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THE MANUFACTURE OF SILVERWARE.-(See page 290.)

## Srimutifir Amman.

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## LANDE BELOW THE OCEAN LEVEL.

In an article treating on some remarkable results of evapo ration and rainfall, published on page 257 of our issue of Apris 28, this year, we described one of the instances of the great excesses of evaporation over rainfall, namely, the Caspian Sea, or which the surface is as much below the ocean icvel as our Lake Champlain is above the same, namely, more than 80 reet. There are, however, two still more remarkable cases of the same sort, the Dead Sea in Palestine and the Great Desert or Sahara in Africa. The fornier is remarkable or the great amount of the depression, and the latter for the immense surface depressed, being in fact the bottom of an extensive inland lake, totally dried up by the heat of a tropical climate, aided by the absence of reeding streams, and by the rainless area which covers its greatest portion. It is, on an average, 80 fect below the ocean, about as much as the Caspian Sea; but it is remarkable for its extent, being nearly 2,000 miles square, or nearly $4,000,000$ square miles.
The F'rench government, having an eye to the colonization or Northern Africa, with Algiers as a starting point, has for some time favored a project for restoring this sandy waste to its primeval condition by cutting a communication with the ocean, and so transforming it into a salt water inland lake. The effect of this on the climate of the surrounding country, and especially on the colony of Algiers, would undoubtedly be most beneficial, because the south wind, in stead of blowing, as it does now, over a sandy desert, would become a sea breeze; this would increase the rainfall, and change a rainless district into a fruitful region. In a commercial point of view, moreover, the benefits of such a change could not be overestimated. The introduction of water trans portation is especially advisable in this tropical region, where the miserable and utterly inefficient caravan is now the oniy mode of carrying goods; and without doubt commercial cities would soon spring up around the shores of the proposed inland sea, which would become the scene of a mighty trave and traffic, as the lake would give easy access to the sur rounding countries, and develop this part of Africa to an extent thus far utterly undreamed of.

But it is weli to look also at the disadvantages of this gigantic scheme. In the first place, it will rob the ocean of gigantic scheme. In the irst place, it will rob the ocean of
such an enormous amount of water that its general surface will be lowered to an appreciable extent. In order to realize how much this lowering wili amount to, let us consider that the total terrestrial surface is, in round numbers, $200,000,000$ square milss, of which the ocean occupies three quarters, or
$150,000,000$. If the estimate given of the Desert of Sahara, $4,000,000$ square miles is correct, it occupies $\frac{1}{98}$ part of the ocean's surface, and, therefore, every foot of depth of water abstracted for the Desert will diminish the ocean $\frac{1}{88}$ part of a foot; and the withdrawal of water for a lake 80 feet deep would leave the ocean level $80 \times \frac{1}{38}$, or more than two feet lower, which would be plainly perceptile in the many harbors where careful tidal observations are made, and in some cases changes may influence the shipping, robbing as it would do
all parts of the world of over two feet depth of water, which all parts of the world of over two feet depth of water, which
would be very bad in those localities where the harbors are shallow.
This much as to an immediate result; but the ultimate consequences would be much more serious. It should be would have no fresh water supply, by rivers; but ined,
whed water would certainly rush in through the channel, to make up for the large evaporation, which we may safely set down at $1,200 \mathrm{lbs}$. of water per year for every square fcot. This would lower the level 20 feet per year, which is one quarter of the whole quantity of the lake. This, for a surface of $4,000,000$ square miles, or $100,000,000,000,000$ square feet, gives $2,000,000,000,000,000$ cubic feet of water to be replaced annually from the ocean, or nearly $6,000,000,000,000$ cubic feet per day, or $250,000,000,000$ cubic feet per hour, or 4,166 ,666,666 cubic feet per minute, or $69,444,444$ cubic feet or $525,000,000$ gallons per second. As the German Rhine carries only $1,000,000$ gallons of water per second, on an aver age, the channel bringing the supply to the Desert of Sahara from the ocean would have to carry as much water as is car ried by 525 rivers like the Rhine; and from the salt water only pure water would be evaporated, leaving the salt behind. As this amounts to 4 per cent, or $\frac{1}{25}$ of the sea water, and as nearly 20 feet deep, or $\frac{1}{4}$ of the water in this new lake, would annually evaporate, it would only take $4 \times 25$, or 100 years, one single century, for all the water to disappear, and
a deposit of salt take its place. Then the now sandy desert would be changed into a desert of salt: which salt would fill the whole basin, and would certainly be a more serious af fliction to Algeria than the present sand plain can possibly

## THE THORNEYCROFT FAST LAUNCHES.

In a recent description of the French torpedo experiments at Cherbourg, we noted the wonderful speed of nearly 19 knots per hour attained by a steel torpedo launch built by Messrs. Thorneycroft. In such small craft, displacing at obtainable 15 tons, this extreme velocity appears to be has been maintained over measured distances for more than two consecutive hours, the engine then developing 220 horse power. The dimensions of a launch which attained this
speed are as follows: Length 63.04 feet, beam 8.53 feet, draught of water (average) 2 feet, displacement (that is to say, the total weight of the vessel and all its contents) 15 tons.
monstrate remarkable progress in navigation, on the othe hand this achievement cannot be attributed to any new dis covery, but results from improved application of known principles, and especially from the rare perfection of the con struction of the motive apparatus, which develops great power, while its weight is reduced to the narrowest limits. This, however, it not the only element of success. The model of he hull is such as to diminish to the utmost the liquid resist ance opposed to its onward movement. Again, the material of which the hull is built is such as not to absorb by its weight a fraction of the total displacement which may be usefully devoted to the motive machinery. To this end it is built of steel plates, and weighs but 9,900 lbs., or less than a third of the total displacement. In order that the propelle should afford the maximum effect, it is necessary that the liquid vein upon which it acts should be as large as possible in comparison with the resistant section of the vessel. Or dinarily the section of vein acted upon is less than the latter In the Thorneycroft launch, the screw shaft is placed on level with the keel, instead of being located at a point half way between the keei and the water line, as is usually the case. The screw then projects below the keel for nearly half its diameter, and consequently it acts upon a section of vein greater in area than the greatest section of the vessel This arrangement doubtless contributes materially to the speed; while a sharp bend of the keel protects the propeller from damage.

As already noted, Messrs. Thorneycroft's success in pro ducing a motor both light and powerful has been remarkable. The complete machine-that is, including boilers and the water contained-weighs in all $16,060 \mathrm{lbs}$. The power at the speed of 189 knots having been 220 horse, the weight is therefore but 72.6 lbs . per horse power. The machinery is therefore probably the lightest ever produced for purposes of navigation. Large marine engines for a long time rarely weighed less than 440 lbs . per horse power; and it is only through recent improvements that this has been reduced to 330 lbs. For ordinary launches, with non-condensing engines running at high velocities, the usual weight per horse power is about 220 lbs . It is therefore interesting to note under what conditions Messrs. Thorneycroft's engines are produced. They are condensing machines, two cylinder, on the compound system. The boilers are of the locomotive type, with the difference that the tubular surface is reduced about one half. This is the only sacrifice which has been made for the economic production of power; and it was ne cessary in order to reduce the weight of the apparatus. The safety valves are loaded to $13 \cdot 2 \mathrm{lbs}$. The engine makes 430 revolutions per minute, which requires great mechanical ex cellence of the mechanism, and especially of the air pump. The consumption of coal per horse power per hour is 3.52 lbs. The grate surface is $11 \cdot 19$ square feet. $\quad$ n artificial blast is conducted directly to the fire chamber instead of to the ashpit.

