit and Windsor, was a welcome visitor at Canadian Foundryman office a few days ago. Mr. Lane has had wide experience in editing foundry publications as well as in actual foundry practice and was as a consequence in a position to relate many interesting narratives in his life's history. Anyone who has followed up foundry work has a store of these narratives, but there are only a few who have the ability and forethought to keep them in presentable form, and Mr. Lane is one of the few. Mr. Lane knows the foundry business from bottom to top and can easily recite every step forward in the progress of the foundry of years ago up to the foundry of today. He is one of the few who saw in advance the necessity of foundry men looking to something better than the foundry which had been considered good enough for so many hundreds of years and for that reason devoted some years to editorial work with that as his aim. He is now engaged in engineering, advising and constructing work in connection with new manufacturing plants. The machine shop and foundry buildings of the Grinnell Company of Canada, Ltd., Toronto, now under construction, were designed and are being engineered by the company of which Mr. Lane is the head.

OPENS GREAT FOUNDRY

The following article taken from the "Belleville Ontario" of Oct. 14 refers to the opening of the large Ryan-Bohn foundry in the latter part of September and speaks well for one of Canada's "Old Boys." In the days when Dan Ryan was young there were not the openings in Canada for bright youths that there are today and many a promising young mechanic was forced to cross the line to seek his fortune. They invariably "made good" and Canadian Foundryman is always glad to report instances such as this:

D. J. Ryan, formerly employed by the James Smart Manufacturing Co., Brockville, and now counted one of the foremost foundry men of the United States, has recently had his ideas incorporated in the new Ryan-Bohn foundry plant at Lansing, Mich., at the opening of which last month Mr. Ryan was present. He is vice-president and general manager of the company and in addition has large foundry interests in Cleveland and Detroit. The plant has 158,600 square feet of floor space. Mr. Ryan is a brother of M. J. Ryan and of Mrs. Thomas O'Brien, Brockville, and of John Ryan, C.P.R. engineer, Ottawa. He was born in Elizabethtown, near Brockville, and began his foundry career in Brockville.

Foundry Practice in Far Off Australia

The First Systematic Account Ever Published, With Special Reference to Plate, Spray and Machine Moulding.

IN this short series of articles I do not propose to go far into the scientific side of founding, but as everyone is urging everyone else to "produce more," and the simplest way to produce more is to find better methods of production, these articles may be helpful to my readers.

The simplest form of moulding is no doubt plate moulding, either by hand or on a moulding machine. In fact it is so simple that an average foundry labourer can earn his wages (moulder's wages) in a few weeks, but his learning is usually left very much to himself, and this very often results in partial failure.

I propose to go into details and explain the points that make the difference between success and failure in the operation of plates, either on machine or used by hand.

1.—A Foreword to Foremen and Managers

I do not intend to tell you what type of machine to purchase, as there are so many good machines on the market, each in my experience as good as the other, but before purchasing a machine it is necessary to consider what machine will be most suitable for your work, and whether you can keep that machine fully and profitably employed. For it must not be supposed that any machine will do any and every class of work. Having fixed on the type of machine you require, buy it if possible on a guaranteed output, and after the operator salesman has demonstrated with it to your satisfaction. From his output, however, deduct 25 per cent., for remember he is an expert, that is why he has, and holds his position, whereas the operator you put on the machine may take years to reach the same standard of proficiency, and by that time there may be a new machine on the market, and you want it. I have seen foundries where good machines have been installed, tried once and then scrapped, because the moulders said they could get better results on the floor. Experience shows that labourers make better machine operators than moulders. I say this, not because I want to cut out moulders, but as a moulder myself, I do not want to work a machine; the work is too hard, and a laborer does not mind the work, considering the difference in moulders' and labourers' wages. And if we are to hold even our own market, for small ironmongery castings, we must put labourers on the machines.

I can also cite another instance where one firm was making certain castings on a power machine costing over £600, while another firm a few miles away was making similar castings on a small hand squeezer, costing £14, and getting double the output per man! This shows a difference of judgment in selecting the machine for the work, or the work for the machine.

2.—Sand

Sand for machine or plate moulding must receive more attention than sand used by skilled moulders, as the moulder has a knowledge of the quality of sand his work demands, whereas a machine operator usually takes what he gets, having at least for a time no practical knowledge of what he requires. Sand for small castings up to ⅜-inch thick ought to contain, approximately, 80 per cent of silica of very fine grain (the finer the silica in the sand the finer the skin on your castings), 15 per cent. of alumina, and 5 per cent. of very fine ground coal dust, increasing the percentage of alumina than that used for hand moulding, as the machine-rammed mould is more porous than the hand-rammed, and the steam and gas get off more freely. Castings that require to be vented freely if made by hand may, with safety, be cast without venting if made by machine. In fact the vent wire is becoming a forgotten item in a machine moulder's tool kit.

In some districts suitable sand without the coal dust can be procured from the quarries. In others the sand has really to be made. Good sand can be made by spreading silica sand on the floor, adding 15 per cent. clay, mixed as clay wash, and treading or milling to mix properly, coal dust being then added. The percentage of coal dust ought to be greater for machine-made castings than for floor-made castings, as the finish of the castings to a great extent depends on the carbonic acid gas formed by it during casting to keep the metal from fusing the sand, and thereby producing a rough casting, which in floor moulding is overcome by the finish, and plumbago put on the mould by the moulder. An excess of coal dust must be avoided, or cold shots, caused through the carbon formed where the metal meets the misruns, through the pressure of gas holding the metal back, will be the result.

3.—Sand in Machine Moulding

Another important point to be remembered in machine moulding is that all sand must be riddled on to patterns. Never on any account put it on with the hand, nor touch it with the hand after riddling on. If you do so you form a parting, which stops proper action of the machine in ramming, and causes bad castings by bits washing off when cast where the parting has been formed. There being a greater body of sand at the back of the parting so formed, the steam and gas will always go to the point of least resistance, and blow out into the mould, forming a buckle or scab and bad casting. Furthermore, if you are to get the best out of a machine or plate you have no time to put on sand with the hand, or to tuck the sand round the pattern. Any work that must be tucked, such as gear wheels, ought not to be made on such a machine, but on a jar ram machine, where tucking is entirely done away with. In short, any machine that requires assistance from the operator ought to be seen to at once, as either the machine is not adapted for that work or the operator is not adapting himself to the machine.

There are machines on the market that do all operations except carrying away the moulds; others that do all operations except filling in the sand and lifting off the mould; yet others that are simply rammers, and last of all, machines that are really only pattern and stripping plate carriers. All other operations have to be done by hand.

For light castings the heap sand ought to have the coal dust put into the required strength, and used as facing sand. For heavier work, or where strong sand is required, a box about 3 ft. x 3 ft. x 2 ft. deep (a barrel or cask is a mistake) ought to be placed in a position convenient to the machine, and kept supplied by a general labourer, never by the machine operator, for while he goes for sand the machine waits his return. Workmen are not allowed to loaf around, so don't leave your machine loafing.

The success of the moulding machine in any foundry depends on the ability and ingenuity of the foreman to adapt the machine to his work, and his work to the machine. The advantages of the machine over hand-made castings are numerous—cheaper production, more accurate castings, less cleaning, and uniformity in size of product. This is an important item where the castings have to be fitted and machined to jigs, as both operations are reduced to a minimum.

4.—The Hand-press Machine and Snap Flasks

The possibilities of a little hand-press machine are too numerous to mention, and as a start on machine moulding they are to be recommended, as the first cost is small, and the accompanying plant is also small. The plant consists of snap flasks and bottom boards. Snap flasks are wooden boxes hinged at one corner and held closed at the opposite corner with a latch. These boxes are sold in England and America in stock sizes. Here I understand several firms of pattern makers have taken up the making of them. The fittings can also be purchased in sets, that is if you prefer to make your own snap flasks. In making snap flasks be careful to select well-seasoned timber, not liable to warp or get out of shape. Before ordering your snap flasks, fix on a standard most suitable for your work. The following sizes are recommended as being most suitable generally: 12 in. x 12 in., 14 in. x 12 in., 16 in. x 12 in., and 18 in. x 12 in.

In cases known to me the flasks had been ordered as the job cropped up, without any idea of standardization, and this was a source of endless trouble and confusion. Of course other sizes or shapes may be required to suit specific work, but they would be classed as special. The size 18 in. x 12 in. I find is the largest that may be used with economy on a machine. Over that size it is much too heavy for one man to lift, and there is no room for two men on a small machine. The work ought to be sent to a large power machine with iron flasks. Of course some may prefer cast iron flasks even for small machines, but the cost of over 100 pairs of interchangeable, well-fitted flasks is no small item, not to speak of the extra labour entailed in shaking out, carrying and stacking, and the energy spent in carrying boxes is so much less for making moulds.

5.—A Word or Two to the Operator

Listen attentively to the instructions given you, ask why at every opportunity, more especially when you may have had bad castings. There are several reasons for bad work; once you know them all, there is only one, and that is carelessness. Once you know the reason you do things to one job you are able to apply it to other jobs without being told. Get to know your machine, become part of it, and treat it accordingly. When finished with one tool, your shovel for instance, put it in position for picking up again with the least possible labour. Every movement saved means something towards making a mould. Let all your energy be expended in doing really useful work, then you have no need to work hard, you only work quick, and there is a vast difference.

WANTS INFORMATION ON CUPOLA MANAGEMENT

Editor Canadian Foundryman: I have been offered a position as foundry foreman, but have not accepted it because I do not know anything about the furnace. Can you explain the process of preparing the furnace from beginning to end, including melting the iron, and in such a manner that I can follow it right through so that I can successfully run off the heats without depending on the melter for information? I have no fear regarding the molding on the class of work to be done, but I am afraid of the melting.

Answer. — This question has been pretty well gone into on previous occasions, but it is a subject which never grows old and I think I can enlighten you sufficiently. Presuming that the bottom was dropped after the last heat and that you are going at it in the morning, the following movements in the order given should give you the best of results. Most modern foundries have wet under mills, sand sifters, magnetic separators, etc., to assist them in doing the work, and you will govern yourself according to the appliances at hand.

The cinders, etc., under the cupola will be hauled out if this has not already been done the night of the last heat. The cinders which are still inside of the cupola will be punched out with a long bar from the charging door until the opening is big enough for you to get inside and chip it out with a hand pick. In chipping it be sure and do not allow anything to project beyond the original line of the brick lining. Everything in the drop will now be scraped out clean and the iron and coke separated from the cinders. The sand will be run through a half-inch riddle and wet down similar to a molding sand heap. While this is soaking the cupola lining will be daubed to repair the damage wrought by the previous heat. This daubing can be bought ready to be tempered with water, but if none is on hand fire clay and sand thoroughly mixed and tempered similar to stiff mortar can be used. The daubing is intended to bring the lining back to its original shape, but if any more than an inch of thickness is required it is better to leave it scant rather than put on too much daubing. No more lining should be used than will dry while the fire is lighting. If there is any moisture in it when the blast is put on it will melt and run down and be worse than if not used at all. After the lining is properly attended to, the bottom doors are put up and properly propped. If the center prop does not hold it real solid the hinges should be wedged and if necessary additional props should be used. The doors must not even tremble when ramming down the sand bed. The sand which was sifted out of the cinders and tempered is now shovelled in and levelled off and rammed similar to ramming a mold. This bed should be thick enough to be sure that it will not spring a leak and it should have a slight slant from the back right down the entire length of the trough as well as the diameter of the furnace. A small amount of sand from the molding floor makes a good surface on the bed. The trough and a few inches back of the breast should be mixed with stiff claywash. The cupola is now ready to be charged unless it is wished to first put in the "breast." I prefer to put the breast in after the coke is lit through. Shavings and kindling are now put in and sufficient wood to be sure of a good even light up of the coke. One of the most important points in connection with melting is to have the coke thoroughly lit all the way across. In charging the first coke for the bed put in enough so that when all the wood is burned and the coke thoroughly lit through there will be about 20 inches of coke above the top of the tuyeres. This can be ascertained by having a pole measured for the purpose in advance. The amount of iron which can be melted with this bed charge will be about three times the weight of the coke in the bed. The coke and the iron should always be kept level and the charges of coke which are used after the first one should be about six inches in depth, and the iron charges should be from 8 to 10 times the weight of the coke. In charging on the first coke it is as well to intentionally leave it scant until it is burned through when the balance can be put in and levelled to the proper height, after which the iron should be charged on at once, the breast put in and all draft closed. It is not always convenient to put the blast on at exactly the time the cupola is ready and for this reason the cupola should be ready ahead of time and damped up tight and held in readiness for the convenience of the molders, but otherwise there is nothing to be gained by allowing the iron to lie on the burning coke. No heat is generated by the coke unless the coke is being consumed, and if that is expected the blast should be put on at once. To allow the furnace to stand for an hour or so after charging on the iron simply wastes the fuel and results in accumulating ashes and causing a dull, dirty heat.

CASTING MUNTZ METAL IN IRON MOLDS

In the last issue of Canadian Foundryman the question was asked if there was any way in which Muntz metal could be successfully cast in permanent molds. We received no answers to the question, which we might say was exactly what we anticipated, for the reason that we had never heard of anyone accomplishing the task, although in a small way it has been done on bulky chunks, but not with any degree of success. While on the subject we will refer the reader to the article on page 302, which was read at the Foundrymen's Convention at Columbus, Ohio, by Mr. Charles Pack, of the Doehler Die Casting Co., of Brooklyn, N.Y., who, we believe, is in an exceptionally favorable position to know what success is being achieved in this direction.

There is no "impossible" for the man who can will strong enough and long enough.

* * *

The sun never sees the dark side of anything.

* * *

All things come quicker to the man who meets them half way.

* * *

Red Flags are never found in the hands of savings depositors.

* * *

Lots of fellows have tried to kill time —but it is going yet.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—I am trying to manage a small polishing plant and am without experience in the selection of brushes used in finishing metals, horn, wood and imitation ivory. Literature relative to the many interesting materials used in the process of polishing is very scarce and as I am anxious to master the business in every particular I shall appreciate any information you may be able to give me. Publication in your valued paper will meet my requirements.

Answer.—The principle point respecting brushes used in the process of polishing which should interest a person in your position is—what constitutes a good brush? To make a good brush requires a good block to begin with. Blocks should be kiln-dried and stored while in the rough; storage should be sufficiently long to permit warping if warp they must. When thoroughly dry they are trimmed down to finish size. Holes for brush material should be uniformly spaced and arbor hole must be accurately centred to insure true running. Brush material should fit holes tightly and be bound by tough brass wire. Special attention should be given the inspection of wheels as to trimming; tufts of brush material should always stand out straight and be tight, while the brush should be accurately balanced and true. There are four kinds of material used in brushes, each having its advantages for certain requirements. Metal wire brushes are made from brass, steel and nickel silver wire, straight or crimped. Usually the finer the wire the greater the speed of rotation, ordinarily speeds vary from 750 to 2,600 r.p.m. Do not force the work into the brush, scratch brushing is essentially a cutting operation and the cutting should be done with the ends of the wire; forcing the work into the brush bends the wires and reduces the efficiency of the brush; reverse the direction of rotation frequently, this tends to straighten out the curved wires. Crimped wire scratch brushes are intended to produce a matte effect or satin finish on copper, aluminum and other soft metals. When treating soft white metals with a brass wire brush, a suitable lubricant should be used to prevent the discoloration of the white metal. Steel wire brushes may be used dry on the same class of work. Tampico is a yellowish white fibre which is obtained from the central spike of undeveloped leaves of several species of plants. Probably the best tampico comes from the agaves, which grow wild in portions of Mexico, while South America furnishes considerable quantities of inferior fibre. Tampico withstands the action of water very well and makes a very durable and inexpensive brush material for all purposes necessitating wet treatment. It is often found mixed with bristles, in which case the fibre is dyed. A mixed brush, or one composed of fibre and bristle has certain points of value intermediate between the pure bristle and the pure tampico brush; it is cheaper than the bristle brush and stiffer than the tampico brush. Beware of brushes containing horse hair. Horse hair is inexpensive and is a very poor substitute for fibre; it loses its stiffness when used in water, and when dry has poor cutting powers. If you wish to test the material, the following may assist you. Horse hair is cylindrical, bristles are tapering and curl and crumple at the end when burnt, giving off the characteristic odor of burning organic matter. Tampico burns without curling and the ash is soft and easily powdered. Horse hair and tampico are sometimes dyed and mixed with or substituted for expensive bristle in the manufacture of brushes. Pig bristle will not soften or become matted when used with water, is very springy, and will outwear nearly any other hair or fibre for ordinary work. The best grade of bristle comes from the long-haired pigs of China and Russia. It is very expensive and substitutes are frequently used by the manufacturer.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

* * *

Question.—Please inform me how to make and operate a bright silver plating solution for coffin hardware and similar work.

Answer.—Procure three or four 2-quart bottles, fill each bottle with a strong solution of sodium cyanide, and add some carbon disulphide, cork and set aside for at least three or four days, allowing the cyanide solution to dissolve as much of the carbon disulphite as possible. Add about 5 ounces of solution to begin with or more if results are not as desired. Add same amount during each working period as may be required. Keep bottles filled so that solution is always ready. These frequent additions facilitate uniform condition in the plating bath and avoids the liability of producing brown discoloration on the work due to excess carbon disulphide in the bath. The exact quantity to be used each time will depend on size of your bath and the amount of work you handle per day. Label the bottles and number them to insure uniform results.

* * *

Question.—Will you please furnish us with a formula for good brass solution which will work well for barrel plating?

Answer.—For brass plating steel goods by means of the mechanical plating machine, the following formula will be found reliable. In produces a clean, bright yellow brass, and if the full proportions are employed the bath will be sufficiently strong to reduce the resistance to current to a very satisfactory degree. Maintain the temperature near 120 deg. Fahr. Presuming you have an 80 gallon tank for the apparatus and will require approximately 75 gallons of solution, proceed to dissolve 60 lbs. of sodium cyanide in the water. Do not heat the water to facilitate the operation. Suspend the cyanide in a bag at the surface of the water and stir the water occasionally. When the cyanide is completely dissolved, add 45 lbs. of plastic carbonate of copper by removing a portion of the cyanide solution and allowing it to take up some of the copper. Repeat until all the carbonate is in solution, then add 30 lbs. of plastic zinc carbonate in the same manner. Stir the solution for a few minutes and then suspend a bag containing 45 lbs. of sal soda crystals in the solution. When the sal soda is dissolved, add 11½ lbs. of ammonium carbonate and 9 lbs. of sodium bisulphate. Stir the completed solution well and heat to 120 deg. Fahr. Electrolyze for a few hours before plating a batch of work. Use good grade yellow brass anodes. As the solution will become warm through heat generated by the resistance of the bath, it will not be a difficult matter to maintain a temperature of at least 100 deg. Fahr. The bath will yield fair results when run cold, but much better deposits are obtained if used warm and time is saved, particularly in cold weather. Do not operate the solution above 120 deg. Fahr. as the constituents of bath decompose rapidly at higher temperatures.

Judge: "Have you anything to offer the court before sentence is passed?"

Prisoner: "No, your honor; my lawyer got my last cent."

HAMILTON

Foundry Products

Thoughtful Expenditure is Wise Economy

THE closer you cut your operating expenses, the greater is the profit from your foundry. The saving of every cut in your costs is clear profit. Similarly, all extra expense is paid from the profits of the foundry. This being so, "Thoughtful expenditure is wise economy."

Our thirty years' experience enables us to manufacture foundry products which are equal to the world's best.

Buy direct from us. Thus you save the profit which would otherwise go into the hands of middlemen. Why pay more for the same quality?

All our products are fully guaranteed. Should **you** not think them all we claim, they may be returned without charge.

MADE IN CANADA

Facings

DO you want facings of dependably uniform quality? Do you want clean lifts, thus producing smoother castings and lowering your cleaning costs?

Use our facings! They will prove to you what really satisfactory facings are. And our prices are lowest consistent with quality.

Gambite

A PURELY Canadian product made from the best Canadian spruce. It has proved itself superior to any liquid Core Binder on the market. It contains 52% of soluble solids, is free from gas and can be used alone or in combination with oil, flour, rosin or any dry compound.

The Hamilton Facing Mills Co., Limited

Head Office and Mill:

Hamilton : : Canada

PITTSBURGH MARKETS

PITTSBURGH, November 11.—There is no material change in the iron and steel situation as to the volume of demand appearing in the open market, the demand being extremely light. The amount of stocks consumers had when the market turned soft cannot be estimated closely. It may have been considerably greater than buyers represented, when they were importuning mills and furnaces for heavier shipments, but whatever the stocks are the buyers wish to reduce them, and they desire to have as small stocks as possible on the inventory date. The quadrennial election last week has had no appreciable effect on the general situation.

The changes that have occurred in the past week have been in connection with prices and the volume of production, both showing more or less declining tendency. The decline in prices is spotty and irregular, affecting some products greatly, others scarcely at all. The decline in production, in the aggregate, is steady, though it is not steady as regards any individual producers.

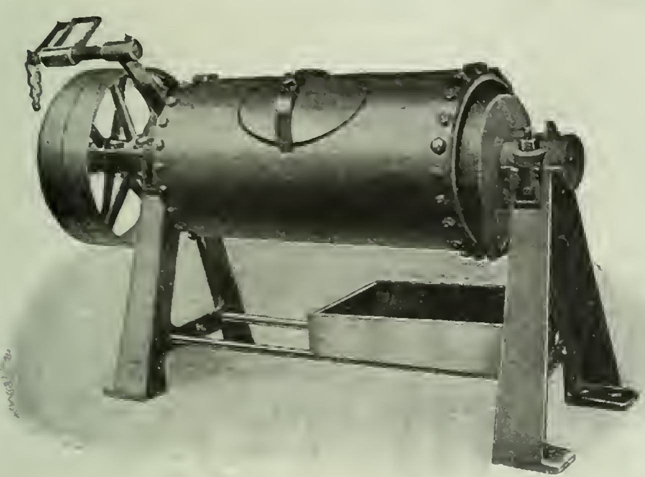
Since furnaces began blowing out, early in October, about two score stacks in various parts of the country have gone out, the greater part being late in October and early this month, while there were proportionately somewhat more steel works furnaces than merchant furnaces that went out. The blowing out occurring so largely late in October, the month's output was not greatly affected, and with the operating furnaces in receipt of better supplies of coke the month's output as a whole showed an increase over the September rate. In fact the October rate was the best shown for any month this year excepting last March, being about 39,000,000 tons a year, while the rate last March was about 40,000,000 tons. The rate now, however, is doubtless well under 37,000,000 tons.

In the matter of steel production the curtailment depends on the state of order books. As the Steel Corporation is very well filled with business its output has not decreased, and has possibly increased a little. Those of the independents that pursued a relatively conservative course in the matter of prices are moderately well filled, but with cancellations and suspensions are unable to run full, and thus a number have reduced output only by say 10 or 15 per cent. Others, with lean order books, which they cannot replenish to any great extent by cutting prices since there is little business obtainable at any price, have had to curtail more, and probably quite a number of small independents are running at 60 per cent. or less. The necessity for curtailment strikes one mill after another. At the present time many mills are counting up how many weeks their order books will carry them at 50, 60, or 70 per cent. By the end of the year the independents, on an average, will hardly be operating at more than say 60 per cent., and perhaps the average will be under 50 per cent., while even without any improvement in business the Steel Corporation ought to be able to maintain its present rate of output until April or later.

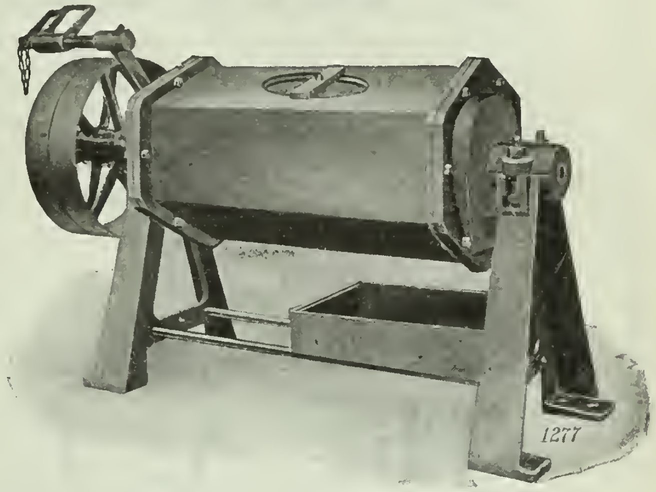
On bars, shapes and plates the common quotation among independents is now 3 cents. In instances an independent is asking more, but merely as a nominal price to protect contracts on books.

