WORK

An Illustrated Journal of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

VOL. IV.—No. 173.] SATURDAY, JULY 9, 1892. [PRICE ONE PENNY.

WORK WORLD.

A NEW method of soldering aluminium is before us. The surfaces to be soldered are sprinkled with chloride of silver, and the solder is then melted down as usual.

* *

Long-distance telephones are now so reliable that St. Petersburg and Moscow are to be brought into communication by this method. The distance is 409 miles.

* *

A tramcar which owes its motive-power to the expansion of ammonia from the liquid to the gaseous state is now being tried experimentally in America. It runs eighteen miles with one charge of ammonia, the pressure obtainable being about 150 lb. per square inch. The spent gas, moreover, is absorbed by water, from which it can be extracted and used over again. The car takes two minutes to recharge, and is noiseless.

* *

Chrysoprase jewellery is one of the latest things out. This apple-green variety of chalcedony makes up into light, tasteful articles, particularly if a few small diamonds and rubies are added. Not being a bright stone itself, it needs them to set it off to advantage. It is introduced, doubtless, to succeed the moonstone, which has had so long a run. The moonstone possesses, however, an amount of life—a change or play of light that is—of which the chrysoprase has not a vestige.

* *

We can yet hold the first position in shipbuilding, or the French Government, which required a gun-boat to be built within forty days, would not have sought out Messrs. Yarrow, who built it in twenty-three days! It is 100 ft. long, 18 ft. beam, and draws 18 in. of water. It has two decks, and is fitted to carry seven quick-firing guns throwing shell loaded with bullets. It is propelled by paddle-wheels astern, and will carry 400 troops. On a trial trip a speed of nearly ten miles an hour was attained.

* *

The notion of a two-stone has been introduced into America for engagement rings. If the stones are chosen so as to represent the supposed good qualities of the engaging parties, somebody will have to look up Theophrastus, who divides precious stones into male and female orders. The Oriental ruby is said to be male, while the spinel ruby is female; with sapphires the deep blue is the male, the pale blue the female. These and other gems are credited with wonderful merits and properties.

* *

The Government of Holland is considering the project of draining the Zuyder Zee. It has an area of 760 square miles. It is proposed to construct a dam from the mainland on each side of the island of Wieringen, then to divide the enclosed area into four parts and drain them successively. The dam is estimated to cost over three and a half millions, and the drainage thirteen millions, the time occupied being thirty-two years. The machinery would be made in England.

* *

In two new photographic developers, the Amidol and Metol, the former has claim to novelty in that it energetically develops the images on gelatino-bromide of silver plates with an acid reaction of the solution, while an alkaline reaction is not only useless but prejudicial. The Amidol acts as a faultless rapid developer as well as a slow one. The Metol acts with the alkaline carbonates as a very energetic, clean, and quick working developer for gelatino-bromide of silver plates, and also weaker for chloride and chloro-bromide plates.

* *

When stiff boot toes are made, workmen bring the stiffening over the top of the toe. This is a mistake, and one which, it would be thought, practical men would not continue to commit. The vamp, cap, and lining, or even the stiffener itself, make a very hard substance to press upon the great toe nail. All that is necessary is that it shall be as high as the last is thick. This prevents the leather from falling into wrinkles—all that is asked of a block toe—and saves dame Nature the trouble of adapting herself to surrounding circumstances, by creating an ingrowing toe nail.

* *

Glasgow boasts the two tallest stacks yet built—St. Rollox, 435 ft. above ground level; and Townsend's, 454 ft. above ground, or, with the addition of the iron crown on top, 474 ft. The Germans claimed to have the highest stack in the world, but when they said so they had not heard of Townsend's. A noted steeple-jack is now employed to point the Townsend chimney from ground to top, which he does by means of ropes suspended from the top, on which is hung a "Bosun's chair." The surface to be pointed is 6,000 square yards, which it will take three months to execute.

* *

The work of the Mint is extensive. During the year 1891, 142 tons of gold bullion were melted and cast into sovereign and half-sovereign bars; and 237 tons of silver were melted for the Imperial coinage and for medals. Many experiments have been made in this country and abroad to ascertain the wear of gold coin, but trials in special apparatus are no criteria of wear in ordinary use. It appears that on the average it takes twenty years to reduce a sovereign to its least current weight. A new series of alloys of aluminium and gold is of interest from the intensity of the colours, which varies from yellowish-green to purple.

* *

A new retort house at the Rochdale gas-works is built on an entirely new system, which, if it becomes general, will do away to a large extent with that white slavery—gas stoking by hand. The coal is fed into a hopper on the ground level, and passes between toothed rollers which break it up into small pieces. It then falls into a pit, in which two series of buckets, mounted on an endless chain, revolve. These buckets convey the coal upwards to a height of about 35 ft., and discharge themselves into another hopper, which has a sliding bottom. Under this is a railway running the whole length of the retort house, along which runs a carriage capable of holding enough coal to charge two retorts, and having a spout at the bottom reaching to the opening of the retorts below, so that a man at the top to load the carriage, and one at the bottom to open the retorts, can manage the stoking for the whole. The coal falls in and "stokes" itself. The retorts are placed on an incline of about 30°, and when it is time to discharge the coke they are opened at the lower end and empty themselves.

ABOUT WORK AND POWER.

BY W. C. CARTER, M.I.MECH.E.

THE STEAM-ENGINE INDICATOR.

THE invention of the indicator is attributed to the genius of James Watt, though some detractors have suggested that he stole the idea from a workman in his employment. However that may be, the discovery was a stroke of true genius, and from his achievements in other directions the probabilities point to Watt as being certainly one of the few men of that day from whom we might expect such a masterly idea.

The indicator is a machine which traces automatically a line diagram upon a card which possesses most interesting features. From it we can obtain almost all the information we want about the action of the steam in the cylinder, and it has been well compared to the stethoscope of a doctor, by which internal complaints may be diagnosed.

The diagram is confined to the operations of one stroke of the engine, and therefore its indications have to be multiplied by the number of strokes in a minute to find the Power developed, as they do not show any *time* data, which, we have seen, are necessary to the question. The diagram then shows us simply the work of each stroke, and therefore contains only two elements—Pressure and Distance. Referring to Fig. 5, supposing that we make the vertical lines to represent lengths of stroke of piston, we shall, by suitably combining them, form an area which shall represent by its surface the amount of work. For example—if A B is made to represent 5 lb. pressure on piston, and A D is made to represent 6 ft. stroke of piston, the work done is $5 \times 6 = 30$ foot-pounds; but if we multiply the side A B (= 5) by the side A D (= 6), we get an area of 30 square units of some kind, so that it is clear that the area of the complete figure does really represent the amount of work, just as we know that geometrical truths can be illustrated by arithmetical examples, as they are all a part of the exact science of mathematics. Thus our arithmetical operations in finding the work can be exactly reproduced by combining two dimensions into an area as in the figure. We see in Fig. 5 that the full pressure is maintained to the end of the stroke, as the pressure line, B C, remains parallel to the base line, A D. The line B C is, of course, formed of an infinite number of points which are the ends of imaginary vertical lines, each representing the pressure at that particular part of the stroke.

Suppose, now, that at half-stroke (E) we cut off the steam and the pressure begins to fall from the point, F, an expansion takes place, then the line, F C, will also drop as the vertical measurements become constantly less, and we then get the hyperbolic curve (approximately) of the expansion of steam as shown dotted.

Our argument still holds good, though the figure is no longer a rectangle, and the area is still proportional to the work developed, whatever shape the card becomes. It will be beyond the scope of this paper to go into the many points indicated by this wonderful instrument, such as valve-setting, compression, weight of steam used, etc., but we have said enough to show how it is that we can obtain a graphic and automatic representation of the work done by the steam.

Of course, it would be awkward to have a card as long as the stroke of the engine, so it is usual to drive the indicator from some point, the motion of which *corresponds* to that of the piston, but does not exceed about 5 in. altogether. The vertical scale is controlled by the compression of a spring, which can be changed at will. All that we have to remember is that, according to the scale of reproduction, our diagram is *proportional* in each way to the piston stroke and the pressure. We have in Fig. 6 a general view of a Richard's Indicator.

The vertical barrel, A, carries the card, and revolves upon its axis driven by a cord

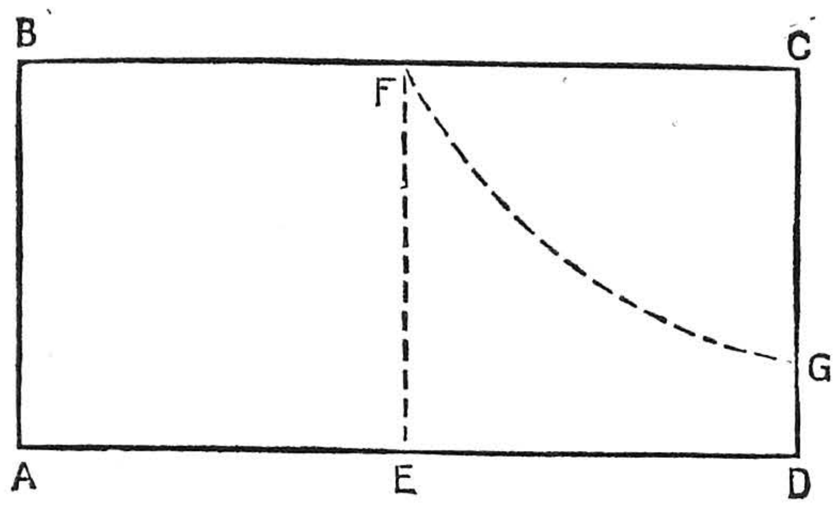


Fig. 5.—Diagram showing Work of Stroke.

attached to some suitable point with a stroke of about 5 in. Adjacent to the barrel is a small steam cylinder, B, containing a piston, which is open at the lower end to the engine cylinder, so that any steam therein can act upon it. The piston-rod, C, which carries, by means of the parallel motion, D, the pencil or marker, is kept down by a spring acting upon the piston in the cylinder, the strength of which is tested and known.

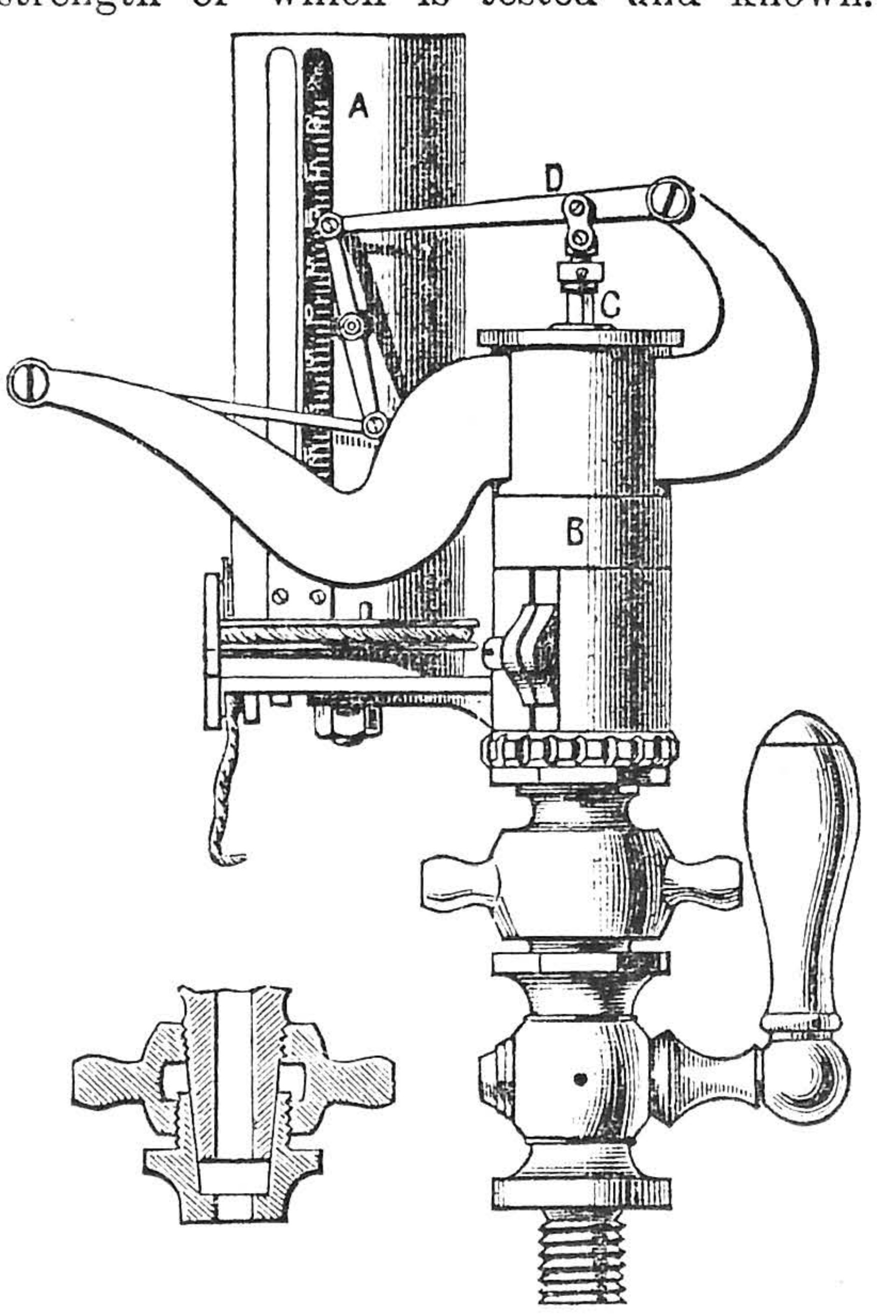


Fig. 6.—View of Richard's Indicator.

Supposing the spring to be what is called $\frac{1}{32}$, we know then that every inch it is compressed will represent a cylinder pressure of 32 lb., and so for other scales. 32 lb. pressure in the cylinder will compress the spring 1 in., and draw a vertical line upon the card of that height (A B, Fig. 5). Then as the stroke proceeds, and the pressure is maintained, a horizontal line will be drawn as at B F, Fig. 5. Steam is then cut off, pressure and marker begin to fall, and the combined vertical and horizontal motions produce the curve, F G. Then on the return stroke the exhaust opens, the pressure falls to its lowest point—we may call it zero for our purpose here—and the line, D A, is traced, completing the diagram. To find the work indicated, all we have to do is to take a series of vertical measurements, strike an average, refer to the scale of pressure, and thus find the mean pressure exerted by the steam during the stroke. The work done is then in one revolution—Mean pressure × piston area × twice the stroke; and in one minute, M.P. × area × 2 stroke × revolutions per minute; and therefore, to find horse-power, we get the formula—

$$\frac{\text{M.P.} \times \text{A} \times 2 \text{ Stroke} \times \text{Revolutions}}{33{,}000}$$

We thus find the horse-power in the cylinder, and when we have found the brake-horse-power by the method described on page 194 we have all the efficiency data we need to find the modulus.

We now conclude our brief discussion of this all-important and all-pervading subject of the indestructibility of energy, and it is hoped that these articles may, perhaps, place familiar problems in a new light, and that they may suggest to the reader many applications of their truth that have not occurred to him before, and also possibly save him from attempting to circumvent inexorable nature by bewildering but futile complexities of mechanism.

BOOT AND SHOE MAKING.

BY WILLIAM GREENFIELD.

THE PRINCIPLES OF LASTING.

The Principles of Lasting.—In my last paper I left you with the inner soles fitted, blocked, holed, etc., on the lasts, and ready to receive the tops you will have bought.

The tops should be judged as to which is the best for each particular foot, putting the best part of the vamp—the stoutest or tightest—where you, or whoever is going to wear them, wear most. This is generally on the outside, though some people put undue strain upon the inside. This is occasioned by a spring in the walking, or through letting the heel tread over on the inside; so when this is known to be the case, the best part of the vamp must be put inside.

The upper should now be laced up as far as the bend or throat—that is, where the eyelets finish and the hooks start. This is done to prevent it flying open while it is being lasted and sewn. The stiffener—for you will only last one boot at a time—can be pasted on both sides. Judge the half of it, and put it into the upper between the lining and the outside, letting the centre be against the back seam of the golosh. The dotted line A (Fig. 1) shows its position in the boot. You then place the last upon your knees, inner sole downwards, with the heel to the left and the toe to the right. Place the top on the last, and pull it over at the toe with the right hand; place it at the back, so as to get the back seam exactly in the centre of the back of the last, covering at this portion only about two-thirds of the last, as shown at D. This is called "horsing."* Then turn it over, bottom upwards, holding the toe firmly with the right hand; place the heel between the knees, change the left hand for the right at the toe, and, with the pincers in the right, draw the toe of the upper over the toe of the last very tightly, taking care that the back seam and centre of the vamp and toe are quite straight on

* Horsing is hoisting the back of the heel. It enables you to last the boot more forward, and to throw that draft into it which it would be very hard to get by the use of the pincers only.

the last. Then hold the upper firm with the left to where you have pulled it, and place the forefinger on the spot where the pincers are, and hold it there till you can put your first tack in at A (Fig. 2). This is the plan of the sole of the last, with the tacks numbered in alphabetical order, to show each time a tack is put in, and which is the proper order to put them in.