## THE PERMANENT SUPPLY WATER WORKS OF

 BALTIMORE.One of the greatest engineering works now in progress is hat to supply the city of Baltimore with water, and the genemen in charge of it have been so busy pushing it forward hat they have had very little time to talk about it: in consequence of which not many people outside of the city know anything of it, and comparatively few have any idea of the immensity and difficulty of the works that are now so quietly progressing to supply them with an almost unlimited supply of the necessary article of water. One of our cor respondents lately called on Mr. Robert K. Martin, the en gineer in charge, who was so obliging as to show him over the line of works, and we are thus enabled to lay the follow ing particulars before our readers.
Baltimore is at present supplied with works having a capacity of about $15,000,000$ gallons a day, which comes from Jones' Falls to Lake Roland, whence it is brought by a con duit $3 \frac{3}{4}$ miles long to Hampden reservoir and Druid Lake. From the latter, which is 53 acres in extent and 217 feet above tide, one portion of the water is raised by power ful steam pumps to a high service reservoir 350 feet above tide, for supplying the highest region of the city; a second part is supplied direct to the mains; and still another portion is allowed to pass to Mount Royal reservoir, which is only 150 feet above tide, so as not to give too high a pressure to the lowest portion of the city.
This supply having been found to be insufficient in the summer season, it was resolved to increase it temporarily by erecting, near the Gunpowder River, a pair of Worthington's duplex compound pumping engines, capable of raising $10,000,000$ gallons a day from that river, over a hill 265 feet high, to Roland Run, a tributary of Jones' Falls above men tioned. This arrangement, however, was not sufficient for some of the more enterprising of the Baltimoreans, and a new plan was devised; and it is now being carried out, notwithstanding considerable opposition by interested parties, by the capable and energetic civil engineer of the Water Commission, Mr. R. K. Martin, who had charge of the pre vious works, erected in 1858. The source of the new supply is the Gunpowder River, which at about nine miles from Baltimore makes its nearest approach to the city, as at this point it takes a bend in another direction Advantage is taken of this turn to form a dam across the stream, and so form a storage lake which will, it is believed, be capable of supplying the city with $175,000,000$ gallons of water every twenty four hours. This lake will be from 500 to 1,000 feet wide, about 20 feet deep on the average, and will extend up
the Gunpowder a distance of about 5 miles through the most picturesque scenery, which is constantly changing, as the river and the valley through which it runs pursue a very devious course between ranges of precipitous, wooded hills, from where it leaves the open country near Meredith's Ford bridge, which forms the head of the lake. To facilitate operations, a road 10 miles long, about 30 feet wide, and about 10 above the intended level of the lake, has been cut in the sides of the hills on each side, which will no doubt be utilized hereafter as a pleasure drive by the lovers of beautiful scenery.
At the lower end of the site chosen for the lake, two hills jut out into the valley, leaving but a comparatively narrow place, of which advantage is taken to form a dam which will raise the water about twenty feet above the natural level of the river. In one of these hills is the mouth of the tunnel, hereafter referred to, from the side of which a dam will be built having an overfall of 300 feet and a wing of 190 feet, that will extend into the opposite hill. This dam will be of the most substantial character, of heavy stone laid in hydraulic cement. The stone work will be 31 feet high and about 65 at the base, having its foundation on the solid rock; and it is estimated that about 20,000 perches of stone will be required for this part alone. The face of the overfall will be built of large blocks from three to four feet in depth; and to prevent any undermining, an apron is to be cutbelow the overfall resting four feet below any of the other foundations. The other side of the dam will be protected by a backing of 165 feet of puddle clay, gravel, and riprapping. The parapet walls will rise 12 feet above the overfall, and will be level with the floor of a gate house that is to be erected at the tunnel end of the dam. At the gate house begins the tunner, which is to carry the water to Lake Montebello. This tunnel is nearly seven miles long- 36,510 feet-and is therefore the longest in the country. The bore is circular in shape and is 12 feet in diameter. Over five miles of it will be through hard gneisse which is being cut with drills driven by manual labor, as the contractors think that, owing to the comparatively small area of the tunnel, the power drills are not economical enough to pay them for the cost of the necessary machinery. A portion of the tunnel is being cut through softer material-a kind of limestone, that crumbles into powder by the force of the explosion when blasted. This part of the tunnel will have to be bricked; but where the gneiss occurs, the brickwork will be dispensed with, except in some localities where there are bad breaks and crevices in the rock, and at the hottoms of the shafts which will, when the tunnel is completed, be arched over with masonry 6 feet thick, to withstand the immense pressure of the loose earth filled in above.
To facilitate the operations in the tunnel, fifteen shafts, from 65 to 300 feet deep, have been sunk, most of which are down to grade; and in some of them considerable work has been done on the tunnel. But owing to the hardness of the rock for the larger portion of the distance, very fast progress cannot be made-only about a running foot of tunnel per shift of 12 hours, or two feet per day, as in tunneling night and day are alike so far as work is concerned, the only light in either case being that obtained from the small lamps attached to the miners' hats. As before stated, the contractors employ manual power for drilling, which, in the hard work, is done by task work-thirteen feet per shift being the miner's task. The holes are bored 30 inches deep, and an eight ounce cartridge of giant powder (nitro-glycerin and sawdust) is used in each hole, at which rate about 7 lbs. of powder, at 40 cents per lb., is used for each running foot of hard rock tunnel, making for the five miles through the gneiss nearly $\$ 74,000$ for explosives alone, to say nothing of that used in the other portions of the work.
The shafts are from $8 \times 17$ to $8 \times 20$ feet inside the timber work, which, when used, adds about 30 inches to the above figures; and as fast as they are completed they are fitted with improved safety cages to prevent accidents from the hoisting mechanism; but they have only the ordinary tipping bucket until the shaft is down to grade. The exhaust from hoisting engines is utilized to create a draught in a pipe, the mouth of which is near the heading, and by this means ventilation is secured in the tunnel.
In the limestone portion of the tunnel, between shafts 1 and 2 , the stratum makes an eccentric dip, leaving a "pocket" of mud which, as the miners were working towards it, suddenly ran into the tunnel, overwhelming and suffocating one poor fellow who had been driven by it against the timbers; but the remainder of the workmen managed to escape. In this, as in some other sections, the water forms a great hindrance to operations, a spring being found here which keeps a steam pump of a capacity of 200 gallons a minute constantly at work, while about the same quantity of water percolates through other crevices in the rocky sides of this
section of the tunnel and has to be removed by another pump of the same size. The same trouble occurs in other shafts, especially No. 5 .
To make the necessary observations required to properly line and level the tunnel, a straight line has been made over the tops of the hills and through the woods, and three observatories have been erected for this purpose. As an instance of the great care taken by Mr. Martin in this matter, it may be stated that these structures are double, consisting of an inner tower (on which the instruments are placed) protected from atmospheric and other influences by an outer one, entirely detached from the other, on which the engineer stands when making his observations.
At the lower end of the tunnel is to be located a reservoir,
to be known as Lake Montebello, which is being formed by damming up a valley admirably suited to the use to which it is being put. The upper and lower ends of the valley, up with the east and west sides of the reservoir, willbe chosed pith dams of stone and earth, 450 feet wide at the base and 100 feet at the top, with each end imbedded in the hills at the sides, so that the greatest possible strength may be obtained; for this is one of the most critical pieces of construc tion along the whole line, as these dams will have to sustain the pressure of $600,000,000$ gallons of water. The north and south sides of the valley, about 3,500 feet each, will form the other sides of the reservoir, which, when completed, will have the appearance of a natural lake, and will have a superficial area of about 80 acres and a depth of at least 30
feet. The sides will be finished with riprapping and the to will be surrounded by a fine road $1 \frac{1}{2}$ miles long and from 60 to 80 feet wide, divided from the reservoir by a neat and sub stantial iron fence.
There being a stream running through this valley whose water is too impure to be used, a drainage tunnel, 2,870 feet long and of 9 feet diameter, had to be made to carry it away, which tunnel will also serve to take off the surface drainage, and to empty the reservoir, should it be required. From this reservoir, another tunnel, 2,600 feet in length and 12 feet in diameter, is now in course of construction. This tunnel is cut through soft material, and therefore requires strengthening with brickwork laid in hydraulic cement. Where the tunnel -is of the right character, the top arch is three bricks thick and the invert below the spring line two bricks, with a proportionate backing of from 18 to 24 inches above the spring line, built in against the timbers or the rock wall of the tunnel. In the soft places, there is an additional ring of brickwork added, and the backing is proportionately increased. In all cases, the arch is packed over the top with clay well rammed in. The brickwork in this, as in the main and drainage tunnels, requires to be done with the greatest care, as it has to stand not only the outside pressure of the immense weight of material above it, as in railroad tunnels, but also the internal pressure of the water within, which is always searching for weak spots to break through, and it is therefore being done by the day. It is estimated that about $12,000,000$ bricks will be used in all the tunnels.
One portion of this tunnel passes beneath a well, the bot om of which is only four feet from the top of the tunnel; and yet the water of the well has not been drained, and it continues to furnish its usual quantity of water, notwith standing that another well, 300 feet from the tunnel, was al most immediately drained and has now no water whatever. At the end of this tunnel will be a gate house from which the water will pass int) six pipes of 48 inches diameter each, by which it will be conveyed to the city limits, and there connected with the present system of mains for distribution throughout the city
Along the line of the work have sprung into being several temporary villages for the miners and laborers, showing styles of architecture that one would hardly expect to find so near a great city, varying from the tolerably comfortable offices of the contractors to that of the squalid log huts of the negro laborers on the storage lake, with a single room that is half below ground and half above. Many drinking shops have also been built on the line, or rather as near to it as they can be built (for the engineer will not allow them on the city property), in which the men squander their hard earnings after each pay day, and so unfit themselves for their labor as to cause no small delay to the progress of the work.
Unlike the offlials of some other cities that may be named, those of Baltimore appear to have a fashion of completing
their public works without exceeding the apropriations for their public works without exceeding the appropriations for year or two ago, and it appears as if it would be the same with the water works. The whole amount appropriated for this purpose is $\$ 4,000,000$; but the engineer in charge, who is doing his best to cut down the expenses all he can without depreciating the quality of the work, thinks the whole im provement can be completed at a cost of very little, if any, over $\$ 3,000,000$. About 1,500 men are employed-common
laborers getting $\$ 1.25$ per day and miners $\$ 1.50$. It is expected that the whole work will take about three years to finish, and Baltimore will then have a natural flow through the
tunnel that will supply it for generations to come with all tunnel that will supply it for generations to come with all as the river at the point tapped is 170 feet above mean tide and consequently will give water to nearly all the houses in the city, except in the extreme northwest section, for which the water will still have to be pumped into a high service re rvoir
Mr. Martin is assisted by Mr. C. P. Manning, consulting engineer, W. L. Kenley, chief assistant, and seven resident engineers, Messrs. R. B. Hook, W. R. Warfield, C. O. Swan, C. T. Manning, O. H. Balderston, and C. A. Hook, who are named in the order of the work they have in charge, beginning at the storage lake. The contractors, also named in the same order, are Messrs. Condon and Co., Fenton and Allan, Bruce and Patterson, L. B. McCabe and Brother, J. Donoue and Brother, and J. E. Eschback.
From this cursory sketch, some idea of the magnitude of the work in which the city of Baltimore is engaged may be obtained-a work alike honorable to the public spirit of her citizens and the gentlemen engaged in its construction.