It Will Pay You to Use This

BRASS FOUNDRY EQUIPMENT



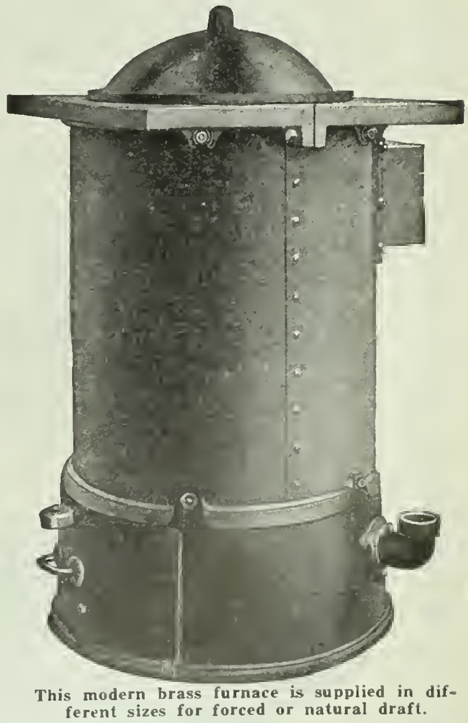
Tumblers for wet or dry milling. Made in two sizes.



Wet or dry in two sizes same as above.

Were You at Columbus?

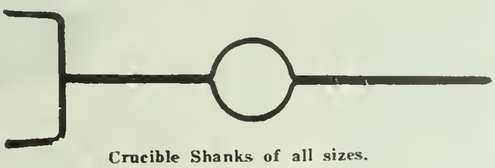
IF you were fortunate enough to be able to attend the big convention you must have been impressed with the benefits of using up-to-date equipment in your foundry. It is more profitable!



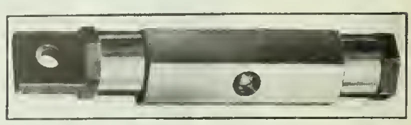
This modern brass furnace is supplied in different sizes for forced or natural draft.

The celebrated Morgan English Crucibles, carried in all sizes.

If you are using old-fashioned tumbling mills, melting furnaces or other equipment you are losing time and money. Have us advise you on new appliances. We are prepared to give complete estimates and any other necessary particulars. How can we serve you?



Crucible Shanks of all sizes.

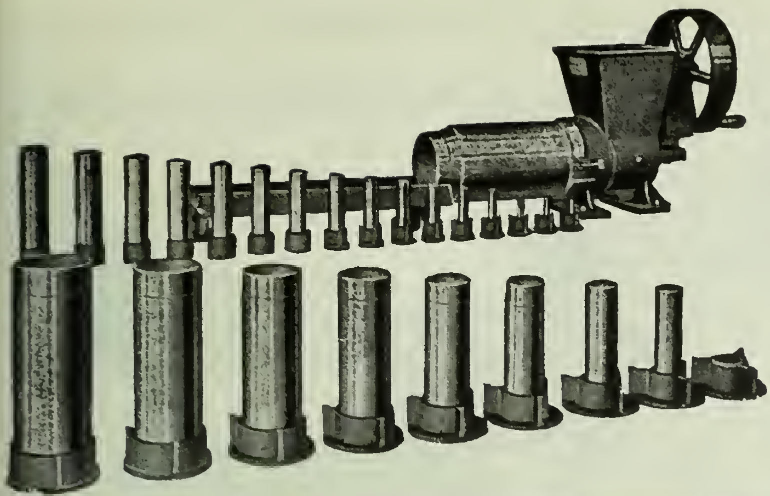


Branford Vibrators

The Dominion Foundry Supply Co., Limited

"Everything for the Foundry"

MONTREAL QUEBEC | **TORONTO** ONTARIO | **WINNIPEG** MANITOBA



No. 2 Wadsworth Improved Core Making Machine

(Capacity 3/8 in. to 7 in., 27 sizes)

From 3/8" to 2¼, advancing by eighths.
From 2½" to 3, advancing by fourths.
From 3½" to 7, advancing by halves.

Sold in combination of sizes as listed below:

From 3/8" to 1½ (10 sizes)
From 3/8" to 2¼ (16 sizes)
From 3/8" to 3 (19 sizes)
From 3/8" to 4 (21 sizes)
From 3/8" to 6 (25 sizes)
From 3/8" to 7 (27 sizes)

QUALITY
WADSWORTH
ECONOMY

Complete Core Room Outfits

We have spent 20 years in the DEVELOPMENT, DESIGNING and BUILDING of CORE MAKING MACHINERY and other CORE ROOM EQUIPMENT and now devote our entire time and factory to this SPECIALTY.

If our STANDARD LINES do not fill your REQUIREMENT, write us, and we will design SPECIAL MACHINERY or EQUIPMENT that will.

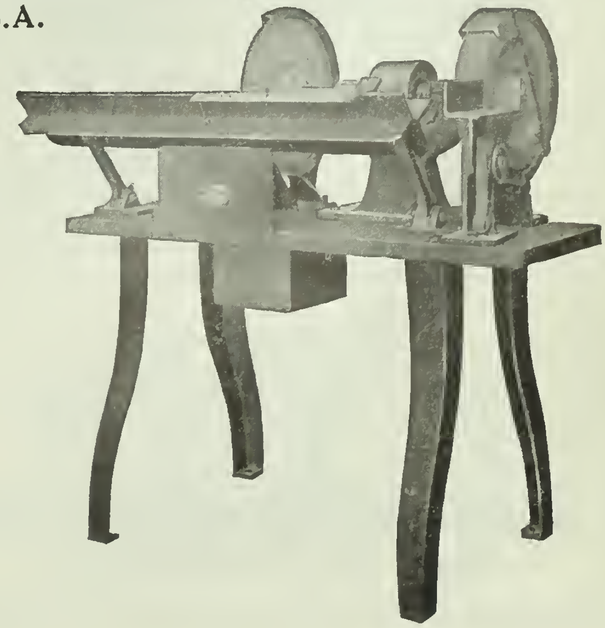
THE WADSWORTH CORE MAKING MACHINES are the only CORE MACHINES on the market, upon which a RODDED CORE can be made.

THE WADSWORTH CORE MACHINE & EQUIPMENT CO.

AKRON, OHIO, U.S.A.

The No. 1½ Wadsworth Core Cutting Off and Coning Machine built to cut off and cone cores from ½" to 4", by power only, mounted on an iron base with legs. The cutting-off wheel is equipped with a rest and graduated steel scale so that the gauge may be readily adjusted and the cores cut off to the desired length.

The Coning Wheel is equipped with an adjustable rest so that it may be set to any angle, giving the taper or print wanted. We furnish with each machine a gauge giving the standard taper for The Wadsworth Standard Core Print.



Our collections are payable to a Canadian bank, where we carry an account.

Our equipment is sold by All Canadian Foundry Supply Houses.

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The BAUER

Revolving Knife Wood Trimmer

What It Means to You:

A PERFECT CUT—LESS WORK—LESS COST

THE Bauer Revolving Knife Wood Trimmer—an entirely new machine—fully satisfies a long-felt demand in woodworking machinery. It is positively the most efficient machine of its kind on the market. By means of its revolving knife, it actually cuts and does not merely crush off the wood. This means a perfect, straight, smooth trim, one with a polished effect. The knife has a cutting edge of 16½ in., all of which is used in operation, thus greatly minimizing the necessity of sharpening. The design of this machine is such that all possible danger is reduced to a minimum. It is the safest of all trimmers.

A device is furnished with each machine, by means of which the knife can be easily, accurately and quickly sharpened.

This machine is the best of all wood trimmers, and remember,—the best is the cheapest and the most economical in the long run.

Ask Your Dealer or Write Direct.

A. E. BAUER & SON

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TABOR

10" Power Squeezer

Designed especially for use in molding light snap flask work in large or small quantities. The Tabor 10 in. Power Squeezer combines with simplicity and durability the highest efficiency for the rapid production of bench work, requiring flasks up to and including 14 x 20 inches, or the equivalent. Absolute uniformity in density of sand is obtained, and consequently the loss of castings, due to swelling or blowing of the molds, is reduced to a minimum.

Send for Bulletin M.R.

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CUT FASTER LAST LONGER

Than any other wheels on the market

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EMERY WHEELS A SPECIALTY
WE SOLICIT EXPORT TRADE

Tell us the service you want performed and we will supply you with an abrasive wheel that will save you time, money and worry.

Send for one of our catalogues and tell us your troubles. We do the rest.

CANADIAN HART PRODUCTS, Limited

Successors to

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THE OSBORN ENGINEERING COMPANY

design your new plant

Whatever the nature of your work may be, we are sure that you will want your buildings to be thoroughly modern—to incorporate the latest engineering ideas—to provide for production with a minimum of lost motion—to insure the utilization of labor to the best possible advantage.

The Osborn Engineering Company has a number of experts on its staff who have made foundry design their specialty.

Our record is one of success—may we serve you?

The Osborn Engineering Co.
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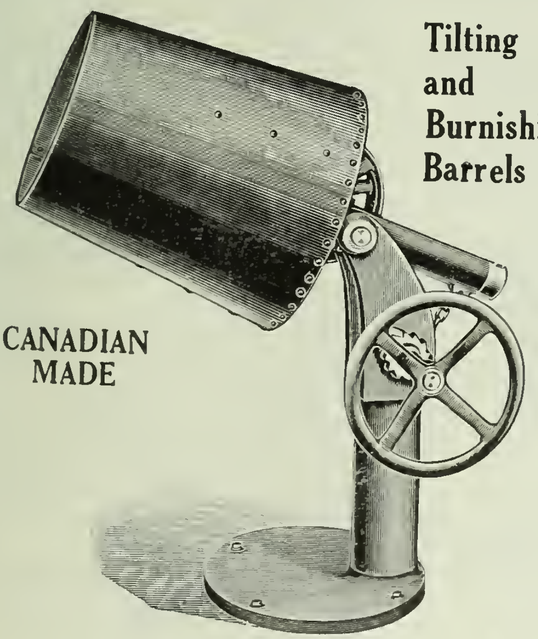
We plan for Efficiency plus Economy

Tumbling Barrels



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CANADIAN MADE

SLATER & BARNARD
LIMITED
Hamilton, Ontario

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

DOWEL PINS
Diamond Clamp & Flask Co.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DOUBLE CYLINDERS
Curtis Pneumatic Machine Co.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC DRILLS
Holden Co., Ltd., The, Montreal.

ELECTRIC FURNACES
Electric Furnace Construction Co.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.

ELECTRIC STEEL FURNACES
Pittsburgh Electric Steel Furnace Corp., Pittsburgh, Pa.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, OIL, GAS AND STEAM
Holden Co., Ltd., The, Montreal.

ENGINES, STEAM
Ministry of Munitions, London, England.

ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS, INDUSTRIAL
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS (FOUNDRY)
H. M. Lane Co, The.

FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FACING SAND MIXER
National Engineering Co., Chicago, Ill.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md., U.S.A.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FITTINGS, CAST IRON
Crane Ltd., Montreal.

FITTINGS, FLANGED
Crane Ltd., Montreal.

FITTINGS, MALLEABLE
Crane Ltd., Montreal.

FITTINGS, SCREWED
Crane Ltd., Montreal.

FLASK FITTINGS
Diamond Clamp & Flask Co.

FLASK PINS
Sterling Wheelbarrow Co., Milwaukee.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Diamond Clamp & Flask Co.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Mussens, Ltd., Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Sterling Wheelbarrow Co., Milwaukee.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FLEXIBLE JOINTS
Holden Co., Ltd., The, Montreal.

FORGINGS
General Combustion Co., Montreal.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY CONTROLLED AIR HOISTS
Curtis Pneumatic Machine Co.

FOUNDRY ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

FOUNDRY EQUIPMENT
Diamond Clamp & Flask Co.
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY PLATES, ETC.
E. C. Atkins & Co.

FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.

FOUNDRY SUPPLIES

FOUNDRY WEDGES
Sterling Wheelbarrow Co., Milwaukee.
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Woodison Co., E. J., Toronto.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pittsburgh Electric Furnace Corp., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Caward Gaskill Furnace Corp., Chicago, U.S.A.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

FURNACES, ELECTRIC
Electric Furnace Construction Co.

FURNACES, STEEL
Caward Gaskill Furnace Corp., Chicago, U.S.A.

ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.

GLOVES
F. H. Wheeler Mfg. Co.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAND ROTARY SAND RIDDLE
Berger Machine Co.

Swartwout
Industrial Specialties
Patented

For a Better Foundry

Swartwout Metal Core Ovens. Car, Shelf, Rack and Portable Types.

625° inside and not hot enough outside to scorch the hand. Little loss of heat here.

Bigger production, better working conditions, lowered costs—these are the results attained with Swartwout Foundry Equipment.

Swartwout Metal Core Ovens, because of the special insulation encased in the compact steel walls, reduce heat radiation to a minimum. High heats are reached quickly—(425° in 25 minutes is no trick at all with a Swartwout). Fuel costs are cut and hours saved in baking time.

The Swartwout Two-in-One Gasoil Burner has saved many a foundry from shut-downs. When the gas is shut off any oil fuel may be burned on low air pressure, without losing heat an instant.

Swartwout Rotary Ball-Bearing Ventilators rid your plant of the foul gases generated in baking and pouring and assure a continual and costless supply of clear, fresh air to your workmen.

Swartwout Air Traps and Air Separators insure compressed air users dry, efficient air at all times, increasing output and decreasing tool and air line repairs.

Swartwout Portable Electric Oven.

Scarcity of coal or coke, and shortage of gas or oil don't worry the man with a Swartwout Electric Oven.

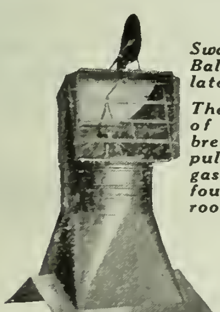
Swartwout Metal Core Cars and Racks. Built in standard sizes ready for delivery.

Every Foundry Executive Needs This Catalog

It contains complete information on all Swartwout Foundry Specialties that serve to make a cleaner, neater, speedier and more economical foundry.

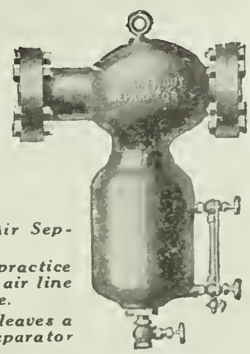
SWARTWOUT SPECIALTY DIVISION OF

THE OHIO BODY & BLOWER COMPANY
CLEVELAND, OHIO, U.S.A.



Swartwout Rotary Ball-Bearing Ventilators.

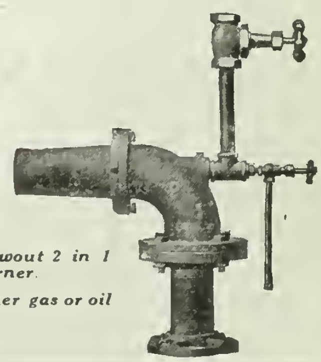
The costless power of the passing breeze is used to pull the foul air and gases out of your foundry and core room.



Swartwout Air Separator.

In foundry practice water in the air line spells trouble.

Only dry air leaves a Swartwout Separator



The Swartwout 2 in 1 Gasoil Burner.

Burns either gas or oil instantly.

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.
GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
GRAY IRON
Magnetic Manufacturing Co.
GRINDERS
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.
GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.
GRINDING PANS
National Engineering Co., Chicago, Ill.
GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.
GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.
HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.
HEAT TREATING
General Combustion Co., Montreal.
HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
F. H. Wheeler Mfg. Co.
HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.
HIGH DUTY
Magnetic Manufacturing Co.
HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.
INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.
IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.
IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.
JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
JOURNAL BOXES
Holden Co., Ltd., The, Montreal.
KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.
KNOCK KUT POWER HACK SAWS
E. C. Atkins Co.
LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.
LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
LEGGINGS
Frederic B. Stevens, Detroit, Michigan.
F. H. Wheeler Mfg. Co.
LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.
MAGNETIC PULLEYS
Magnetic Manufacturing Co.
MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.
MALLEABLE IRON
Magnetic Manufacturing Co.
MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
METAL CUTTING BAND AND SAW MACHINES
E. C. Atkins & Co.
METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.
MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.
MITTENS
Frederic B. Stevens, Detroit, Michigan.
F. H. Wheeler Mfg. Co.
MIXERS
National Engineering Co., Chicago, Ill.
MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
MOLDING MACHINES
Berkshire Mfg. Co., The.
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
The Cleveland Osborn Mfg. Co., Cleveland, O.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.
MOLDING SAND—SEE SAND
Frederic B. Stevens, Detroit, Michigan.
MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.
SAND RAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
NITROGEN
Dom. Oxygen Co., Toronto, Ont.
NOZZLES, SAND BLAST
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md., U.S.A.
NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.
OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
OIL AND GAS FURNACE BLOWERS
Roots Co., P. H. & F. M., Connersville, Ind.
OIL METERS
General Combustion Co., Montreal.
OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.
OPEN HEARTHS
General Combustion Co., Montreal.
OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
Frederic B. Stevens, Detroit, Michigan.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.
OXY-ACETYLENE AND OXY-HYDROGEN WELDING AND CUTTING EQUIPMENTS
Holden Co., Ltd., The, Montreal.
OXYGEN
Dom. Oxygen Co., Toronto, Ont.
PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.
PARTING COMPOUNDS
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
PATTERNS
Frederic B. Stevens, Detroit, Michigan.
Montreal Pattern Works
PATTERN MAKERS
Scarfe & Co., Ltd., Brantford, Ont.
PATTERN MAKERS' BENCHES
Diamond Clamp & Flask Co.
Oliver Machinery Co., Grand Rapids, Mich.
PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.
PATTERN MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
PATTERN SHOP EQUIPMENT.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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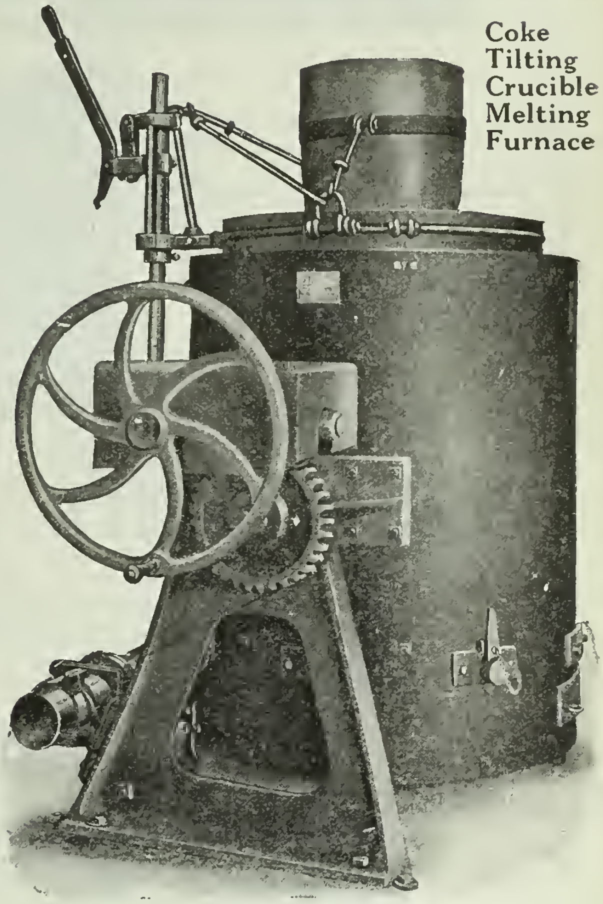
MONARCH FURNACES

What a Time-Saver is This One Feature!



Coke Tilting Crucible Melting Furnace

Turning the furnace over after each heat and crowbaring the clinker and grate bars is not modern foundry practice. The Monarch Coke Tilting Crucible Melting Furnace offers a far more efficient, economical method. All that it requires is a few shakes of the four upright bars after each heat. The grate bars are of the revolving type. The coarse finger extensions break up all clinkers.

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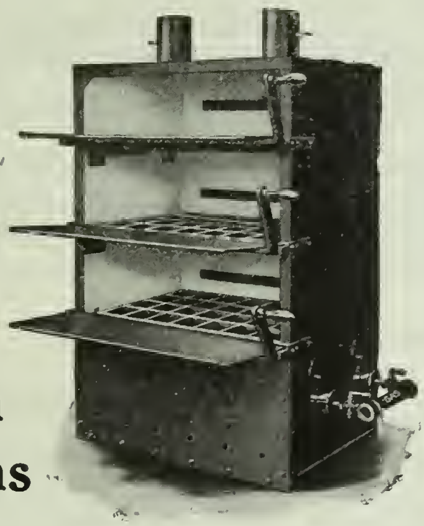

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Monarch Core Ovens are well designed, and carefully built by hand labor. We have all sizes in stock, ready for immediate shipment.

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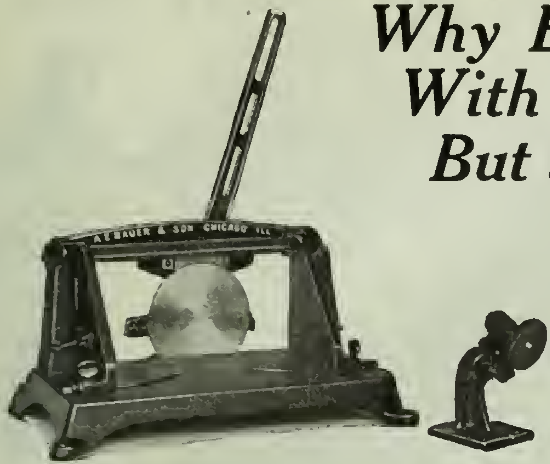
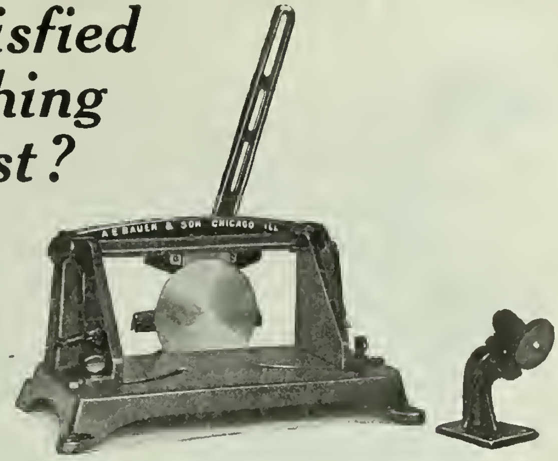
Why Be Satisfied With Anything But the Best?





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What It Means to You:

A PERFECT CUT—LESS WORK—LESS COST

THE Bauer Revolving Knife Wood Trimmer—an entirely new machine—fully satisfies a long-felt demand in woodworking machinery. It is positively the most efficient machine of its kind on the market. By means of its revolving knife, it actually cuts and does not merely crush off the wood. This means a perfect, straight, smooth trim, one with a polished effect. The knife has a cutting edge of 16½ in., all of which is used in operation, thus greatly minimizing the necessity of sharpening. The design of this machine is such that all possible danger is reduced to a minimum. It is the safest of all trimmers.

A device is furnished with each machine, by means of which the knife can be easily, accurately and quickly sharpened.

This machine is the best of all wood trimmers, and remember,—the best is the cheapest and the most economical in the long run.

Ask Your Dealer or Write Direct.

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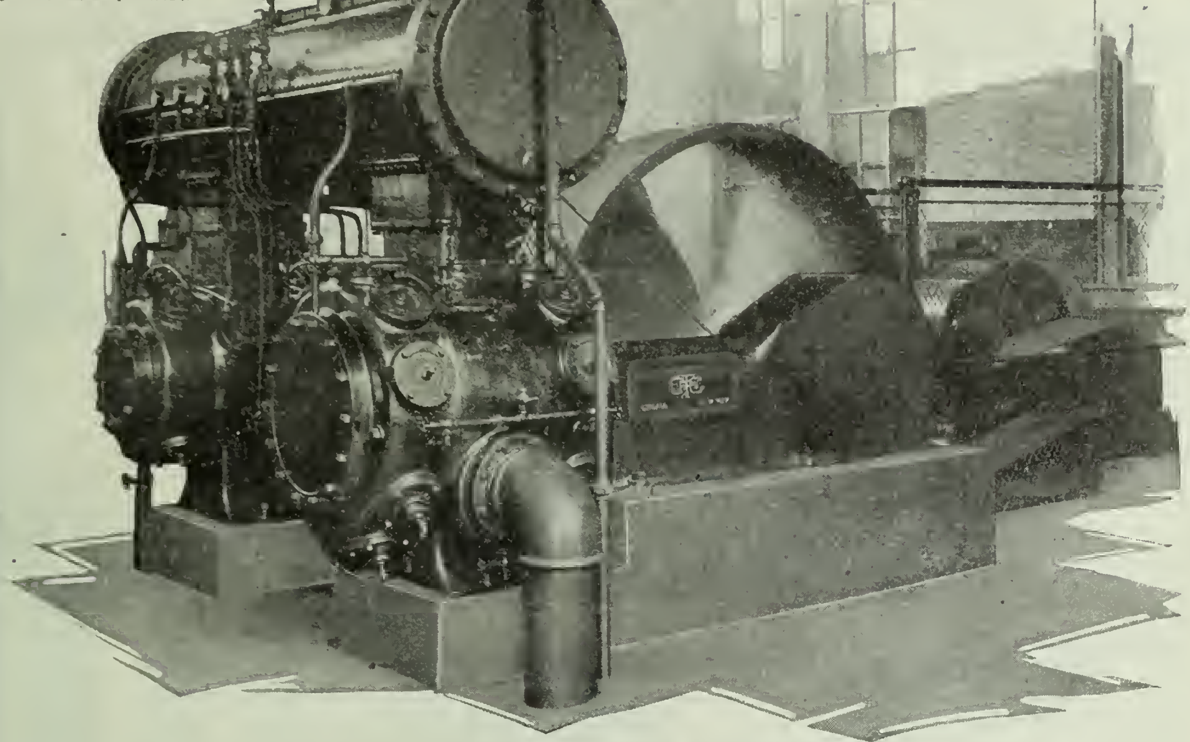
Chicago Pneumatic Class O-CBE Air Compressor installed by Fulton Iron Works, St. Louis, Mo. Capacity 1145 cubic feet of air per minute.