The leather is then pulled over, and a tack put in at B and B, each time working a reasonable and equal portion of stuff between each two tacks. These three lasting tacks*—in fact, all tacks in lasting—are put in right through everything, and into the last enough to keep the work solid; for although they are there only temporarily, they have to remain till the boot is sewn and the stitch takes their place.

Now, if the upper be quite straight upon the last, the next two tacks to be put in are C and C (Figs. 1 and 2). These are called draft tacks, as they put and keep what is called a draft in the boot or shoe. This draft is got by pulling hard with the pincers in a direction from the top of the stiffener, as shown by the line E E. It is also to get this draft that the upper is hoisted at the back, for when the whole of the fore part is lasted, and the back or heel of the last knocked down into its place, it must necessarily form a line of tightness at E E, and it is this line of tightness which is called draft. The side linings are now put in between the lining and outside, only they are not pasted; their position is indicated by the dotted line, F.

The prime principles of lasting are tight lasting, the drafting out of all the wrinkles and pipes at the toe and C, and equal pull at all parts—one side equal with the other—for it is this evenness of lasting which makes the boot look clear and set nicely when it is finished. If lasted properly, it will look, when the last is out, as though the last had not really been withdrawn.

The two tacks, D and D, can now be put in—they will hold the side lining firm; and while lasting up the sides or round the heel, you must always see that you get the lining lasted tightly; otherwise, when the boot is finished it will set in puckers and hurt the foot.

It will be seen that the top does not touch the last at G, but it must be lasted, first on one side and then on the other, until all this foulness is away, or you will have your work a size too large when finished.

When you have got all the tacks in the fore part as far as E E (Fig. 2), the heel of the last can be knocked down into the upper until the bottom of the golosh is just above the insole, for at the seats it does not need much to last over. Sewn seats and pegged seats I shall deal with later on. The waist and seat can now be lasted similarly to the fore part, but these need not be pulled so hard, especially the waist. In fact, in the case of a shoe it will only be necessary to pull it over with the thumb and finger, or you may pull all the draft from the quarters, and thus make them baggy at the sides in wear.

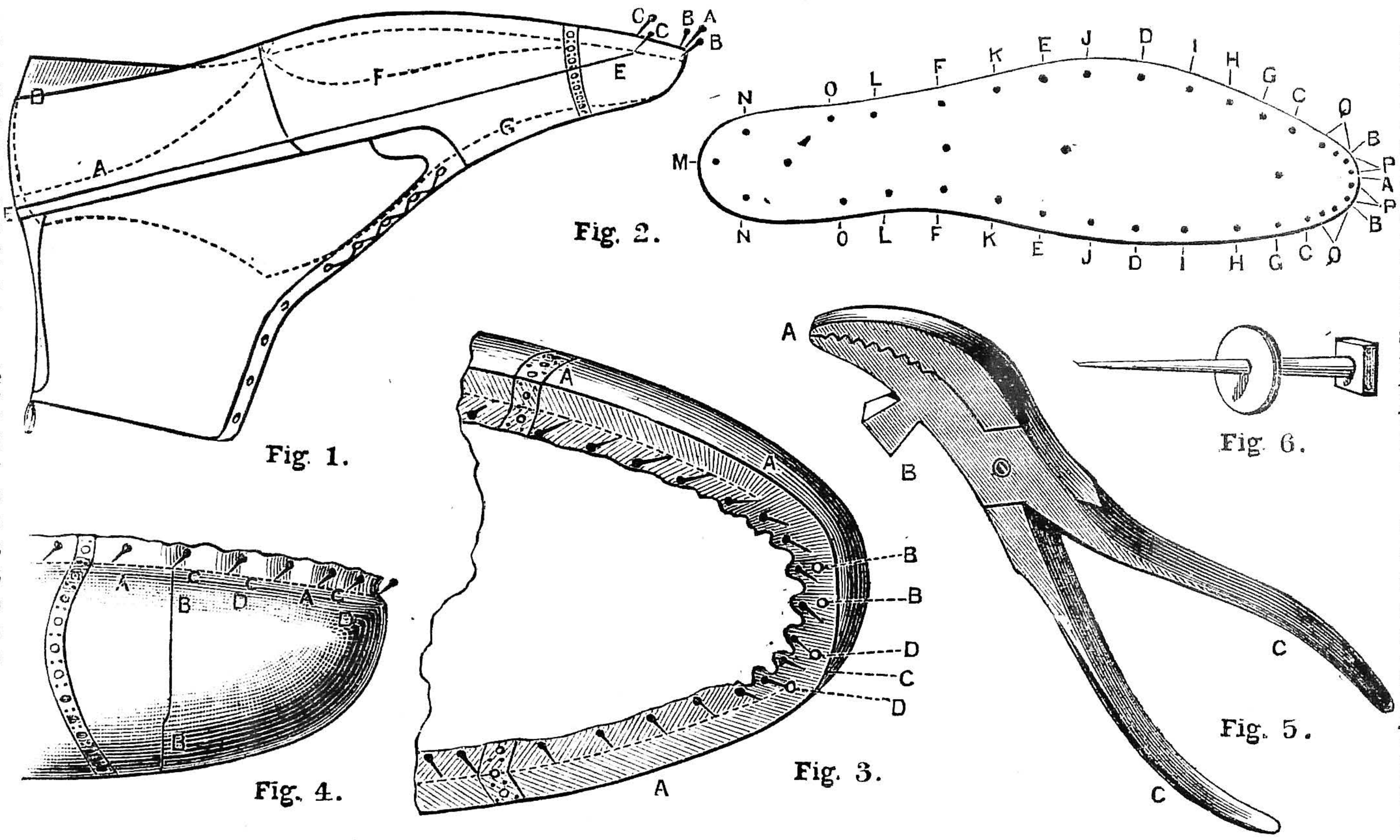
Should you be lasting somewhat heavy leather, its stoutness will cause it either to set away from the last or form itself into wrinkles at the heel, and even up the sides. If this prove so, before you start to sew in seat or welt all these wrinkles or pipes must be got clear away. I shall fully explain this in lasting the toe, for the toe is a portion that will always form itself into wrinkles; and though the other parts will not need so much humouring, its treatment is exactly the same.

Now you have the last in the upper, and, with the exception of the toe, the boot is lasted. We will now proceed with the toe, which can, after you have got the first three tacks in, be very well left till the end, if you do as has been described. You will have gained practice and confidence, and this will enable you to spend as much time as you can spare upon the most important part, the toe, which, if not well and properly lasted, gives a boot or shoe, both before and after wear, a very ungainly appearance.

In lasting a toe there must necessarily be a lot of wrinkles, and as you put in each tack a "pipe" forms between it and the one next to it. Now, to last a toe properly, as much foul stuff must be got round the toe end as you possibly can, and this is where it must be lasted away: which means that you must pull as much stuff to the toe as you can in putting in the draft tacks. All must be lasted away between them, dividing the stuff as equally as you can between A and B and B and A, and also between B and C on either side. The two parts, P and G, will take a little care to last them well, but, as I have hinted, negligence here causes great defects before wear; because, if these wrinkles be not lasted out, a dreadful appearance of unevenness is given. Then, after wear, the toe falls in, and this sometimes all on one side. Thus, if the toe be lasted well at the outset, it will keep up and look smooth till the boot is worn out.

In lasting, the next thing is to tap the upper all round with the hammer at A A and A (Fig. 3). This will hammer out all the wrinkles that the "pipes" have caused in this region, and will have to be done each time a tack is put in or altered on the top.

Previous to putting in each tack, the leather must be pulled quite hard. This is done according to the substance of the tops; the stouter they are the harder work it will be to last them. Fig. 5 shows a pair of shoemaker's pincers, A being the jaws with which to hold the leather while you lever the leather over, making B, the fulcrum, rest on the inner sole, while you pull and press upon the handles C and C, holding them quite firm, that you may have a proper grip of the leather. When it has been pulled enough, hold it in its place with the forefinger of the left hand until it has been made secure with a tack or rivet.



Boot and Shoe Making. Fig. 1.—Top in Position for Lasting, showing Draft and Draft Tacks. Fig. 2.—Plan of Sole, showing the proper place for Tacks and their right order of using. Fig. 3.—Bottom View of Toe lasted. Fig. 4.—Side View of Toe lasted. Fig. 5.—Shoemaker's Pincers. Fig. 6.—Lasting and Sole Tack.

You can hardly have too many tacks in the toe. You want to keep putting them in until all the pipes and wrinkles are out, and the toe quite clear as far as the dotted line A A. (See Fig. 4).

I will now tell you what is technically meant by "pipes" and "wrinkles" in lasting. These are merely the hills and valleys that leather will form itself into where there is surplus stuff. This foulness must be lasted away as explained above. If a V-shaped piece of leather was cut out of each pipe when you had it lasted, as far as shown in Fig. 3, you would be able to tap it down, and in this way get out the wrinkles and pipes. This is sometimes done, but only by slovenly workers. No good seatsman* would think of resorting to such inferior

* Fig. 6 is a lasting tack—Scotch ones are best. ⅜ in. rivets will answer the purpose for light or medium work.

* Seatsmen: hand-sewn makers only.

means, for, although it looks very well at first, the result, when finished and in wear, is far from satisfactory.

It often happens in lasting a toe it is harder to get a wrinkle out clear than it is to manage a "pipe," because if another tack is put in in the centre of the pipe—that is, between two tacks or the two wrinkles which two tacks have made—at B B (Fig. 3), this tack will help to last the pipe out. Then with a tap or two with the hammer it can be got clear away. Either of these means is useless for a deep wrinkle. The tack that has formed the wrinkle, as C, must be taken out, and an awl put under to push it out, so that a "pipe" is formed. The two tacks must be put in at B and B, and then the pipe can, as before, be tapped out easily.

When there is a toe-cap, the vamp should be lasted first. The toe-cap can be turned back while this is being done as far as the line B B (Fig. 4). The vamp can be treated as above, and should be done as well as if it was not going to be covered up with the cap; in fact, to give it an extra fine finish before the cap is put back into its place for lasting, the vamp can be lightly filed or rasped round in front of the tacks at C, C, C on the top, and at D, D round the edge, and then hammered again at both places. This will make an even surface to last the cap upon.

In hammering the upper, do not give heavy blows, but, as I have said, only "tap" it. This can be done well all round the boot, especially at the toe, where there is a double substance, at the sides, where the side linings are, and at the heel, where are the stiffeners. This will all help to keep the boot in its place when made.

When a top is very hard to last, and there is difficulty to get it close down to the last in front—especially if the last is very hollow here, or the tops are heavy—it is best to last it down as follows:—Take half of a pair of medium welts (a half is quite sufficient, and then the remaining half will do for the other boot), and make a hole in one end: then get two sole tacks* or two large lasting tacks; cut two little round pieces of stout sole leather, and drive the tacks about half-way through, as at Fig. 6. Put the end of the welt with the hole in it at one side of the boot, and nail it there with one of the tacks, knocking it in down to the round piece of leather. Hold the boot firmly with the left hand, and pull the welt on the other side with the pincers, letting the piece of welt come right across the vamp, and when you see you have got any of the fouIness away, put a tack in the vamp, or put the other sole tack in through the piece of welt and vamp as well, until you have put a tack in each side of the piece of welt, that you may take out the sole tack and liberate the welt while you are trying again to get more purchase, and the upper tighter to the last. This system is also very good for the waist when that is hard to get in. Although you adhere to the same principle, however, the mode of treatment is different, for in lasting the fore part, if you cannot get it tight enough with the pincers, you can give the two sole tacks a knock sideways, which will send their heads nearer together over the inner sole, and so tighten the tension of the welt. In the waist the welt does not go over the upper, but simply across the inner sole, from F to F (Fig. 2). To tighten the upper in this case—for although I have said tops need not to be lasted much in the waist, it often happens that they are cut so small that some means like the above must be resorted to—you must put a chisel or file under the welt, and gently lever it up while you knock the tacks sideways; but the tack must not only be knocked aside, but at the same time be sent a little further in. This, as this tack has the piece of leather on it, will prevent the tack from breaking away from the upper. Before leaving this chapter I must impress upon my readers and workers the necessity of thoroughly mastering the principles of lasting, for upon this so much of the beauty of a boot or shoe depends. In my next paper I shall hope to describe the way to fit the welts, and the method of making threads.

* Sole tacks are like lasting tacks, only larger.

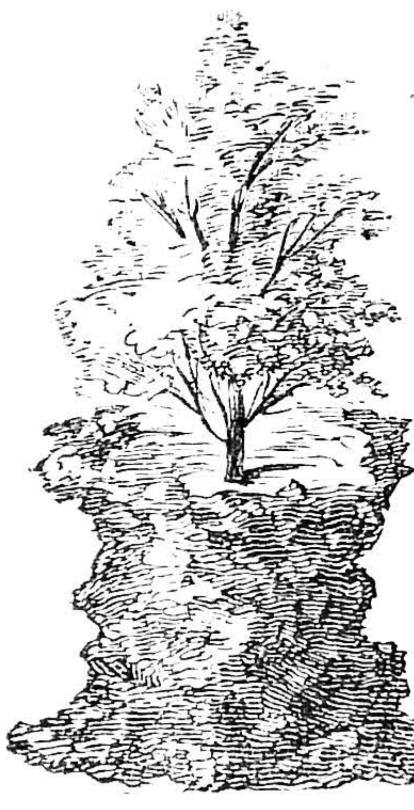


Fig. 5

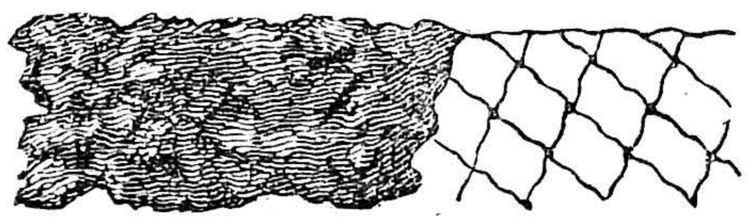


Fig. 7

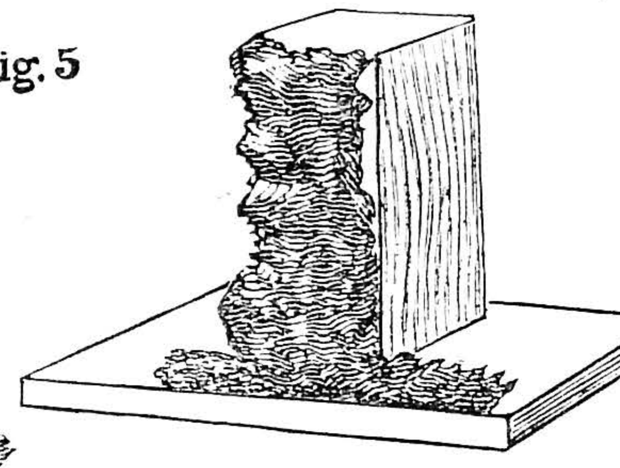


Fig. 6

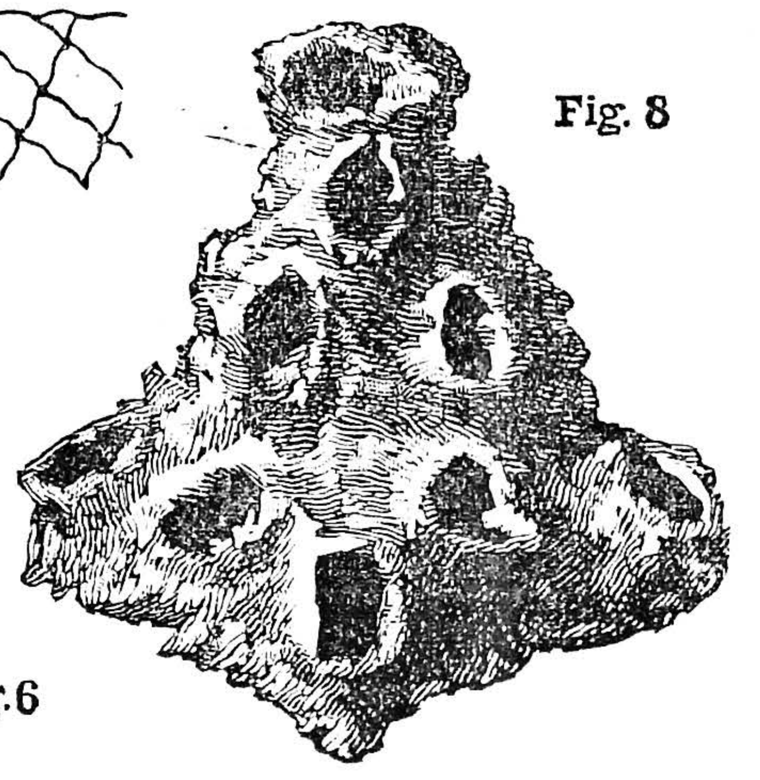


Fig. 8

Fig. 5.—Rustic Vase. Fig. 6.—Method of constructing on Mould. Fig. 7.—Rustic Bordering. Fig. 8.—Rustic Pyramid.