Tre most valuable part of a man's education is that which

## WHAT IS A TEMPORARY STAR

On November 24, 1876, Professor Schmidt, Director of he Observatory at Athens, Greece, noticed a new star, of the third magnitude, in the consteliation Oygnus. The three nights immediately preceding had been cloudy, but the star had not become visible on the night of the 20th. Astrono mers throughout the world were at once notified of the dis covery, and the object was diligently observed both in Europe and America. Its apparent magnitude very rapidly diminished from the date of its discovery. In a few week it became invisible to the naked eye; and in less than three months its light was no greater than that of a star of the ninth or tenth magnitude. Other instances of such pheno mena are well known in the records of astronomy. The following catalogue, with the exception of the last two, is given by Humboldt:
 It is worthy of especial notice," Sir John Herschel re"that all the stars of this kind on record, of whic the places are distinctly indicated, have occurred, withou exception, in or close upon the borders of the Milky Way and that only within the following semicircle, the preceding having offered no example of the kind." The striking fac here noticed indicates the existence of unknown physical conditions in this portion of the heavens, favorable to the production of the phenomena described.
Again, while two or three of the recent temporary star have remained visible as small telescopic objects of some what variable brightness, yet in no case has an outburst oc curred in precisely the same locality with a previous one. The supposed identity of the stars of 945,1264 , and 1572 cannot therefore be sustained, and the assumption that "all the temporary stars are simply variable stars" of long period is wholly destitute of support.
phenomena be explained without then
assemption of an dnknown cause?
It is a remarkable feature of the binary systems among the fixed stars that the orbits have great eccentricity, the less component in its periastron passage coming into very close proximity to the greater. This approach, in several known instances, is within less than the earth's distance from the sun, and, in at least one case, less than that of Mercury. Among the large and increasing number of known systems whose elements have not been determined there are probably some of still greater eccentricity. If we suppose in such case that the principal star is still in a gaseous condition, and that the radius of its atmosphere is greater than the periastron distance of its companion, the latter will at each return, by plunging through this atmosphere, produce an increased degree of light and heat. Its period will become shorter a each successive return, until it shall be arrested by penetrat ing the denser strata of the principal star. Its orbital motion will thus be converted into heat and the phenomena of a new or temporary star may be presented to distant specta tors. Such collisions as we have supposed must have oc curred very frequently in the solar system when the sun's diameter was much greater than at present, as comets of small perihelion distance would be absorbed by the central mass.
"The circumstance," says Humboldt, "that almost all these new stars burst forth at once with extreme brilliancy, as stars of the first magnitude, and even with still stronger scintillation, and that they do not appear, at least to the naked eye, to increase gradually in brightness is, in my opinion, a singular peculiarity, and one well deserving of consideration."* The fact here stated is in manifest har mony with the theory above proposed. It is worthy of note, moreover, that the part of the heavens in which the outbursts have occurred is rich in double stars and sidereal clusters.
Bloomington, Ind.
Daniel Kirewood.