Is your air compressor sometimes a vacuum pump?

IT IS when the inlet is *choked* in connection with the unloading mechanism.

Choking the suction of an air compressor at no load forms a partial vacuum and *wastes power.*

Contrast this with the operating principle of a Chicago Pneumatic Air Compressor. At no load the valves are automatically held open, permitting free air *without vacuum*—gaining a distinct power-saving over compressors using the choked intake system of unloading.

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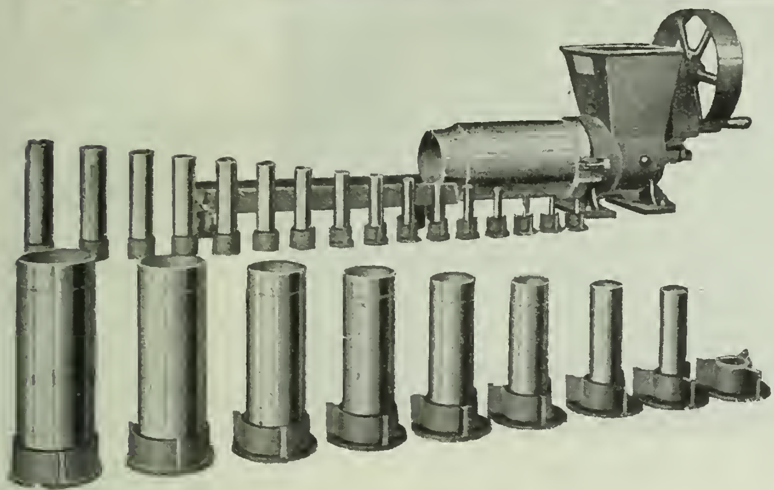
CANADIAN PNEUMATIC

CHICAGO PNEUMATIC

The Compressor with the Simplate Valve

QUALITY WADSWORTH ECONOMY



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From 3/8" to 2 1/4, advancing by eighths.
From 2 1/2" to 3, advancing by fourths.
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From 3/8" to 3	(19 sizes)
From 3/8" to 4	(21 sizes)
From 3/8" to 6	(25 sizes)
From 3/8" to 7	(27 sizes)

Complete Core Room Outfits

We have spent 20 years in the DEVELOPMENT, DESIGNING and BUILDING of CORE MAKING MACHINERY and other CORE ROOM EQUIPMENT and now devote our entire time and factory to this SPECIALTY.

If our STANDARD LINES do not fill your REQUIREMENT, write us, and we will design SPECIAL MACHINERY or EQUIPMENT that will.

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The No. 1 1/2 Wadsworth Core Cutting Off and Coning Machine built to cut off and cone cores from 1/2" to 4", by power only, mounted on an iron base with legs. The cutting-off wheel is equipped with a rest and graduated steel scale so that the gauge may be readily adjusted and the cores cut off to the desired length.

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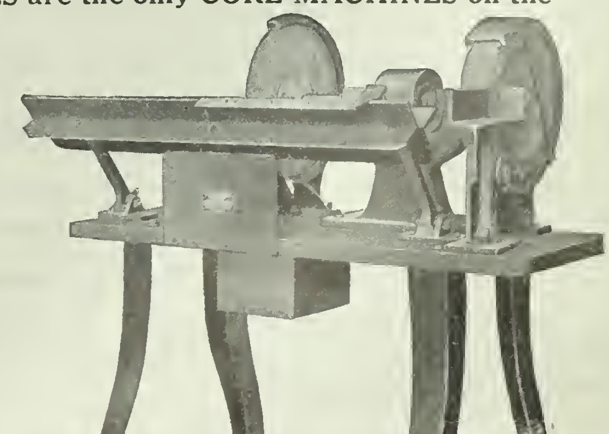

Our collections are payable to a Canadian bank, where we carry an account.

Our equipment is sold by All Canadian Foundry Supply Houses.

THE WADSWORTH CORE MACHINE & EQUIPMENT CO.

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CANADIAN FOUNDRYMAN
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METAL INDUSTRY NEWS

Members of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Pneumatics—Its Usefulness in the Foundry

Air as a Motive Power and as a Means of Transmitting Power is Described in a Somewhat Condensed Form.

IN describing air and its multitudinous uses it would be out of the question to give anything like a complete treatise in a paper of this kind as books of a thousand pages are quite common on this subject. To go into details of the part taken by air in the foundry would cover many pages and would necessarily contain much material which would be dry and uninteresting to the average practical foundryman, which is what I claim to be. Engineers enjoy going into details and employing technical expressions of many syllables, but foundrymen want plain facts in plain foundry language, and it is with this in view that I will endeavor to give a general synopsis of the subject and trust to the intelligence of the reader to follow up any feature which is of particular interest to him.

When I speak of foundrymen reading a different class of literature from that which would be read by engineers I do not place them on a lower grade of intelligence, but I realize that the two callings are so vastly different that what would be of interest to the one would be unintelligible to the other. After many years of experience among foundrymen I think I am safe in saying that bits of history or chemistry even though they do stray away from the foundry field are read with interest if not too long drawn.

The history of air as a force dates back several thousand years, as we know that the ancients used bellows to blow their fires. Sailing vessels and windmills are also examples of how this force has been utilized for ages, but the part which interests the foundryman of today is what use it is being put to in the foundry. Included in the equipment for this purpose are blowers of various types, cranes, molding machines, sandblast, rammers, chisels, sand sifters, vibrators and innumerable other tools. In fact if compressed air is kept on hand it can be used for practically any purpose where pressure is required. We will speak of it as pneumatics.

In introducing to the reader the subject of "Pneumatics" it will be as well to first point out the diffeience between pneumatics and aerostatics.

Aerostatics is the science which treats of air at rest, that is, with the particles in equilibrium; while pneumatics is the science which treats of air in motion.

It will thus be seen that both appertain to air. Now what is air?

According to the ancients, air was one of the four elements of nature—earth, air, fire, and water. Earth included all solids, fire was an element the mystery of which no one tried to solve, while air included all gases, and water included all liquids. These views are no longer accepted, although it is within the last one hundred and fifty years that it has been proven that these original "elements" consist of many elements which can be subdivided into molecules and atoms, and which according to some scientists can be still further subdivided into smaller particles than are yet known; but from the standpoint of pneumatics the theory of air being one of the elements would probably have been sufficient for the purpose, although from the standpoint of education and the knowledge of chemistry it is interesting to note that air is in some respects similar to water and that air and water have certain affinities as well as certain well defined resemblances and peculiar characteristics. For instance, air is composed of oxygen and nitrogen, while water is a combination of oxygen and hydrogen—all dry, colorless, odorless and tasteless gases, but when properly mixed they constitute apparently quite different substances, but which are not so very different as might at first appear.

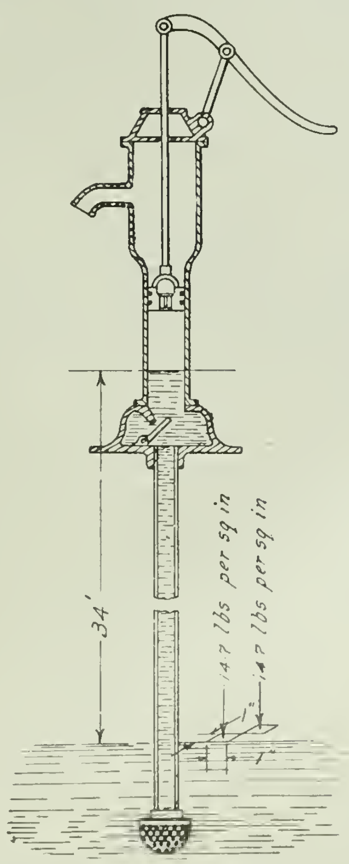


FIG. 1—WEIGHT OF AIR ON EVERY SQUARE INCH OF WATER IS 14.7 LBS., OR EQUAL TO A COLUMN OF WATER 34 FEET IN HEIGHT.

Water and air will mix readily — as proof, the ammonia refrigerator will extract ice out of the air on a hot summer day, and water will fall from the air of its own accord in the form of dew after sundown.

Air

Air is the gaseous substance which fills the atmosphere surrounding our planet. It is elastic, and is destitute of taste, color and smell. It contains by weight oxygen 23.10 parts and of nitrogen 76.90, and by volume oxygen 20.90 and nitrogen 79.10; or of 10,000 parts there are in perfectly dry air, of nitrogen 7,912, oxygen 2,080, carbonic acid 4, carburetted hydrogen 4, with a trace of ammonia. But air, as we have pointed out is never dry; it has always in it a varying amount of watery vapor.

The density of air being fixed at the round numer 1,000, it was formerly made the standard with which the specific gravity of other substances were compared. If water be made unity, then the specific gravity of dry air is .0012759. At 62 degrees Fahrenheit it is 810 times lighter than water. At the surface of the sea the mean pressure is sufficient to balance a column of water 34 feet in height. The exact height above the earth to which this air extends is not known, but from what we are able to prove, it is possible to form a reasonably close estimate.

At 2.7 miles above the surface of the

earth half its density is gone, and the remainder is again halved for every further 2.7 miles. From this we may conclude that some small density would remain at forty-five miles, but it would be very slight.

Atmospheric Pressure

In the study of aerostatics, which is the science that treats of air at rest, we

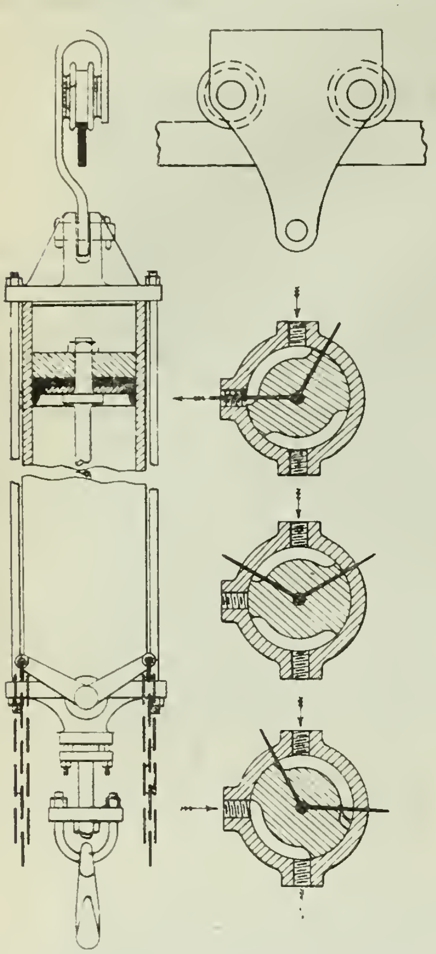


FIG. 3—PNEUMATIC HOIST. NOTE THE THREE DIFFERENT SETTINGS OF THE THREE-WALL VALVE

learn that this forty-five odd miles of air, bearing down upon the earth, exerts a pressure, not merely downwards, but in every direction, amounting to 14.7 lbs. on each square inch, which is usually called in round numbers 15. On a square foot it will amount to 2,160 lbs. or more than a ton. It would act upon our bodies with crushing effect were it not that the pressure, operating in all directions, produces an equilibrium. If any gas or liquid presses upon a surface with a force of 15 lbs. it is generally described as having a pressure of one atmosphere.

Pneumatics

Now if we harness the air and put it to work we enter into the science of pneumatics in which we always have one dependable force, viz., the atmospheric pressure of 15 lbs. to the square inch. In addition to this we have the knowledge that air is elastic and can be expanded and compressed at will.

To impress on the mind of the reader the real import of the force which the atmospheric pressure of the air exerts we will cite the case of a suction pump. This might seem more appropriate for a lesson on hydraulics, but it is purely the work of air, and it is pressure and not suction which forces water to rise up into the cylinder of a pump.

Let us picture an ordinary well pump placed in a deep well with the cylinder thirty-five feet above the surface of the water. We will also assume that everything about the pump is perfect so that there is no possibility of leakage. In the bottom of the cylinder is a gravity valve, and on the bucket is a similar valve. Gravity will of course keep the valves closed unless some force is applied to open them. As we raise the handle of the pump and thereby lower the bucket, the bucket valve raises and allows the air in the cylinder to pass up above the bucket. When we shove down on the handle and raise the bucket, the bucket valve automatically closes and the air which formerly filled the cylinder is expelled. This would leave the space within the cylinder in a state of partial vacuum were it not for the bottom valve opening from the pressure on the outside, viz., the 14.7 lbs. of atmospheric pressure. This acts exactly the same as the weight on a scale which bears down on one end and forces the other end up. The water in the well yields from this pressure sufficient to force enough water up into the pipe to bring the inside into equilibrium with the pressure outside. As we repeat this operation the water continues to be forced up the pipe to take the place of the air which is being removed until the 34 feet is reached, after which it will rise no more, for the reason that it exactly balances with the atmospheric pressure on the outside.

Of course at the altitude of inland localities which are considerably above sea level the air will not be so heavy and will not force 34 feet of water, and with ordinary pump work which might not be real perfect it is not considered good practice to attempt much more than 25 feet.

Now, as we have said, air can be expanded or compressed. If the pump just described had no opening at the bottom every stroke would have removed some of the air and what remained would expand and of course be less dense. If continued until all the air is removed a vacuum will be the result. Now all of this can be reversed and air can be forced into the cylinder at a pressure above the atmospheric pressure. Thus if we have the bottom open and close the top and then work the lever we will have compressed air in the cylinder. If we connect this to a tank and continue to operate the pump we will fill the tank with compressed air. The pressure may be raised to whatever degree is desired within the tank's ability to stand the strain. From this point we begin to make use of air as a force. An almost limitless number of uses can be made of it if connected to the proper kind of appliances. In Fig. 3 will be seen an air hoist of standard design. The principal features of this hoist, which are shown in the illustration are a cylinder in which slides a piston having a rod that is supplied with an eye or a hook at its lower end. The air pipe is connected to the compressed air tank, or to the pipe leading from this tank, by a hose and the air is admitted to the cylinder by the three-way cock which is operated by the chain and which is shown in three views at the right of the illustration. The three-way cock is so constructed that when in the position shown at the cylinder with the chains hanging even the valve is closed as shown in the second view to the right. By pulling on the chain to the left the ports in the cock will appear as in the top view to the right, letting the compressed air enter the cylinder below the piston, thus raising the piston. When high enough the chain to the right is pulled, bringing the plug back as in the second view and holding the piston in a position of rest. By pulling the chain on the right still further and bringing the plug to the position shown in the third view the air in the cylinder will follow the course of the piston to descend. The speed at which the piston ascends or descends can be regulated to a nicety by carefully handling the chain which controls the three-way plug.

This is an excellent device for drawing difficult patterns as by admitting a very small amount of air the pattern can be drawn very slowly and the air acting like a cushion prevents any jolting or jarring such as would be occasioned if chains are used. It is also handy for handling empty ladles about the cupola, for lifting cores at the oven or for setting cores, or in fact for any crane job within its capacity. There are other types of pneumatic hoists which will be shown later on in an article on cranes and hoists.

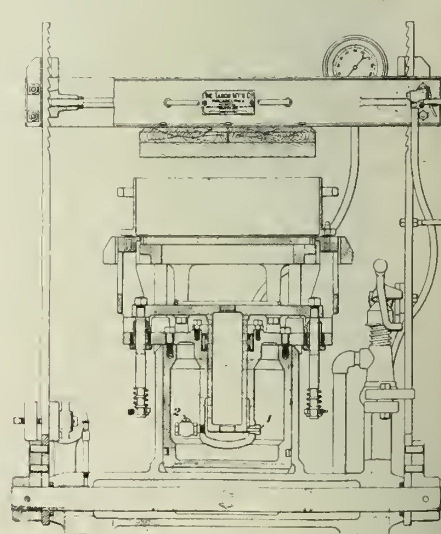


FIG. 4—INTERNAL MECHANISM OF AIR-SQUEEZING, PATTERN-DRAWING, MOLDING MACHINE.

Pneumatic Molding Machines

The manner in which compressed air can be made to do practically every operation on a molding machine is of particular interest. As every foundryman knows, the sand in a mold requires to be rammed, tucked, squeezed, jolted or made hard by whatever means appears most adaptable to the work in hand. If the mold is to be squeezed it can be put into any sort of a vise and the operation performed, but some methods are better than others. For work within certain limits it is quite possible to jump on a lever to do the squeezing and in many cases it is about as good a method as any, but the limitations are necessarily restricted so that other means are necessary and there is nothing to compare with compressed air. As an example we will take the power squeezing, pattern drawing, vibrating machine for molding from split patterns. Air would perform all the operations if required to do so, but for the pattern drawing it has been found advisable to use oil in conjuction with the air. The oil, however, is controlled by the air, which makes it in reality a pneumatic operation.

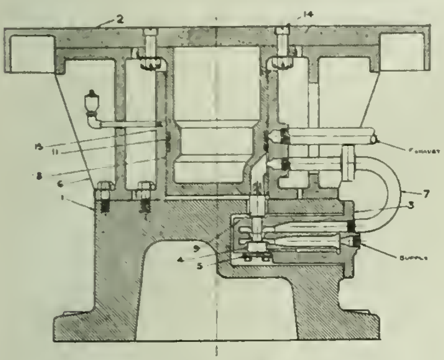


FIG. 5—SHOWING INTERNAL MECHANISM OF JARRING MACHINE.

In the sketch Fig. 4 will be seen the internal mechanism of one of these machines. Attached to the bottom frame of the machine will be seen the main cylinder, inside of which is the main piston which carries inside of it a smaller cylinder which in turn is fitted with a piston. The main or outer cylinder is the squeezing cylinder and the inner one is for drawing the pattern. The space inside of the main piston and surrounding the inner cylinder is filled with oil. The pattern-drawing piston is not connected to the table on which the patterns are placed as the patterns are drawn by lifting the mold from them. The patterns rest on the table supported by the main cylinder and the flask rests upon the frame supported by the pattern-drawing piston.

In operating the machine the half flask is put in position over the pins in the flask-frame of the machine. After putting in the sand the yoke which is shown supported by the two side irons and which can be swung backward and forward is drawn forward and air pressure applied by pressing the operating lever, thus opening the pop throttle valve and admitting compressed air to the squeezing cylinder.

When the pressure gauge indicates that the sand has been squeezed to the proper density, the operator releases the valve lever and allows the piston with the members carried by it to resume their normal position.

After the yoke is thrown back the drawing of the pattern is accomplished by raising the operating lever of the machine, thereby admitting compressed air into the oil tank, thus forcing the oil through the opening (1) in the pattern-drawing cylinder, which causes the pattern-drawing piston to rise carrying with it the flask frame and flask, thus lifting the mold from the pattern.

When the operating lever is raised to draw the pattern it also admits the compressed air into the vibrator which vibrates the pattern as the mold is being raised from it.

The nipple (1) where the oil enters the pattern-drawing cylinder will be seen to be screwed in until it almost touches the piston, thus admitting the oil very slowly and raising the piston equally as slowly. As the piston raises past the nipple, thus allowing the oil to enter more rapidly, the piston picks up speed until the nipple is entirely open when the remainder of the stroke will be rapid.

This arrangement insures a slow draw until the mold is free from the patterns.

By releasing the operating lever the air is discharged from the pattern-drawing cylinder and the piston and flask frame resume their normal position. This will take place while the operator is removing the mold to the floor, the check valve (2) opening and allowing the oil to escape much faster than would be the case if the opening (1) had to let it all out.

Jolting Machines

Another operation which is performed with air as the motive power is jolting the molds. This is probably the most universally employed of any of the processes in the foundry and some machines include the jolter along with the squeezer and other devices. The main features of the jolting machine will be seen in the engraving Fig. 5. The valve arrangement for reversing is similar to that of the chipping hammer and will be described under that heading. (1) is the base, (2) is the table, (3) the inside body, (4) valve piston, (5) valve body cap, (6) bumper frame, (7) connection pipe, (8) is the piston or plunger, (9) operating stud, (11) piston ring, (14) table bolt, and (15) is the cylinder. In operating the jolter the flask and pattern are placed on the table and the table jolted up and down, and the sand, from its own weight and momentum settles down into every detail of the pattern, making a mold of superior quality, and jolted to any degree of density. The jolting operation is performed by letting the compressed air into the supply pipe where it passes into the valve, through the connection pipe (7) and into the cylinder (15). As the air expands it raises the plunger (8) and in so doing reverses the valve, thus cutting off the pressure. The plunger will now be high enough to allow the air to escape through the exhaust pipe, allowing the plunger to descend and the table (2) to jar against the bumper frame (6). This operation is repeated until the desired degree of density is accomplished.

It must not be taken from this that the dead weight of the table falls upon the solid iron bumper, as this would cause a commotion in the foundry and do damage to molds in all parts of the shop and in all probability destroy the mold which is being jolted. The air under the piston is not all exhausted into the outer atmosphere, but some is held as a cushion so that the table is almost on the point of reversing its motion when it strikes. Some makes of machine will in addition have springs and leather bumpers and different devices to deaden the shock. It must be remembered that it is not the noise of the blow which does the work, but that it is the momentum of the sand itself, and if the motion of the machine could be reversed quick enough without striking a blow it would be equally as effective. Jarring machines are now made which successfully do the work on a barred cope. Pneumatic jarring machines are used on very small work and on every size of work up to sixteen feet square and perhaps larger.

The Cupola Blower

The cupola blower is an example of an

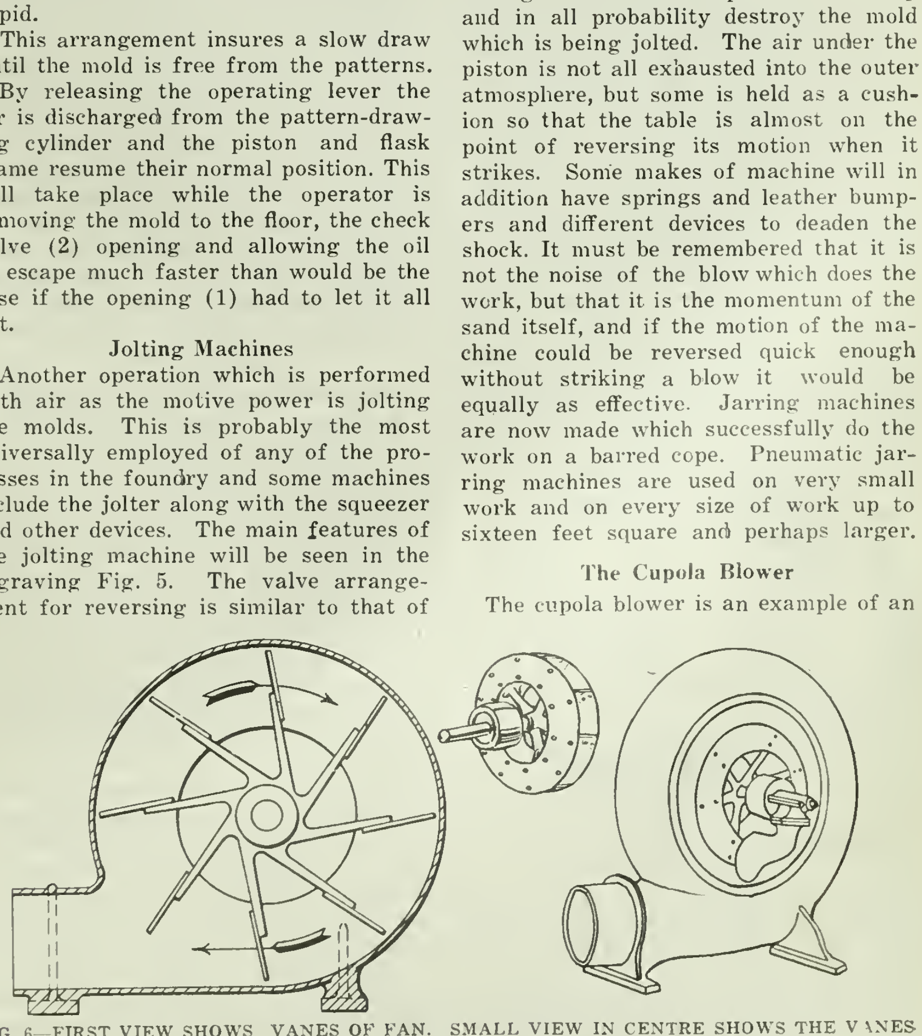


FIG. 6—FIRST VIEW SHOWS VANES OF FAN. SMALL VIEW IN CENTRE SHOWS THE VANES WITH SIDES RIVETED ON TO PREVENT WASTE OF AIR AND ALSO TO RENDER THE FAN NOISELESS. THIRD VIEW SHOWS GENERAL CONSTRUCTION OF FAN.

instrument the reverse to that we have been describing. In this the air is controlled by the machine and not the machine controlled by the air. There are many designs of blower but all are confined to one or the other of the two types, viz., the fan and the positive blower. The two types are here shown. Dr. Edward Kirk, the renowned cupola expert, says of them that he has melted iron in cupolas where both types have been used and he has also seen a lot of melting done with both, and has concluded that fast and economical melting can be done with either if the cupola is properly managed. This is certainly true, as no machine can give satisfaction unless given a show. However, each of these types has its advocates and both are extensively used in supplying cupola blast. The question of superiority of one type over the other is one that has been extensively exploited and for which extravagant claims have been made by the manufacturers of each and proved by them to their own satisfaction as well as to that of their patrons; and where such claims can be proved there must be some good points in each.