SIMPLE UTENSILS FOR THE GARDEN.

BY C. MAYNARD WALKER.

RUSTIC VASES—POTS—BORDERING.

WHILE it is perfectly true that the chief ornaments in a garden, of whatever size, should be the plants and flowers themselves, it is pretty generally admitted that the pleasing effect of a flourishing garden is materially assisted by a few artificial surroundings judiciously applied.

The object of the present article is to describe a very simple method of producing a great variety of appropriate objects for this purpose at a trifling expense, the materials used being Portland cement, sand, and ordinary gas-coke.

Fig. 5 shows a rustic vase made of these materials to any desired size, and will be found very suitable for corners of beds, centre of wide walks, steps, etc., is practically imperishable, and improves in appearance with age. The process of manufacture is this: Ordinary gas-coke is broken up into suitable-sized pieces, about the size of a hen's egg, and dipped into a thin batter of Portland cement (these are laid aside until wanted); then, having decided upon the size and shape of the required vase or pot, it is made up as shown in Fig. 6. For the mould for the inside take any suitable object, such as a deep pickle-jar or other culinary vessel, preferably of a taper form; cover it with two thicknesses of old newspaper (this is to avoid contact with the cement); turn the mould upside down upon a sheet of paper, and proceed to build up (as Fig. 6) by sticking the pieces of bathed coke together with a mixture of one part of Portland cement to three parts of sand, using sufficient water to make it into an easily-worked, pasty substance, somewhat thicker than cream, but not so thick as mortar. So soon as the work has been built up and is *well set*, turn it over and build up the base (as Fig. 5), and afterwards withdraw the mould, and finish off with a few touches here and there of cement; sand may also be sprinkled on while the work is wet.

A rustic pyramid (Fig. 8) is made upon a similar principle, differing only in the details. Decide upon the size of the pyramid you wish to make and the number of pot-pockets; then get a circular piece of zinc or tin-plate, rather less than the diameter of the base, and to it solder an upright cylinder for the centre support; begin building up with larger rough pieces for the base; cover some ordinary flower-pots with newspaper, if you wish to withdraw them, if not, use them bare; lay them on the slant, and build up more rock-work; then lay another tier of pots and more rock-work until a rustic pile is made up pleasing to the eye. This will be found very useful for many positions. Any size and any shape of pots may be made up in the same simple and expeditious manner.

Fig. 7 represents a portion of a rustic bordering, which will be found very suitable for large or small gardens. I have frequently noticed that in many cases where the owner of a garden has not been able, perhaps, to afford stone or pottery edges, a good deal of labour and expense have been expended upon wooden borders, with the result that they are very ugly and unsatisfactory, and in a very short time become rotten. Fig. 7, however, is practically imperishable, and is very cheap, and may be made by anyone. The work is somewhat similar to the foregoing, except that it is constructed *in situ*, and the core is a strip, say, of 3 in. or 4 in., of wide-mesh galvanised iron-wire, upon which the coke is cemented, producing a serviceable and continuous bordering in any direction required.

The same kind of work may be advantageously applied to the construction of raised beds or banks near walls or pocketed rock-work upon walls, and the covering up of places which would be otherwise eyesores in or around the garden.

I may say that I have used this work for many years in all sorts of ways, and nothing could be more suitable for the purposes in view. Of course, Nature will in time clothe this rock-work with a minute vegetation, which will give it all the colour it needs; but at first it presents a rather raw appearance, which can be toned down by applying very sparingly a little colour—green, brown, or red—mixed with boiled or linseed oil, just enough to take off the raw colour of the cement. For the bordering and for banks, walls, or other work of a similar description, as much as five or six parts of sand may be used to one of cement.

HAND WORKING OF SPECULA FOR THE NEWTONIAN TELESCOPE.

BY EDWARD A. FRANCIS.

Rough Shaping the Concavity—Stroke and its Effects—Fine Grinding with Emery.

The tool being fastened to the centre of the bench (Fig. 8, page 115), the first task, that of roughly shaping the concavity, may be attempted.

A handful of wetted sand, or a lesser quantity of grain emery, should be spread evenly on the tool, and over this the speculum should be pressed down and moved to and fro with long, swinging, deliberate strokes, the greatest care being taken that the centres of tool and speculum coincide at each stroke. The workman should also move slowly round the bench, in order that no two consecutive strokes may be given in the same direction. When it is felt that the sand or emery no longer cuts, it may be washed off with a sponge and fresh material supplied. The centre of the speculum and the edge of the tool will first become deeply scratched, and then actually worn away, but the grinding must be continued until the concavity of the speculum fits the convex metal gauge (Fig. 11, page 183). The gauge should, of course, be applied vertically and diametrically. It is better that the curve should be a little too deep than too flat, for it will flatten slightly in the first stages of the fine grinding.

Water must be freely used. In no circumstance should dryness be tolerated. After the rough grinding is completed, the glass and the bench must be scrupulously cleaned. The presence of a stray grain of coarse emery or sand during the later working might be disastrous, for which reason it is best to use a quite fresh sponge for the finer processes. The rough cutting of the concavity of a $5\frac{1}{2}$ in. speculum should be completed easily in from four to five hours.

The desired final curve is given to the speculum by judiciously varying the length and variety of the movement of the speculum over the tool, and the skill of the workman lies almost entirely in a knowledge, gained by experience, of the exact effect of any given variety of stroke on the concave surface.

Since a long, swinging, straight stroke has been shown to best cut away the centre of the speculum, it follows that a shorter stroke will cut the surface more evenly, and for this reason a short stroke is adopted, generally, throughout the fine grinding.

A straight stroke of one-third or one-fourth of the diameter of the speculum will tend to equalise the wear and keep the concavity spherical. Any stroke greater will tend to deepen, and any lesser stroke will tend to flatten, the curve. But it is desirable at intervals to work for a short time with an irregular stroke, in which the centre of the speculum wanders erratically from the centre of the tool. Such a stroke is illustrated in Fig. 12, which is the reduction of a tracing from a Rosse machine.

The short curved stroke, which will be hereafter referred to, is illustrated in Fig. 13, which shows the path of the centre of the speculum over the tool.

With this knowledge we may proceed to the fine grinding.

The roughly cut surface of the glass has to be smoothed by working with the successive fine grades of emery powder. At first unwashed flour emery may be used until the glass presents a fairly uniform appearance—that is, until the coarse scratches or pits left by the sand begin to disappear. Then the graded emeries must be resorted to.

The object of the first emery grinding being to reduce the scratches left by the sand, so the object of each successive grade is to reduce the scratches of the preceding grade, and thus the workman may decide, by examination, when the time has arrived to change any given grade for the next finer. A "wet" of well-prepared, good emery should work for from ten to fifteen minutes before its cutting power is lost.

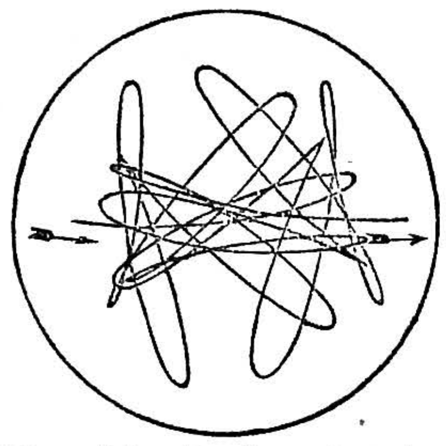


Fig. 12.—Reduced Diagram showing Irregular Stroke.

The best stroke will be one-third, and scarcely any pressure will be needed; the speculum for the rest of the working being always guided rather than pressed down. As the fine grinding reaches completion, the stroke should be reduced to one-fourth, and an occasional irregular movement may be introduced, because the danger of working the concavity out of centre will have passed.

Very little emery will be required for each "wet," and the lesser the quantity used the better will be the workmanship.

The actual process is as follows:—Emery wetted to the constituency of cream is carefully spread over the tool, the tip of the finger being used to detect and remove grit. The speculum is then placed centrally over all, and at once pressed hard down in order to crush any large grains of mineral which may have escaped notice. Two or three short circular strokes are then given to distribute the abrading material, and then work with straight strokes is maintained, the wetted emery, at first chocolate in colour, being felt to distinctly cut the glass. But the chocolate colour slowly changes to grey as the fine glass becomes incorporated with the emery. Finally, the cutting sensation ceases entirely, and the speculum moves as on stiff grease. It is then slid (not lifted) from the tool, and the glass surfaces should be cleaned before fresh emery is supplied.

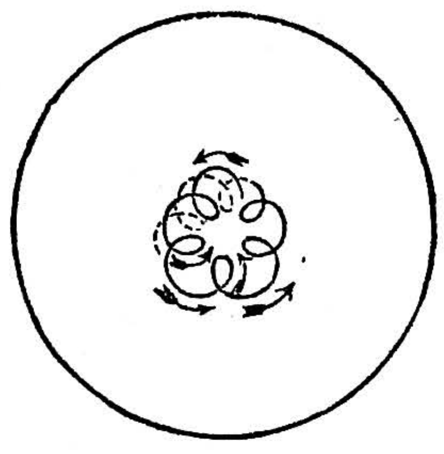


Fig. 13.—Reduced Diagram showing the Path of the Centre of the Speculum over the Tool in a Short Curved Stroke.

There is a likelihood that from lack of skill the centre of the concavity may, in the rough grinding, be cut too deeply by the sand. If this be so, it will become evident at once, when the finer working is begun, because, while the greater part of the glass will be perceptibly smoothed, the central depression will remain rough. In such a case it is best to return to the coarser grinding for a short time, and work with an irregular stroke and without pressure.

It is also desirable to test the focal length before the graded emeries are brought into use. This is effected by wetting the smoothed glass surface and placing it in the direct sunlight so that it will reflect a faint image of the sun on to a shaded paper or wall. When the reflected image is smallest the distance from mirror to wall will be the approximate focal length. If it be found to be too long or too short, it can be most speedily corrected by rough grinding, using a long, straight stroke to shorten the focus, and a short, circular stroke to lengthen it.

Assuming, however, that all is correct, the fine grinding may be now steadily proceeded with, using the graded emeries in careful succession from the coarsest to the finest, and doing the utmost that can be done with any one grade before the next finer is applied. With the three finest grades it is a good plan, at the end of ten or fifteen minutes' work, to slide the speculum off and wash it, leaving the tool unwashed, and then to return and work the wet speculum over the unwashed tool for five minutes longer. This secures an exquisitely delicate surface. It is not necessary, when changing emery, to dry either the speculum or the tool, and water (in drops) may, of course, be applied at any time as the working demands it.

When fine grinding has been properly and intelligently performed, the final curve is quite spherical, and the surface of the glass is "semi-transparent, appearing as if covered with a film of dried milk." It is then ready for polishing.

A THREE-CORNERED CHINA CABINET.

BY E. MONTAGUE AUSTIN.

Introduction—Selection of Material—The Back—Easy Method of Squaring same—Base and Plinth—Carcase Top—Centre Partition—Doors—Pillars—The Top and Moulding of ditto—Back Rail—Fitting Spindles—General Hints—Cost—Conclusion.

Introduction.—Perhaps, at first sight, a few of our amateur readers will be inclined to think that the subject of the illustration looks rather difficult for them to attempt, and that to "throw off" so large a job would be a little beyond their ability. Anyone, however, who has carefully read the lucid and thoughtful lessons given in previous numbers of Work in the rudimentary use of wood-working tools ought to be able to turn out, with a very few tools, such a piece of work creditably and to their own satisfaction. Furthermore, I would just like to breathe (in only the faintest suspicion of a whisper) the old saying about the "faint heart" and the "fair lady," and so endeavour to dispel all fears for the result, provided with honest intention the start is made, and a little perseverance is brought to bear to carry the work through to the finish.

Being in the proud position of parent to the article which I have fondly christened "a three-cornered china cabinet," I feel I am able to speak with tolerable confidence as to the simplicity of its construction; but as I know our editor's space is limited, I will waste no more of so valuable a commodity in mere argument, but get straight to the work of description.

Selection of Material.—To repeat that somewhat monotonous phrase which usually prefaces all instruction for making anything of timber, the first thing to decide on is the wood of which our cabinet is to be made. This is quite a matter of taste or convenience. Of course, the carcase of the cabinet is made of deal, and the remainder of whatever other wood is decided on.

The Back.—First in order of making is the back. This can be made of $\frac{1}{2}$ in. matchboarding (*i.e.*, boards with tongued and grooved edges), and should measure, when complete, 2 ft. 6 in. wide and 3 ft. 6 in. high. Cut a sufficient number of lengths of the boarding (it is usually 6 in. wide exclusive of tongue) to make up the necessary width when fixed together and knocked up tight, and fasten the whole firmly together with two pieces 4 in. wide, screwed or nailed on across the back 4 in. from the top and bottom respectively. This is, perhaps, a little rough, but it answers the purpose very well, and as the back is covered internally with a lining, the work need not be too elaborately done. For the same reason, matchboarding need not necessarily be used; any $\frac{1}{2}$ in. stuff closely jointed would suffice. Be sure that the back is quite square when finished. The following is a simple method of ascertaining whether the back is square: Carefully measure diagonally across from top right-hand corner to bottom left-hand corner; then measure in the same way the two opposite corners. If the two measurements agree, the back is square; if they do not agree, the necessary alteration must be made until they do.

Base and Plinth.—Next make the base, a plan of which, with measurements, is shown at Fig. 1. The cross lines show a method of jointing up the pieces composing the floor of the cabinet, those on the outermost edge being of the "face" stuff, the remainder of deal. The plinth is also made of the better material, and the dotted lines in Fig. 1 show the blocks underneath which glue this in position. The plinth is $4\frac{1}{2}$ in. deep, of $\frac{3}{4}$ in. stuff, and must be very carefully put on and mitred where joined, to fit with a clean joint.

Having made the base, mark out on it the position of the various upright pieces as shown in Fig. 1, setting the face line back $2\frac{1}{2}$ in. from the front all round, and then make the carcase top (shown in section, Fig. 2, B) in a similar manner to the floor of the base, only the size necessary to exactly cover the portion lined out—that is, $2\frac{1}{2}$ in. less than the floor of the base, all round. When ready, this carcase top is screwed down to the top of the back and partition, and has the side and front pieces dovetailed to it. The side pieces and centre piece are of $\frac{3}{4}$ in. wood, the former being 4 in., the latter 3 in. wide at the face, and they must be cut the necessary length (3 ft. 2 in.), to allow of their being dovetailed into the carcase top as before mentioned, and dowelled into the base; or they may be screwed up from beneath, if preferred. The base is fixed in position with four screws through the back, as shown in Fig. 1. The inside edge of the sides (that next the door frames) must be bevelled off at the proper angle to bring their edges at right angles to the doors. The centre piece has each side bevelled in the same way (see Fig. 1, A). The four strips $\frac{3}{4}$ in. wide (marked B, Fig. 1) must be carefully fitted to the bevelled edges of the side and front pieces with a clean joint. The partition in the centre is of $\frac{1}{2}$ in. stuff, $16\frac{1}{2}$ in. wide and 3 ft. $\frac{3}{4}$ in. long, and is fixed in position with screws from the back, and through the carcase top and base.

Doors.—If everything has been made as directed up to this point, and the whole temporarily fitted together, you will now be in a position to make and fit the door frames. These are of $\frac{3}{4}$ in stuff and of the following measurements:—Uprights $2\frac{1}{4}$ in. wide, top rail 3 in. wide, bottom rail 4 in. wide. The frames are mortised together in the usual way. The outside measurement of the door frames will be approximately 1 ft. 7 in. wide by 3 ft. high; but the exact size had better be taken from the space left for them after fitting two narrow sills $\frac{3}{4}$ in. deep on the floor, and also the two head pieces over the doors shown in section (Fig. 2, E). Make the door frames a little large, to allow of accurate fitting, and with a $\frac{1}{4}$ in. rebate for the glass (Fig. 2, C), which is fixed in position with $\frac{1}{4}$ in. strips bradded to the frames, as shown. The glass is not put in, however, till the last thing, when the whole is painted or polished and the doors ready for hanging.

Pillars.—If possessed of a lathe of sufficient size in which to turn the pillars, these may now be got on with. These are turned out of 2 in. square stuff, and I think no difficulty will be experienced in drawing a full-length pattern from the sections given in Figs. 4, 5, and 6. They measure from end to end 3 ft. $1\frac{1}{2}$ in., exclusive of tongues, but leave the ends a little long, to allow for fitting. The spindles on the back rail may also now be turned; one is shown reduced at Fig. 3, as also the terminal pillars. If not possessed of a lathe, make careful full-size drawings of the articles, and any turner will get them out for a few shillings.