## A Simple Fire Escape

J. R. M. writes to suggest that a piece of stout canvas, about 20 feet square, with hand loops all around it, could be held in the hands of a few men under the windows of a burning house. Persons could then jump from the windows with safety, especially if the handles were attached to the canva with rubber or wire springs, which would give elasticity to the canvas, and break the fall of the person jumping from the window.

THE MANUFACTURE OF SILVERWARE.
There are certain industries which grade so insensibly into the fine arts that, in referring to those who follow them, one scarcely knows whether to use the terms workmen or artists. The manufacture of jewelry is one of these callings, that of silverware is another. The casual looker-on, seeing men with metal tools and hammers in their hands, bending over their benches, working at some dull-looking metal, instinct ively regards them as mere manual laborers engaged upon no arduous
task; but if
he glances
over their
shoulders, and sees the ductile metal under their manipulation assume the most exquisite shapes, if he witnesses work produced not only of marvelous delicacy, but bearing the imprint of genius in every detail, the simple tools and begrimed garb of the workers are noticed no longer, and a feeling of genuine admiration comes uppermost in the mind capable of appreciating true artistic skill. Silver working has its prosaic side; for, despite beautiful ornamentation, forks and spoons are the commonest of every-day articles, and teapots, as teapots; are not conducive to lofty reflections. But on the other hand, such homely objects tend to make the industry what it is-art-workmanship, or to render it a link between the ideal and the actual, a means of adaptation of the airy conceptions of the artist to forms of utility. The manufacture of silverware may be divided into two parts: first, such as relates to the production of forks, spoons, and like small objects of definite form; and secondly, that relating to the making of hollow ware, which includes vessels of every description, whether for use or ornament. We propose in the following article to trace the various processes as practised at the largest establishment devoted to such work in the coun-try-that of the well known firm of Tiffany $\&$ Co., of this city
The silver, to fit it for use, is alloyed with copper in the proportion of 0.075 copper to 0.925 of silver. The metal, on its reception at the factory, is weighed and tested to determine its standard quality, and is then sent to the melting hearth to be run into ingots of proper size. The operation of melting is represented in Fig. 1. (See front page.) The charge in each crucible is from 400 to 450 ozs., which, on becoming fused, is poured into either a skillet mold or else run into bars. The skillet is an ingot about 10 inches long by 6 inches broad, and $1 \frac{1}{2}$ inches thick, and is used for making the plates subsequently spun into hollow ware. The bars from which spoons, etc., are produced are some 20 inches in length, $1 \frac{1}{4}$ inches in width, and $\frac{3}{4}$ inch thick. As in these two forms of the metal are the starting points respectively of the two departments of the manufacture above noted, we shall trace the operations upon each separately, beginning with

THE MAKING OF FORKS AND spoons. The bar of silver alloy above mentioned is placed between heavy rolls (Fig. 2, front page) and flattened out to $\frac{1}{4}$ inch in thicknessPonderous shears then cut it into suitable lengths for the individual articles to be produced; and then rolling in a transverse direction flattens that portion which is to form the bowl of the spoon or tines of the fork, until at such part the width is about $2 \frac{1}{2}$ inches. The
blank, as it is termed, is now of the shape of A (Fig. 3, front page). It is then placed in dies in a drop press; and on the fall of the hammer, it emerges in the shape shown at $B$ in the same figure. Next follows the rolling; and this involves the use of one of the most expensive machines employed. The outlay is incurred in the manufacture of the steel rolls, a pair of which is shown in Fig. 4 (see front page).
would, of course, be flattened out. The operation of drop pressing is shown in Fig. 6 (see front page). At A, a tin die or a spoon is separately exhibited
The proper curve to the handle of the spoon is imparted by setting with a wooden mallet. Then follows smooth filing and weighing of the objects previous to their polishing. As a rule, about one third the metal in the original piece cu from the bar remains in the spoon; and during the variou operations detailed, the absolute waste of material rarely ex ceeds 3 per cent. Nothing further is necessary but the buf fing and polishing, which is done on wheels rotating at abou 2,000 revolutions per minute, oil and sand being first used and then ordinary rouge powder. Fig. 7 (see front page) represents the polishing room. Meanwhile the elegant boxes satin-lined and Russia leather-c o v ered, are be ing prepared from coppe models of
the objects which they re to con tain; and in these recep tacles, the gracefully shaped arti cles, dazzling n their fresh polish,repose n the sales rooms of the ron palace n Union Square.

We may now retrace ur steps back to the murky basement where the silver is melted and olled, and


## REPOUSSE WORK.-CHASING.

otate in front of him. $\Lambda$ s the metal enters the rolls, it is thence follow the skillets in their final manufacture into aught by the deep notches made beside the pattern, and is low ware thus prevented from slipping. On emerging, a spoon blank appears as in Fig. 5 (see front page). The pattern is perfectly stamped; but the bowl is flat, and around the spoon now out lined is a large amount of superfluousmetal, which is clipped off by hand shears, the pieces falling into a locked box. Then the blank is carried to a file wheel, which removes all the material close up to the edge of the pattern; and if a fork is be ing made, a rotary file cuts the spaces between the tines.