With the fan, centrifugal force throws the air to the outside of the blades and in so doing creates a vacuum or suction at the centre which draws in more air to be thrown to the outside. By referring to the sketch Fig. 6 it will be seen that the air enters at the centre and the vanes by slanting back at the circumference assist the centrifugal force to drive it with greater force away from the centre and out of the outlet. With the positive blower, Fig. 7, the air enters at the bottom and is carried from one air-tight pocket to another by the revolving impellers until discharged through the outlet at the top. The impeller as will be seen must be exact in order that they will fit perfectly in any position. The laying out would not be as difficult as the machining to get the exact epi-cycloidal and hypo-cycloidal curves. These curves are not always complete as shown but have a section on the outside of the im-

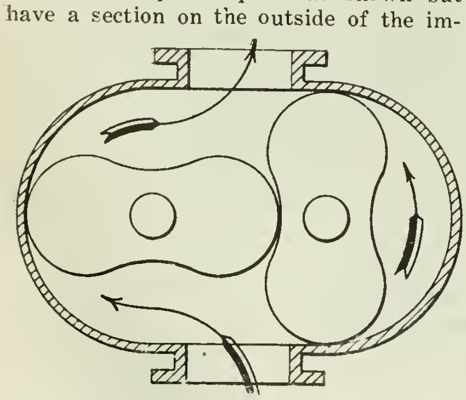


FIG. 7—End view of positive blast machine. The air follows the course of the arrows and is forced as though in a pump.

peller which follows the curve of the shell and into the concaved side of the other impeller.

Another device where air is the motive force as well as the product is shown in the illustration Fig. 8. This is an experiment which was tried out in a blacksmith shop some years ago with remarkable success. The driving rig was removed from an ordinary portable forge and the nozzle (B) was screwed in the shell so that the air current would impinge on the vanes of the fan (A). The amount of throttle opening required is very small to drive the fan at a high rate of speed, so that it is remarkably economical of air. The blast furnished is almost an ideal one for this purpose, and one capable of the closest regulation.

By the device shown in the illustration the compressed air supplies a blast of

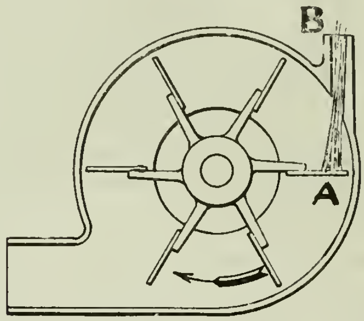


FIG. 8—EXPERIMENT TRIED ON A FAN WHICH GAVE ASTONISHING RESULTS.

many times its own volume, and with all the pressure required.

These are just a few examples of what is accomplished with air as an aid. Every molder who has worked where compressed air was available knows its advantages for blowing out deep pockets in a mold. Every scratch-room man knows its advantages in chipping castings with the pneumatic chisel and in cleaning the castings with the revolving steel brush or with the sand blast. The pneumatic rammer is a tool once used always used, and the pneumatic vibrator for drawing patterns is a big advantage on many classes of work. All told, compressed air is one of the most important adjuncts to the successful operation of the foundry.

THE SAND-BLASTING MACHINE

The following letter received from a manufacturer in the United States would appear to be appropriate for publication in this issue inasmuch as compressed air, or air under pressure is one of the main factors in the operation of the sand blast machinery. The sand blast machine is not a substitute for any other device but covers a field of its own.

In the United States alone, purchases of sand blast equipment in 1920 are comparatively 800 per cent. greater than in 1914—based on the sales of this company.

For many years the sand blast had been adopted by only the more progressive and far-sighted of manufacturers. Suddenly, stress of necessity in war for a quick, thorough and economical cleaning, forced a recognition of its many advantages in nearly every industry.

The Government used the sand blast in many lines of production, from heavy battleship armaments to intricate aeroplane parts and Victory medals.

To-day, in peace, the varied applications are greater than ever, and range from tipping a steel pen point to cleaning the largest steel castings.

Every size, shape and character of metal production, whether castings, forgings, stampings, sheet, plate, structural shapes or heat-treated parts, as well as pottery, chinaware, glass, etc., are feeling the magic touch of the sand blast with profit in time and cost.

Some processes in your industry, yet unthought of, may be profitably handled by sand-blasting.

LIGHT FIRE IN CUPOLA WITHOUT KINDLING WOOD

In our last issue we answered a question from a prospective foundry foreman who wanted information on how to prepare the cupola and take off the heat. In our explanations we described, along with other things, how to place the kindling in the cupola so as to insure an even fire on all sides. We heard no complaints from any of our readers, but we had a suggestion from one on how to proceed without kindling. This system, while being quite common in the United States, has not yet become common practice in this country. It is, however, gaining quite a foothold, and is undoubtedly the coming system, and for this reason we are prepared to admit that it is entitled to proper consideration. The method alluded to is that of using an oil burner outside of the cupola and blowing the flame through the breast opening into the coke bed. The preparation of the cupola is practically the same as for wood, with the exception that the first three layers of coke have to be put in so as to allow the flame to be properly distributed. This is not difficult, but it requires some care and in order to enlighten those who contemplate adopting this method we will endeavor to prepare the illustrations and describe in our January issue how to prepare the cupola for lighting up without wood.

In the first section of this issue we have endeavored to interest the reader in the advisability of having compressed air in the foundry. If compressed air is installed, the oil burner is of trifling additional expense, but if not a hand arrangement for the use of the burner can be procured which gives equal satisfaction.

Work all Winter.—The dredge "Cyclone," the largest thing of its kind in the world, is not to be stored away for winter but is being taken to the Chippewa Power Canal, where it will continue "to eat up" sand all winter. The big craft will be a great assistance in getting more power for Ontario on the Hydro development.

Brantford, Ontario, is contemplating the erection of a technical school at an estimated cost of $320,000.

Pouring Temperatures as Affecting Shrinkage

Why Shrinkage Decreases as Temperature Rises—Advantages of Hot Pouring—Precautions to Be Taken Against Burning in of Cores—Caution Necessary to Avoid Extreme Oxidation and the Occlusion and Expulsion of Gases Resulting in Porosity.

By R. R. CLARKE

THIS discussion concerns chiefly castings in which bulk is heavy or variable or the ratio of volume to surface high. Examples are a 6-inch cube, a 5-inch pin brass 12 inches long, a valve body, a flanged bushing, etc. In using the word shrinkage we observe the sense of drawing, sinking or receding of metal at its highest or heaviest casting vicinities of between the variables of bulk where the shrinkage is unusually strong and exceedingly local.

Briefly the propositions at hand are:

1. Shrinkage decreases as temperature rises.
2. Cleanliness and compactness advance with temperature.
3. A closely defined and dangerous limit intercepts a rising temperature, marking the activity of gases and oxides and making for a most distressing condition in the castings.
4. Hot pouring necessitates molding with that end in view.

The paper of which this article is an abbreviated version was read at the American Foundrymen's Convention at Columbus, Ohio, in October last, by Mr. Clarke, of the Nolte Brass Co., Springfield, Ohio. At the convention Mr. Clarke quoted several actual cases in support of his arguments. Lack of space precludes our reproducing them here, but the reader will find that sufficient explanation is given to enable him to fully understand the points dealt with.—Editor.

Fluidity Is Factor in Shrinkage

That shrinkage should decrease with temperature is an apparent contradiction, since expansion's law is to advance with temperature and measure a corresponding contraction in return to normal. No doubt the explanation rests in part at least on the greater fluidity enabling the metal to generate and transmit higher gate pressure, run the mold more searchingly and establish and maintain better communication between its parts.

The primary advantage of hot pouring is a clean, solid, unshrunken casting realized through a comparatively small gate easily removed. Instances could be cited where a change of gating practice and pouring temperature reduced the gate metal from 100 pounds to 20 pounds and cut down cleaning time and expense, melting loss, etc., correspondingly.

Additional advantages are the suppression of hair line fracture, of gate pin holes, and the nullified effect of molding inconsistence to which cold metal is so peculiarly sensitive. Against a hard cope or damp core cold metal immediately rebels and solidifies, preserving the effect. Hot metal contends against the condition and often prolongs fluidity beyond the activity of the cause.

The hair line fracture is a modified form of recession deriving from unequal contraction and intensifying with erratic molding such as wet sand, hard ramming, sparse venting, etc. By our experience it seldom seriously attends hot pouring but to greater or less degree always emphasizes cold pouring.

Requirements of Hot Metal Mold

A hot metal mold requires sand rather dry, rammed hard, faced well, vented freely and clamped or weighted securely in pouring. Similar precautions should be taken against the burning in of cores.

The author's experience lends to the belief that within certain limitations there is a suggestion of identity between the running capacity of metal in light thin castings and its power to resist shrinkage in bulky castings or variables between volume, that the ability of metal at proper temperature to run a thin gate and light casting is at least an indication of its function at the same temperature to transcourse the same gate to a clean, solid, unshrunken bulky casting. Both experience and experiment contribute to this inference under certain limitations as previously stated.

Hot pouring and solid castings apply more directly to the more common copper-tin, copper-tin-lead and copper-tin-lead-zinc alloys as 90 copper 10 tin, 88 copper 10 tin 2 zinc, 80 copper 10 tin 10 lead, 85 copper 3 tin 5 lead 3 zinc, and weakens in those metals and combinations observing an unusually high contractive tendency. Among these are pure copper, monel metal, yellow brass, manganese bronze, aluminum bronze, tobin bronze, muntz metal and other high zinc mixes. A further striking feature of shrinkage is that new metals or combinations on first melting usually advance shrinkage beyond that of a succeeding manipulation. Metal melted and pigged and then remelted and cast or that representing part new, part remelt will usually express shrinkage less than all new metal cast on first melting.

High pouring temperatures are critical chiefly because of extreme oxidation and the occlusion and expulsion of gases resulting in porosity. They therefore call for extreme caution and high-powered judgment. Beyond the danger line metal has sometimes a curdled-milk appearance, sometimes a dull-colored surface crust and sometimes a wicked looking exhibition of the varying colors arising from the different constituents such as tin, lead, etc. Another phenomena of transgression is a spattering or crackling sound as that of boiling slag. Metal at such temperature will often appear mushy and cold and consequently deceiving as to its temperature when judged solely on its appearance of fluidity. These are dangers we might state we have encountered mostly in air and oil melting. On the other hand, cold pouring by virtue of low fluidity weakens cohesion, strengthens metals' power to hold and include its dirt and dross and denies that gate pressure deriving from the hydrostatic principles.

Many actual cases could be cited in proof of these arguments, among them the casting of heavy valve bodies, trolley wheels, heavy pin brasses, large bushings, heavy gear wheels, brazing flanges, pressure castings and many others.

The author regrets being unable to furnish pyrometric rather than mere judgment values on the temperatures to which he has made reference throughout feeling that such definite information would greatly increase the value of his remarks. However, this information is foreign to his knowledge and experience and therefore beyond his power to submit.

NEW LINE

The National Electro Products, Ltd., Toronto, who are at present manufacturers of electrolytic oxygen and hydrogen by an electrolytic process, have added still another line, namely that of Purox equipment. This line includes a complete range of oxy-acetylene and oxy-hydrogen welding and cutting torches, decarbonizing and lead burning outfits, gauges, regulators, hose, goggles, welding rods, fluxes, etc. This is a new line in Canada but has been used in the United States for the past five or six years. The first time this line was shown in Canada was at the Toronto Exhibition, and they drew favorable comment at this time.

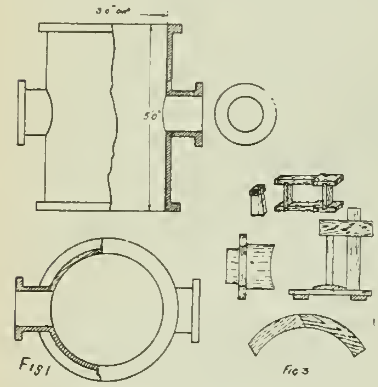
The Sterling Action & Piano Co., Toronto, acting for an English company, has purchased a block of land at the corner of Church and Newcastle streets, New Toronto, where it is proposed to erect a factory for the manufacture of musical instruments, accessories, etc.

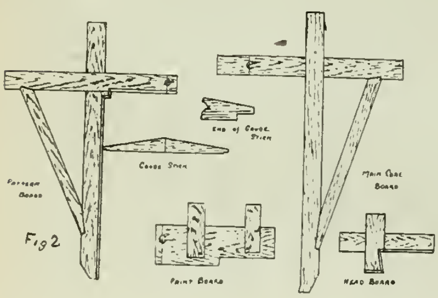
Patterns for Sweeping Cylindrical Molds

Demonstrating the Appliances for Sweeping Instead of Making a Complete Pattern—The Method of Molding is Also Shown.

By CHARLES A. OTTO

CASTINGS of a cylindrical character lend themselves particularly to a variety of contrivances for limiting the amount of pattern-making necessary to produce the required molds. When the diameter of the requisite casting is small, in comparison with its length, a loam pattern is frequently made about a spindle rotated horizon-





tally, the desired shape being formed by a profiled, edged board maintained at the necessary distance from the spindle to insure the correct diameter. When the diameter of the required casting is large however, it is much more convenient to make use of a vertical spindle.

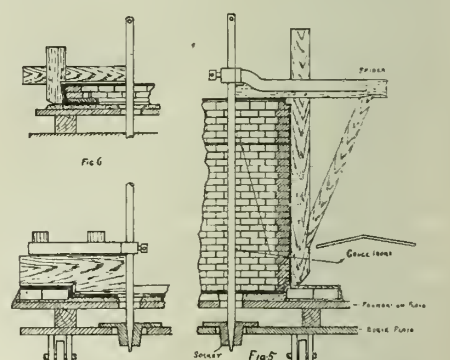
In principle the two methods are similar, their adoption being determined according to the form and number of castings required. Though additional work is thrown upon the foundry in the production of such castings by sweeping the molds, the low cost of the pattern work more than compensates, and, as a rule, when only one or two castings are required it provides the most economical method of dealing with cylindrical work.

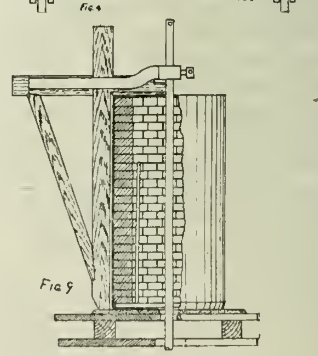
The sketch shown in Fig. 1 illustrates a type of casting for which sweeping provides an excellent means of preparing a mold. There are many methods adopted. Sometimes the cope is swept out, or a loam pattern is formed and the cope is built about it with bricks and loam, or a loam pattern may be used for producing the mold in dry sand. The combination of loam and dry sand in the production of such a mold is frequently resorted to, and, providing the foundry has facilities for dealing with the work in the manner herein described, castings can be economically produced.

The pattern work consists of a number of sweeping boards and such subsidiary pattern sections as are more conveniently made in wood, to be attached to the main loam pattern when it is completed and dried. The first board is a print board for sweeping out a recess to serve as a guide for the center core. The diameter of this core being three feet, it is not essential that the guide should be deep, a depth of two inches would be ample. The pattern board is made straight, with the exception of a projecting piece at the top for sweeping out a recess into which a wood flange can be put. It is convenient to knock a nail in the edge of this board, as indicated on the sketch Fig. 2, to make a horizontal mark about the loam pattern and save trouble in setting the branches.

A gauge is necessary for convenience in setting the boards and a method of checking back to give the core diameter is illustrated.

For a casting of this description it is advantageous to have a head cast on and a sweeping board is necessary to form the outside shape of the head decided upon. The form of head shown in the sketch is very frequently used, varying in height from 6 to 15 inches, according to individual experience and the pressure to be sustained by the resultant casting. The main core board in this instance is straight and made long enough to carry the print, and whatever height of head to be cast on. It will be noticed that the long boards consist of two pieces of timber half lapped together and having struts attached to steady the board when sweeping. This type of board is serviceable in use. It is advisable to leave the centers clearly marked on all these boards and on the gauge stick also so that they may be cut when the diameter of the spindle to be used is definitely decided upon. In addition to the sweeping boards a number of sectional pieces and two core boxes are necessary, as indicated in Fig. 3. Two branches, having their flanges cut for drawing into the mold or fitting loosely over the core-prints when it is intended to use a loam cake, form the largest item of actual pattern-making. Full flanges are required for both top and bottom, in the latter case the segments are cut to fit against the loam body, whereas, for the top, the segments must be wider to fill up the recess swept out for their support. In both cases it is necessary to make one of the segments a key piece, since they are to be withdrawn into the mold. It saves the molder trouble if the inside edge of this key piece is clearly marked to indicate that it is the first piece to be withdrawn. In cylindrical work of this character, when a head is cast on, it is the general practice to increase the thickness of metal comprising the head and cast the full circumference. Such a method gives an unnecessary strain to the casting when cooling and may result in a change of form after the head is removed. To alleviate this difficulty it is good practice to break the continuity of the head by inserting cores about two inches in thickness. With this end in view it is necessary to make prints to rest upon the top flange and against the loam pattern of the head; four will suffice. Two core boxes are required, one to form the branch cores and the other for the rectangular cores to divide the head. Fig. 3 illustrates a pin board suitable for making the branch cores. This method is cheaper than making a full core-box and the core takes no longer to make. The bottom board carries a piece shaped to the curve of the main core and cut to the diameter of the branch core. A turned pin is made to revolve in the center, to which is attached a sweeping board made long enough to have a bearance on the bottom board.





It will be observed that all the sweeping boards illustrated are chamfered to be worked with the left hand of the operator, the right hand being used to apply the loam. This practice is, however, not general. Some molders prefer to work the reverse way, being sometimes referred to as a clockwise motion.

The first operation in the foundry consists in sweeping the bearance by means of the print board. The general preparation is illustrated in Fig. 4. A foundation plate of suitable dimensions is supported on a bogie plate, a suitable spindle, socket and spider are located for convenience in taking the sweeping board. A considerable amount of spindle work of this description is done by fixing the spindle and revolving the spider about it, using a fixed collar to prevent it dropping, or, the spindle may revolve between centers, the top being connected with a wall brace. In this article another method is shown which dispenses with the wall brace. The socket or footstep carries a long tapered hole into which the machined spindle fits accurately; a lubricant is applied so that the spindle revolves easily in its socket. When a three-inch spindle is used a considerable height can be swept without the necessity of counterbalancing the board and spider. If the sweeping board is cut to fit dead against the spindle, the gauge stick need only be used to check the diameter of the print swept out. The board may be bolted to the spider or simply secured by means of clamps. The foundation plate usually carries a large number of short gaggers so that the loam will adhere and the height of these determine the thickness of loam forming the bearance at the bottom of the print, usually about 1 to 1½ inches. When the board is set against the spindle and secured to the spider, a bedding of loam is applied to the plate and where possible a layer of bricks set in to make up the space between the board and plate, leaving about ¾ inch for the final application of loam; the board being rotated to sweep the required shape. Where it is not convenient to use ordinary bricks and the thickness of loam necessitates stiffening to prevent sagging, dried loam may be worked in with advantage. The bearance, when swept, need not necessarily be dried, but it should be allowed to stiffen for an hour or so before a commencement is made with the pattern. The pattern board, having been cut to suit the spindle, is set parallel to the spindle by means of the gauge stick, and to prevent the end of the board sinking into a green bearance a strip of sheet iron should be used for it to rest upon during the time of setting. It is convenient to make two gauge irons as indicated in Fig. 5 to take the diameter of the loam pattern. These are set into the brickwork during the time of building, forming a check on the correct diameter when sweeping. A dusting of parting sand is given to the bearance, and loam and bricks are applied, leaving a space of about ½ inch between the bricks and sweeping board. The brickwork used in the construction of a pattern need not be so substantial as is necessary for the center core, a single brick wall with the joints alternating would be ample. When the brickwork is built up, loam is applied to the outside, and the board rotated to sweep the necessary shape.

The loam pattern, when completed, should be allowed to stiffen before moving it into an oven to be dried unless there are facilities for moving it without jolting which might cause the pattern to sag a little.

The pattern for the head can be formed in very much the same manner. In this case, a level bearance is necessary, and a lifting plate is required to be bedded in loam upon which the brickwork is built, as shown in Fig. 6. This too requires to be dried. In many iron foundries special floors are set apart for loam work, each having an oven adjoining to which the day's work is transferred for drying during the night.

When these loam patterns are dry they can be lifted to the dry sand floor. In some cases, the mold is formed above the floor, a bearance being made to take the foundation plate and using a deep box or a series of shallow boxes, to make up the height to the top of the head.

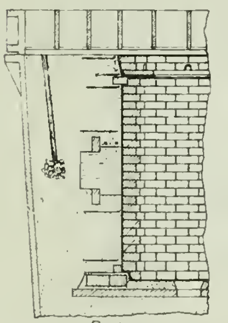


Fig 8

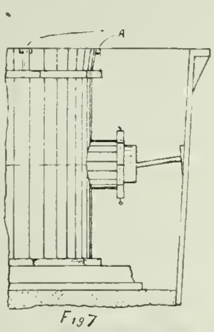


Fig 7

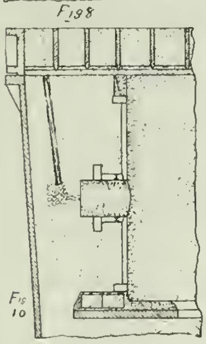


Fig 10

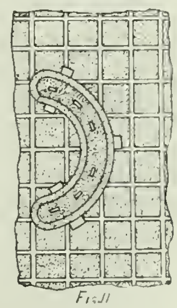


Fig 11

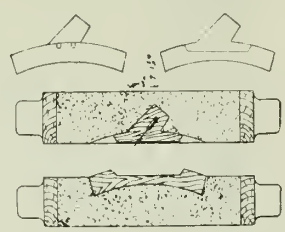
This method presents casting difficulties, especially when the travellers are comparatively low, necessitating either a part or the whole of the job being made in the floor. It is the latter method which is herein described.