The Top.—Now comes the top. Let this be of good material, $\frac{3}{4}$ in. thick, with a nice grain, and carefully planed up. It is rather less than the size of the base, say $\frac{1}{2}$ in. each way, and is made in the same manner. When ready, fix it in position with screws from underneath the carcase top. Now mark the position of the moulding (Fig. 2, D), and also that of the pillars on the underside of the top (which, by the way, has its edge rounded as shown), and take it off again to drill the necessary holes ($\frac{3}{8}$ in. deep —not *through*, mind !) for the tongues of the pillars. Having fitted these in position (top and bottom), proceed to make the three pieces of moulding, as shown in section, Fig. 2, and carefully fit them in position ready to be finally glued to the top.

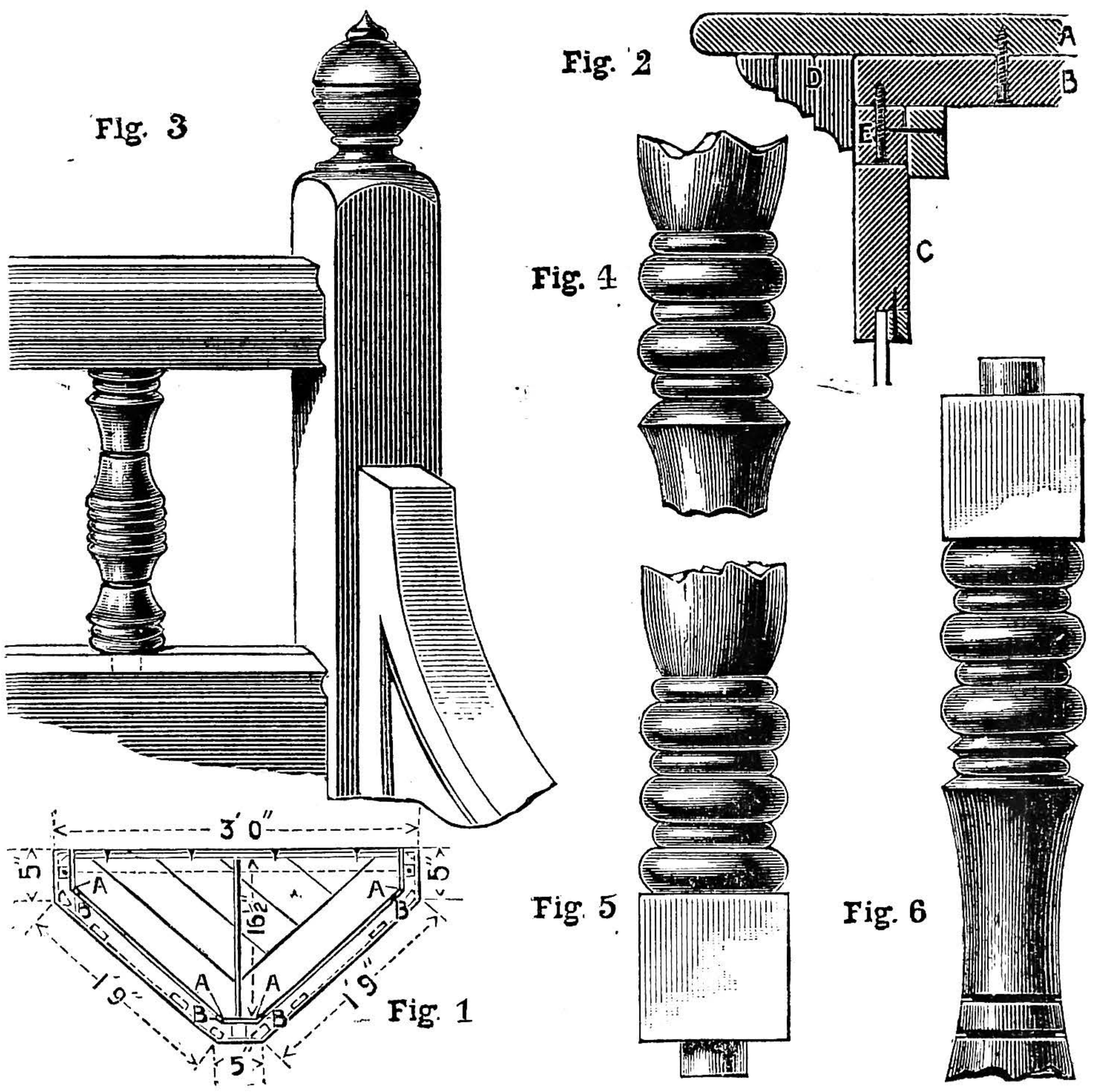
The back rail is made as shown in Fig. 3, and measures, extreme length 3 ft., width $5\frac{1}{2}$ in. The narrow rail is $\frac{3}{4}$ in. wide, with the face edges grooved as shown; the upper edge of the wide rail is also grooved. Be careful in marking out the position of the holes for the tongues of the spindles that they are accurately placed above and below each other, so that the spindles will be perfectly upright.

When the doors are fitted ready for hanging, and with locks and keys, etc. (as to which I think no particular explanation is needed), the shelves may be made with any $\frac{1}{2}$ in. or $\frac{3}{8}$ in. stuff you have at hand, and fixed in position (when covered) on narrow bearers, bradded or screwed to the back and partition. This is done after the cabinet is lined.

This concludes the description, so far as the making and fixing portion of the work is concerned. It only remains for the cabinet, when so far completed, to be stained, polished, or painted, as the taste of the maker may dictate, and lined with a suitable material, such as baize or Japanese paper. With a general hint or two, therefore, as to method and cost, I will now close this description, which I trust may enable any amateur to turn out a both useful and ornamental piece of furniture.

As to method: always plane up all wood, so far as is possible, before finally measuring. Cut rather too much than too little, as the waste caused by sawing and planing in getting things square and true frequently exceeds expectation and spoils the piece. Finish off with glass-paper each section as you go along; it saves time in the end. Make all measurements with the utmost care, and make them twice over, to prevent mistakes.

These few points, carefully borne in mind, will save much time and vexation, and greatly increase your pleasure in the work.



A Three-Cornered China Cabinet. Fig. 1.—Plan. Fig. 2.—Section through Centre of Door. Fig. 3.—Portion of Back Rail showing Spindle, Terminal Pillar, and Support. Figs. 4, 5, 6.—Centre and Ends of Pillars.

With regard to cost, the prices set out below are what the materials cost the writer, but they can be used as a rough guide only, as quotations vary with localities—

	s.	d.
Wood (deal)	3	0
„ (walnut)	6	6
Scarlet baize lining, 3 yds. at 1s. 4d. ...	4	0
Glass	2	6
Locks and hinges	2	6
Polish and sundries	1	6
	£1 0	0

If turning has to be paid for, the cost will be about 4s. 6d. more.

Wishing every success to those who may attempt this not difficult piece of work, I will only add that I shall be pleased to help anyone over any little difficulty they may encounter through the medium of that most useful section, "Shop."

WRINKLES FOR ALL.

To remove hot-water marks from mahogany, rub the mark on the wood with linseed-oil, and afterwards pour on the spot a little spirits of wine (not methylated spirit), and rub dry with a soft cloth.

For a leakage in iron pipes, mix iron filings into a stiff salve with vinegar. Well dry the pipe, and fill up the crack with the salve, and it will soon harden and effectually stop all leakage. If the hole or crack is too large to stop with the salve, a bit of thin sheet iron can be securely fixed over the fracture.

To detect iron from steel tools, place the tool upon a stone, and drop upon it some diluted nitric acid (four parts of water to one of acid). If the tool remains clean, it is of iron; if of steel, it will show a black spot where touched with the acid. These spots can be rubbed off.

Parchment paper can be prepared as follows:—Boil a bit of good white soap in soft water till an oily fluid is produced. Lay it on any kind of paper with a brush, and when dry, coat it with a strong solution of alum. It will be like leather, and waterproof.

For an imitation black walnut, mix one part of walnut-peel extract with six parts of water, and coat the wood with the solution. When the material is about half dry, rub on it a solution of bichromate of potash with water. This plan adopted even on poor pine will defy detection from real walnut.

An excellent furniture polish may be made with equal parts of shellac, varnish, linseed-oil, and spirits of wine.

For good harness composition, take ½ lb. of ivory black, 1 oz. of indigo blue, 1d. heel-ball, 1 oz. of gum arabic, 2 oz. of spirits of wine, ½ pint of turpentine, and ¼ lb. of beeswax. Dissolve the wax in the turpentine, and the gum in the wine. Mix the whole together, and simmer over a slow fire ten or fifteen minutes. Take care that it does not run over.

Perspective View of Three-Cornered Cabinet.

AMERICAN INVENTIONS.

The Yankee brain seems to be at once the most imaginative and the most fertile in the matter of inventions—spending itself as it does in original ideas for tools and appliances which find their way all over the globe. We bring before our readers suggestive details of a few of the most recent results of the inventive faculty of our "cousins."

One is a self-closing gas burner arranged to close automatically when the flame is accidentally blown out or the gas is shut off at a distant point. The tip passes through an opening in a plate made of two metal strips of different material, preferably brass and steel, so that when the plate is heated by the flame it bends upward. On the under side of the plate is a downwardly extending rod engaging a spring on the burner pressing on a wheel on the cock, the wheel containing a spring to close the cock when the other spring is disconnected, such disconnection being effected by the movement of the rod on the cooling of the plate to which it is attached.

A trace support is a simple and inexpensive metallic loop device adapted to be readily raised or lowered on the skirt to assume the proper position to carry the trace according to the size of the animal, the device being connected at its lower end with a strap to which the belly band may be buckled.

Another useful article is a labelling machine for quickly, accurately, and securely attaching labels to bottles, cans, and other receptacles, one operator, by its use, conveniently handling a large number of bottles and firmly attaching the labels. A bottle receiver contains a pad adapted to be dipped in a paste box next to which is a label table, revolving brushes being arranged next to the table, while there is a plunger for pressing a bottle between and through the brushes, and means for imparting simultaneously a vertical sliding motion to the receiver and to the plunger.

A vehicle pole is an adjustable pole adapted to vehicles of different widths. The pole has a cross-piece at its rear end, secured to the pole in the usual way, braces attached to the ends of the cross-piece being secured to the pole by bolts, and the rear ends of the braces are provided with eyes, while between the eyes and the pole in each brace is a longitudinal slot. The pole iron passes through the eye on the brace, extending forward underneath, and the iron is adapted to be moved in or out and securely clamped to the brace in any desired position.

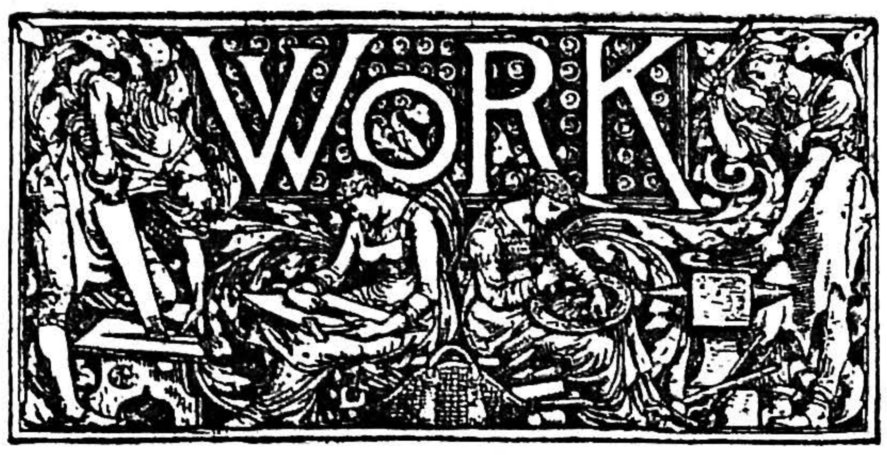
An ingenious improvement has been effected in a wrench. This consists of a bar forked at one end and provided with serrations on the inner surface of one of the arms of the fork, the bar being bevelled and serrated at the opposite end and furnished with a pivoted serrated jaw, designed to act in conjunction with the serrated end of the bar as an adjustable wrench. A screw-driver blade is formed on the outer end of the pivoted jaw, the implement forming a simple and inexpensive tool for turning and holding round or polygonal rods, nuts, gas burners, etc., and for the use of bicyclists to turn the spokes of the wheels.

Coach, carriage, and cart builders will be interested in an axle bearing by which a simple, cheap, and easy running bearing is provided. It is adapted for application to all sorts of vehicles, and the outer end of the hub is so rounded off that when struck by the hub of another vehicle it is not likely to be injured. The outer end of the axle box is closed and its inner end recessed and screw-threaded, while the axle has enlarged bearings in the box and a collar to fit the recess, a nut on the axle entering the threaded portion of the box, and a binding screw being held partly in the nut and partly in the box.

In this country the weather is rarely hot enough to call for fans in our bedchambers, and the prospective uses of a bed fan would probably be more connected with illnesses than rude health. There seems to be scope for the invention somewhere! Hence the bed fan, a device adapted to be set up by a bedside, and operated by a treadle. It consists of a light standard from which projects a shaft carrying a fan wheel, the height of which can be readily adjusted, while the fan may be turned to throw the breeze in any direction. The device is worked noiselessly and almost entirely without friction.

Some new bicycle mechanism consists of a wheel formed with a hollow hub journaled in the bicycle frame, and carrying on its periphery a pinion in mesh with an internal gear wheel on a shaft passing through the hub, and also journaled in the bicycle frame. The improvement forms a driving mechanism of simple and durable construction, permitting of easily running the wheel at a high rate of speed, and rendering its construction very compact and strong.

A newly patented American harness saddle is for single harness, and is so made as to be expeditiously and conveniently fitted to the back of any horse. The construction provides for holding the tree of the saddle at an elevation above the back of the animal, to which the saddle is applied, and the pads are so made that they will not chafe or injure the skin, the pads being also amply ventilated.



is published at La Belle Sauvage, Ludgate Hill, London, at 9 o'clock every Wednesday morning, and should be obtainable everywhere throughout the United Kingdom on Friday at the latest.

TERMS OF SUBSCRIPTION.

(*Sent post free to any part of the world.*)

3 months, free by post	1s. 8d.
6 months, "	3s. 3d.
12 months, "	6s. 6d.

Postal Orders or Post Office Orders payable at the General Post Office, London, to CASSELL and COMPANY, Limited.

TERMS FOR THE INSERTION OF ADVERTISEMENTS IN EACH WEEKLY ISSUE.

	£	s.	d.
One Page	12	0	0
Half Page	6	10	0
Quarter Page	3	12	6
Eighth of a Page	1	17	6
One-Sixteenth of a Page	1	0	0
In Column, per inch	0	10	0

Small prepaid Advertisements, such as Situations Wanted and Exchange, Twenty Words or less, One Shilling, and One Penny per Word extra if over Twenty. ALL OTHER Advertisements in Sale and Exchange Column are charged One Shilling per Line (averaging eight words).

Prominent Positions, or a series of insertions, by special arrangement.

*** Advertisements should reach the Office fourteen days in advance of the date of issue.

*** All letters suggesting Articles, Designs, and MS. communications for insertion in this Journal will be welcomed, and should be addressed to the Editor of WORK, CASSELL and COMPANY, Limited, London, E.C.

LOCAL WORKSHOPS.—Proposals having the object of stimulating craftsmen and apprentices of whatever trade or craft, cannot be too frequently or too forcibly introduced to their notice. The industrious workman or the apprentice, determined to improve his position, is legitimately and worthily occupied when devoting his spare time to the study of processes and the acquisition of knowledge of a nature likely to be of advantage to him in the fight for life, and of which he is called upon to make the best. The workman who does not see this aspect of matters places himself at fearful odds in the near labour struggle of the future. We believe that the time has come in this country when we need to return to the condition of things when a craft was not split up into branches as it now is, but when a craftsman's training and capabilities extended to, and were concentrated upon, his craft as a whole. Now, however, apprentices are content to learn little more than a section of their trade, which may be well enough so long as they are kept in steady employment in well-established works and factories. How does this method tell upon the worker, however, when he is face to face with some of the stern facts which are the attendant incidents of strikes and such-like emergencies? Emigration is the outlet often mooted at these critical times, but where, we inquire, is the chance for the craftsman or apprentice if he emigrates, taking with him the knowledge of a mere branch of his trade? It is a pity that the so-called friends of the workers, the agitators who stir up discontent among the men, the leaders who prate to them from rostrums—in fact, their whole host of irresponsible advisers—do not instil into them some of the teachings which would tend to make them more thorough and all-round workmen worthy of their ancestors in the old days of guilds and craft communities. A remedy for this evil seems to us to lie in the establishment of co-operative workshops, especially in villages and localities where it is possible for men of various and kindred trades to meet together for the purpose of interchanging ideas concerning modes and methods of work. This would be good if limited to men of any given craft, but far better if interchange of thought took place between those of different crafts. There is no reason why a smith should not know something of a plane, a shooting-board, or mitre, and a carpenter would be none the less qualified as a worker for an acquaintance with the tempering of iron and the forming of edge tools. Even if restricted to particular classes of trades, such as work in iron, wood, stuffs, etc., co-operative workshops would be productive of great good for the especial trade represented; but workshops arranged on a plan whereby several workers of different trades could meet for interchange of even the rudiments of the various crafts would be productive of untold good to the men and their trades, and would tend not a little to conserve many craft interests of the country which are now being slowly driven out, only to be superseded by foreign labour. Why should not a common workshop, with benches for different craft tools and paraphernalia, be fitted up and attached to working men's clubs? The clergy of town and country parishes might do much in starting a scheme of this kind. Even on a small scale village workshops would do much to divert men with leisure evenings from less wholesome pursuits. We should be glad to see the matter taken up and thoroughly ventilated in our columns by clergymen, masters, and workmen. We are on the verge of a great national crisis in connection with the trade and labour of this country. Employers and workers—be ready!