The next operation is forming the bowls of spoons or the curved portions of other objects. This is done under the drop press by steel stamps, which force the portions to be curved into matrices made of tin. This metal is used because it is softer than the silver alloy, and yields to the raised portion of the ornamentation on the under side of the object as the blow is delivered. If the matrix were of steel, the ornament

HE MANUFACTURE OF SILVER HOLLOW WARE
Each skillet is passed some twenty times through the heavy 24 inch face rolls before mentioned (Fig. 2, front page), until it is reduced to a thickness indicated by 26 wire gauge (Brown and Sharpe's). Meanwhile the designers have produced detail drawings of the object to be manufac tured, a pitcher, for example, of the form shown in Fig. 8 (front page). With the plate before him, a workman marks on the silver the lines laid down in the draw ing, and, following them, rapidly cuts out the object. Our pitcher is now an assemblage of disks. Two, which answer to the upper and lower hemispheres of the lower portion; another forms the cover, and still another is to be made into the slightly flared straight intermediate portion. Then there are two narrow strips from which the orna mental bands are to be made. The decorative object on the cover and the handle are not provided for; but these we shall refer to fur ther on.
The materials which are to be rendered concave are sent to a spinner, who has before him the drawing and a wooden pattern of the shape of the desired bowl. He pinches a disk in the fixed center screw of his lathe between two flat surfaces of wood, one of which is the wooden pattern. A burnisher resting against a pin in the lathe rest is now applied near the center of the metal, and the latter is gradually but rapidly bent or arranged unti it fits close against the curved face of the block. The spinner at his work is repre sented in Fig. 9. The disks which are to form the upper part of the pitcher, globe, and also the cover, are treated in a similar manner and the square-shaped pieces are flared by a similar process. While this is in progress, the narrow strips which are to form the or namental bands are passed between engraved rolls, which impress upon them a suitable pattern. Their ends are soldered together, and they are bent around formers which give them the requisite flaring shape. Now the various parts of the pitcher being completed, nothing remains but to solder them neatly together, and the vessel assumes its desired form.
The handle and:ornament for the cover, having been mould ed in wax, and clay moulds prepared, are cast, an operation of the greatest delicacy, inasmuch as there is an immense amount of intricate undercutting work to look after. The moulds are made in fragments of every possible shape, and all are numbered so that they can be readily put together. At this stage, the handle and cover being affixed, our pitcher
may be deemed complete. That is, it may be buffed and polished, and we should have a handsome plain article with a little tasty ornamentation on handle, cover, and on the fillets. If, instead of a pitcher, we had selected a snuff-box or waiter as our example, the spinning process would of course have been omitted, and the bent portions, forming the bouge (or bulge) of the waiter or sides of the snuff-box, would have been hammered over formers. No matter what the article is, however, the manufacture might as stated end here; but should we require an elegantly decorated object, we step at this point out of the region of handiwork and at once enter the realms of fine art.

> How silver is decorated

We shall now proceed to explain the various ways in which our pitcher might be ornamented, and of these the simplest is the satin finish. This is done by a patented implement, small in itself, but, like a great many other articles, very important in the office it performs. The object, having been polished, is held against a revolving bunch of fine brass wires, the latter being loosely held to the hub of a wheel. A stream of soapy water runs down on the brush while it is in revolution. The silver, being held up to the moving wires, is thus covered with minute stratches which finally produce upon the surface the soft sheen of satin. This is one of the most beautiful finishes that the metal can receive, and the rapidity with which it is done is remarkable.
Still more ornate is the flat chasing. By this process, tasteful figures are produced on the silver by dots and lines made with a punching tool. No metal is cut away; and in this respect the operation differs from engraving, in which sharp cutting gravers are employed to produce the design in sunken lines. $A p$ pliqué work is just the reverse of the foregoing, as the ornaments, instead of being made by indenting or removing the metal, are added by affixing portions to the surface. The metal is previously rolled or stamped into figures, scrolls, or braids, and these are simply soldered on the object to be ornamented. When finished, silverware in appliqué resembles that decorated by the repousse process, which forms the subject of Figs. 10 and 11.
Repousse work is probably the highest branch of the silversmith's art, and calls for the most consummate skill. The name means "repulsed" or "pushed back"" work, and is applied because the metal is raised by hammering on the object from within, that is, it is dented outward. As it would be manifestly impossible to insert a hammer in many small narrow-necked vessels, or to use it in any hollow object with any convenience, the snarling tool is employed. This is simply a metal bar having one end bent and secured in a vise and the other turned upward and tapered to a dull point. The design having been scratched lightly on the exterior of the object, the latter is slipped over the bar, so that the vertical end of the same comes just under the portions which it is desired to have in relief. The workman then taps lightly on the snarling iron, close to the vise. The resiliency of the bar causes the blows to be transferred to the silver; and at the same time it tends somewhat to equalize their force. As soon as the entire pattern is raised, the vessel is annealed because the hammering hardens the silver, and the subsequent operations depend entirely upon its ductility. If the ornamentation is to be in very high relief, the snarling is repeated, and the ornamentation raised still higher. Then another annealing follows, and so on, until the artist judges that the raised parts sufficiently protrude.
The vessel is now filled with a resin composition, which sets hard and gives a firm backing, and is then placed on a pad before the artist who does the chasing, Fig. 11. This chasing differs from the flat chasing previously noted, in being a very much more elaborate process. The artist has before him hundreds of minute steel punches, and with these he literally pushes the metal into the designs called for by the drawing. To make a raised flower, for example, he has first merely a bulge on the surface produced by the snarling tool. With his little punches, he pushes certain parts of the metal under the edges of the protrusion, throws up other portions, and finally the shapeless swelling is converted into the thin delicate flower petals, in full relief from the s face. Of course this is very costly and very lengthy work. We were shown a single tea set of four pieces-all quite smallwhich were covered with exquisite flowers and arabesques, and on which one man had worked for eighteen months. The price of the articles was $\$ 1,500$-a large sum to pay for the objects intrinsically considered, but not at all exces sive when the work lavished on them is remembered. Ornaments for race cups and other decorations not attached to the surface are cast and afterwards carved.
There are three more processes for decorating silver, which we have yet briefly to review. Gilding is resorted to, not only for lining the interior of vessels but for producing tasteful designs on the exterior. The gold is deposited, by the electro-plating bath, upon such portions of the articles as may be desired, all of the surface of the latter save the pattern to be gilded being covered with wax. Enameling is an art by itself, and would form the subject of a paper even longer than the present general summary of the industry. It will suffice to say that the design is first engraved upon the object. Then the enamel, mixed with a little water into
paste, is painted in the incised portions. The article i then fired in a special furnace; the enamel fuses, vitrifies and, when complete, is nothing more than colored glass in laid in silver. A very beautiful mode of ornamentation which was practised in the middle ages, but which has remained for centuries almost unused until revived by Messrs. Tiffany \& Co., is niello work, or the inlaying of silver with different metals and compositions. A black enamel and red copper are used, the first being inserted in the incised por tion of the work by the process above described, and the second, by electro-deposition. The effect of the ricb color of the copper and the solid black of the enamel, in contrast with the pure white luster of the silver, is exceedingly fine
In Fig. 12 is represented the famous Bryant vase, a mag nificent specimen of repoussé silver work, made at a cost of $\$ 10,000$. The ornamentation is in high relief and chased with wonderful delicacy. This splendid work of art is in-