In those foundries which are rarely called upon to deal with work of this description the usual plan is to prepare a pit large enough to accommodate the work; but if the amount of work warrants it, it is preferable to sink a case into the foundry floor, and, to prevent any risk from water, it should have a bottom plate secured to it. It is necessary to prepare a level bearance at a distance from the top of the case equal to the full height of the combined loam patterns and the foundation plate, as illustrated in Fig. 7. The main loam pattern is then lowered into position and preparation made to locate the various wood pattern sections. Frequently, the pattern-maker is called upon to "mark off" the loam dummy, as it is called sometimes, and set the pattern sections in position. It is necessary to determine centers directly opposite to each other for the branches. The mark cut into the dummy while sweeping gives the horizontal center, and by making use of this line a vertical line can easily be struck from which the periphery can be divided into four equal parts. The segments forming the bottom flange need only be set against the body, resting on the loam bearance; the branches wedged into their correct position, as shown in Fig. 7, the top flanges can be set in the recess after the dead piece has been located, and then the four prints A should be set for the purpose of dividing the head. The setting completed, the molders can proceed to ram up the job. It is necessary to have milled sand against the pattern but it can be backed up with ordinary floor sand. Commencing just over the bottom flange, and, at intervals of about 10 or 12 inches above it, rodding is necessary to give support to the sand. Any odd pieces of cast or wrought iron will suffice, providing they are 9 or 10 inches long. These rods should be clay-washed, bedded into the sand about three or four inches apart and radiating into the center of the loam pattern. As the process of ramming proceeds and the branches become embedded, the stays can be removed and the screws or skewers taken out of the flanges. It is advisable to introduce ashes off the branch prints and ram up a vent pipe from them to the surface of the case. The general construction of the mold is illustrated by the part section Fig. 8. It is, of course, necessary to rod the sand over the branches. When the sand is rammed up and levelled off flush with the top of the case and loam pattern, the cover box can be located and guides driven into the sand surrounding the case and against the cover box. A part section of a suitable cover box is shown in Fig. 8, having supporting bars about 11 inches apart and at right angles to each other. Gate and riser sticks require to be set. Work of this type is sometimes run from the bottom flange only, or a certain amount of metal may be supplied from the bottom at first and the remainder supplied direct from the top, but generally equally as good results can be obtained by running the whole job direct from the top, following the center core. It is necessary to keep clear of the branch cores and also the small head division cores. Twelve gate sticks can be set, half of which would serve as risers. The whole of the cover box need not be rammed up but only such as will give a reasonable covering to the mold.

When the cover is completed, it can be removed and a commencement made to strip the mold. The loam pattern forming the head can be easily withdrawn in its entirety, but the main loam pattern cannot be removed whole, it must be broken and taken out gradually until the mold is cleared. The inside is swabbed and sleeked over, brads being used to reinforce corners surrounding pattern sections, and any unnecessary sharp corners rounded off. It is advisable to draw the branches first and sleek off before the bottom flange is withdrawn, the top flange and prints being the last to be removed. Molds made in the foundry floor must be dried in place, either gas or oil may be used as the fuel, or, the old-fashioned coke fire may be the means of providing the necessary heat, according to the facilities available; in any case the cover box should be supported over the mold so as to partially close it and make the best use of the heat. During the preparation of the mold the cores will require to be made. The four small cores of the head are readily made and no venting is necessary. The branch cores need grids having a number of prods or gaggers surrounding them. These are bedded into loam on the shaped center of the pin board and loam built up to cover the gaggers. These cores are not usually finished at one operation, but are allowed to stand until partially dried, when they will take a finishing coat better. After removing the pin it is necessary to make up that part of the core which comes into contact with the main core, the remainder can be filled with ashes. The main core is built up on a level bearance in a somewhat similar manner as the loam pattern excepting that a plate is required to form the bottom, and strong enough to support the full weight of the core. More care is required in the construction of this core than is necessary for the loam pattern, since it is to withstand the pressure of the molten metal. No gauge irons are used, hence the work must be tested after it has been swept as a check against the correct setting of the sweeping board. The general formation of this core is shown in Fig. 9. When the mold and cores are dry, all parts with which the molten metal comes into contact should be blackwashed and again thoroughly dried. Runner and riser basins require to be prepared, two of the type indicated in Fig. 11 would fulfil requirements. It is a good plan also to prepare stoppers to cover the gates in the runner until sufficient metal has been poured to form a head in the runner, this method tends to keep any dirt on the surface and prevents it entering the mold. When all are properly dried, the job can be fitted together and closed preparatory to casting. The branch cores are inserted, a contact being first made with the ashes for venting. These cores should be at least ¼ inch clear of the position to be taken up by the main core and chaplets are necessary to maintain this position. The main core is next carefully lowered and then the small head cores inserted. The mold should be carefully inspected before finally closing, a candle attached to a piece of wire can be suspended, when any damage done while lowering the main core is likely to be seen. When all is clear the cover is lowered into its relative position, the runners set and grouted into their respective places and the box parts bolted or clamped together ready to receive the metal. The method described is especially useful to the jobbing foundry when additional work can be done in the foundry at a considerable reduction in pattern work.

A MOLDER'S SUGGESTIONS ON MAKING PATTERNS

It sometimes happens that a molder can stumble upon ideas which are of value but which would not come into the pattern-maker's head because he would not be likely to realize the difference it would make to the molder. I have in mind one idea which is sometimes adopted because it is the easiest way to make the pattern but not because it is any advantage to the molder. As an illustration of what I am referring to I will cite the case of a break-shoe such as I have seen made for street cars. As will be seen, there is a lug on the back



UPPER LEFT SHOWS LUG DOWELLED ON RIGHT SHOWS METHOD DESCRIBED.

which could not possibly be drawn out of the mold unless it is loose on the pattern. The average pattern-maker would dowell that lug to the body of the pattern, making it necessary to dig out the dowell holes each time and then hold the lug firm with one hand while tucking the sand with the other. If the molder is careful enough to never have one of the castings with a crooked lug he is above the average of molders. By having a portion of the main body of the casting attached to the lug as shown in the picture, all the molder has to do is to blow the loose sand out of the pocket in the pattern and drop the lug with its accompanying foundation into place and the pattern is as substantial as though all in one piece. This method of pattern making can be worked to advantage on almost any job where there are to be lugs projecting. Instead of dowelling the lug to the pattern it can be fastened to a portion of the pattern which is to be let into the main body as shown in the break-shoe. This will always insure a correct job, neater in appearance and easier done. If several projections are on the pattern they can frequently be fastended to the same loose section thereby making a much greater saving of time.

REPAIRING LIPS AND BOTTOMS OF STEEL KETTLES

Owing to the nature of the smelting process followed at the Nickelton, Ont., plant of the British-American Nickel Corporation the slag obtained sometimes runs high in matte, the action of which is very destructive to steel kettles, tending to wash away the steel at the point of contact and injure the kettle beyond further practical usefulness.

The company has recently been getting economical results by reclaiming its kettles by means of Thermit welding. In two cases described pieces of steel were forged and welded to the kettle rather than completely filling up the burnt areas with Thermit steel. By this method undue contraction strains were minimized.

In the case of a kettle with two holes in the bottom three patches were made instead of two owing to the irregularity of the holes and the facility of making two patches easier than one irregular patch. In lining up the patches approximately 1 inch was provided at the edges for the entrance later of Thermit steel. These patches were surrounded by a yellow wax pattern and the usual Thermit welding practice then followed.

In arranging riser patterns these patterns were used both inside and outside, one coming off at the high point and two others placed about half way down on the wax. These latter two served to take care of the shrinkage of metal when the weld started to cool.

The welding of the bottom was spread over two operations owing to the fact that there was insufficient material on hand to complete the job the first time.

Welds Made on the Sides of Kettles

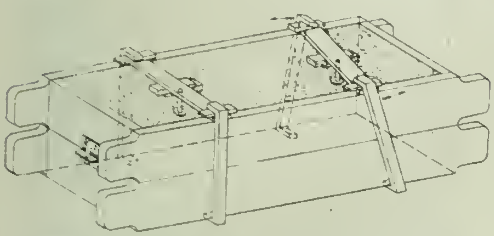
In the case of welds made on the sides of kettles care must be taken not to put too much stock in the collar of the weld, otherwise there would be a tendency to retard the clearing, or so-called skulling of the kettle. In applying the wax collar the wax should be from ⅛ in. to 3-16 in. fuller than finished shape in order to allow the shrinkage during contraction.

In forging the lip patch the blacksmiths followed the outline of the cut material, cutting and shaping it to provide a space of about 1 in. It was no small job to shape the patch, and it is believed that in future repairs of this kind time can be saved by cutting away the kettle to a square shape as shown in one of the sketches shown us. The lower portion will not then lend itself readily to melting down during the preheating operation. It may also be preferable to cast the lips of steel rather than forge them.

A company in which B. L. Banford is interested will be incorporated to take over a factory at Listowel, Ont., and install new equipment at a cost of $50,000 for the manufacture of steel, wire and wooden wheels.

CLAMPING DOWN CHAPLETS

The illustration here shown will tell a story which most molders have experienced, but which few molders seem to think worthy of investigation. The chaplet shown in the picture should be under the wedges instead of alongside of them, but that is not the point to be discussed. The chaplet, as the molder is aware, is put in place before closing the



Clamps to the left both inclining in the same direction and nearly plumb. Those to the right clamped in the usual manner with nothing to prevent them from turning when upward pressure relieves friction against the flask.

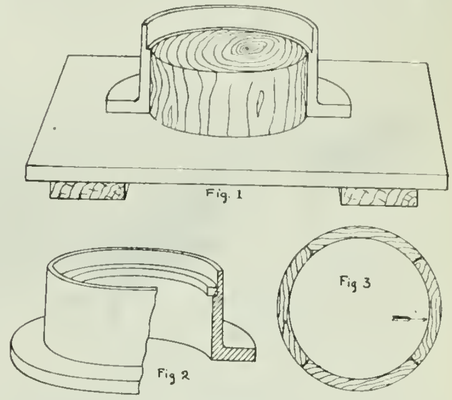
mold. When the mold is closed a chaplet bar is placed across the mold, as shown in the illustration, and wedges put between the chaplet and the bar to hold the chaplet firm. Every molder knows how to do this, but where he frequently uses bad judgment is in putting on the clamps. The idea of clamping "sun about" as they call it, and as is shown at the right in the illustration, is bad practice. When the pressure of metal forces the chaplet upwards it simply brings those clamps to a perpendicular position, as there is nothing to prevent it. The bar turns the reverse way from that in which it has been clamped, and the chaplet raises perhaps an inch without changing its position otherwise. If both clamps are clamped in the same direction, as shown at the left, the upward pressure can not move them unless the chaplet bar is thrown bodily towards one end of the mold, taking the top of the chaplet with it. If a gagger or any kind of a prop is placed between the chaplet and one of the cross bars of the cope it will prevent any possibility of this occurring. If the molder will look at the two views in the illustration he will see how little there is to prevent the clamps from becoming loose in the one case and how impossible it would be in the other. It is of course advisable at all times to have the clamps as near straight up and down as possible, but it is hard to have them perfectly perpendicular. If molders will give it a little thought, what possible reason can they give for clamping a mold with the clamps crossing each other? If the guide pins are perfect they will prevent the cope from turning but there is always a risk and many a mold runs out without the molder knowing what caused it. The pressure raised the cope a hundredth part of an inch and relieved the friction on the parting and this allowed the cope to turn enough to take up all slack in the pins and in doing so raised a little higher as the clamps became nearer to plumb, thus allowing the metal to escape at the parting.

Think this over, molders, and see if you don't agree with me that clamps put on so as to both point towards the same end of the flask have a better chance to hold the mold together than clamps pointing in opposite directions. If you don't think so, write to the Canadian Foundryman and give your reasons, and help to improve the molders' profession.

METHOD OF MAKING MAN-HOLE

The article in Canadian Foundryman a short time ago in which sewer castings were shown has tempted me to describe one which I think is entitled to some recognition. In the illustration Fig. 1 will be seen cross section of man-hole, main casting pattern without inner ring. In Fig. 2 will be seen how the ring is put in. The ring pattern, Fig. 3, as will be seen, is in four sections. These are placed on the shoulder shown on the inside of the pattern. Fig. 1.

In molding this the nowell is rammed up with the pattern as it is shown. The follow board projects up into it as far as the shoulder on the pattern. The sections of ring, Fig. 3, are put in place and rest on the follow board as well as on the shoulder of the pattern. After ramming up the nowell and rolling it over and lifting off the board, the inside will have to be filled, but this is no harder to do now than it would have been at first. After making a straight parting and ramming the cope and lifting it away, the pattern is drawn, leaving the ring in the sand. The ring will now be drawn, piece at a time, towards the outside, but this will be easily accomplished, as the sections project outward to the amount of the shoulder, and the molder simply has to reach down with a sharp wire and pull them one at a time towards the outside until they are clear of the sand and then lift them out. This method of molding the ring is frequently used to good advantage on high-class work. If the flange is to be on the outside of the job, one of the sections of the ring pattern will have to be cut beveling in the opposite direction, so that it can be drawn, after which the others draw easily.



CROSS-SECTION ELEVATIONS, MANHOLE PATTERNS.

NEW PROCESS BEING USED IN MAKING HIGH CARBON STEEL

An industry has recently been established in Orillia, quietly and unostentatiously, which, if the hopes of its founders are half realized, will reach tremendous proportions, and may even revolutionize the steel industry of Canada, if not of the world. This is Dyrob Steel (Consolidated) Ltd., which two or three months ago began operations in part of the National Hardware Co.'s factory, and is now beginning to produce on a considerable scale.

The process used by the Dyrob company is entirely new. In brief, it is a method by which tools, dies, springs, and other steel articles hitherto manufactured only from the high-carbon, expensive steel can be made from mild or soft steel, and afterwards hardened. Two market advantages are thus gained. In the first place the raw material costs very much less. In September, tool steel cost 35 cents a pound, and high carbon steel 22 cents a pound, whereas low carbon steel could be bought for 4 or 5 cents a pound. Not only this, but the latter can be worked up a great deal easier and at a great deal lower cost than the more expensive material. After the tools or dies or other articles have been made in soft steel, the carbon can be introduced into them by the Dyrob process. This produces an article which is said to be not only as good as, but superior to those made by the old process from carbon steel and at only a fraction of the cost. This claim is borne out by the testimony of firms which have used Dyrob tools. The Tudhope-Anderson Co., for instance, who have been having their dies made by this process for some time past, testify that whereas formerly they were only able to get 400 or 500 bands off a set of dies, have got 1,700 bands off dies treated by the Dyrob process, and the dies are still apparently in good condition.

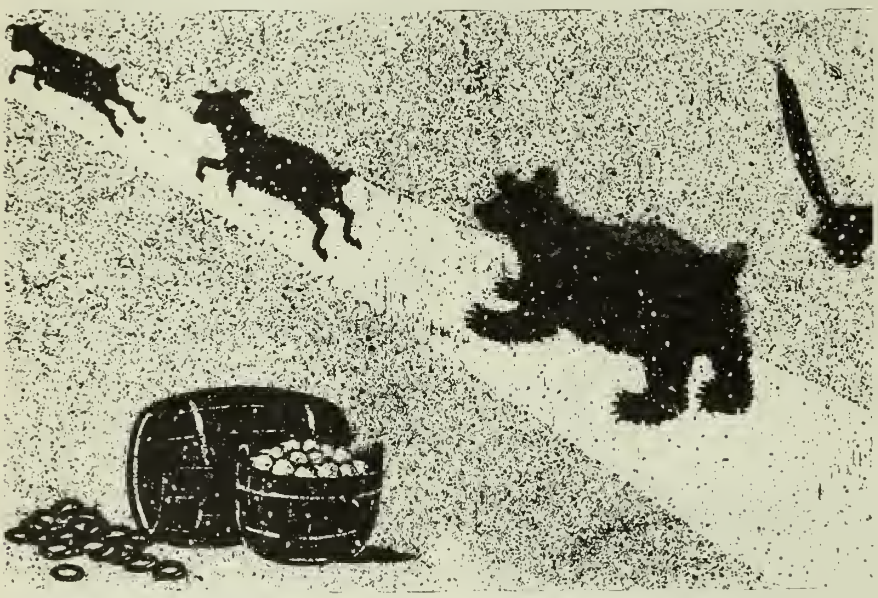
The process is the invention of Mr. S. M. Robertson, who has charge of the new plant in Orillia, and who collaborated with Prof. F. C. Dyer, of the University of Toronto. Hence the name "Dyrob." Mr. Robertson has been working on the process for eight years. For the past two or three years a small factory has been operated in Toronto and a large amount of work was done for Toronto firms, with most satisfactory results. This was, however, to a considerable extent experimental, and the Orillia plant is the first effort to use the process on a commercial scale. Already, 14 or 15 men are employed, and before the end of the week a night gang will be at work. The company has taken an order for 10,000 pairs of skates, which have to be produced before the end of December. From this on, rapid development is looked for.

A Foundrymen's Barbecue, In Royal Style

If You Do Not Know What a Barbecue is Just Read This Story and See What It is, and Who Are the People to Handle it.

ALL human beings are gregarious and like to get together with some common object in view, and foundrymen are no exception. It is indeed a pleasure to meet friends, and renew acquaintances, and we often prefer to have such meetings free from discussions of business and its attendant worries.

About six years ago H. M, Lane had a large laboratory in Detroit where some tests in regard to core sands, core binders and the reclamation of old sand were



THE MENU AT THE BARBECUE. THE BARREL CONTAINED CIDER.

being carried on, and at that time he and E. J. Woodison got together and served what they called a coremakers' dinner. The men consisted of baked beans, baked sausages and baked potatoes—all cooked in a core oven. Each man's individual dinner was put in a wooden bucket, which was pushed down a conveyor to a point where they could help themselves. The bucket was then turned wrongside up and used as a seat while eating the dinner.

Both gentlemen thought it would be well to have a general foundrymen's dinner again, and the long-talked-of event took place on November 13 at H. M. Lane's place on Grosse Isle, Michigan, which is known as Gray Gables. This is a large island connected with the mainland by a bridge and situated about eighteen miles from Detroit. Mr. Lane secured a bear, and after properly fattening him on pears, apples, and other choice foods he was turned into bear meat at the same time that a couple of sheep were turned into mutton.

Invitations were sent out to all foundrymen in this region, and the entire lower floor of the house was fitted up as a dining room, as was also a large garage and shop to the rear. About one hundred and fifty signified their intention of attending, but the other fellows evidently thought the matter over, for about two hundred and fifty showed up. Fortunately the potato crop had been so good that with the help of the meat above referred to and certain other viands no one went away hungry.

The invitation sent out consisted of a little envelope, on the outside of which was printed: "You'll be there to meet the bear," and the enclosure showed Bruin on the run with two sheep in advance and fate following in the shape of a knife. The non-committal barrel shown in the foreground contained cider, and this, with apples, fried cakes, nuts and the regular food on the menu, seemed to supply everybody with an ample amount of nourishment.

The foundrymen agreed from the core of their heart that they had a sandblasted good time and that to have missed the dinner would have been unbearable.

A photograph of nearly two hundred of the visitors was taken on the lawn before the dinner, which was fortunate, as once they got to the table they ate until dark and then climbed into about eighty automobiles which brought them and drove home.

SIGNS OF PROGRESS

The Grand Union Hotel, Calgary, is to be repaired at a cost of $30,000.

Edmonton is to have a new $10,000 curling rink on the south side. The permit has been issued for construction and N. B. Cuthberson has the contract for the building.

The plans of the proposed new Collegiate Institute, London, Ont., are being considered by the Board of Education and as soon as the approval of the Department of Education is secured work on the building will commence.

Plans for the new million-dollar hotel, London, are being finally revised and work will be started within a few weeks.

A new brick and cement building costing $40,000 is being erected by the J. H. Bryant Co., Ltd., Sherbrooke, Que.

The corner stone having been laid, work will proceed rapidly on the New Methodist Church at Sydney, N.S. It is hoped that the church, which will be one of the finest in the city, will be ready by July next.

PHOTO OF SOME OF THOSE WHO PARTICIPATED IN THE LANE-WOODISON BARBECUE AT THE GROSSE ISLE ESTATE OF MR. H. M. LANE, ON SATURDAY, NOV. 13th.

LETTER TO THE EDITOR

Editor: In your July number you mention having submitted a copy of your paper to an old timer who failed to praise the editorial skill of the editor but was enamored with the advertisements.

As I have reason to believe that I am the aforesaid "old timer" I will unfold a tale which will show the evil effect of "swelled head" which might result from praise and will also describe a later and final experience in the foundry.

Soon after quitting the foundry business in 1888 I landed a job or "accepted a position" as machinist in a new shop, built by an old established concern. Owing to the location there was difficulty in retaining men, therefore I was allowed to remain, along with others, one of whom will be the hero of my tale.

A dozen or more years later this hero was in charge of erecting heavy machines and I was in charge of making tools and devising methods of doing the work, a job which required considerable knowledge and experience, while the hero's required little of either. Conditions which, at first, were all that would be expected had become obnoxious and I was on the lookout for a change of location when the hero announced that a friend had recommended him for superintendent of a rival shop which was under construction and that he would accept if I would accompany him. I had no confidence in his ability to handle such a job but considerable in my own, so I agreed to go, and we went. He secured the foreman of the drawing office and the leading molder. The pattern-maker came from another shop. The superintendent wanted to do the right thing but vanity and greed bore too hard and the result was a remarkable case of "swelled head," one of the worst on record.

An interesting tale could be told of his doings in the machine shop and in other departments, but foundrymen are not supposed to appreciate anything outside of their own domain, so I will spare them. However, I would like to tell one which happened just outside of the foundry, after which I will get down to business.

A frame building for storing coke had been built and some men were employed on the roof when word came that the president of the company, who had been away, had returned and would visit the shop the next day, but no hour was mentioned. The superintendent being anxious that the president should find him attending to business, got on the roof and had to remain there until about four in the afternoon before the president arrived and discovered how faithful he was.

Now for the Foundry

The molder was genuine, of some forty years' experience, but he was weak in figuring, which brought me into the game. Dan (this was his name) wanted two cupolas of a capacity equal to that of the old shop which we had just left, and as the business was to grow and the foundry to be extended, they were located in one corner, and there the trouble began. Dan wanted the smaller one in the corner so that there would be more room when using the larger one, but the superintendent insisted, and the larger one went next the wall and so close that it was necessary to swing the ladle to get it properly under the spout. The cupolas being located, the charging floor came next, but as none of us was up on structural work I made a plan of the location and the job was turned over to a concern in that line. The intention was to put the blower—a Roots—on the floor, but for some reason it was put in a small building outside, some twenty feet distant. As the blower discharged downward and a railroad track ran between the blower house and the foundry an underground pipe was necessary. Dan and I decided on a cast iron pipe with leaded joints, and the pattern-maker saw no difficulty in making the connections. The superintendent again interfered and had a line of tiles put in. Under the blower on the line of these tiles there was a lively spring which filled the tiles with water which froze solid. After thawing it out and removing the remains of the tiles, the next project was a concrete tunnel. I planned to make a tube coated on the outside with asphalt, but the superintendent objected to this also, claiming that the concrete would be water tight without the asphalt, so I adjourned and let him do it his way. Shortly after it was done he came to me and asked if I thought a drain would remove the water from the tunnel. I thought it would and proceeded to lay four-inch tiles down the hill. This might have succeeded had we not encountered a rock of enormous proportions. As usual he came to me for advice and on this occasion I suggested putting in an ejector to be operated by compressed air, and this was agreed upon, and before each heat the water was blown out.

The Elevator

An elevator for the charging floor was in order so the necessary parts were ordered. I told the labor boss how to proceed and he had the guide posts located ready for the concrete when along comes the superintendent and orders the guides removed and the concrete placed without them, the holes for the guides being cut out of the concrete after it hardened.

While all of this was going on Dan was having his troubles. He lined his ladles and built fires in them to dry them and was called down by the superintendent for smoking up the foundry walls. He gave dimensions for core oven and the same was built, but on the superintendent's orders the roof was three feet lower than ordered. It was heated with gas and the gas went out soon after the oven was closed. No air was being admitted and, of course, combustion stopped. I had to locate the trouble and provide a remedy.

Pneumatic Rammer

The question of pneumatic rammer came up. Dan did not see things as the superintendent did. A laborer can ram the sand as hard as a molder and make as good time, but for such jobs as tucking bars and placing gaggers and using the rammer on work of this kind the foreman reserved the right to be the judge, but the superintendent ruled.

About this time the superintendent reduced Dan's pay and Dan quit. In talking with me the superintendent said Dan did not study the business or read books. I told him some things which did not set well, among others I mentioned two trunks full of books and papers on foundry that Dan and I had gone through. Another foreman came and as he had too few men he could trust he asked me to help at casting time, my job being at the catching ladle. On one occasion I noticed a decided change in the sound of the wind and called to the foreman. The superintendent thought it was blowing too hard and slowed it. This was the last of my foundry experience, and was quite a few years ago, and when I got the first glimpse of the Canadian Foundryman and saw all the equipment which has sprung into existence since then, it certainly opened my eyes.

Old Timer.

OVER A HUNDRED THOUSAND FOUNDRIES

An interesting letter was received a few days ago by the editor of this paper from a manufacturer of a device to be used in the foundry. We know the device and know that it is everything which the manufacturer claims for it, with one slight exception. In order to convince us that it was well worth boosting, he handed us the following: "We wish to advise you that there are over a hundred thousand foundries in Canada and the United States using this device and these users tell us they would not go back to the old method under any circumstances."