TRADE CLASSES AND YOUNG WORKMEN.—On the use the latter make of the former we have a word to say, and that word is one of serious importance to English trade in the future as well as to the individual well-being of the workman himself. On the way the young members of a trade act with regard to their own improvement, there is depending at the present time a very momentous matter; it is no less than the question of whether technical education shall or shall not be a success. We know that France and Germany have technical schools at work; then why should not we also find more of our young men availing themselves of all the advantages that trade classes give them? The fact is that very many are deficient in moral courage, or they have not pluck enough to take a course which shall separate them from those whose motto is, Take it easy, or don't trouble. If the apprentice or young workman will but look back, he will find that there has been an advance during the last few years in every direction. This much he will gather from conversation with even the most prejudiced of workmen, and yet the same older man may be the first to dissuade a youngster taking up with "new-fangled notions," such as joining a trade class, or a class in science and art. Let us make clear a prevalent misunderstanding with regard to technical instruction. It is not intended to supplant workshop practice, but to supplement it. At a trade class there are opportunities of arriving at the reason which governs this or that method; a course it is impossible to follow in most workshops, especially those where the teaching is—"Not to reason why."

IRIS BREAD-PLATTER DESIGN.

BY FLORENCE HUDSON.

I WONDER how many readers of WORK are familiar with the lovely berries of the wild purple iris (*iris fœtidissima*).

Please do not, because I begin with such a remark, jump to the conclusion that I therefore imagine WORK to be strictly urban in its circulation, or that its readers one and all despise country walks. It is to the true "yokel" that the proverb "Familiarity breeds contempt" is usually applicable; but real country walks worthy of the name mean glorious scrambles by footpath, wood, or moor—a turning aside from roads and beaten tracks often impossible during an English winter.

To those who love such rambles Flora reveals her choicest treasures — every season some fresh delight, the sheltered corner where the first spring sunshine tempts the celandine to show its golden stars, the undulating pasture where

> "I saw a crowd,
> A host of golden daffodils;
> Beside the lake, beneath the trees,
> Fluttering and dancing in the breeze.
> * * * * * *
> And then my heart with pleasure fills,
> And dances with the daffodils"

—the moor above the sea, where a sharp eye spies the white heather token of "good luck"—the fairy crimson lichen cups nestling in feathery moss. Year in and year out Nature charms us by her "infinite variety."

But in January even Nature is economical; the glowing autumn leaves lie dank and sodden beneath our feet, even the hips and haws are scarce, and Flora can contribute little beyond a few stray gleams of golden gorse.

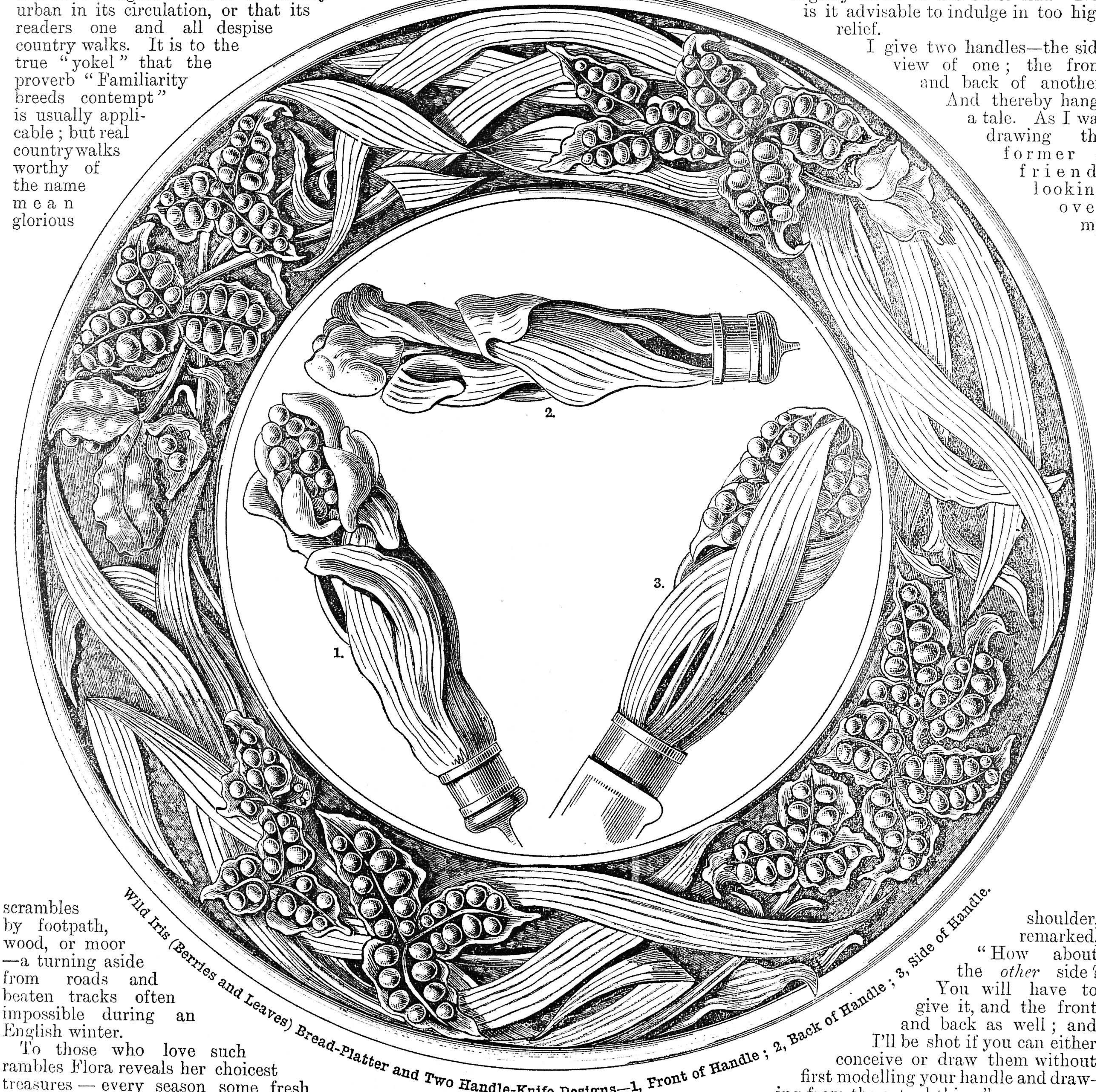
Then to come suddenly on a clump of iris, with long, sword-like leaves of vivid green showing off in fullest contrast the brilliant orange-scarlet berries, borne in a three-lobed, opened ovary of delicately withered brown—to come on such a treasure is indeed to secure a prize. Such was my good fortune, and, having carried home my treasure, the thought struck me, "How well such berries would look carved"! and the result was the design given in this number.

I do not think the pattern calls for much explanation. Bread-platters are articles in such common use that everyone is aware that they must be made of some very hard wood, that the centre part must be perfectly flat, and that it is usual to keep that part highest by sloping the ornamental border slightly down to the outer rim. Nor is it advisable to indulge in too high relief.

I give two handles—the side view of one; the front and back of another. And thereby hangs a tale. As I was drawing the former a friend, looking over my shoulder, remarked, "How about the *other* side? You will have to give it, and the front and back as well; and I'll be shot if you can either conceive or draw them without first modelling your handle and drawing from the actual thing."

"Well, yes! if that is *really* wanted, I suppose I must; but, for my part, I should say that it is *not* necessary. The other side would be very similar, and surely anyone capable of carving such a handle could easily make any slight variation or addition necessary."

However, we had a long argument, and at last, like the unjust judge, I gave way to his "importunity"; and modelling clay not being procurable, I resorted to putty, and with a stick inside as a support, I made the second handle.



Wild Iris (Berries and Leaves) Bread-Platter and Two Handle-Knife Designs—1, Front of Handle; 2, Back of Handle; 3, Side of Handle.

When done, I made careful drawings of all four sides—if you can apply such a term to rounded surfaces—and submitted them to my friend.

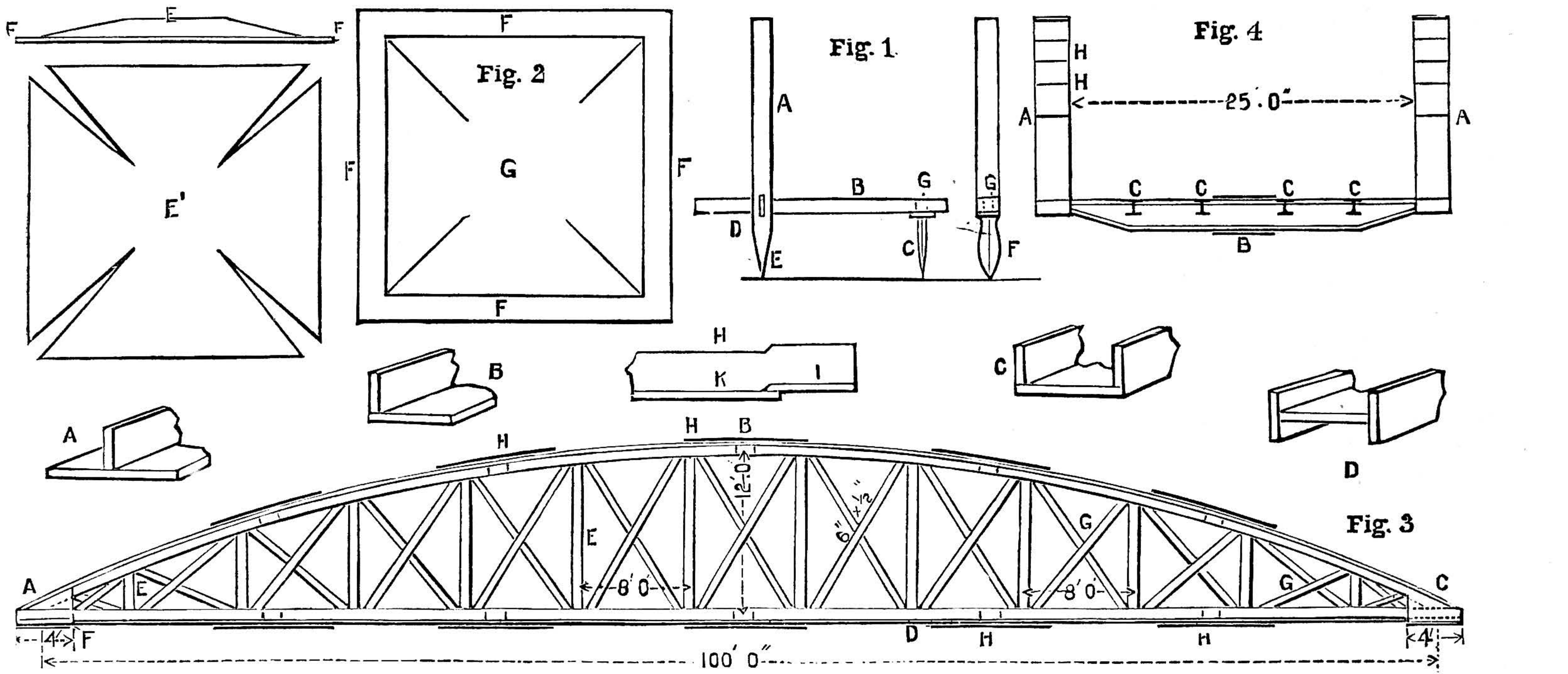
"Ah, that's capital! Now, wasn't I right? Let me put them together! *That* leaf goes up there, and turns so; and *that* one—no, it's the *other* one—stay, where does *that* bit come from? Let me see, *this* is the right side—no, it isn't, it's the left. Oh, bother the thing!"

Then, woman-like, I laughed at him, and said: "I told you so." The end of it was we both agreed that if

> "Multiplication is vexation,
> Practice drives us mad;"

and that we were quite convinced that the readers of WORK were far too clever to need anything beyond "suggestions" for a handle.

I ought to add that a good working size of the platter is a diameter of 14 in.



Iron Bridge Modelling in Cardboard. Fig. 1.—Cutting Compasses. Fig. 2.—A, T Iron; B, Angle Iron; C, Channel Iron; D, Joist or H Iron; H, Joggled End of T or Angle Iron; E, E', and G, Buckled Plates. Fig. 3.—Side Elevation of a Tied Arch. Fig. 4.—End Elevation of a Railway Bridge.

IRON BRIDGE MODELLING IN CARDBOARD.

BY FRANCIS CAMPIN.

MATERIALS—TOOLS—KNIVES—RULES—CUTTING COMPASSES—T IRON—ANGLE IRON—CHANNEL IRON—JOIST IRON—JOGGLED ENDS—BUCKLED PLATES—TIED ARCH.

MODELS made in "Bristol board" of iron bridges, if neatly executed, always present a pleasing and interesting appearance; and their construction not only gratifies the amateur, but also educates the student if it is faithfully carried out. Bristol board is a very superior quality of cardboard, sold by those who supply artists' materials and by some stationers. Its uniformity of substance renders it very suitable for our purpose, but cardboard of a lower grade may be used with considerable success, but it does not present so finished an appearance as the work produced from the better material.

The tools actually required for this description of work are neither expensive nor numerous, though in this, as in other matters, those who wish to spend a good deal of money can do so; but they should remember that it is not always the one with the best outfit who produces the best work. Personal patience is, however, indispensable. The occupation is cleanly, and need make no litter, and therefore calls for no special apartment for its pursuit. The straight-edges and curves for guiding cutting-knives must be of steel or brass, or else of wood edged with metal. The latter gives the better hold for the fingers, and is not so likely to numb their tips as rules entirely of metal. The cutting-knives should be of the best steel, with heart-shaped points, like that of the ordinary desk-knife, and well hardened, that it may not rapidly lose its edge. This is a most important point, because paper or cardboard will soon destroy the edge of any knife that is not made of the best steel. The point of the knife is kept close against the guiding-edge in order that the cut may be steadily and evenly made.

For cutting circular arcs, a compass of the form shown in Fig. 1 is used. It consists of an upright metal bar, A, with a point, E, at the bottom to rest on the centre of the arc to be cut. In the vertical bar a slot is made, into which a horizontal bar, B, fits, being passed through it to a distance which will place the knife-blade, C, at the desired radial distance from the centre, E. The bar, B, fits the slot closely, and is secured in position by a thumbscrew, D. A side view of the knife is shown at F. It is made with a tang, G, to fit tightly into a slot or recess in the bar, B. Small discs, such as are used to represent rivet-heads, may be cut out of card with a leather punch.

In making up the different forms, great care must be used to obtain neat joints, as upon this the whole appearance of the work very materially depends. In Fig. 2 are shown some forms of constant occurrence in iron bridge work. No angular forms are to be made by creasing and bending the cardboard, as clean, square corners cannot in that way be obtained. It is also obvious that the cutting-blade should be kept at right angles to the surface of the card, in order to secure square edges. The board upon which the card is cut should be made of elm or sycamore. A sheet of plate-glass is preferred by some, but this has the disadvantage of being somewhat slippery. Clamps for holding the parts together while the glue or cement is setting may be used at the option of the modeller. We, however, have not had recourse to them.

In selecting the cementing material strength and cleanliness must be sought. The slightest smear on the white cardboard is very perceptible, and mars the appearance of the whole work; and it cannot be removed without injuring the surface. The well-known Diamond cement is probably the cleanliest to be obtained, but it is expensive. Fish-glue is exceedingly strong, but it is also abominably nasty. The ordinary glue, properly prepared and carefully applied, serves the purpose very well. The best clear glue should be purchased, and soaked in cold water (previously boiled) until it assumes a gelatinous consistence. It is then to be boiled with sufficient water to render it thin enough to be filtered through book-muslin. After this it may be simmered down to any thickness found desirable; but it must always be borne in mind that the thinner the layer of glue in a joint is the stronger will the joint be. A piece of very smooth deal, sharpened down to a chisel edge, is very convenient for applying the glue to the edges of cardboard.