## Fig. 12.-THE BRYANT VASE

tended to symbolize Mr. Bryant's life and character through the medium of a classic form, covered with ornamentation drawn from Nature, and suggested by his works. The heavier lines of the fretwork are derived from the apple branch. Poetry is symbolized by the eglantine, and immor tality by the amaranth, which is said never to lose its fragrance, and these are blended with the lines formed of the apple branch. The primrose, for early youth, and ivy, for age, form a border directly above the handles. Encircling the neck at the narrowest part, the immortal line "Truth crushed to earth shall rise again," is rendered verbatim, the beginning and end being separated by a representation of the fringed gentian, which Mr. Bryant remembers in one of his poems as always pointing to heaven. Eras in the poet's life are illustrated by a series of bas-reliefs. In the first, he is a child, looking up with veneration at a bust of Homer, to which his father points as a model. The second shows him in the woods, reclining in a meditative attitude. Beween the first and second of these medallion pictures, is a portrait of the poet, laurel-crowned. Above this, the lyre
for Mr. Bryant's verse, and beneath, the most primitive
rinting press, in remembrance of his connection for ove alf a century with the New York Evening Post.
In a smaller medallion is the waterfowl, used by Mr. Bryant as an emblem of faith. The ornament around the ower part of the vase is of the Indian corn, with a single band of cotton leaves, and at the foot is the water lily. Th designer has introduced these symbols from Nature, as the fittest means of illustrating the life of an author whose writ ngs teem with symbols drawn from the same source.
It would be remiss on our part to close this article with merely a cordial acknowledgment of the courtesy with which very detail of the manufacture we have described was sub mitted to our inspection. The work which Messrs. Tiffany Co. are now carrying on is of national importance; for heir establishment is not only a great business concern bu a school of art. In this country, where art museums and milar means of educating popular taste are few and far be tween, our people are in large measure dependent upon the art industries of Europe; and an immenseamount of money is yearly expended in the importation of object of ornament made abroad, which could be equally wel manufactured here, did the requisite degree of cul tivated artistic skill exist among us. This fact is now well recognized, and efforts are being made by public spirited men to provide the necessary collections where on correct standards of taste are based; but Messrs. Tiffany \& Co. are doing even more than this, for they are directly educating men as art workers. In the de signing department of their factory, boys are admitted at an early age and taught to design; and already many super

## Tremendous Mining Blast.

On April 19, a mass of iron ore, reaching to a height of 170 feet from the base and perforated with three large arches, was blown to fragments. It was situated in the famous "" 21 Mine" of the Port Henry Iron Or Company, Essex county, N. Y. The mine had been dug to a depth of 300 feet and a diameter of 600 feet, in the center of which stood the mass to be broken up, which contained nearly 80,000 tons of the finest iron ore. In the pillars which formed the arches, 100 holes were drilled horizontally, of 3 inches diameter, some of them being 40 feet deep. The holes were completely filled with vigorite, a new explosive; and the charges were fired by electricity, in two blasts. The first wa completely successful, but it somewhat marred the effect of the second by breaking some of the electric wires; 40,000 tons of ore were thrown down, and will be removed before the remaining charges of the second blast will be fired.

## New Facts about Iceland Spar

Professor A. K. Eaton, of Brooklyn, widely known as the inventor of an improved spectroscope, describes in the Amervan Chemist a curious fact about Iceland spar. Hitherto the statement has been currently made and accepted that the axis of the crystal is the only di rection along which there is no display of the curious property of the spar-double refraction. Wishing to obtain the widest possible divergence of the two rays from the spar, Professor Eaton cut it in planes perpendicular to the axis of the crystal; and to his great surprise, instead of getting the utmost separation of the rays, he found no double refraction perceptible. Finally he cut a crystal in the form of a sphere, and, by experiments upon it, ascertained that the two images of the ray are superposed on each other, so as to make no double refraction, not only when the ray passes through the axis, but also when it passes through in a plane di rection perpendicular to the axis. From Professor Eaton's diagram it appears that the greatest divergence is to be attained by passing the ray through at an angle of $45^{\circ}$ to the axis of the crystal. •The fact is decidedly important in the use of the polariscope.

## Driving Horses by Electricity.

The French papers describe an invention for driving horses by electricity. The coachman is to have under his seat an electro-magnetic apparatus, which he work by a little handle. One wire is carried through the rein to the bit and carried to the crupper, so that a curren ee up goes the entire length of the animal along the spine. A sudden shock will, we are gravely assured stop the most violent runaway or the most obstinate jibber. The creature, however strong and vicious, is transformed into a sort of inoffensive horse of wood, with the feet firmly nailed to the ground." Curiously enough, the opposite ef fect may be produced by a succession of small shocks. Under the influence of these the veriest screw can be endowed with a vigor and fire indescribable.

A Wonderful Spouting Well.
According to the Miner, the town of Wilcox, Pa., possesses a remarkable curiosity in the shape of a spouting gas well: It says: "There is an immense reservoir of gas in the hole, together with a seemingly endless supply of water, and there is evidently a gigantic and never-ceasing struggle be tween the two elements for the mastery. For a few moments the gas will throw the water to the height of one or two hundred feet, followed (by igniting the gas) by a volume of
fire. Then the water will run back into the hole.

## Comuntations.

## Our Washington Correspondence.

To the Editor of the Scientific American:
The amount of cash receipts at the Patent Office would seem to indicate that business was reviving there as well as elsewhere-the money received on Friday of last week being over five thousand dollars, the largest amount, with one exception, ever realized in any one day since the establishment of the Office
A few days since there was a report in the papers that Seoretary Schurz would soon hear charges made against Commissioner Spear by J. McCleary Perkins, which was followed by this paragraph in the Republican:
"The statement that Secretary Schurz was to hear the evidence on certain charges made by one J. McCleary Per
kins against Commissioner Spear, of the Patent Office, had kins against Commissioner Spear, of the Patent Office, had no foundation in fact. There are several charges now pendtime to examine them, result in barring Perkins from practising before the Department, and which will doubtless be heard before any charges preferred by Perkins against any