A paragraph such as this might be read by almost anyone without attracting any especial attention, other than what was intended; but how many of our readers would realize that there are not that many foundries in the world. Without going into exact figures we will point out that there are approximately six thousand foundries in the United States and Canada combined, and three thousand in Great Britain. It is doubtful if any other country can make a better showing in proportion to population, and comparing these figures with the population of these countries we find about one foundry to every twenty thousand of population. This would not figure up to a very great number if we take in the entire population of the world, regardless of the fact that some of the most populous countries have very few foundries. It is an undoubted fact that there are not one hundred thousand foundries in the world.

Does it Pay to Mix Iron by Chemical Analysis?

Giving Much Valuable Information on Cupola Management, Together With Pointers on Properly Mixing the Metal.

By W. W. ELLIS, Author of "The Metal Mixer"

JUDGING from the little interest some foundrymen take in mixing iron by chemical analysis, those who do not know would form the impression that it does not pay to mix iron by analysis. I have noticed that a large majority of foundrymen are perfectly contented to go along from day to day using the old method of mixing by fracture—just guessing at it, trusting to luck, we might say; for that is exactly what it means, especially so when making a new mixture. I have even had foundrymen tell me that you can't make good machinery castings unless you use 40% pig iron, and men who are looked upon to be up-to-date foundrymen and, of course, think they know all about mixing iron. They say they always mix their iron on a 40—60 basis. Now, when I hear a foundryman talking like that or along those lines I begin to think he knows very little more about mixing iron than his grandmother did. And I am sure there are any number of foundrymen who mix by analysis who will back up my statement.

I want to make it clear that when I talk about mixing iron I mean mixing iron in every sense of the word. A mixer should know why he uses so much of this or that pig iron and scrap, and what mixture to expect from it. He should know why he can expect such an iron from his mixture. Let us analyze the 40—60 statement, and we will very soon see how really absurd it is to talk in that way of mixing iron. In the first place let us consider the variety and number of different brands of pig iron there are on the market. I believe that "Church," in his two books gives the furnace analysis of more than 200 different brands of iron that are made in different parts of the world. Now, as nearly all of these different brands have grading numbers from one to six, it is evident there must be several hundred grades of pig iron of a different chemical composition to each other on the market. But let us take only No. 1 pig irons from a few furnaces, although the American Foundrymen's Association has agreed to the limits of silicon and sulphur the different numbers shall represent, still can we, or do the manufacturers keep to the agreement?

Here you will find that one furnace will produce a No. 1 pig iron with almost the same chemical contents as another furnace would sell for a No. 3, and so it is with one brand and another. Especially is this so when comparing Southern and Northern irons. Unless you make your mixtures by the chemical composition of the iron, you cannot tell with certainty just what you are mixing. As there are no two furnaces that produce the same grades of iron of the same composition, or in fact one furnace that produces exactly the same composition in all their No. 1 pig iron at every cast, does it not seem absurd for a foundryman to say he always makes his mixtures 40-60? Suppose, for instance, he is using pig iron with the chemical composition just right to give him the proper mixture for ordinary machinery castings. After allowing for loss of silicon while melting, the mixture should contain 2.2 per cent. silicon before going into the cupola. If the scrap contained about 2 per cent. silicon, then, to get that mixture the pig iron would have to contain 2.5 per cent. silicon and 40 per cent. of his pig, and 60 per cent. of the scrap would give him 2.2 per cent. silicon in his mixture, although he would not know why his mixture was just right. But suppose the next carload of pig he received was softer; say it contained 2.75 or 3 or 3.6 per cent. silicon—these seem to be the prevailing percentage of silicon Southern irons contain—would the foundryman who makes his mixtures by the 40-60 method or by fracture know the difference between them? He puts them down as pretty much alike for the fracture of these different irons would not be very much different from one another. You cannot tell the exact composition of iron by its fracture. Who can tell the composition of pig iron cast in an iron casting machine by its fracture? Now, let us see how much good high-priced pig iron the 40-60 men are throwing away every time they use pig iron that contains more than 2.5 per cent. silicon with ordinary machinery scrap containing about 2 per cent. silicon when they are making mixtures for the general run of machinery work. Let us take the extreme figure quoted, say the pig iron contained 3.6 per cent. silicon. To make the same mixture as we did with the 2.5 per cent. silicon pig we would have to use only 12½ per cent. of the 3.6 per cent. pig as against 40 per cent. of the 2.5 per cent. silicon pig iron. Does not that show how really absurd it is for any foundryman to talk about 40-60 mixtures of iron? He may have in his yard or may be using an iron, if he only knew the real composition of it, which could make the same castings and practically the same composition with 27½ per cent. less pig than is required to make the same castings with the 2.5 per cent. pig iron. It is the same with other mixtures. The saving reaches all down the line, no matter if we are making semi-steel or soft iron for stove plate. The man who mixes by analysis knows what to expect from his mixtures simply because he knows what he puts into them, and yet some foundrymen think and maintain there is nothing to be gained by mixing iron by analysis. The gain is not only in saving high-priced iron, but in being able also to mix and use up any low grade, or any old thing in the shape of iron and steel and make good castings from it. And not only that, but we can make two or more castings with practically the same analysis, even if we do cast them on separate days. Mixing by analysis does pay, and pay big, and no one knows it better than the progressive foundyman who makes it a point to learn all he can about his trade so as to help push it to the front. The foundry has been kept in the background too long, and the moulders are the only ones to blame for it. As a class of mechanics they have always been contented to put up with any old makeshift of shop or equipment, but thanks to real progressive men in the business, the foundry is being placed in a class equal to any of the mechanical trades, so that manufacturers and employers are beginning to realize that the foundry is just as important and should be equipped with labor-saving machinery as well as any other part of their plant. So it behoves us foundrymen to get and introduce anything that will build up our trade so that it will be shown the same respect and consideration as any other mechanical trade. The automobile industry has been one of the biggest factors in bringing the foundry up to its present standard. But, do you suppose for a moment that the foundry would have served the automobile industry so well if all mixtures had been guessed at instead of being mixed by chemical analysis?

They absolutely had to know what they were doing so that they could do or make the same mixture with the same chemical contents day after day, and only by scientific mixing have they brought the foundry up to its present standard in the automobile industry. But you can be assured they were not men that thought they could mix iron on the 40-60 basis.

I have heard foundrymen comment on mixing iron by analysis, because as they say, you cannot tell the composition of the scrap. Especially is this so in making large marine cylinders when a large amount of scrap is used. Men that talk like that are not apt to know how hard or how soft they are making their cylinders, or other mixtures. In making mixtures for large cylinders the scrap need not be the controlling element in the mixture, so if one did make a mistake of a point or so in judging the composition of scrap it would not influence the mixture to any great extent, and especially if the composition of the pig iron is known, as it certainly should be when making mixtures for that class of work. All the pig should be medium low silicon. and especially low phosphorus iron. On the other hand suppose the pig iron on hand is a little high in silicon which would then make the scrap the controlling element and of course would influence the mixture by having a much higher percentage of scrap than pig iron, well then, several pieces of selected scrap—for scrap for that class of work should be selected as far as possible—could be picked out from different parts of the pile, a few drillings taken from each piece and determinations made which would then give practically the composition of the whole scrap pile. Then the mixture could be secured almost exact, and it may surprise some of these men who talk about the composition of the scrap to know that mixtures for large marine cylinders have been figured to contain 1.7 per cent. silicon in the casting, and the metal has contained that amount when determinations have been made. In making mixtures for cylinders we should always try and get from 5 to 15 per cent. steel scrap in our mixtures, according of course to the section and weight of our castings. Mixing by analysis is the only sure way to make mixtures, and it is the cheapest method; you know what you are doing and you know what you are using to do it with, so I maintain it does pay to mix iron by chemical analysis, and it behooves anyone who has anything to do with making mixtures, or for that matter anything to do with the foundry, to learn all he can about this subject; then, when he has mixtures to make to strict specifications, he will realize to his own satisfaction that it does pay to mix iron by chemical analysis.

FLUXES—THEIR USEFULNESS

I had occasion a few days ago to visit a foundry where a very fair class of work was being done and where as a consequence a fairly good class of workmen were employed. The whistle blew for the noon hour meal and the boys gathered around a fire in one of the big ladles which happened to be standing in front of the cupola. The sight seemed so familiar to me that I could not refrain from joining the assembly and taking part in the conversation which, owing to the surroundings, easily drifted into ladles and cupolas and melting, and finally into the production of dirty castings. This progressed along regular lines until one of the fellows, who by-the-way was the assistant foreman, came out with a humorous story of his views on iron purifiers and the arguments advanced in their favor. He proceeded to tell of a salesman who came to the shop at casting time to demonstrate a flux he was handling; how he put a handful into the ladle and watched its action when the metal was tapped into it. The narrator seemed to consider it a huge joke that this demonstrator should suppose that anybody was going to be bamboozled into believing that this was going to have any effect on the resultant castings. The rest of the fellows joined in the laugh and concluded that these loafers had to live and that if they could not make a go of it by selling flux they might have to go to work.

Now this is just the sort of thing which keeps the foundry in the background. Foundrymen do not intentionally stand in their own light, but that is exactly what they are doing. If they would read more, and think more, and talk less nonsense, they would see things in a different light. There are some queer things in nature which are hard to explain, but which we know to be facts. For instance, we know that alkalies and acids will kill each other so that neither have any strength. We know that ammonia counteracts the effects of lime in water. We know that certain acids will dissolve iron but will not affect lead, and that by painting the inside of the iron retainer with white or red lead it is not affected. We know that other acids will dissolve lead. Then there are other acids which will dissolve most of the metals but will not attack beeswax, yet beeswax can be dissolved in benzine. Now get down to foundry work. Fluoric acid has very little effect on iron, but will dissolve glass, and can not be kept in a glass bottle. Now glass is made of sand, and fluoric acid will dissolve sand. If sand is melted in with iron it makes slag, most of which rises to the top, but some minute particles will remain in combination with the melted metal until after it is poured into the mold, after which it segregates into spots, large enough to show in the casting. If fluoric acid could be introduced into the melted metal it would certainly free the metal of minute particles of slag. Every foundryman knows the beneficial effects of lime in making a thin slag which carries away the sticky slag in the metal, and most foundrymen know how manganese assists in removing sulphur from the metal. Now if we combine fluoric acid, lime and manganese and introduce the compound into the metal we have taken one step in the right direction. Fluorspar is a mineral which consists chiefly of fluoric acid and lime, and is an ingredient in some of the fluxes. However, I am not posing as an authority on the manufacture of flux, but simply want to point out to the reader that there are hundreds of elements in nature which affect other elements in a manner which it would be impossible to know of by any other means than by experimenting. Vanadium, tungsten, nickel and various other substances have been found to have certain effects on metals, and it is the business of the chemist and metallurgist to delve into the mysteries of nature and learn what they can for the benefit of mankind, and when they learn the various difficulties to be overcome and learn by actual proof what to use in order to overcome these difficulties and put it on the market for that purpose it is no joke and is nothing to laugh about. Some chemicals are so effective that the hundredth part of one per cent. will have a marked effect on the metal, and this fact is what confuses the average man and makes him think there is nothing to it. Using flux is just one feature in foundry practice and as Dr. Kirk says of the cupola blower, it matters not what type is used, as none of them will give satisfaction unless the cupola is properly charged. So likewise flux will not perform miracles, and if the metal is not properly melted the flux will not give the results anticipated.

CUTTING RISER 44 INCHES SQUARE OFF OF A STEEL CASTING

Heavy cutting with the oxy-acetylene flame has become so common that to-day nothing short of a super cut attracts particular notice. A real super cut was made recently in the plant of the National Car Coupler Company at Attica, Ind., when a cutter operating an oxweld blowpipe tackled a 44-inch (square) steel riser. The cut was rendered more difficult becuse of the upright position of the riser, which necessitated a horizontal cut. If the riser had been horizontal and the cut vertical the operation would have been much simplified. To off-set this difficulty the operator resorted to first cutting the corners of the riser so as to reduce the uncut cross section to a smaller square. This operation was repeated until the remaining stem could be easily cut through. The equipment consisted of the oxweld cutting blowpipe, Linde oxygen and Prest-O-Lite dissolved acetylene.

In this manner it would appear that there is no limit to the thickness of steel that can be cut with the oxy-acetylene torch, as the operation of slicing off angles can be carried to any desired extent so long as access to the metal with the cutting flame is provided. With the injector type of blowpipe the "reach" of the flame enabled the operator in this instance to carry out the work by simply directing the jet through the initial kerf.

HER CLEVERNESS

"Daddy," asked little Willie, "why is a black hen cleverer than a white hen?".

"I give it up," said daddy.

"Because a black hen can lay a white egg," said Willie, "and a white hen can't lay a black egg."—New Success.

Why Boys Do Not Take to the Foundry Business

Synopsis of Talk Delivered at Polytechnic High School, San Francisco, California

By JOHN HEDLEY

IN the October issue of Canadian Foundryman there appeared a very fine article relating to the lack of interest displayed by the average boy in the doings of a foundry so that very few desirable boys want to take up foundry work as a life's occupation. It has been a subject of great interest to me for a long time, not only to make molders but to make better ones. This being the case, you will readily understand with what pleasure I read the article in Canadian Foundryman. I am enclosing some material which I jotted down when preparing for a talk at the Polytechnic High School, San Francisco, and if there is anything in what I have gathered which you think would be of interest you are entirely welcome to use it.

Because of the growing scarcity of apprentices to the foundry, it has been a source of great anxiety to the foundrymen of the Coast to devise some means of keeping up the supply of skilled workmen to enable them to carry on the work. As a result of this anxiety the subject has been brought up from time to time but with very slight results.

A paper of the writer's was lately published in the foundry section (Chippings) of "Metal Trades," which, combined with a letter to the California Foundry Association from Mr. Schoen, the Federal Commissioner who has this very important business in hand at this time, was calculated to arouse the interest of our young people in choosing the different branches of the metal industry as a means of gaining a livelihood and becoming skilled and useful men at the aforesaid metal trades. Moreover, the foundry class of the Polytechnic High School made a visit to my place of business and took a deal of interest in what was done there, and as I plainly saw they were a fine lot of boys, ready and alert and just the right stuff to make good men, it occurred to me to get their opinions why High School scholars, although taking vocational training, never came to the foundry to follow it as a life's work. This question was put to them in writing and the answers were given in writing, very candid and clear, but showing unmistakably and unanimously that the foundry was about the last place they would go for the purpose of learning a trade.

The principal objections were: no dignity, did not want manual work, no brains required, dangerous and dirty, no promotion, and several other reasons.

Of course I was somewhat staggered because I am myself a molder and an expert and take great pride in that fact, so I answered the boys and thanked them for their candor and courtesy in answering my request, but took occasion to point out to them that their ideas and premises were not founded on facts. This caused them to confer with their teacher, and they explained to him that they were guided only by what they had seen and observed as students in the vocational training as practised at the Polytechnic High School, to which place they all belong.

As a result of all this the superintendent asked me if I would come to the school and give them a little talk on this subject and tell them how it appeared to me. I did not at first care to bother with it, but after considering it decided to do so, and was well pleased with the attitude and attention shown me. Mr. Wm. Mulcahey, of the Chas. Kawin Co., Chicago, accompanied me and spoke at some length also. He took what one might call the scientific end, while my part was the practical or actual manipulation of the melted metals.

They are a fine lot of youngsters and would soon excel if started at the foundry game, but there seems to be no chance of getting them interested.

I suppose the only way to get skilled men will be to get younger boys, teach them the trade with commercial surroundings, and then make it obligatory that they be taught enough of figuring, reading of blue prints, metallurgy, cupola practice, etc., in the evenings or some other suitable time, during their period of apprenticeship, so that we will have a supply of skilled men born in the country, and not look to foreign countries to supply such want, for as you are well aware emigration has practically ceased, and even at that nearly 60 per cent. of the workers in this country are foreign born.

Synopsis of Talk to the Boys of Polytechnic High School on Vocational Training for the Foundry

"Our wealth, commerce and manufactures grow out of the skilled labor of men working in metals."

—Richard Cobden.

First I spoke of the dignity and high repute in which the metal worker was held in ancient times, starting with Tubal Cain, Genesis 4th chapter, who taught all artificers in brass and iron, also at the building of King Solomon's Temple (1st Kings and 2nd Chronicles), where one great king sent to another great king for a suitable overseer to carry on the work which was done at the Temple, also spoke of the great size of those castings made at that early age, and the brain work and dignity which went with it at that time.

Later, the bronze image, the Colossus of Rhodes, also the Dai Butsu, a colossal figure of Buddha fifty-five feet high, made by Katusho of Corea at Nara, Japan in the year 740, also a great bell of thirty-five tons weight at same place.

In addition to all these facts, princes of the church have not been too proud to work in the foundry. Witness in the year 950 or thereabouts Dunstan, Archbishop of Canterbury; Bernard, Bishop of Hildesham; Theodwin, Abbot of Ely; also St. Eloi of France for pastime became expert in the casting of metals. Much of their work remains to the present day. No lack of brains or dignity there.

I mentioned also the Big Bell of Moscow 220 tons, the Bell of Pekin, Bell of Russia 61 tons, and various other noted pieces of work.

Later we find renowned artists making not only marble statues but large bronze statues which survive to the present day. Among the more noted of these artists might be mentioned Michael Angelo, Benvenuto Cellini and many others, none of whom have been accused of lack of brains or dignity.

After this I took occasion to speak of the defects of their method of being taught the foundry trade. Briefly, the student goes at it for a short time, sixty or eighty minutes, twice a week or thereabouts, and does not pour the iron into those molds perhaps once in two weeks, and as I look at it, it would be impossible for any student to keep up his interest in such work, also one would imbibe the idea that it was not of much importance whether it—the casting—was good or bad; so this method would tend rather to discourage the student. On the other hand, in a real foundry the idea is never lost sight of that any piece, whether great or small, is always made for a definite purpose, and very often of the last importance. In some broken down job, a large steamer may be held up or a factory stopped until repairs can be made. In any case, no matter what the machine is, a good staunch, sound casting is the first essential part to start with.

So that in looking over the vocational foundry it would appear to me that the student would be more inclined to keep away than to go to a foundry.

I also took occasion to say that the great lack of efficiency is to be traced to lack of skill among workers. This has been clearly shown during the war, when, not having enough skilled men to go around, the places were filled with inexperienced men, with correspondingly poor results.

I mentioned also that the supply of skilled men from Europe had stopped for some time past, and the consequent great nced for the American boy to get in and learn to do our own work.

In connection with this view, I took occasion to mention the strong economic pressure that will shortly be brought to bear, not only from Europe but to some extent from the Orient, with my opinion that the best defense against that would be a strong and well trained army of skilled mechanics. That old gag "Made in Germany" was no pipe dream.

I also pointed out that business and professional openings were well filled up, and it took just as much application and perseverance to succeed there as it did in any walk of life, but the clever mechanic at least always had a good living and could look on his skill and ability as so much capital, with small chances of going bankrupt.

I also pointed out to them the rising power of labor, and the great consideration shown to it at present, so very different to the way it stood in my younger days. "Back to the farm" was the slogan of the late Theodore Roosevelt, one of our greatest men in the history of the United States, and this I take to mean "back to a more simple mode of life" by which labor would be ennobled whether on the farm or in the workshop.

I asked the question, Can we afford to let other nations do our work for us? I say, No, for when that is done decay is surely setting in and this great country is slipping in the scale of nations. I also called attention to the lessons taught us by the war, in which we showed such a woeful lack of skilled mechanics in every branch, the great waste that went on and is still going on to some extent, with one great fact evident in the case of Germany being able to make such a determined stand simply in the fact of her having armies of skilled men at her control, which enabled her to supply her tremendous wants in the field when opposed to so many powerful enemies that she faced at that time.

The object of Mr. C. C. Schoen's U. S. Training Service was then touched on, briefly as follows:

Emphasize the importance of foundry work and elevate it to the dignity it merits.

Induce into the foundry a higher type of young men.

Increase the efficiency, scope and usefulness of the average foundryman.

There is a lot more, but this will serve to show what I tried to bring out to the young men of the school, who seemed to be interested in what they heard. Afterwards Mr. Mulcahey gave them a clever and pithy speech on the importance of foundry work, the great advancement that had been made in late years, the increasing stress that metals, especially cast iron, now have to bear, notably in all types of internal combustion engines, by which science steps in with chemistry to assist the foundryman, thus doing away with the old haphazard methods of a few years ago.

Mr. Mulcahey then told in a very clear and convincing manner that he considered the metal trade in its various branches as the greatest field of promotion to be found today.

Refractories for Electric Furnace Lining

The Following Paper Was Presented at the Fall Meeting of the Electric Furnace Association at Columbus, and Treats Mainly on Rotating Type of Furnace.

By CARL H. BOOTH

IT IS a well known fact that the life of refractories has had a great deal to do with the success or failure of electric melting furnaces. A careful study of the reasons why some of the earlier types of equipment have not met with large success will disclose that this has been due to the difficulties experienced in getting roofs and side walls to stand up. This condition has also, in many cases, limited the size of furnace which could be built. One of the best known examples which bears out this statement is the Stassano electric furnace, which was one of the earlier types of arc furnace equipment developed.

The writer has been interested for many years in the possibility of developing a type of electric arc furnace which would show an improved life of refractories. Surprisingly good results have been secured on a two-phase, three-electrode, bottom-conducting type of arc furnace. Recent records from a three-ton furnace of this type give an average of 125 heats per roof, 275 heats per lining, while the bottom has stood up for over a year without replacement. Some roofs have lasted over 250 heats, and linings as long as 475 heats. This furnace has been operating on an acid basis. The refractories used have been a good grade of silica brick for the roof and a portion of the side walls, the balance of the lining being rammed-in gannister.

But no stationary type of furnace has the same opportunity of securing long life from refractories as that where the body of the furnace is in motion during some portion of the melting period. Obviously, the best results can be obtained from a furnace in which all parts of the lining are subjected evenly to the same temperature as far as practical, and this result can be further improved if the entire lining is washed by the hot liquid bath of metal, thus aiding in cooling the refractories and securing an even wear.

In the past year and a half adequate records have been secured from a rotating drum type, single-phase arc furnace, used principally for the melting of non-ferrous metals to show an exceptional life of refractories. The construction of this furnace being almost like a barrel, permits the removal of the two flat heads of the cylinder so that in lining the drum the best possible conditions are available. In practice the plan has been to lift the furnace shell off of the rollers upon which it rests, place it on one end, remove the flat end which is on top, and lower the lining into the shell, piece by piece. While five or six hundred heats have been secured from linings made up from arched clay brick, the standard type of linings used have consisted of only three or four pieces, viz.: a large cylindrical tile for the body of the shell and two circular flat end bricks for the ends. After these have been put in place, loose heat-insulating material is tamped in hard between the brick and the steel shell, and after the top end brick is in place the steel end plate is again bolted on to the shell. The bricks described have been made of a good grade of fire-clay, and due to the absence of joints and the rotation of the furnace as pointed out above, results in records being made of 900 to 1,000 heats from a lining. The pouring temperature in most cases will run in the neighborhood of 2100 to 2200 degs. Fahr., although many heats have been made on high temperature alloys where the temperature has averaged 3,000 degs. Fahr. It should be especially born in mind that the material used is only fire clay and not silica or magnesite.

The experience with this type of furnace bears out the statement that where the construction of the equipment permits the washing of the complete lining with the liquid bath, the best possible life of refractories can be secured. It also demonstrates that it is entirely practical to use the ordinary class of material, which can be bought at the lowest price, and secure exceptionally long life refractories. In a short time records will be available as to life of linings used in this type of furnace for melting steel and iron where the average temperature requirement will run in the neighborhood of 3000 degs. Fahr. It is confidently expected that a much higher life of refractories will result than with the stationary type of electric melting equipment under similar conditions.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal industries.

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Compliments of the Season

MANY things will transpire between now and Christmas Day, but this will be our last opportunity to greet our readers before the holiday season is upon us, and when we again make our appearance upon your desk or in your letter box we will be journeying on into the year of our Lord Nineteen Hundred and Twenty-One. The year which is now passing has been an extremely interesting one for us, as it is always a pleasure to work for those who follow the noble art of foundry work, whether in the capacity of employer or employee and any message which we can carry or any service we can render to the founder is a privilege rather than a task and in the year which is about to be entered upon we will endeavor to be of greater service to our patrons than we have been in the past.

Our services have certainly been appreciated by our readers, judging from the flattering letters which we receive. Our questions and answers column has been particularly well patronized and we cordially invite those who are in need of assistance to write us and we will spare no pains to secure the correct answer if such answer is anywhere to be secured. If we can answer the question correctly and in a manner which will be of use to the questioner, we are not too proud to say so. We never hang a bluff, and we have never yet been cornered on an incorrect answer.