When several thicknesses of card require to be superposed, the glue used should be very thin and the work placed under a weight or in a press until it is dry. For tubular work the cardboard is not very suitable, and this may be more satisfactorily produced from cream-laid letter-paper. It is necessary to have a rod, or cylinder, to fit the internal diameter of the tube required, and upon this the paper is rolled after having been coated with glue. The number of turns of paper will depend upon the thickness required. The strength of columns made in this way is quite astonishing to people who are not accustomed to its use.

In Fig. 2 A represents the end of a T iron, such as are used for struts and stiffeners. A strip of card is cut for the table, and down its centre two lines are drawn, to show the position to be occupied by the rib. One thick pencil line, equal in width to the rib, should not be used in place of two fine lines, because the lead may interfere with the proper adhesion of the glue. When the rib is properly placed upon the table, it should be trued up to a vertical position by pressing squared strips of wood upon each side of it.

An angle iron, of which an end is shown at B, is made in a similar way; but here the rib is glued on at the extreme edge, which it must exactly meet along the whole length. Channel iron, C, and H iron, D, are built up in a similar way. Plates known as "buckled" plates are very commonly used for bridge flooring. They have horizontal fillets, F, around them, and the centre, G, is dished up while hot under a press (as shown in side elevation at E). To model this in card the fillet, F F, must be cut out separately and the central part made of a piece of card, E[1], somewhat larger than the interior of the fillet edge (it is also gored out at the corners, as shown). All the edges are touched with glue, and then brought together by bending the card so that it assumes a dished form when it is pressed into the fillet, which is laid on a board or piece of glass—the latter preferably, as the glue does not stick to it, though this remark does not apply when Diamond cement is used. The necessary length and width of the piece of card, E[1], are found by drawing sections of it and measuring round the curve, E, with a pair of fine dividers. The extent of goring will be such as to leave the edges equal in length to the inside edge of the fillet by which they will be surrounded. Where angle or T bars are to be joggled (as shown at H), the joggle, I, should be made in a separate piece and glued on to the end, and the rib, K, cut out to fit it.

Having given these preliminary instructions, we will now take an example of an iron bridge and show how to proceed in modelling it. It is, of course, taken for granted that drawings are supplied, as it is not the modeller's business to design the work. The type of bridge selected is that known as a tied arch (it is shown in side elevation at Fig. 3). It is 100 ft. effective span from centre to centre of the bearing-plates, which are each 4 ft. long, those at one end of each girder being mounted upon rollers to allow of the expansion and contraction due to changes of temperature. Each main member consists of an arch, A, B, C, the thrusts at the end of which are resisted by a horizontal tie, D, instead of being taken on abutments, as is the case with masonry arches and also with some in iron. This arrangement, however, saves building heavy masonry supports, as the pressure on the bed plates becomes vertical. The tie is connected also to the arch by uprights, E, which take up the load brought upon them by the cross girders. The distance between centres of arch and tie at the middle of the span is 12 ft., and the uprights are 8 ft. apart; between the uprights are flat bars, G, 6 in. by $\frac{1}{2}$ in., which act as counterbraces in distributing the load and resisting undue distortion of the arch. An end view of the bridge is shown at Fig. 4. A, A, are the tied arches, between which is a clear width of 25 ft.—they carry the cross girders, B, 8 ft. apart from centre to centre—and C, C, C, C, show the positions of the longitudinal bearers under two tracks of railway carried by the bridge. These bearers are connected by bracket irons to the cross girders.

In my next paper I shall complete this subject by treating of the composition of the arch and tie, the uprights, girders, rail-bearers, and cover-plates. I shall also describe the construction of the arch and tie. Should the bridge prove attractive, possibly the Editor will let it be followed by other cardboard designs.

SCIENCE TO DATE.

Properties of Pure Boron.—The pure amorphous boron recently prepared by Moissan has very remarkable chemical properties. It is infusible even in the electric arc, but it inflames in air at 700°, forming boric anhydride. It combines with sulphur when heated with that substance with brilliant incandescence; with selenium it behaves similarly, but without incandescence; but has no action on tellurium. A similar gradation of properties occurs in the case of the halogens, with chlorine and bromine it unites with incandescence, while with iodine there is no action. It combines with nitrogen at high temperatures, but has no action on phosphorus, arsenic, or antimony. On contact with silver fluoride in a mortar there is at once incandescence and detonation. It reduces metallic oxide like carbon, and even a gunpowder may be made of boron, sulphur, and nitre. It has no action on sodium and potassium, but silver, platinum, iron, aluminium, and magnesium combine with it to form borides.

Photography in Colours.—M. Lippmann, who lately communicated to the French Academy a process for photographing the solar spectrum, has made further progress with his experiments, and has succeeded in improving the sensibility of the film. He says that "On the layers of albumino-bromide of silver rendered orthochromatic by azaline and cyanine, I obtained very brilliant photographs of spectra. All the colours came out at once, even the red, without the interposition of coloured screens, and after an exposure of from five to thirty seconds." He submitted also photographs of a stained glass window of four colours—red, green, blue, and yellow—a group of draperies, a plate of oranges surmounted by a red poppy, and a many-coloured parrot. These showed that the form is produced in the photographs as well as the colours. The draperies and the bird required five to ten minutes' exposure in electric light or daylight, the other objects several hours in diffused light. It seems from this that we are not very far from the solution of the great problem of photography in colours.

New Chemical Element.—*Masrium* is the name of a new element which they have reason to believe exists in the mineral "Johnsonite," an impure manganese alum found in Egypt. Johnsonite contains about 2 per cent. of masric oxide. Masrium appears to have an atomic weight of 228, and in its reactions resembles zinc and aluminium, giving white gelatinous precipitates with ammonia, ammonium sulphide, and ammonium carbonate. It is distinguished from zinc by the insolubility of its hydrate in ammonia, and from aluminium by giving a precipitate with sulphuretted hydrogen in an acetic acid solution, and one with potassium ferro-cyanide insoluble in dilute hydrochloric acid.

High-tension Electricity.—The use of electric currents of high potential and great frequency, such as currents with a potential of 130,000 volts, have revealed many interesting new facts. They show that the insulating power of various bodies is only relative, and that with currents of a sufficiently high potential all bodies become conductors. Thus the conductivity of slate, which has hitherto been considered a perfect insulator, is made manifest by the establishment of the electric arc between electrodes of slate pencils when a high-tension current is used.

Fogs.—Experiments are being made on the dispersion of fogs by electrical means. It is found that under the influence of an electric discharge of sufficient force, fog resolves itself into rain, and in this way we may hope to be rid of our fogs.

Crystallised Anhydrous Sulphates.—M. Klobb has succeeded in obtaining the sulphates of zinc, copper, cobalt, and nickel, crystallised but yet anhydrous. They are prepared by adding the ordinary hydrous crystallised sulphates to fused ammonium sulphate, and then heating till all the ammonium sulphate is volatilised. Anhydrous zinc sulphate thus prepared crystallises in colourless octahedrons, which dissolve with extreme slowness in cold water, but more rapidly in hot water. Anhydrous copper sulphate forms grey crystals, which rapidly dissolve in water forming the ordinary blue solution. Anhydrous cobalt sulphate forms red octahedrons, which are only slightly attacked by water, even on boiling; while, still more remarkable, the green crystals of anhydrous nickel sulphate are practically insoluble in hot or cold water.

NOTES FOR WORKERS.

ELECTRIC tramways are generally superseding the horse cars in the United States.

DISTILLED water has considerable solvent action on glass, and even common water dissolves minute quantities. A German chemist has estimated the amount of glass dissolved by measuring the change in the electrical conductivity of the water.

PETROLEUM comes chiefly from Russia and the United States, but the Assam (India) Railway Co. have a well 650 ft. deep, delivering 700 barrels daily.

A PORTION of the test for all United States heavy guns now consists in firing them with full charges ten times in as rapid succession as possible.

THE juice of the lacquer tree (*Rhus vernicifera*) is the natural varnish used by the Japanese for their famous lacquer work. Sixteen years ago specimens were brought from Japan to Frankfort, and from seeds of these there are now thirty-four trees, 30 ft. high and 2 ft. in circumference. It is intended to push their cultivation and make lacquering a German industry.

KID gloves should be mended with fine cotton thread, and not with silk, as the latter cuts the kid more.

MINERAL lubricating oils have no action on copper and zinc, and of other metals they act least on brass and most on lead.

IT is said that metal surfaces can be effectively protected by dipping them, after chemical cleaning, into a cold bath of one grain isinglass dissolved (with boiling) in one ounce of water.

THE most perfect preservative of the colours, etc., of fish, insects, and animal specimens is carbolised oil. Cocoanut oil is the best, and a little carbolic acid is added to it.

A NEW telephone has been invented which is independent of insulators, is small, of simple mechanism, can be made cheaply, and is easily set up. The receiver is attached to the operator's ear, so as to leave his hands at liberty to write.

To restore faded manuscripts so that they may be more easily photographed, Herr Liesegang recommends passing them through a weak bath of ammonium sulphide.

THE active crater of Tongariro, the volcano in North Island, New Zealand, is in a state of eruption.

DURING 1891 nearly 19,000,000 gallons of water were used by the Metropolitan Fire Brigade to extinguish fires in London. About one-third of this was taken from the river, canals, and docks. There were 2,892 calls for genuine fires.

To restore the elasticity of indiarubber articles, steep them for a few minutes in a mixture of 2 parts water and 1 part ammonia.

A MECHANICAL engineer of New York has made a set of chessmen of silvered bronze. All the pieces are historical and contemporary, having the costumes and equipments of 1194. It took him six years.

A MARBLE cutter has made a small working engine of marble. It has a vertical piston and two side fly-wheels; its height is 23 in., and it is 10 in. by 20 in. square. It comprises 100 pieces of marble, held together by twelve brass screws, and it is worked by air pressure.

IT is said that there are over 100 electric elevators in New York City.

A SINGULAR phenomenon, lately pointed out but not yet explained, is that the interior of a piece of mild steel may be raised to the fusing point while the outside remains solid.

ALL the dynamos used at the Chicago Exhibition will be installed in the Machinery Hall, occupying a space about 700 ft. long and 110 ft. wide, or about 77,000 square feet. Here electric power to the extent of 22,000 horse-power will be obtained from dynamos of the principal manufacturers of the world.

ONE of the biggest rocks moved in railway construction in America was recently excavated on the Mexican Southern line. It was 120 ft. in height, and measured over 1,000 cubic yards. Six dynamite cartridges were successively fired under it, and at the sixth the giant boulder rolled away.

A FIRM of American distillers have discovered how to make whisky which is quite odourless, and yet retains all its other properties.

TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

SHIPBUILDING TRADE.—There is stagnation in almost every quarter. At present, writes our Liverpool correspondent, eighty-five vessels, of a total tonnage of 84,317, are laid up, owing to poor freights. The shipbuilding yards are doing little, and the launches are few.

ENGINEERING TRADE.—In the Lancashire district stationary engine building section scarcely any new orders of moment are being placed, while only those machine tool makers who are engaged on work of a special character are at all busy. Boiler makers report very little business. Considerable satisfaction has been manifested in connection with the performance of some ten-wheeled locomotives which were made by a Manchester firm for the New South Wales Government. These engines have proved highly satisfactory, while those of American manufacture have been shown to be unsuitable for the lines, owing chiefly to their excessive weight. Shipbuilding on the Mersey remains in a state of stagnation, while marine engineers have no new work of any kind coming forward. Many of the large textile machinists are becoming very slack, while the few orders that have been placed have only been obtained by the very lowest tendering. The iron trade of the district continues dull, and is characterised by a want of confidence with regard to the future, operations being necessarily restricted. Notice of reduction in wages has been served upon the engineers of the Tyne and Wear; some 18,000 men will be compelled to suffer a reduction of 10 per cent. The feeling of the men, who seem to understand the state of the labour market, tends towards a settlement without any strike. The two recent strikes have evidently shown the folly of turning out in the face of a falling market.

COAL TRADE.—The principal event of the week has been the tapping of the Barnsley seam of coal at the Canklow sinkings of Sir John Brown & Co., Ltd., at a depth of 420 yards below the surface. The bed of coal at this point is 8 ft. thick. Sinkings are also being continued at the Parkgate seam, which will most likely be found at a depth of 620 yards. Barnsley coal is quoted at from 10s. to 10s. 9d. per ton. Steam coal sells quickly at from 9s. to 9s. 6d., and manufacturing coal at from 4s. 6d. to 6s. At Newcastle gas coals are firmer and steam coals are in demand. Household coals are slacker, bunker coals cheaper and more plentiful. Coke is likewise easier.

BUILDING TRADE.—Our Birmingham correspondent writes:—Both sides in the strike having waived points the strike has ceased. The grant by the London men of 5s. per week, bringing up the strike pay to 22s. per week, strengthened the case considerably for the men. In Rochdale and district the threatened strike of joiners has been averted, the masters having agreed to pay the extra ½d. an hour which was demanded by the men. This makes the wages 8½d. per hour, which is the same as was paid a few years ago, this rate of pay dating from July 1. At Colne the employers have agreed to raise the rate of wages from 8d. to 8½d. per hour.

IRON AND STEEL TRADES.—At Sheffield the iron and steel trades are fair. Best brands of crucible steel find a ready market, but there is no demand for common qualities. The work at the rolling mills and tilt forges increases, but improved business is more noticeable in cycle trade work than in the specialities for which Sheffield is famed. At the Middlesbro' iron market prices showed an upward tendency, the reason being that manufacturers have had great difficulty in restarting the furnaces; and though fifty-five furnaces are in blast, they are producing very little iron, and in some cases what is made is of such poor quality that it has been put back into the furnaces. It is probable that it will be near the end of this month before any considerable quantity of No. 3 is made. Merchants have been selling No. 3 for prompt delivery at 41s. per ton, but makers quote more. Buyers offer 40s. for July deliveries, and for July-September 39s., but sellers will not entertain these figures. Middlesbro' warrants have risen above Scotch, present price being 41s. 2d. Finished iron and steel works are more fully employed. Common iron bars are £5 10s.; best bars, £6; iron ship plates, £5 5s.; iron angles, £5 2s. 6d.; steel ship plates, £5 17s. 6d.; steel angles, £5 12s. 6d.: all less 2½ and f.o.t. for large lots. Blast furnace coke is 13s. 3d. per ton delivered.

FIRE BRICK TRADE.—The fire brick and sanitary pipe trade in Durham county is brisk.

CARRIAGE TRADE.—In Liverpool there are a few men inquired for; both body makers and carriage painters are in request.

CHEMICAL TRADE.—Chemicals remain steady, with a good demand, especially for soda ash and bleaching powder.

COTTON AND FLANNEL TRADES.—These continue to be in a very bad condition, particularly the former.

NUT AND BOLT TRADE.—This is very dull; one of the largest works in the Midlands avers that it is ten years since they were so slack.

ELECTRO AND SILVER TRADES.—The Sheffield silver, plated, and Britannia metal trades are greatly depressed.

CUTLERY TRADE.—The statements made in Sheffield of late concerning the slackness of trade are amply borne out by the circumstance that three firms have asked for reductions of 5 per cent. The men in one instance have given a fortnight's notice to leave their employment.

PLUMBERS' TRADE.—Our Liverpool correspondent writes:—There is no alteration to note; the amount of work is moderate. Plumbers are wanted for Bolton, and 8½d. per hour is offered.

TIMBER TRADE.—This is very quiet. The market is certainly firmer, and in some cases a rise in prices has been recorded. A fine parcel of Sequoia planks (California redwood) has been sold. Some of the planks measured 6 in. by 46 in. This is an extra width even for this wood, the average size being about 3 in. by 35 in.; prices averaged 2s. 6d. White wood fetched 1s.; American oak, 2s. 2d.; walnut, 2s. 6d.; ash, 10d. per cubic foot; and walnut boards, 3½d. per foot super. Our Liverpool correspondent writes:—There have been large sales of timber, including 277 tons lignum vitæ, 30 tons Malabar ebony, also large quantities of mahogany, rosewood, cedar, satin wood, walnut, and hickory spokes.

SHEET METAL TRADE.—Shipments of tin plates for abroad have been well kept up, in fact, in excess of production, so that stocks have been lowered. Prices consequently show a slight advance. Block tin has advanced in the last few weeks £10 per ton. Zinc and lead are a little easier in price. Copper remains at about the same quotation. Manufacturers of tin and iron goods are fairly busy just now, baths, trunks, and such articles being in good demand. London trade is somewhat dull.