From this, it would appear that Mr. J. McCleary Perkins does not get along quite as well with the present Commissioner as he did for a time with the last one. Shortly after Mr. Duell took his seat, Mr. Perkins, having much more time on his hands than clients to occupy it, undertook to oversee the business of the Office. For a time, it seemed, from the authority he assumed, that he considered himself as Acting Commissioner, or at least Assistant Commissioner. and actually took possession of and occupied a desk in one of the rooms for his own private business, until Mr. Dueil got tired of his officiousness, and he was refused its further use, since which time he has become what one of our papers calls him-"a chronic grumbler.
There has been a vacancy for some time past in the Board of Appeals, owing to the inability of Mr . Marble to take the position on it to which he had been appointed, as he was filling another office; and having now been appointed Assistant Attorney General, he has formally declined the position. It having been determined to fill the vacant office by a competitive examination, the Commissioner, Assistant Commissioner, and Assistant Attorney General were appointed as an examining board, before whom the following gentlemen who competed for the position were examined: Messrs. Fox, Wilkinson, Dyrenforth, Burke, Bartlett, Hedrick, Tilden, Durnall, Bates, Wilber, Catlin, Bowen, and Antisell, all of whom are members of the examining corps, except Dr. Antisell, who formerly served in that capacity, but resigned many years since. The examination is said to have been entirely practical, and to have reference to office work only. The board will examine the papers as soon as they can spare time from their current work, and report the three last to the Secretary, who will then nominate one to the President for appointment.
Application having been made by a printing firm in your city to register as a label a print representing a race course, without any descriptive matter thereon, the intention being to sell the print to customers to ornament their goods, the examiner rejected it on the ground that it should be registered as a trade mark, if registered at all; but the Assistant Commissioner on appeal decided that such a print does not meet the requirement of a trade mark or copyright, and that it should therefore be properly registered as a label, as it is not to be considered as a work of art, but is to be used for other articles of manufacture.
Reports from nearly nine hundred counties in which winter wheat is raised have been received by the Agricultural Department, of which about one quarter are unfavorable; but in the remainder the yield promises to be from average to superior. Of three hundred and twenty counties in the Ohio basin, only forty-five report below the average. Grasshopper ravages are reported in twenty-two counties of Kansas, and the wheat-growing districts of Texas are said to be alive with these insects. There is, however, an increase of the area of wheat in the latter State, and the prospects are favorable in other respects. In the other cotton States, a dry autumn and variable winter have depressed the condition of wheat below the average.
The sixth report of the Government Inspector of the works for the improvement of the South Pass of the Mississippi is just received; from which it appears that, since November 18, 1876, about 16,000 cubic yards of material have been dredged at points where the channel was the worst. A part of stone, until it is of a height of from six inches to two feet above the average flood tide; and one hundred and sixtyseven additional piles have been driven. A table accom panying the report shows that the depth between the jetties has gradually deepened from nine and two tenths feet in June, 1875, to twenty and a half feet in March of this year. At the head of the passes, the west T head has been extended up the stream, and its upper part made a solid dyke; a line of mattresses has been carried from the east $T$ head down to the head of Goat Island; a solid mattress dam has been built across the old east entrance to the South Pass; and about 30,000 cubic yards of digging has been done. The rising of
the river caused a sharp scour between the $T$ heads, so that the river caused a sharp scour between the T heads, so that
near twenty-four feet could be taken from the Mississippi into the South Pass on March 7, 1877.
The National Academy of Sciences is now holding its fifteenth annual session, at the Smithsonian Institute in thi
city. The following papers have been read up to the time of writing this:

On a new measuring instrument, the vernier micro in star declination", by. Mayer. "On systematic error the young stages of osseous fishes," by Professor Alexander Agassiz. "On critical periods in the history of the earth, and their relations to evolutions, and on the quarternary at such a period," by Professor Joseph LeConte, of San Francisco; read by Dr. John L. LeConte. "On the progressive motions of storms," by Professor Wm. Ferrel. "On the effect produced by mixing white with colored light," by Professor O. N. Rood. "On Newton's use of the term 'in digo,' with reference to a color of the spectrum," by Professor O. N. Rood. "Improved method of obtaining metallic spectra," by Professor G. F. Barker. "On the inter nal structure of the earth as affecting the phenomena of pre cision and mutation," by General J. G. Barnard, U. S. A. "On a proposed new method of solar spectrum analysis," by "On a proposed new method of solar spectrum analysis," Prof essor S. P. Langley, director of the Alleghany Observa-
tory. "On complex inorganic acids," by Professor Wolcott tory. "On complex inorganic acids," by Professor Wolcott
Gibbs. "On a micrometer level and topographical camera," by Professor E.C. Pickering. "On the determination of the co-efficient of expansion of solids," by Professor A. M. Mayer. "On the results of deep sea dredgings," by Professor A. Agassiz. "On a new detached gravity escapement, the laws ruling the vibrations of tuning forks," by Profes sor A. M. Mayer
Many of these papers and the discussions that followed were deeply interesting; and as the session will continue a day or two more, it is probable that other equally interesting subjects will be discussed. The following gentlemen were elected members: Dr. John W. Draper, of New York; Dr Scudder, of Cambridge; Dr. Elliott Cones, Dr. Henry Dra per, of New York; and Mr. C. S. Pierce, of the Coast Survey.

The War Department will, it is said, at the coming extra session of Congress, call for an appropriation for the manu facture of improved arms, so that their accumulation might place the government in readiness for any emergency. It is stated that there will not be more than about 8,000 arms of the improved patterns on hand at the close of the present year; and that if the States should draw all they are entitled to, the stock of improved arms held in reserve would be exhausted. The style of gun now being manufactured is that known as the Springfield breech-loading rifle, and it is argued that these guns should be manufactured in sufficient quantities to render a gradual accumulation of them in store a certainty, as otherwise the government may find itself without arms at a time when they may be wanted very badly. The ordnance officers are also complaining about the meagre means of defense on our coasts and harbors, as serting that we have little or no means of operating against the heavily armored ships that the European powers could bring against us, excepting the torpedo boats, which are as yet but in the experimental state. It is stated that several experimental guns have been made; but they cannot be
tested, as no money has been appropriated by Congress for tested, as no
In consequence of a recent decision of the Supreme Cour respecting the eight hour law, Secretary Sherman is about to issue an order that hereafter no officer shall pay ten hours' wages for eight hours' work, thus practically reversing the order of General Grant constituting eight hours a day's work.
One of our street railroads has received permission to $\operatorname{tr}$ the dummy engines now successfully used in Philadelphia and will shortly introduce them on both their lines, if on trial they meet with approval.
Washington, D. C
Occasional.

## Letter from the oldest Locomotive Engineer now Living.

To the Editor of the Scientific American
I am probably the oldest living locomotive engineer in the United States, possibly in the world. In the year 1832, I think, the Schenectady and Saratoga railroad went into operation, and in that year imported a locomotive engine from England, made by George Stephenson, and named after him; an engineer named Turner came with it and ran it for some months; but as he was a man in poor health, I frequently was called upon to fill his place, as I was then superintenden of Clute \& Bailey's machine shop and foundry, where the work for that road was generally done. The engine above and run up Inink, was the first in the United States placed the first railroad built in the State, but was operated by horse power for several years, with stationary engines at both ends for hauling up and letting down the passenger cars on the in clined planes at Albany and Schenectady. I saw a short article in some paper a few years since, saying that the locoSchen engine above mentioned was still in the city of there, for I assure you it was a curiosity, when compared with those of the present day.
I have never followed the occupation of an engineer either on a steamer or locomotive regularly, having always preferred that of a machinist, so as to be at home with my fam ily at night, although in my younger days I have frequently pearsted on both when necessity required it. I am now 7 years old, and for the last 35 years have been living on my
farm in the mountains of Georgia, enjoying good health; I
am hearty and active, and can do as good work as I ever did and can mount a horse as spry as when 45 years old. I pre sume you have had a description or descriptions of the loco motive alluded to, or I would send it, as well as my recollec-

Clarksille
J. Van Buren.