With feelings of profound thankfulness to our many readers for their cordial co-operation, we present, with this issue, our final effort for the year and look forward to the coming year with the same degree of satisfaction which we are enjoying during the closing days of the present year. In the meantime we wish you all a Merry Christmas and a Happy and Prosperous New Year.

Conditions Not Too Bad

WHILE the readjustment process has undoubtedly taken a very serious turn in regard to those whose business happens to be in the line of textiles, rubber and leather goods, and no doubt to some extent in every line, certain it is that the metal industries have suffered the least of any. True, some of the foundries have had to temporarily slacken their pace, but on the whole they are doing a fair amount of business.

A short trip through a few of Ontario's industrial centres by a representative of Canadian Foundryman reveals some facts which may be taken as a criterion for conditions throughout the country at large. The piano business and the automobile business which heretofore have been the last to feel the effects of a lull, are this winter experiencing a decided depression in the volume of business coming in. Some will attribute this to the luxury tax and others to over-production. Howbeit, they are slack and such other industries as depend on them are in a similar predicament. The crash in the sugar market was probably the biggest factor in scaring the prospective purchaser of other commodities out of buying beyond actual necessities for fear of a sudden drop in the price, leaving him with a stock of high-priced material to sell at a sacrifice, but beyond a slight scare there is nothing to cause apprehension.

In Guelph two of the foundries depend mainly on the piano business and are as a consequence running considerably below their capacity. The Callander Foundry, which has recently been reorganized, is as busy as could be expected at this time of year in normal times, but could handle more business. The White Sewing Machine Company is running to normal capacity. The stove works is busy. The Gilson Mfg. Co., manufacturers of gasoline engines, tractors, etc., have been increasing their force during the last few weeks and the International Malleable Co. is very busy.

At Kitchener one foundry depends largely on the automobile tire business and is consequently operating below capacity. The Canadian Blower & Forge Co. is working to full capacity with abundant orders, but of course turning none away. The other shops are running, but not busy.

At Preston the foundries are all operating at about normal for this season—no rush on, but good prospects. There are four foundries in this town, all keeping on their regular staffs of men.

At Galt—the Manchester of Canada—everybody is optimistic, although some of them are none too busy. The Canada Machinery Corporation, the Goldie & McCulloch Co. and R. McDougall Co. are all waiting until after the new year for things to brighten up and are running on short time instead of letting their men go. The Galt Foundry Co. are fairly busy, but not rushed, while the stove works, Sheldon's, Limited, the K-T Foundry and the Malleable Iron Works are very busy and working to capacity. The brass shops are all running their full staffs, but not finding business any too brisk. Cowan & Co. have just completed a very large contract and are not quite so busy, but have some orders. The Perfect Machine

Co. and the various other tool works are running about normal.

At Brantford, everything is booming. The Buck Stove Works, which was damaged by fire some time ago, and which has been taken over by the McClary Mfg. Co., of London, is again in running order and contributing its share to the business of the McClary Co. The Pratt & Letchworth Malleable Iron Works, like all the malleable plants in the country, is very busy. The Cockshutt Plow Co. and the Verity Plow Co. are both running to the limit and getting some work done outside. The Massey-Harris Co. have every floor in use and running full time. The Waterous Engine Works Co. is running every floor in the foundry and every machine in the machine shop in addition to running a night gang in the machine shop. They are also getting both foundry and machine work done outside. The Goold, Shapley & Muir Co. are fairly busy on their own work and are filling in their spare capacity assisting the Waterous Engine Works Co. with their enormous paper mill orders. The American Radiator Co. is busier than at this time last year. Orders for small boilers and radiators, such as are used in dwelling houses are a little below, but those for larger buildings are in excess. The Dominion Steel Products Co. are doing a line formerly imported and are meeting with success. They are putting into commission a new furnace for special brands of metal, and is the only one of the kind in Canada. The Hartley Foundry Co. is busy on jobbing work and the numerous brass foundries are all busy. Another foundry is also in contemplation in Brantford, details of which will be given later.

In Paris the two foundries are very busy. The J. H. Bradley Foundry has a regular run of casting to supply and no falling off has been noticed; while the McFarlane Engineering Co. have the foundry filled with workmen and also have two annexes utilized. It is their intention to build a large extension to the foundry in the spring.

In London the same condition prevails. The Forest City Mfg. Co. is running every floor and has a large extension under construction. The Spramotor Co., who have two shops in London and one in St. Thomas, are working to their utmost capacity. The Vulcan Foundry are running a reduced force, but busy with what they have. The Empire Brass Mfg. Co. claim they are as busy as they were at this time of the year before the war, but are not quite as busy as they were a short time ago. The P. Courtney Brass Foundry is a recently established concern and are pleased with the amount of work coming their way. The McClary Works, Beatty Bros., Leonard Engine Works, the George White & Sons Co. and the Mallough Foundry seem to be making the usual amount of noise and throwing out the usual amount of smoke, but train time was up and we had to postpone our visit to these plants until a future date, but from the number of calls made and the results mentioned which are exactly as we found them, we are convinced that there is no panic looming up or any occasion for one. There is still a shortage of everything and if the public can only realize that normal times can only be attained by continuing to keep the wheels of industry moving, everything will run along smoothly. The one feature in connection with normal times which the public do not seem to grasp, is that there always have been quiet spells at certain periods of the year. Another point to be considered seriously is that the busy times and the big profits and high wages which were the direct results of the war were financed with borrowed capital. The accounts with the interest thereon are falling due, now that the war is over, and everyone's contribution to the State must be bigger in proportion to his income than before the war or else the debts must go unpaid. Produce and continue to produce is the only way to raise money and this cannot be done with factories closed or with speculators holding up legitimate business.

Malleable Cast Iron

DURING the year which is just drawing to a close we published a series of articles on malleable iron which met with such approval from our readers as to warrant our continued efforts in that direction during the coming year. We have arranged to have a malleable iron section in every issue hereafter. Malleable iron has been in use for many years, but has always been a more or less haphazard business from the foundry standpoint, with the result that many opportunities were lost. The advent of the steel foundry opened the eyes of the malleable men to such an extent that research work was proceeded with on an extensive scale, and to-day it is possible to order malleable castings and know in advance what is to be received. It is also possible to use malleable iron for work formerly thought beyond the bounds of malleable possibilities. The first malleable cast iron of which we have any record was made by Reaumur, about the year 1720. We know also that Lucus, in 1804, and in later years, Lenox and Boyden, worked with this metal. However, it is only within the last few years that research and an exchange of information have made possible the rather remarkable advance in improvement enjoyed by the industry and have placed its plant operation on a really scientific basis.

It will be our purpose to indicate some of the principles on which the process is based and to point out some of the results that have been attained.

Sand

IN the January issue of Canadian Foundryman there will appear the first part of a short article on the subject of sand. This might appear to be a dry and uninteresting subject, but it is nevertheless a most essential one from the foundry standpoint. The article will be written for educational purposes and will run into four issues. It will be written so that the apprentice can read it and grow up with the knowledge thus gained and so that the foreman or the purchasing agent or anyone who is interested in the foundry can be benefited.

While research work has been going on in metallurgical matters it must not be imagined that sand has been overlooked. There is knowledge on this subject that was not possessed by anyone a few years ago, and in addition there is knowledge which has always been possessed by some and considered unworthy by others. Sand suitable for one purpose is not suitable for another, and sand which is suitable under certain conditions is not suitable under other conditions. These are the points we will endeavor to bring out so that the foundryman may be able to govern himself under all conditions.

"I Wonder if he Has Really Reformed?"

Scraps from the Foundry Scrap Pile

The Huron Specialty Casting Co., Goderich, Ont., is contemplating establishing a foundry and manufacturing plant and is asking the city to erect a building, sell it to the company and grant the usual exemption from taxes.

Modern Implements, Ltd., Walkerville, Ont., has been incorporated with a capital stock of $100,000 by Charles D. Donaven, William J. Davidson, Thomas S. Biggar and others to manufacture implements, tractors, tools, etc.

Takes Business Trip to Europe.—John C. Panghorn, vice-president of the Pangborn Corporation, Hagerstown, Md., manufacturers of sand-blasting and allied equipment, sailed on Nov. 27th from New York aboard the steamer Olympic for Southampton. He will spend several months in Great Britain and on the European continent on business in connection with the company.

New Foundry for London, Ont.—Ald. John Bridge, president of the Chamber of Commerce, announces that a foundry to employ four hundred hands has been secured for London, that the site has been selected in London East and the deal closed for the same. Another industry to manufacture engines, etc., and employ several hundred hands is also announced as just closing a deal for the purchase of a site, but whether it will include a foundry is not stated.

Foundry Changes Hands.—The foundry property known as the Callander foundry, organized by the Callander Manufacturing Co., but which has for some time been controlled by W. Louden and H. B. Callander, of the Louden Machinery Company of Canada, has been purchased by Alexander Callander and his four sons and Edward Suffried, under the name of the Callander Foundry Company, Limited. They will continue to do the castings for the Louden Company in addition to such other work as comes within their capacity.

Large Extension to Toronto Foundry.—The Canadian Hanson & Van Winkle Co., Ltd., manufacturers of electro-plating materials, Toronto, Ont., announce that they have made quite a large addition to their foundry, having erected a grey iron foundry which is up to date in every particular, and are now prepared to make any class of grey-iron castings, and are particularly specializing in soft machine castings for the machine trade. It is their intention to do a certain amount of jobbing, outside of their own casting. With this latest addition they are now in a position to cast grey iron, nickel, bronze of all kinds, brass, aluminum, and zinc, and are prepared to make prompt deliveries.

Large Extensions to Galt Brass Works.—A new foundry building of brick construction with steel trussed roof 142 by 60 feet has just been added to the plant of the Galt Brass Works. The walls and roof of the building are well provided with glass, thereby providing abundant light, while the walls between the windows are covered with radiators, thereby making a comfortably warm and well lighted place for the workmen to work in. The shop is equipped with twelve furnaces. The office of the plant is also being extended.

Fire at Orillia.—The buildings, plant and equipment of the Electric Foundries, Ltd., at Orillia, were destroyed by fire. The concern was electrically operated, smelting being done with an electric furnace of 1,500 K.V.A. capacity. Ferro-silicon and pig iron were the products, and the foundry was being operated continuously day and night. The loss will be from $25,000 to $40,000, depending upon the condition of transformers and other electrical equipment after the fire. The plant was insured. The cause of the fire is unknown, but it may have originated from electric current which enters the building at 22,000 volts. The fire spread so rapidly that the workmen had barely time to get out with their lives. The Canada Castings, Ltd., which is operated in an adjoining building, was undamaged.

Use Vancouver Ore.—Vancouver Island ore will be melted in a Seattle plant that is being constructed by Rothbert Process Steel Company at a cost of over $300,000. The company will produce carbon and high-speed steel and the plant will have a capacity of fifty tons a day. Convenience to supplies of all materials essential for manufacture of high-speed steel as well as electric power prompted the organization to locate its plant at Seattle. Large deposits of magnetite iron ore in Chelan county, Vancouver Island, are owned by the Rothbert organization. Dr. Rothbert experimented for eight years and for the last three years produced steel on a small scale by his new process. The chief economy obtained, he claims, is by the production of high grade steel from the ore through a single operation, eliminating the pig iron stage of production. Heats are turned out in four hours. Dr. Rothbert claims that titanium, which is considered a barrier to the smelting of magnetite ore, is accountable by his process for the superior qualities of his product, and he asserts he can produce by electric methods in competition with Eastern mills.

SMELTER OPENED AT BELLEVILLE

The report comes from Belleville that a plant for the smelting of silver, gold, copper and iron ores which abound in North Hastings has been opened in that city. This is rather a vague report, as a plant for refining of gold would be vastly different from one such as would be used in the production of pig iron. However, there is a smelter for the reduction, and it is good news to receive.

One of our earliest recollections is the shipping of iron ore from Belleville to Cleveland to be run into Bessemer steel, but why it could not be used for anything in Canada has remained a mystery. A short time ago we had occasion to visit the little town of Madoc, which is situated some thirty miles north of Belleville in the county of Hastings, and the enthusiasm of the inhabitants was wonderful, but it was not bringing them much. There were minerals of almost every known variety within a small radius, but very little was being done with them. They had iron which was so heavily charged with sulphur that it was easier to recover the sulphur than the iron. This was used in the manufacture of sulphuric acid. Then they had a couple of other varieties of iron. There was also the gold, silver, and copper already spoken of, as well as mica, plumbago, asbestos, soapstone, fluorspar, limestone, marble, etc. Some of the mines were being worked, notably the fluorspar and the soapstone. The soapstone, or more properly the talc, was shipped over the line in box cars to be brought back in little tubes and paper boxes in the form of face powder, but the metal industry was dead. It is to be hoped that the smelting venture will be successful.

FOUNDRY FOR ELMIRA

A. Hemme Sons & Company, Limited, a newly incorporated firm, have purchased the two-story brick building formerly occupied by the Ideal Shoe Co. and will make certain alterations and extensions required in order to utilize it as a machine shop. An entirely new building will be erected for the foundry. The company will manufacture root seeders, weed-destroying machines, etc.

REMODELLED FORT WILLIAM PIPE FOUNDRY

The Canada Iron Foundries, Limited, are just completing extensive alterations to their Fort William plant, and among other changes have completely remodelled their cast iron pipe shop. The plant as it now is represents the only one of its kind in Canada. A complete, illustrated description of this plant will appear in the January issue of this publication.

COMES TO TORONTO

Mr. W. J. Irving, who for many years has held the position of advertising and sales manager for the Canada Machinery Corporation, Galt, Ont., has been transferred to Toronto, where he has taken over the management of the Toronto sales branch of the company.

Mr. Irving was originally a patternmaker by trade, but later on took up the work of draftsman, from which he acquired that of designing. Several of the lines made by the Canada Machinery Corporation are Mr. Irving's own ideas.

For the last ten years Mr. Irving has been on the road selling the goods manufactured by his company. Mr. David King, who has had charge of the Toronto office for many years, is retiring, having passed the age of three score years and ten, and Mr. Irving takes his place.

W. J. IRVING.

MALLEABLE IRON MEN STATE CASE

A Basic Industry, and Its Worth Proved By Experiences During the Great War

Presenting a memorandum on behalf of the various Canadian manufacturers of malleable iron, F. L. Storey addressed the Tariff Commission. Mr. Storey pointed out that the American industries of a similar nature, with their immensely larger market, operate under a condition of mass production which is non-existent and unattainable with the Canadian foundry in sparsely-populated Canada. If the tariff were removed these United States plants could reduce the selling field of Canadian manufacturers by their competition. Another handicap against the Canadian foundry is that the laid down costs of raw materials are greater than those of the U.S. foundries. This extra cost arises from the duty which the Canadian manufacturer has to pay on pig iron, coal and fire brick and the extra freight to Canadian foundry points.

He submitted these figures in respect to the Canadian malleable iron industry: Capital employed, $2,605,000; wage roll (yearly), $3,410,000; output, $6,816,000; employees, 2,634. "This," he argued, "is a key industry, and the war has taught each country the necessity for its protecting and preserving its key industries."

BOOK REVIEWS

Modern Welding Methods is the title of a new 292-page book written by Victor W. Page, M.S.A.E., and published by the Norman W. Henley Publishing Co., 2 West Forty-fifth Street, New York, and as its name implies, treats on modern welding methods, which include the art of joining metals based on data furnished by the leading authorities on this subject. It considers fully the latest practice in the use and practical application of the oxy-acetylene welding and cutting torch; the spot, butt and arc systems of electric welding; the utility of the Goldschmidt thermit process, and also includes notes on forge welding, brazing and soldering and heat treatment of steel. The book is illustrated with two hundred engravings showing processes, machines, etc.

Descriptions of the various metals, ferrous and non-ferrous, with best methods for preparing them for welding are given. In addition to the regular welding feature, many valuable receipts are given for alloys and solders. The book is delivered postpaid for $3.

THE METAL MIXER

W. W. Ellis, 5912 Dover Street, Oakland, California, has sent us a copy of his book, "The Metal Mixer," which he is delivering to the foundry public for $2.00. It is a fifty-six-page book, full of information on the subject of mixing iron. The contents consist of mixtures for medium machinery castings, soft mixture for pulleys, short method, four iron semi-steel mixtures for rolls, correcting mixtures with ferro-silicon or ferro-manganese, semi-steel mixture for rings, piston-valve liners, gears, etc., mixture for marine cylinder liners, mixing with a certain per cent. of steel, figuring three or more elements exact, French specifications for semi-steel shells, sidelights on mixtures, miscellaneous mixtures, analyses of pig irons, approximate grading numbers, approximate analyses of important castings, the influence different elements have upon the iron, percentage of silicon for different castings, judging per cent. of silicon in different kinds of scrap, decimal fractions and percentages, cupola practice. The subjects are all treated in a practical manner, in language easily understood by foundrymen.

COMES BACK TO TORONTO OFFICE

T. B. Reid In Charge of Railway Equipment at the A. R. Williams Company

Mr. T. B. Reid, who for the last couple of years has been in charge of the A. R. Williams Machinery Co. business at Buffalo, has returned to the parent organization, and the Buffalo business has been discontinued for the present.

Previous to taking charge of the Buffalo office, Mr. Reid had been with the company in the capacity of manager of the machine tool department, having held that position from the year 1906 to 1916. Especially during the fitting out of war shops did Mr. Reid come into close contact with the Canadian and American trade.

T. B. REID.

The department of the A. R. Williams business over which Mr. Reid will have charge is that of railroad equipment, which is being reorganized and enlarged.

Mr. Reid received his mechanical training in the first place in the Waterous Engine Works at Brantford, from there going to the machine tool and locomotive shops of United States. Returning to Canada he took up the selling end first with the Fairbanks-Morse Co., and then in 1906 with A. R. Williams, having been in the employ of this company ever since.

INJURED IN FOUNDRY

Arthur Ashton, an employee at the Fleury Foundry at Aurora, was seriously injured by being jammed against the machine he was operating. A green piece of lumber was forced through his leg. He was taken to the Inglehurst Hospital, where it was announced that he would recover.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

BRASS FURNACE OF NOVEL DESIGN

Metallurgical and chemical engineers for a considerable period of time have been endeavoring to solve the question of melting brass and other non-ferrous metals in the electric furnace in the most efficient and economic manner, realizing as they have that there was no question of higher production when melting electrically so long as certain metallurgical features of the process could be properly overcome. As a result of considerable research work, single-phase and even two-phase electric brass furnaces have been designed and put on the market, some of which seemed to solve the question of melting these metals electrically. It has, nevertheless, been a desire of those interested that a three-phase unit might be developed which would do the melting more efficiently and economically, and it will be interesting to engineers in the metallurgical and electrical field to know that such a furnace has been marketed.

The Volta Manufacturing Company, Limited, Welland, Ont., have had their engineering staff at work for some months past developing a three-phase electric brass furnace along the lines of what they considered would be the most efficient piece of apparatus to meet the requirements of the brass and non-ferrous metal industries, and have now put on the market a three-phase electric furnace which they claim is superior to anything heretofore developed for this class of work.

As will be seen by the illustrations of the furnace, the shell is of cylindrical design and is operated in an upright position—similar to the electric steel furnaces. The furnace is lined with refractory brick and the roof is also made of refractory material. It is provided with a cast iron base equipped with a motor-driven set of gears and rollers, which gives to the furnace a natural gyratory movement.

NOTE THE BASE AND ROLLERS WHICH GIVE THE FURNACE THE GYRATORY MOVEMENT

One of the strong features is that it is a three-phase unit, which means a balanced load on the lines of the power company and consequently a better power rate for the operator. It is quite generally known that many power companies, having a limited amount of power on their lines, do not desire and will not permit the operation of a single-phase unit on their lines except at a very high rate. On account of having three electrodes it is not necessary to maintain the same degree of perfect alignment of electrodes as is necessary with the single phase unit in order to maintain a high degree of efficiency and inasmuch as the arcing takes place between the three electrodes the arcing is distributed over a much wider area than in the single phase two-electrode furnace, consequently better melting facilities are provided.

As shown in the photographs, the electrodes enter the furnace through the side of the shell at points 120 deg. apart. Graphite electrodes are used and are supported on heavy cast iron arms which are provided with guides to take the electrode holder. The construction of these arms provides a substantially insulated sleeve around electrode, which is kept cool by means of a water-cooled collar. The latter is in the form of a ball point, and by this arrangement the position of the electrodes can be changed relative to each other, at the same time making provision so that they can be lowered or raised in respect to the metal bath.

The electrode holders move in the guides provided in the cast iron arms. This movement is obtained by means of heavy screws actuated either by hand or

GENERAL VIEW OF THE FURNACE. NOTE THE MOTOR AT SIDE through a simple system of motor-driven gearing. The charge, as will be noted, enters the furnace below the electrodes, and it is not necessary to withdraw the same from the furnace at any time, either during the charging or pouring period. This eliminates any chance of electrode breakage due to the heavy scrap falling on them. It gives a longer life to electrodes and also eliminates the loss of time and the expense ordinarily incurred in removing and replacing the broken ones.

The roof of furnace is independent of the shell. This permits of the relative height of the roof to the bath being designed in such a manner as to insure the best melting conditions as well as the least possible fusing of the refractories. A vent hole with a light cover is provided in the roof of furnace which allows operating under tight conditions with perfect safety. Should gases, formed from the use of oily or dirty material in the charge, reach a certain pressure, they are allowed to escape through this vent in the roof.

In actual practice it has been found that the heat from the arc is sprayed down and over the metal in such a manner as to heat the whole surface of the metal evenly. The effect of this is very important as it reduces the volatilization losses in the metal being melted to a minimum, and the linings, not being subjected to any high temperatures, last much longer. The motion given to the furnace by means of the combination of gears and rollers, has proved itself to be a very efficient and natural mixing, one by means of which superheating of the metal is practically eliminated.

This furnace has been subjected to some very severe tests and is said to have proved itself an efficient and economical melter, very simple of construction and easily handled. When running on yellow brass, metal has been produced with a current consumption as low as 225 k.w.h. per ton of metal produced, and when running on aluminum-bronze the current consumption averaged about 300 k.w.h. These figures were not taken at a time when the furnace was operating continuously and it is only reasonable to expect that the power consumption will be considerably reduced when the furnace is thoroughly heated and is being operated continuous- At the present time the manufacturers are producing these furnaces in the following standard sizes: 500 lb., 1,000 lt., and 2,000 lb.

HANDY POURING DEVICE

A prominent manufacturer, in conversation with the writer a short time ago, remarked that he did not believe it was possible to devise any means of pouring medium-sized work other than the method universally employed of having two good husky fellows holding up the weight of the ladle and pouring at the same time. We have from time to time shown illustrations of different devices and described the method of procedure, but unfortunately most foundries are still using the "Armstrong" method. Every foundryman knows the programme of pouring with a double-shanked ladle with a molder on one end and a hunkey on the other. The hunkey strikes a convenient attitude and the molder twists himself into whatever position he can get into in order to strike the gate. Compare this with a ladle hanging from an overhead track, which can be placed in any position to suit the operator. In the illustration we are fortunate in being able to show a photograph of the actual operation in the foundry. Two workmen are pouring a mold from a double-shanked ladle while the lady is pouring a similar mold from a similar sized ladle. No one can doubt the genuineness of the device after seeing it do the work. It is not necessary to employ ladies in the foundry, but the idea is to show that muscular ability is of secondary consideration, eyesight being about the only requisite.

Overhead tracks are becoming part and parcel of every modern foundry, chiefly to convey castings to the scratch room and to deliver the iron from the cupola to the molders' floors, but on too few occasions are they requisitioned to relieve the molder of the drudgery of this worst of all jobs about the foundry —pouring off his floor.

The pouring device used in this particular instance was supplied by the E. J. Woodison Co., Ltd., Toronto.

THE OLD AND THE NEW METHOD OF POURING.

BRASS ITCH

One of the most interesting of the occupational diseases, and one about which but little has been known as yet, is the result of brass poisoning. The matter is quite satisfactorily treated by Dr. R. P. Albaugh, in a recent issue of Modern Medicine.

The symptoms are exhibited for several hours after exposure to the fumes from molten brass or zinc. They start with a dry, parched thirst, an irritating and unproductive cough, a feeling of constriction in the chest, lassitude and anorexia—which latter is simply loss of appetite—often followed by nausea and vomiting; a headache sometimes develops and chilly sensations are noticeable within one to four hours. The chills rapidly verge into a distinct rigor which lasts from one and one-half to two or three hours. The application of warm clothing or external heat seems not to diminish the rigor of a chill. Muscular cramps and sharp pains in the joints usually accompany the chill. The symptoms end rather abruptly, almost by crisis, and are followed at once by a profuse perspiration. The patient will probably fall into a deep sleep following the stage of relaxation and without any apparent ill effects.