HAT TRADE.—This is dull. The strike at Atherstone, in respect to women doing alleged men's work, is watched with great interest by the workers in Stockport and Denton.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.*

I.—LETTER FROM A CORRESPONDENT.

Jewellers' Examinations.—H. S. G. (*London, S.W.*) writes:—"Seeing the great interest so many of your readers take in jewellery matters, and knowing that you have a very large number of working jewellers among them, I have thought the following questions, set by the City and Guilds of London Institute for their examination in the elementary grade of goldsmiths' work, would prove interesting. The questions were fourteen in number, of which not more than ten were to be answered. Three hours were allowed for the paper. 1. Classify, according to their respective branches or departments, the workmen employed in a large jewellery manufactory, where various kinds of personal ornaments are produced. 2. Give the processes in making a bracelet ⅜ths of an inch wide (lined or not) up to the point of receiving its ornamentation. 3. Describe the mechanism at the back of a diamond star which may be used as a hairpin, brooch, or pendant. 4. Explain the meaning of 'flush joint,' 'mitre joint,' and 'reversible joint.' 5. Describe briefly the following tools and their uses: treblet, rimer, drill-stock, belchering pliers, scorpers. 6. Name five varieties of ornamental engraving, and describe how different effects are obtained in any three of these varieties. 7. What do you understand by repoussé work, and in what does it differ from chasing? 8. Explain carefully what is meant by the 'repairing' of cast figures. 9. Describe the kind of surfaces to which wire decoration should be applied. 10. How would you proceed to make wire decoration, and on what parts of any ornament should it be arranged, (*a*) in bands, (*b*) in separate design? 11. Give some account of the process of *champlevé* and *cloisonné* enamelling, and describe the different effects produced. 12. What is the best style of 'cut out' for transparent enamels? 13. Name and describe not more than six different styles of finish for goldsmiths' work. 14. Describe fully the process of dry colouring. In the practical test the student had four hours allowed in which he had to do one of these three things:—1. Set out a given engraved pattern. 2. Trace and beat up the general effect of a given design in embossing or repoussé. 3. Shape and turn up a given geometric form ready for wire decoration."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Fretwork.—J. H. (*Walsall*).—Without seeing the fretwork, it is impossible to be sure where the fault is; but as J. H. mentions piano panels, we may say that (1) these are cut by practised workmen at good machines driven very rapidly. (2) They are not varnished, but polished. (3) The polisher has had considerable experience of fretwork. J. H. might try the following: Oil with raw linseed-oil the fretwork, doing every part of the cut surfaces, wiping off as much of the superfluous oil as possible; then give a coat of French polish to the cut edges with a brush; with No. 0 glass-paper rub off all that has run on the flat surfaces, and then polish with care. I have seen polishers do fretwork, and they had a small flannel rubber with a penny in it, and were careful not to put too much polish in the rubber at any time. The coin kept the rubber flat, and less likely to catch edges of the fretwork.—B. A. B.

Slot Machine.—A. W. (*Lytham*).—An article will shortly appear.

Patent Office Rules.—S. E. (*Upper Clapton*).—The quickest, most certain, and, therefore, most satisfactory course for our correspondent to follow is to make a visit to the sale-rooms of the Patent Office, 38, Cursitor Street, Chancery Lane, and ask the clerk to show him a copy of the rules containing the fees. He will then have to write on a strip of paper the title of what he wants, take it to the pay-room, hand it in at the window, together with the sixpence, when the receipt will be handed to him, which he takes to the clerk at the counter, who, on receiving it, will hand him the publication. Stamps are not received, and all money has to be remitted by P.O.O. when other than personal application is made. The office is open daily from 10 to 4 p.m.—C. E.

Darkening Oak by Fumigation.—J. H. (*Walsall*).—This is without a doubt the most practical and cleanly plan to adopt for oak; but I am not quite sure that it is so effective for mahogany, this being usually darkened by wiping over with a solution of bichromate of potash, carbonate of soda, or common washing-soda, then allowing it to stand a few hours or overnight, wiped over with red oil, made by steeping ¼ lb. of alkanet root in one pint of linseed-oil. To darken the oak by fumigation, you will require an air-tight box, of a size suitable to contain the goods. A well-made packing-case will do, with strong brown paper pasted over the joints; if a square of glass is inserted to enable you to see the progress being made, so much the better. The liquid ammonia (880) should stand on the bottom of this case in open dishes, to allow the fumes to play round the goods. For a box 9 ft. long, 6 ft. high, by 3 ft. 6 in. wide, half a pint of ammonia is generally sufficient.—LIFEBOAT.

WORK.—A. F. (*Luton*).—This is published weekly at 1d., monthly at 6d., and yearly (bound) at 7s. 6d.

Frame Making.—J. T. M. (19, *Ivory Street, Burnley*) asks for the address of J. A. (*Smallheath*).

Limelight.—STAGER.—To buy the whole apparatus for limelight would cost about £8. I should advise buying lens, about £1 5s.; gas jet, 15s. Have a retort made of strong sheet iron, and make your own washing bottles. There is great danger to a novice in making his own gas. The best way would be to buy the bottles of gas, returning the bottles when empty. If you are resolved to make your own gas, I can give you instructions how to go to work.—W. C.

Condenser.—S. G. (*Cork*).—I cannot recommend the automatic condenser mentioned on p. 113, as so far it has not proved a practical success, and in fact, on the face of it, it seems contrary to physical laws that it should act. You do not say what kind of a condenser you have in charge: whether it is a jet condenser or surface. If it is a surface condenser it should have a condensing surface equal to half the heating surface of the boiler. A jet condenser should not be of less capacity than one-fourth of that of the cylinder which exhausts into it, and in quick-running engines it should be one-half the capacity of the cylinder. The injection water should be about thirty times the weight of steam condensed, and the injection orifice in square inches one-tenth of the number of cubic feet of injection water per minute. If you will send full particulars of the engine and condenser, I may be able to help you with advice in this special case.—F. C.

Gravity Battery.—CONSTANT READER.—This is a variety of the Daniell or sulphate of copper battery without a porous cell. A copper plate connected to a wire is placed at the bottom of a glass or stoneware jar, and covered with copper sulphate crystals. A massive casting of zinc in the form of a crow's foot is amalgamated with mercury, and suspended from the top of the jar over the copper plate. A solution of sulphate of zinc is then poured into the cell until it just covers the zinc element. As sulphate of copper is heavier than sulphate of zinc, its superior specific gravity keeps it at the bottom of the cell as long as it is undisturbed; hence the name of the battery. But why use this for a microphone when one of the dry batteries are infinitely superior?—G. E. B.

Castings for Small Dynamo.—A Constant Reader.—Assuming that you mean 10 c.-p. lamps, then five such lamps will require a 50 c.-p. dynamo. The castings for a 50 c.-p. Siemens should be as follows:—Field magnets, 6 in. × 4 in. × ¾ in.; armature, laminated, 4 in. × 2¼ in. The castings for a 50 c.-p. Gramme should be: Four field-magnet cores, each 2 in. × 1⅛ in.; armature, 3½ in. diameter × 2 in. deep. The castings for a 50 c.-p. Manchester should be two field-magnet cores, 4½ in. × 1½ in : armature, 3½ in. diameter × 2 in. deep. Any of these may be obtained from Mr. Bottone, who will also tell you what wire to wind on the castings. Full directions for making dynamos of this class were given in Nos. 92, 94, 97, and 99, Vol. II. of Work.—G. E. B.

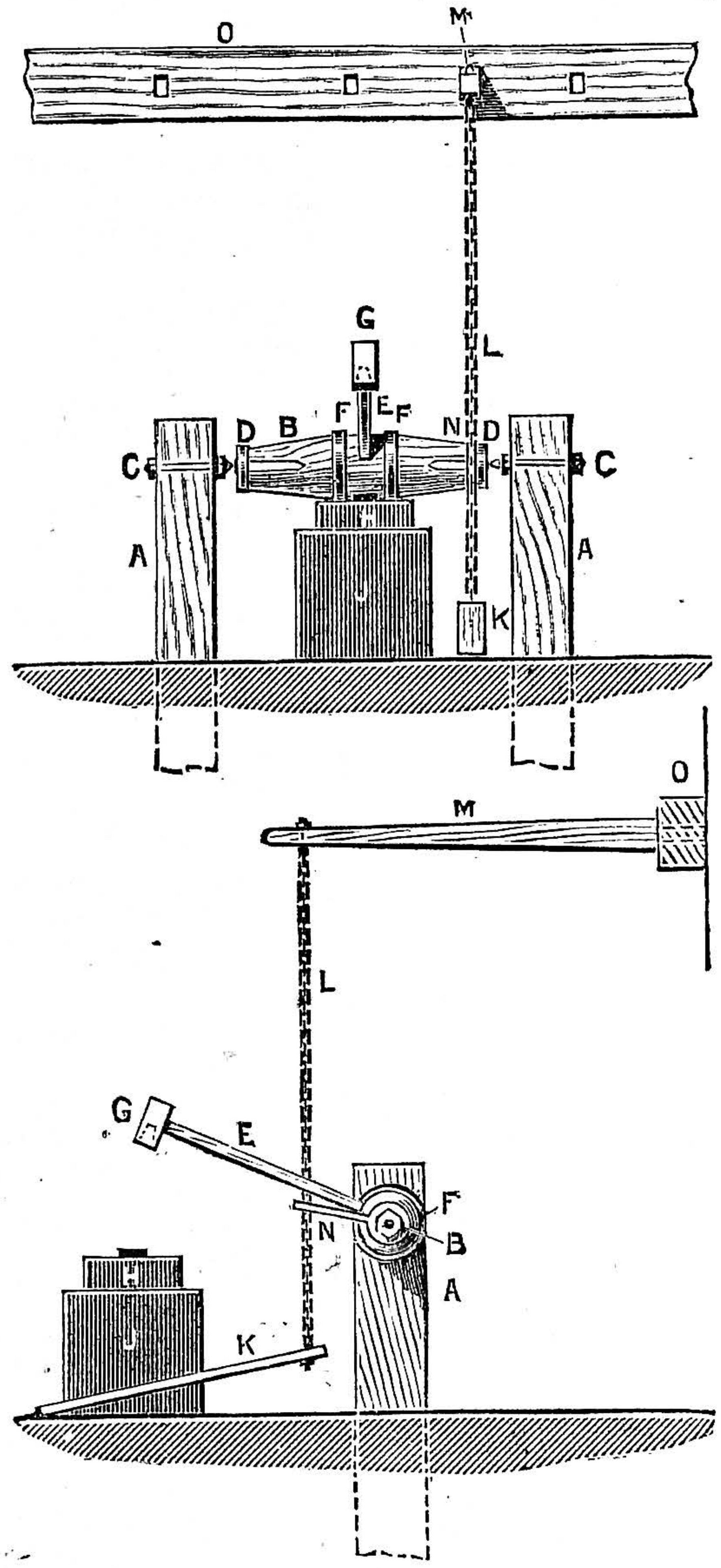
Metal.—A. W. P. (*Leeds*).—The piece of metal enclosed was aluminium. Although aluminium does not occur in the metallic state, yet as oxide and silicate (clay) it is one of the main constituents of the earth's crust. It is generally prepared from "cryolite," a double fluoride of aluminium and sodium. The cryolite is mixed with half its weight of common salt, and heated with sodium in an iron or earthern crucible. The liberated aluminium collects, in the melted state, at the bottom, and is drawn off. It is used in jewellery, for making light chemical weights and the beams of small chemical balances, and in the mountings of astronomical instruments. It is now coming into use for household utensils. Aluminium gold is an alloy of one part aluminium and nine parts copper.—F. B. C.

Violoncello.—H. H. M. (*St. Leonards-on-Sea*).—The editor is making arrangements for the publication of Instructions for making a Violoncello, and it is expected that these will appear in the current volume of Work. The same materials are used as for violin, but, of course, the sizes are much larger. You will find the address you ask for in the advertisement column.—B.

Rubber Tire.—S. B. (*Ardwick*).—S. B. will find all the information he requires in the last of the series of papers on Safety Bicycle construction in Work. (See Indexes.) He must, with a sharp knife, make a clean straight cut 2 in. long on both the broken ends of his tire, first wetting the knife in clean water. Wipe the cuts dry, and smear with rubber solution; leave unjoined for two hours or so, then join evenly, and it will hold at once, and may be put on the wheel immediately.—A. S. P.

Melting Old Tins.—Claudius.—I do not think it likely that a fortune can be realised by this means. If it were possible for you to obtain them in very large quantities for nothing, as was the case years ago, and had plenty of time, it might pay you very well; but you will find that, as soon as people know that any waste substance has a value, they will want to be paid for it; and I think it very doubtful indeed that you would be able to get a constant supply of tins to pay for the expense and trouble you propose. You might, however, try a simple method, as you have a lot. Build a rough brick fireplace that will support an oblong cast-iron pan, about 15 in. by 10 in. by 3 in. deep, and ½ in. thick. Put in this pan two or three pounds of metal for a start, and having your tins handy, and a pair of close tongs, place them in it. Melt out the bottoms, then melt the side seam open, let them get well hot all over in the metal and wipe them into the pan, and throw on one side. You will find the metal in the pan rapidly increase in bulk. The best thing to do with it is to make tinmen's solder of it.—R. A.

Hammer.—J. A. M. (*Tierkelly*).—The figure shows an Oliver hammer. A, A, are two stout wooden posts driven deeply into the ground. Between these there is pivoted on dead centres a piece of wood, B, either round, or square, or polygonal in section. Iron centres are driven into the ends of B, and these pivot upon stud-bolts, C, C. The pivots, and the countersunk holes in which they work, should be case-hardened, and iron bands, D, D, should be shrunk on, to prevent B from being split out at the ends. E is the hammer-shaft, mortised into B; and bands, F, F, are shrunk over B, on each side of E, to prevent the concussion of the hammer-blows from splitting the wood. The hammer-head, G, is recessed, as shown, to receive top swages, and corresponding bottom swages are let into the anvil, H, which in turn rests upon a massive anvil-block, J. The hammer is worked by the foot upon the treadle-board, K. To the far end of K one end of a chain, L, is attached, the other end of L being fastened to a long elastic pole of wood, M. A short lever, N, is also fastened to the chain between K and M, and being further driven over B, of which it forms an integral portion, moves B on its pivots, and causes E and G to descend with the treadle, K. On the release of the foot, the spring-bar M pulls G up; M is tenoned into a stout beam, O, fastened to the wall. I give no dimensions, but the drawing is proportional; so that, knowing the class of work required, you may make it of large or of small size. As regards the drop-hammer, there are several forms. I know one which is, I believe, that most commonly used. There is a pulley, to which a broad stout belt is fastened, the hammer being



Oliver Hammer and Parts.

attached to the lower end of the belt. The pulley is turned round when required, and to any height required within the range of the machine, by means of friction cones, operated with a disengaging clutch. When the clutch is released, the hammer falls; on throwing it into gear again, the hammer is lifted. The clutch is controlled by means of a lever handle within reach of the attendant.—J.

Back Gear for 3½ in. Lathe.—O. B. (*Hanley*).—Fig. 1 will, I think, show you all you want; you must, of course, be guided by your castings for the main dimensions. To throw in the back gear, pull out the pin, E, which in Fig. 1 engages in the groove, C; and slide the back-shaft, B, to the left about one inch, so that the wheels engage; then put the pin, E, back again, so as to work in the groove, D. Instead of having a nut on the face of the mandrel wheel to secure the pulley and wheel together, have a nut, F, on the mandrel, by means of which the pulley, J, can be clamped against the wheel, K, at H; there may be a spring washer between the bosses of these two wheels, just to keep them apart at the rims when revolving separately. This is a much better plan than the ordinary way with *small* lathes, in which the pulley must run fast; because by this means the pulley can be turned inside, and the whole may be in perfect balance; whilst with the usual plan, even if the little lock-nut is balanced in one position it will be slightly out of balance in the other. Besides this, with the nut, F, upon the mandrel, the whole of the front of the large gear wheel is free for utilising as a division plate, as shown in Fig. 2, which is a view in elevation of a somewhat larger headstock. In both these headstocks the end-long pressure on the mandrel caused by boring is taken by a washer and pair of lock-nuts, G, and not by a tail-pin, which leaves the tail end of the mandrel quite free to receive change-wheels of any size on the seating, M, M. Besides this, the mandrel may be bored *right through*, which should be the case on small lathes for metal turning, so that metal rods or wire may be passed up through the universal chuck into the mandrel, whilst a screw, etc., is made on the end and cut off, etc. etc. I would strongly advise the taper hole in the mandrel should be made to take the smallest size of Morse taper, and that in the moving headstock should be the same; get a twist-drill or small chuck of the correct size, and make the holes to suit it. In my opinion, 55° is too sharp for the point of the lathe centres; I would have them 60°, partly because most mandrels, taps, etc., that you buy are centred to that angle—which is almost universal in America, whilst 72° and 80° are common in England. Also, it is very convenient to make the screw in the cylinder of the poppet long enough to push out the back-centre when cylinder is drawn in.—F. A. M.