Brass poisoning does not occur from handling of the metal or the zinc alloys which go into its composition, but is limited to those exposed to the inhalation of the whitish smoke and sublimation products from the molten metal.

There is no specific treatment for brass poisoning, "brass itch" and "brass chills." Zinc is supposed to be responsible for the bad effects. The affection was formerly confused with malaria. Some workmen find relief in drinking hot milk to which pepper is added. A good purge also seems beneficial. Dr. Albaugh advices the prevention of brass poisoning by better hygienic arrangements in foundries and smelters, elimination of careless habits of workmen and large, roomy quarters.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—The commutator of our plating dynamo has become badly worn; there appear to be high spots on it, or, rather, the commutator appears to be eccentric. We do not care to meddle with the machine without some knowledge of proper remedy. Can you advise us?

Answer. — The effect which you describe may be due to the shaft being loose in bearing, the commutator being probably true on the shaft. If this condition prevails, a chattering sound will be noticeable. If bearing is loose, adjust it, if possible. If no provision is made for adjustment, put in new bearing. If the commutator is very rough or eccentric, the armature should be taken out and the commutator turned off in a lathe. Hard mica between the bars of a commutator, which does not wear as rapidly as the copper, will cause brushes to jump. One or several high copper bars projecting above the others will cause brushes to vibrate or to become thrown out of contact with the commutator. To ensure smooth, efficient working of the commutator, it is good practice to have the armature shaft move freely endwise fully an eighth of an inch in the bearings. Maintain a dull brown glaze on the surface of the commutator by applying a little oil or vaseline occasionally, but avoid applying too much lubricant, as other troubles are directly caused by so doing. The brushes should rest evenly on the commutator with full surface contact, and with a positive but light pressure. A bright or scraped appearance of the commutator indicates that the brush contact is poor or the brush pressure is too strong. If surface of commutator shows scratches or grooves, correct the cause immediately, as such conditions never remedy themselves, and may ruin a splendid machine very quickly. Make one man responsible for the care of the dynamo, and interest yourself in it enough to see that proper care is given it.

* * *

Question—At what temperature should an acid copper solution be used to obtain best results, particularly when depositing copper upon non-conducting surfaces?

Answer.—The temperature at which an acid copper bath may be operated for best results depends largely upon the current density employed. If from fifty to one hundred amperes per square foot are employed, the temperature should be about 90 to 95 degrees Fahrenheit. If lower current densities are employed—for example, thirty to fifty amperes per square foot, the temperature should be from 70 to 85 degrees Fahrenheit. The composition of the bath should be kept as near uniform as possible. Do not limit the distance between the electrodes too closely if uniformity of distributed metal is desired.

* * *

Question.—What form of rheostat or switchboard for electro-plating tanks is considered the best? We have had considerable difficulty with ordinary types of current controlling instruments, and wish to install something more durable and efficient if it is obtainable.

Answer.—The difficulty you have experienced with series circuit rheostats has been identical with the experience of thousands of other platers, and although these inefficient instruments have been condemned for years, it is only recently that a more satisfactory type has been obtainable. The latest form of controller is known as a split circuit rheostat, and its use overcomes practically all of the troubles resulting from imperfect current regulation. The rheostat is constructed along commonsense lines, and is now being included in the best and most up-to-date installations. Modern plating room requirements exclude the old type controller. A description of the parallel type rheostat will be found elsewhere in this issue.

> **AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.**
>
> **Officers for 1920-1921**
>
> President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
> Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
> Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.
>
> **PLACE AND DATES OF MEETING**
>
> The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

* * *

Question.—As we have experienced more or less trouble from time to time with blackening of silver anodes in silver-plating solutions, we began to experiment with silver from various sources. In order to test practically pure silver for this purpose, we obtained some bar silver and used some as an anode. A black film formed upon the surface of the bar in the same manner as upon manufactured anodes. Can you inform us what the nature of this black film is?

Answer.—The condition favoring the formation of a black film upon silver anodes is admitted by experts to be caused by methods of refining the silver. Analysis of silver which became black while in the plating solution indicated the presence of peroxide. Silver anodes, which will remain clean, are obtainable, though the sale of such anodes is practically in the hands of one manufacturer, who guarantees his product not to turn black in a solution. Cathode silver is usually alloyed with copper for the purpose of increasing the profits of manufacturers, but an excess of one and one-half per cent. is seldom used.

* * *

Question.—I would like a formula for making black enamel, such as is used for trays, cycle and auto trimmings.

Answer.—Procure an iron kettle of size suitable for your needs; prepare a brick enclosure for a hot fire, and place kettle over the fire, preferably in the open air. To make approximately two gallons of enamel, melt 2½ pounds of asphaltum by slow heat, add 2 quarts of boiled linseed oil, 6 ounces of litharge, 4 ounces of powdered zinc sulphate, and 6 ounces of red lead. Boil the mass thoroughly for about two hours, then stir in 8 ounces of used amber gum (dark and one pint of linseed oil). Boil again for at least one and one-half hours. When the substance becomes thickened, remove the kettle from the fire and add one gallon of turpentine to the contents. This should produce an excellent black enamel of proper consistency for ordinary purposes. Care should be observed while boiling, as the mass is very inflammable.

* * *

Question.—Can you furnish us with information regarding method of platinizing copper? We do not wish an electro deposit, merely a process for producing the color of platinum on copper.

Answer.—Prepare a solution as follows: In one and one-fifth quarts of hydrochloric acid mix nine ounces of arsenious acid and two ounces of copper acetate. When well mixed and in complete solution, clean the copper articles as for plating and suspend them in the solution until the platinum color is obtained.

* * *

Question.—Please inform me how to get a green bronze color on brass or copper.

Answer.—Immerse the brass or copper in a dilute solution of acetic acid and allow to drain; then expose to fumes of ammonia, or immerse in a solution of two parts water and one part perchloride of iron. The longer the immersion the darker the color. The latter method is more rapid than the former, which requires repeated immersions for deeper shades.

The Use of the Pyrometer in Steel Industry*

A Continuation of a Paper Discussing the Progress Made in the Accurate Measurement and Control of High Temperatures in the Treatment of Steel of All Kinds

By R. P. BROWN

A GALVANOMETER indicates the point at which no current is flowing, and when the pointer on the galvanometer indicates zero, the voltage of the dry cell equals that of the thermocouple. The line resistance from the dry cell to the galvanometer is exceedingly small and constant. When the thermocouple voltage has been opposed to the voltage of the dry cell and balanced, the actual measurement is that of the dry cell circuit. Hence this measurement is entirely independent of the resistance of the circuit, including the thermo-couple, lead wires and galvanometer.

The potentiometer can be used with any length of leads desired, and the indications are entirely independent of line-resistance or changes in resistance due to atmospheric changes in temperature along the leads. The potentiometer has a disadvantage as compared with the milli-voltmeter method of temperature measurement in that some outside source of current, a dry cell and standard cell, for example, are necessary as a source of current and the dry cell must be replaced from time to time. The standard cell likewise is liable to injury if subjected to temperatures below 40° or above 104° Fahr. and the standard cells must be checked occasionally.

The claim is made that the sticking of the movable element of the milli-voltmeter may cause erroneous readings and that the potentiometer eliminates this. This statement is a fallacy in that the potentiometer also incorporates a galvanometer, and provided the galvanometer sticks, an erroneous reading is secured.

I recently developed and have been granted two patents on a type of portable precision potentiometer in which we use a spiral resistance winding for our slide wire. The total length of this spiral resistance on a cylinder 4 in. in diameter and 6 in. long is 8 feet. On a corresponding cylinder in the instrument the scale is in spiral form 8 feet long, in which the temperature can be read.

The operating mechanism moves the spiral wound resistance equivalent to the motion of the temperature scale and an index is designed to travel across this temperature scale dependent on the spiral line on which the temperature is read. Naturally with the 8 foot scale, exceedingly fine temperature indications can be secured. Our standard instrument graduated to 2000° Fahr., with base metal thermo-couple, is graduated to 2° Fahr. and can be easily read to a half in degrees Fahrenheit up to a total range of 2000° Fahr.

Potentiometer pyrometers are available in recording form, in which the mechanism automatically balances the voltage of the cell against that of the thermo-couples, and in this instrument the records are automatic and no hand balancing is required.

In either the milli-voltmeter or in the potentiometer type, recording pyrometers are available to plot a continuous record of the temperatures on a chart daily, weekly or monthly, as desired. The recording pyrometers are supplied either to make a single record on a chart, or with two or more galvanometers side by side making individual records on one recording sheet. Multiple recording pyrometers are also available incorporating a switching mechanism, which alternately connects the various thermo-couples to the galvanometer or milli-voltmeter in a recording instrument, and many records can be secured on one chart.

There are numerous methods of producing a record on the chart. The most common form is to use different colors for these individual multiple records, or by using for one record a single dot, for another two dots, the number of records can be multiplied. The records are made distinguishable also by dots, dashes and stars, corresponding to each record. In some instances the record is produced by jumping an electric spark through the record paper, and in others by a printing mechanism with numbers beside each individual record dot, corresponding to the particular thermo-couple recorded.

Where a recording instrument operates on the milli-voltmeter method the frictionless type of recorder is required and the pointer is depressed only momentarily at intervals on the recording chart. In the potentiometer type of recorder sufficient power is available from the motor operating the instrument to imprint a record directly on the chart.

Automatic signaling pyrometers have been used for some years in the larger heat-treating plants where it is desirable that the operator should not decide whether the temperature is correct or not, but should be signalled by lights, as to whether the temperature is within the correct limits. For some years it has been common practice to install a central indicating pyrometer with switchboard, and by means of three colored lights at each furnace, usually red, white and green, to signal from the central station whether the temperature is too low, correct, or too high. Usually 25° is considered a limit within which the temperature should be maintained.

(Continued next month)

*Read before the American Steel Treaters' Society.

TWO GREAT GUILDS

ONE hundred years before Columbus landed in America, there was established in England a guild of gold and silver smiths who, through pride of craft, established a mark whereby when a housewife bought silverware and saw on it the word "Sterling" she made her purchase with absolute assurance of value received.

Five centuries have passed since that mark was established. To-day it still remains an unerring guide throughout the English-speaking world, and woe betide the man or firm who misuses this mark "Sterling." The police of the world stand back of it.

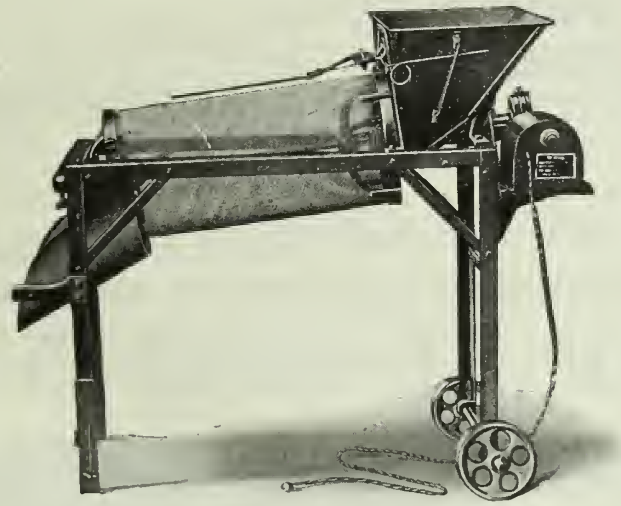
Only six short years ago there was established on the North American Continent another guild of craftsmen — another body of men with pride of achievement—the guild of Advertisers, Advertising Agents and Publishers.

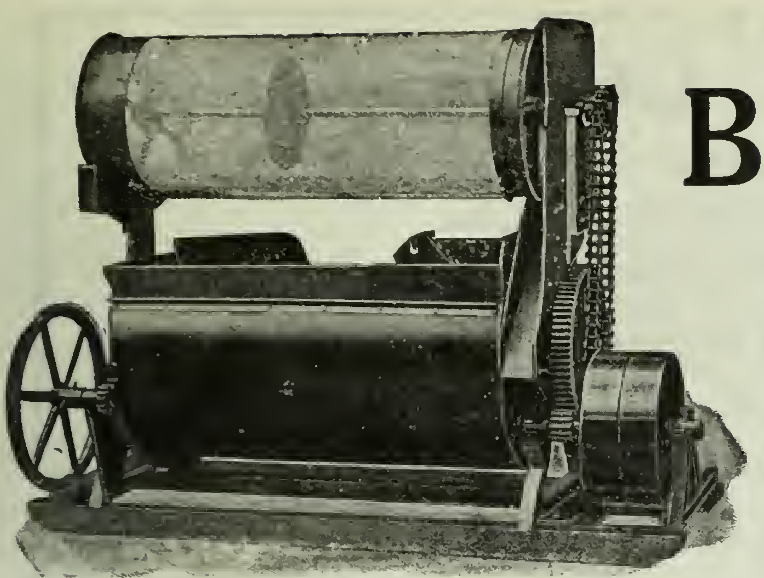
They, too, adopted a hall mark to designate an honest product in the business in which they were engaged.

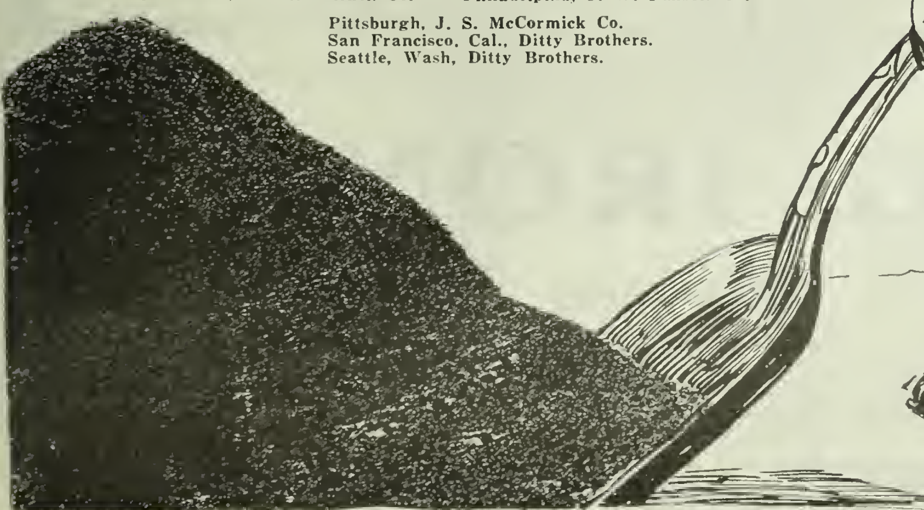
Sentiment, genius or instinct guided the adoption of the three great foundational letters A.B.C. as their insignia. In one respect alone did these two great guilds of craftsmen—separated in birth by over five centuries—differ. One determined the fineness alone, and left the purchaser to measure the weight. The other determined the weight but gave such specific information as would enable the buyer to determine for himself the degree to which that fineness applied to his own particular business.

A.B.C. stands for Audit Bureau of Circulations, and Audit Bureau of Circulations stands for absolute honesty in the preparation and presentation of circulation statements. The advertiser who buys space in a publication whose circulation is audited by the A.B.C. knows exactly what he is getting.

Canadian Foundryman and all MacLean Publishing Company papers are members of the A.B.C.







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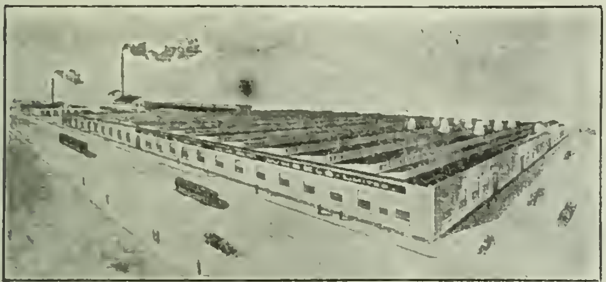

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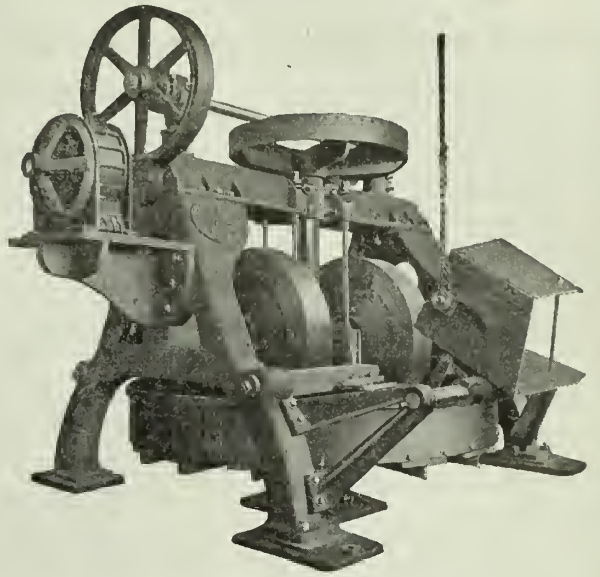

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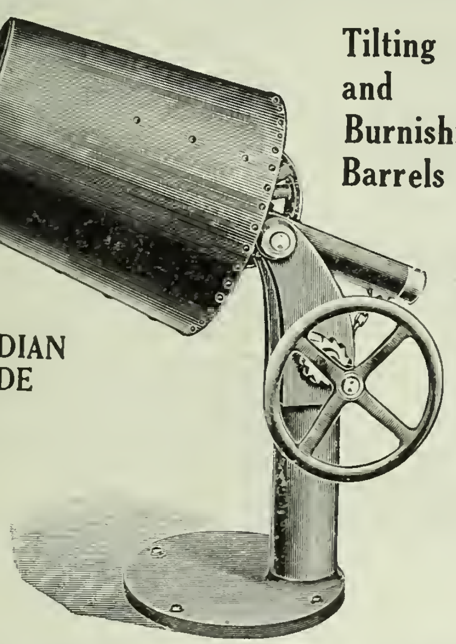

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COATS
F. H. Wheeler Mfg. Co.

CONTRACTORS' STORES
Ministry of Munitions, London, England.

CONVERTER BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.

CORE BARROWS
Sterling Wheelbarrow Co., Milwaukee.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOXES (STEEL AND WOOD)
Woodison Co., E. J., Toronto.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE DRYING PLATES, STEEL
Electric Furnace Construction Co., Philadelphia, Pa.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Reynolds & Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Tabor Mfg. Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Brantford, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.
CORE SAND MIXERS AND SAND MIXING AND COMPOUNDING MILLS
CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.
CORE REDUCERS
Wadsworth Core Machine & Equip. Co., Akron, O.
CORE TAPERING AND CUTTING-OFF
CORE TESTING MACHINE
Wadsworth Core Machine & Equip. Co., Akron, O.
National Engineering Co., Chicago, Ill.
CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
United Compound Co., Buffalo, N.Y.
Woodison Co., E. J., Toronto.
COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.
CUTTERS, CORE
Wadsworth Core Machine & Equip. Co., Akron, O.
CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Curtis Pneumatic Machine Co.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.
CRANES, HAND TRAVELLING
Curtis Pneumatic Machy. Co., St. Louis, Mo.
CRUCIBLES
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.
CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Roots Co., P. H. & F. M., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
DOWEL PINS
Diamond Clamp & Flask Co.
DRAINAGE FITTINGS
Crane Ltd., Montreal.
DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.
DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.
DRINKING FOUNTAINS
Crane Ltd., Montreal.
DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.
DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cleveland Nickel Works, Cleveland.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.
DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison Co., E. J., Toronto.
DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.
DOUBLE CYLINDERS
Curtis Pneumatic Machine Co.
DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
ELECTRIC DRILLS
Holden Co., Ltd., The, Montreal.
ELECTRIC FURNACES
Electric Furnace Construction Co.
ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.
ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.
ELECTRIC STEEL FURNACES
Electric Furnace Construction Co., Philadelphia, Pa.
Pittsburgh Electric Steel Furnace Corp., Pittsburgh, Pa.
ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
EMERY WHEELS—SEE WHEELS
ENAMELWARE
Crane Ltd., Montreal.
ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.
ENGINES, OIL, GAS AND STEAM
Holden Co., Ltd., The, Montreal.
ENGINES, STEAM
Ministry of Munitions, London, England.
ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.
ENGINEERS, INDUSTRIAL
H. M. Lane Co., Ltd., Detroit, Mich.
ENGINEERS (FOUNDRY)
H. M. Lane Co, The.
EQUIPMENT, CORE ROOM
Wadsworth Core Machine & Equip. Co., Akron, O.
FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
Obermayer & Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
FACING SAND MIXER
National Engineering Co., Chicago, Ill.
FACING SAND MIXERS AND SAND MIXING AND COMPOUNDING MILLS
Wadsworth Core Machine & Equip. Co., Akron, O.
FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md., U.S.A.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.
FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.
FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.
FERROUS AND NON-FERROUS METALS
Ministry of Munitions, London, England.
FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.
FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
FIRE BRICK AND CLAY
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Gautier, J. H., & Co., Jersey City, N.J.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FIRE CEMENT
Frederic B. Stevens, Detroit, Michigan.
FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FITTINGS
Crane Ltd., Montreal.
FITTINGS, CAST IRON
Crane Ltd., Montreal.
FITTINGS, FLANGED
Crane Ltd., Montreal.
FITTINGS, MALLEABLE
Crane Ltd., Montreal.
FITTINGS, SCREWED
Crane Ltd., Montreal.
FLASK FITTINGS
Diamond Clamp & Flask Co.
FLASK PINS
Sterling Wheelbarrow Co., Milwaukee.
FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Diamond Clamp & Flask Co.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Mussens, Ltd., Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Sterling Wheelbarrow Co., Milwaukee.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
FLEXIBLE JOINTS
Holden Co., Ltd., The, Montreal.
FORGINGS
General Combustion Co., Montreal.
FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY CONTROLLED AIR HOISTS
Curtis Pneumatic Machine Co.
FOUNDRY ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.
FOUNDRY EQUIPMENT
Diamond Clamp & Flask Co.
Frederic B. Stevens, Detroit, Michigan.
Magnetic Mfg. Co., Milwaukee, Wis.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison Co., E. J., Toronto.
FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY MIXERS
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FOUNDRY PRACTICE
McLain's System, Inc., Milwaukee, Wis.
FOUNDRY PLATES, ETC.
E. C. Atkins & Co.
FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.
FOUNDRY SUPPLIES
FOUNDRY WEDGES
Sterling Wheelbarrow Co., Milwaukee.
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Michigan.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.
FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Woodison Co., E. J., Toronto.
FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
General Combustion Co., Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pittsburgh Electric Furnace Corp., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.
FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Caward Gaskill Furnace Corp., Chicago, U.S.A.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.
FURNACE BLOWERS, ROTARY
Roots Co., P. H. & F. M., Connersville, Ind.
FURNACES, ELECTRIC
Electric Furnace Construction Co.
FURNACES, STEEL
Caward Gaskill Furnace Corp., Chicago, U.S.A.
ASBESTOS, DUCK AND LEATHER GLOVES
Frederic B. Stevens, Detroit, Michigan.
GAGGER MOLD, AIR COOLED CORE MAKING MACHINES
GLOVES
F. H. Wheeler Mfg. Co.
GOGGLES
Berger Machine Co.

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.

GRAND ROTARY SAND RIDDLE

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRAY IRON
Magnetic Manufacturing Co.

GRINDERS, CORE
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Wadsworth Core Machine & Equip. Co., Akron, O.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Michigan.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT, ANGULAR
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Frederic B. Stevens, Detroit, Michigan.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEAT TREATING
General Combustion Co., Montreal.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Woodison, E. J., Co., Toronto, Ont.
F. H. Wheeler Mfg. Co.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Ltd., Walkerville, Ont.

HIGH DUTY
Magnetic Manufacturing Co.

HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Northern Crane Works, Walkerville.
Woodison, E. J., Co., Toronto, Ont.

INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison Co., E. J., Toronto.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOINTERS
Oliver Machinery Co., Grand Rapids, Mich.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOURNAL BOXES
Holden Co., Ltd., The, Montreal.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

KNOCK KUT POWER HACK SAWS
E. C. Atkins Co.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Frederic B. Stevens, Detroit, Michigan.
F. H. Wheeler Mfg. Co.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Ministry of Munitions, London, England.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC PULLEYS
Magnetic Manufacturing Co.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

MALLEABLE IRON
Magnetic Manufacturing Co.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METAL CUTTING BAND AND SAW MACHINES
E. C. Atkins & Co.

METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLS, SAND MIXING AND COMPOUNDING
Wadsworth Core Machine & Equip. Co., Akron, O.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Michigan.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Frederic B. Stevens, Detroit, Michigan.
F. H. Wheeler Mfg. Co.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDS, GAGGER
Wadsworth Core Machine & Equip. Co., Akron, O.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Berkshire Mfg. Co., The.
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