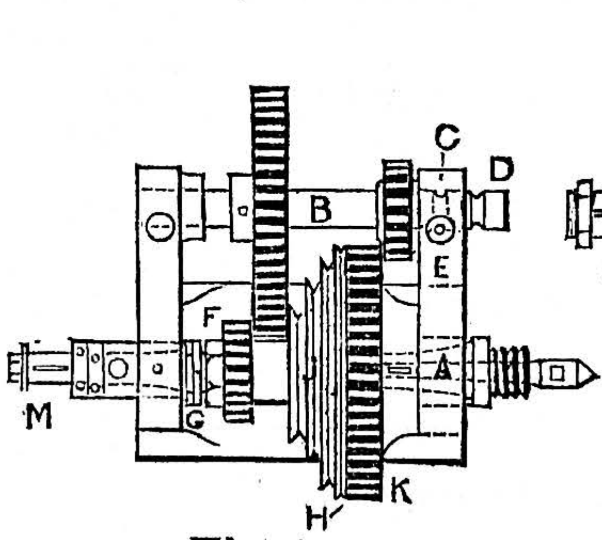


Fig. 1.

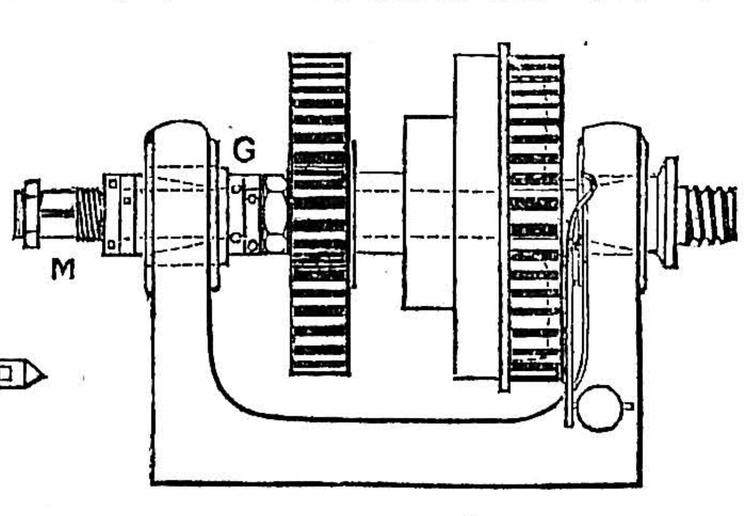


Fig. 2.

Lathe Gear. Fig. 1.—Plan of Geared Headstock with Sliding Back-shaft. Fig. 2.—Elevation of Geared Headstock with Clamping Nut on Mandrel.

New Galvanising Process.—T. E. W. & Son (*Birmingham*).—This is the property of the London Metallurgical Company, Turnmill Street, London, E.C. Tests of the tensile strength of wire recently made, and the results indicated, were as follows:—Steel wire uncoated gave a breaking load per square inch of 165 tons. The same wire, galvanised by ordinary process, 150 tons; and coated by the new process, 165 tons. Many other experiments with favourable results have been carried out by Mr. David Kircaldy and Mr. Arnold Philip, of the Royal School of Mines, and the report of the latter is very interesting. The company do not propose to work the process themselves, but will grant licences; and they already have received a number of applications, some of which have been arranged.—R. A.

Sea-going Engineer.—Sirius.—Our correspondent is quite right in his views as to being qualified as a mechanic for this purpose, and he cannot do better than be apprenticed to some good firm of marine engine makers, where he will have the opportunity of learning his business thoroughly; and if steady, sober, persevering, and attentive to his orders and duties, need have no fear but that he will get on. As his letter does not give us any idea of what part of the kingdom he resides in, it is difficult to advise him as to what firm he should apply to. There are few large sea-ports in the north and east coasts where there are not marine engine makers, but if our correspondent will let us know where he resides, we might be able to indicate a suitable one to apply to near him. One thing our correspondent must carefully bear in mind, if he becomes an apprentice: and that is, to apply his spare time to improving his knowledge in mechanics, mechanical drawing, arithmetic, and natural philosophy, as well as learning to use the tools, and making himself a good mechanic. Fortunately, in the present day there are such enormous facilities afforded to those who are wise enough to avail themselves of them, in the shape of evening classes, in most large towns, that ignorance in such matters can only be looked on as a disgrace to anyone. It is not by any means a necessity that a good mechanic should, or must, necessarily be a bad scholar. The better a man is qualified to hold a high position, the more likely he is to get it, and retain it when got. The main object of all young men should be to rise in the world, and to qualify themselves, whilst young and able to do so, for so doing. The mere fact of a person producing his indentures to show that he was so long under a certain firm no more proves that he is a mechanic, or capable of carrying out work, than his bare word would prove it. All persons intending to go to sea as engineers afloat in charge of machinery have to pass a proper examination by practical men to prove their fitness; therefore, our correspondent should begin and keep on in his leisure time to qualify and prepare himself to give proofs of his ability and fitness when the time comes that he will be called upon to do so.—C. E.

Manchester Dynamo, Shunt Wound.—A. J. (*Lhanbryde*).—Connect the finish end of one field-magnet coil to the commencing end of the other coil. The two free ends of these coils must then be connected to the brushes. Wires lead from the brushes to the terminal binding screws of the machine. The current from the armature then divides between the field-magnet coils and the work in the outer circuit.—G. E. B.

Lengthening Dynamo.—An Electrical Student.—I am in receipt of your kind letter, and note its interesting contents. I think you slightly misunderstand the formula quoted by you. The voltage of the current from a Siemens dynamo is governed by the *length* of active wire on the armature, its rate of speed, and the intensity of the magnetic field. I do not see any discrepancy between this statement and the working of the formula quoted by you. By lengthening the armature, you will get a greater length of wire on it, but the capacity of the wire will be unaltered, and the other parts of the machine must be altered proportionately. To get a greater output, all the dimensions must be altered, including the size of the wire. The reply I gave on p. 813, Vol. III., was intended to prevent the querist from following a will-o'-the-wisp idea approaching that of perpetual motion: and my advice to him respecting more *turns* of wire only applied to his machine and his requirements.—G. E. B.

Electric Light for Bedroom.—HYSTERESIS.—As a No. 4 gas-burner will furnish a light of from 10 to 12 candle-power, and can only be matched, light for light, by a 16 candle-power electric light—and a lamp of this power is very expensive to maintain with current from a battery—I advise you to give up the idea of getting an incandescent electric lamp to light up your bedroom in place of a No. 4 gas-burner. Be content with something less—say an 8 volt 5 c.-p. lamp taking ten large Leclanché cells, or a 5 volt 2½ c.-p. lamp taking some five or six cells of either the Leclanché or one of the better types of dry cell, such as the E.S., E.C.C., Gassner, or Helleser. The light will be very small, but will be enough to see the time on a watch, and enough to see to dress and undress by. I have had one of the E.S. bedroom lighting sets in use since the commencement of last winter, and it has done me good service. A friend at Ipswich has tried the Leclanché with good results. The larger Leclanché, such as the six-block agglomerate type, are preferable to the smaller cells. Use No. 18 or No. 20 cotton-covered wire to conduct the current.—G. E. B.

Dry Battery.—TOM.—(1) A dry battery is not suitable for lighting a 5 c.-p. lamp for any length of time; intervals of from five to ten minutes at a time only. (2) If a battery of five cells will light a lamp properly, you will injure the lamp by adding more cells, and may increase the number of cells until the filament is ruptured. In this, a dry battery differs in no way from other batteries. The lamp filament may be protected from rupture by placing a safety fuse in the circuit, together with a suitable set of resistances. (3) Dry batteries, like all others, can only furnish a fixed amount of current from one charge. Therefore, supposing that the charge will light a given lamp for four hours, and you use the battery for two hours, there should be enough energy in the charge to light the lamp for another two hours. The charge may be economised or used wastefully. As a rule, rapid exhaustion follows a too rapid discharge.—G. E. B.

Curative Magnetic Appliance.—F. C. (*Belfast*).—As your friend has been cured of a bronchial affection of sixteen years' standing by wearing a magnetic appliance, there is hope for your mother being cured by a similar appliance. I have met with many persons who have been cured of different ailments—or, at least, believe that they have been cured—by wearing magnetic appliances. Their construction is most simple. You have simply to make a flannel pad to fit the part of the body affected, and sew on to this, or quilt between two pieces of flannel, a number of flat bar permanent magnets, the number and size of which is entirely a matter governed by the comfortable fit of the appliance. The magnets may be covered in jean or flannel before sewing them on, if so desired. All the polar extremities should point in the same direction, preferably with the north poles downward. For bronchial affections it is sometimes preferable to wear a magnetic pad at the back, between the shoulders.—G. E. B.

Shocking Coil.—J. P. (*Leeds*).—Bobbins with mahogany or walnut ends 3 in. in diameter, and a strong paper tube ⅛ in. thick, 5 in. in length, and inside diameter of 11/16 in. Core to slide in this tube, or to be fixed at one end with a brass tube to slide over it, of No. 20 soft iron wire bound into a bundle ⅝ in. in diameter. Primary wire, four layers of cotton-covered No. 20 copper wire. Secondary wire, 1 lb. of No. 34 silk-covered copper wire. You should have a separate contact breaker with this coil. Detailed instructions and illustrations have already been given in the series of articles on Induction Coils recently published. With current from a pint cell of a bichromate battery, a coil of the above dimensions will give you stronger shocks than you will care to take.—G. E. B.

III.—QUESTIONS SUBMITTED TO READERS.

⁂ The attention and co-operation of readers of WORK *are invited for this section of "Shop."*

Folding Clothes-Horse.—J. W. B. (*Huddersfield*) writes:—"I have designed a folding clothes-horse which shuts up like a music holder on a piano, and the patent agents in this town are pleased with it. How would I obtain a sale for it and secure it, etc.?"

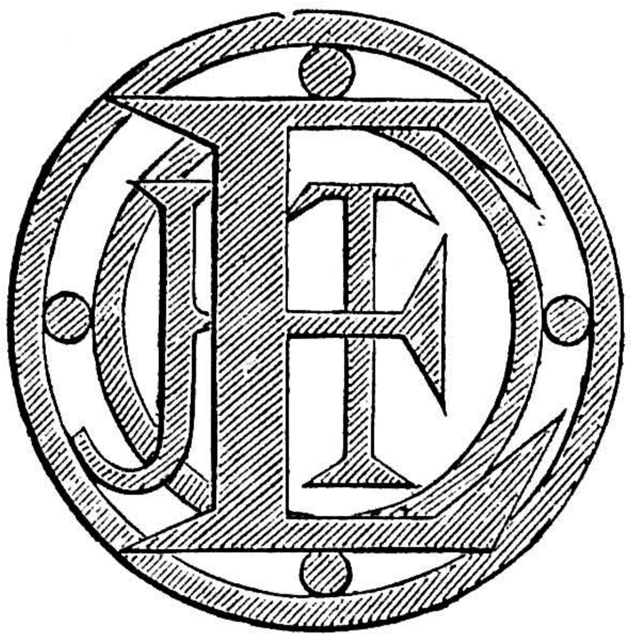
Dulcimer.—AMATEUR writes:—"Will MUSIC give me a few hints regarding the construction of a dulcimer he gave the measurements of in No. 27, Vol. I., of WORK? Do the measurements given include the wrest- and hitch-pins, and what number wire does he use for the different notes? Also let me know the position of the bridges; I have tried to make one, but it has not turned out all right."

Osteology.—OSTEOLOGIST writes:—"Could any correspondent tell me how I may skeletonise birds and small animals? I have been much puzzled over some very delicate specimens that I have seen. How is it done? The names of any books on the subject would be welcome."

Cardboard Boxes.—W. E. (*Herts*) writes:—"Will any reader of WORK kindly inform me as to the best and cheapest methods of making the above; also where the machinery may be obtained that is required for the purpose?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Monogram of J. T. E.—C. K. (*Stratford*) writes:—"In WORK, No. 157, p. 14, YOUTHFUL READER asks for a fretwork monogram. Possibly this one may suit him."



Fretwork Monogram.

Lathe Attachment.—J. A. M. (*Stamford Hill*) writes:—"If LEARNER will refer to No. 131, Vol. III., he will there see a sketch of a fret saw that I have in use, and which answers fairly well."

Perspective.—M. (*Bishop Auckland*) writes to SPECTEMUR AGENDO (see No. 165, page 142):—"There are two works on perspective by Messrs. Cassell & Co., advertised on page 143 of WORK, which may be suitable for you."

Binding WORK.—M. (*Bishop Auckland*) writes to J. H. B. (*Pendleton*) (see No. 165, page 142):—"I am just finishing the binding of Vol. III. of WORK. The materials have cost under 1s. per vol., and the information was obtained from Vol. II. I shall be glad to give you any information. I think you could manage from the instructions given."

Engravers' Tools.—M. (*Bishop Auckland*) writes to ENGRAVER (*Wales*) (see No. 165, page 142):—"You will find full instructions, price of tools, etc., on page 519, Vol. I. of WORK."

Crystoleum Painting.—S. J. (*Failsworth*) writes to HANSOT:—"I would recommend him to procure a book entitled 'A Guide to Crystoleum Painting,' by Mrs. L. H. Goggs, price 1s. This is published by the Crystoleum Company, 500, Oxford Street, London."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—A. J. F. (*Bow, E.*); W. R. (*London*); GARBOARD STRAKE; J. M. H. (*Glasgow*); G. L. (*Poplar*); E. R. (*Camberwell*); B. F. B., JUNR. (*Liverpool*); A. F. (*Ovenden*); A. W. (*Glasgow*); SOUTHPORT; AMATEUR; JUVENILE; ASHWORTH; A. B. (*New York*); S. H. (*Cardiff*); A. B. (*Newnham*); JERSEY COMPANY, LIMITED (*Stroud*); D. A. (*Glasgow*); P. L. (*Bolton*); PERSEVERE; NOVICE; YOUNG SMITH; J. W. M. (*Sheffield*); P. B. H. (*Southport*); V. B. (*Egham*); H. B. S. (*Wolverhampton*); F. H. T. (*Hornsey*); J. C. T. (*Dalston*); ONE THAT WANTS TO LEARN; J. T. (*Edinburgh*); S. J. H. (*Leicester*); A. L. W. (*Aberystwith*); CYMRO; SECOND APPLICATION; J. A. L. (*Hammersmith, W.*); F. S. (*Old Swindon*); PLUMBER; THOMASO.

NOTICE TO READERS.

Next week's WORK (No. 174) will contain, among other articles:—

HOW TO MAKE A PHONOGRAPH;
MAHOGANY MAGIC LANTERN;
TESTING PRECIOUS STONES;
SIMPLE UTENSILS FOR THE GARDEN;
OLD SPANISH IRON WORK;
etc. etc.

"WORK" PRIZE SCHEME.

SECOND COMPETITION.

THE Editor of WORK has the pleasure of calling the attention of his readers to the Second Competition under the Prize Scheme, which so many readers of WORK have thought to be a suitable sequel to the late WORK Exhibition.

The subject for the present competition is, like that of "The Cycle," one that appeals to the whole of our readers, young and old alike, and places them, therefore, at equal advantage.

It will take the form of a suggestion for

A USEFUL ARTICLE FOR THE HOUSEHOLD.

For the three best suggestions for a new domestic appliance, household article, or labour-saving tool of general utility, the following prizes will be awarded—

First Prize, £3;
Second Prize, £2;
Third Prize, £1.

CONDITIONS AND RULES OF THE "USEFUL HOUSEHOLD ARTICLE" COMPETITION.

ALL Descriptions to bear the WORK Prize Coupon, cut from one of the numbers of WORK in which the Prize Scheme is announced.

Each Description to be signed with an original *nom de plume*, and to have the writer's real name and address securely attached to the manuscript in a sealed envelope.

Each Suggestion should be fully described in respect to its purpose, construction, and working, and, where possible, should be illustrated with a drawing of the article itself and its various parts to elucidate the description.

A Suggestion not illustrated will have an equal claim in the competition provided the description be sufficiently in detail to convey a full idea of the article suggested.

In the work of judging regard will be had to the practical nature and utility of the suggestions, and their prospective popularity.

The Prize Suggestions and Drawings, and any others, to be published, if desired by the Editor, in WORK, but the copyright thereof to remain with the authors.

Copies of MSS. and Drawings to be retained by the competitors, as in no case can the return of MSS. be undertaken.

The Editor of WORK will supervise the judging of the Suggestions, and the selection as determined upon is to be final.

All manuscripts intended for the "Useful Household Article" competition must be addressed to the Editor of WORK, c/o Cassell & Co., Ld., Ludgate Hill, London, E.C. They must reach him on or before SATURDAY, JULY 30, endorsed, "Useful Household Article" Competition.