## Remarkable Explosions.

To the Editor of the Scientific American
In the year 1873, some parties in this city conceived the idea of pulverizing brimstone, which was done successfully The product very closely resembles flowers of sulphur, and many tons of it have been sold, the greater part to sheep farmers. At the time of the first attempt, we had pulverized about a hundred tons, and were just about stopping the machinery when a terrible explosion took place; and in a few minutes the mill building was all in flames and completely destroyed. The mill at the time was full of fine dust of sul phur, especially the upper story, where it was floating thick in the air. The explosion seemed to be mainly in the upper story. There was no fire in the building, nor was there any person smoking, and the affair seemed a mystery to every body. Many who pretended to be chemists and experts said there was nothing to be feared from grinding sulphur but I maintained that either sulphuretted hydrogen was gen erated in some way by the attrition, or that the impalpable dust, mixed with the air, was the cause of the explosion. told the mill owner that it would explode again if the at tempt was repeated; but he did not mind me, and when he rebuilt the mill he tried it again. When we were just about stopping after finishing a lot of seventy tons, on July 25 , 1874, another terrible explosion took place, with the same 1874, another terrible explosion took place, with the same
circumstances attending it as on the previous occasion. The circumstances attending it as on the previous occasion. The
mill was burnt to the ground. Since then the owner of the mill was burnt to the ground. Since th
mill never tried sulphur grinding again.
San Francisco, Cal.
J. W. Morrissey.

## Pneumatic Transmission of Time。

To the Editor of the Scientific American
In your issue of April 21, 1877, is an article on the trans mission of correct time in Vienna, Austria. Allow me to state that the transmission of time by a pneumatic system has been in use in San Francisco since February, 1874 where, in the London and San Francisco Bank Building, ne regulator transmits the time to 14 dials. This inventio (of Mr. H. Wenzel, of San Francisco) was patented in July 1873, and is so satisfactory that it has been also introduced in the Nevada Bank Building, with 26 dials; in the San Francisco Club House, with 8 dials; in Baldwin's Hotel with 62 dials, and into a number of private houses. One of these clocks, with a most ingenious, original improvement on the escapement, termed "force constant," and connected with several dials, to which any number of dials in the sam or adjacent buildings may be added, is now in operation, nd can be seen at Mr. C. W. Schumann's office, 24 John St., this city
New York city.
L. Beckers.

## Stream Power and ite Utilization.

To the Editor of the Scientific American
An article appeared in the Scientific American of April 28,1877 , under the above heading, for which you credit the Millstone. I know not to what the Millstone gave credit for the article; but I am sure that it ought to have given credit for the article to the Scientific American of January 14, 1871. If you will refer to that number of your journal, I think that you will acknowledge that no one can be more positive as to the origin of that article than your humble servant. It is one of the weaknesses of humanity to be pleased with due thanks for one's fugitive ideas and compo sitions.

Worcester, Mass.
F. G. Woodward.

American Inventive Progress.
"Under the above heading the Scientific American of May 7th has a long and interesting article, from which we make the following extracts:

To show with what rapidity inventors made improve ments on inventions embodying original principles,' says th writer, 'it may be noted that, in the early days of the sewing machine, 116 patents were granted for improvements thereon in a single year; and out of the 2,910 patents issued in the year 1857, 152 were for improved cotton gins and presses, 164 for improvements on the steam engine, and 198 for novel devices relating to railroads and improvements in the rolling tock. In the year 1848, three years after the publication of this paper was commenced, but 660 patents were granted but under the stimulus of publishing these inventions as the were patented, ten years later, in 1858, the number had in reased sixfold, reaching 3,710, while up to January 1, 1850 as already stated, the aggregate of patents issued amounted to 17,467 ; since that time and up to the present period the total is 181,015 .

And curiosity here leads us (adds the editor) to review our own work, extending back, say, twenty years, or to 1857 a period during: which 170,745 patents have been issued. We ind, by actual count, that 62,062 applications have bee made through the Scientific American Patent Agency for patents in the United States • and abroad. This averages almost ten applications per day, Sundays excluded, over the entire period, and bears the relation of more than one quarte to the total number of patents issued in this country up to the time of writing.' "-Philadelphia Evening Bulletin.

## PRACTICAL MECHANISM.

New Series-No. XXV
PATTERN MAKING.-THIN WORK.
In the examples we have hitherto presented to the reader, we have supposed the pattern to be of such substance or thickness as to be able to bear the pressure of the sand being rammed about it in moulding without breaking or altering its form; but this is not always the case. The parts of a stove, for instance, are cast often less than $\frac{1}{8}$ inch in thickness; the same may be said of most of the ornamental iron work used in architecture, and even cornices and window sills range only about $\frac{3}{16}$ or a $\frac{1}{4}$ inch thick. It is true that for this kind of work metal patterns are almost invariably used; but for the pattern maker this is indifferent, as wood patterns have to be made from which the metal patterns are to be cast. Take, for example, the window sill shown in section in Fig. 187; to enable it to withstand the pressure of the sand while ramming, we must fill the interior with

form or block, shown at F , which is to be used in conjunction with the board, B. This form and board are no less useful to the pattern maker than to the moulder; for let the form be once obtained of the proper size and shape, and the construction of the pattern is so far simplified as to be merely a covering of this form with wood slightly thinner than the required thickness of metal. Most thin work is made in this manner, especially if the patterns are of such size or shape as to need the joining together of many pieces; it is not the pattern itself that demands our first attention, but rather the form that supports it.
Thin work demands great care and patience on account of its fragile nature. Scarcely any hold can be obtained for nails; and though the best glue is used, it cannot always be relied upon. Dovetails for square corners, if they are end wood to end wood, will be found very superior to glued joints. Furthermore, as few joints should be made as possible, and the pattern should be well protected by several coats of varnish. In working out thin mouldings, as for instance, the portion of the sill from $a$ to $b$, which should be of one piece, we plane up a piece of a suitable width and thickness, and trace the outline of the moulding upon each end of the piece; then, as it lies flat upon the bench, we work out on one side to the lines which will fit the form, as in Fig. 188, and then, by temporarily fastening the piece to the
form, F , to give it proper support, we are enabled to work out the opposite side to the required shape. In working out thin mouldings, a circular saw with an adjustable table will be of great assistance, as by its means we may make a series of saw cuts so close togethe as practically to take out half the stuff, and form an excel lent guide for cutting away the other half (see Fig. 188). The part from $a$ to $c$, Fig. 187, should not be formed by glueing
thin stuff together at the obtuse angle, but should be of one thin stuff together at the obtuse angle, but should be of one
piece. Fig. 189 is a section of a cornioe lying upon its bed or follower board, B ; it may be made of one piece, as in the previous example.

Firig. 189.


In moulding work of this kind, the procedure is as follows The board, B, with the form and pattern, is placed upon a level bed of sand so that it may not wind or twist under the weight that is to be put upon it, which will consist of the nowel rammed full of sand. The board and nowel are fastened together by cramps, and, the ramming finished, the whole is turned over; the board and form are then removed. There is no longer any necessity for the support of the latter, as the sand, having been once rammed, does not press upon the pattern to its injury, but keeps its position and becomes a good and sufficient support to it during the ramming up of the cope, which is now placed in position, and the moulding continued in the usual manner. Instead of the form, F , which fills the interior of the pattern, we may provide a
strong enveloping form, as shown in Fig. 190; the difference is that the reverse side of the casting will be uppermost as
compared with the other case. The form must fit that side compared with the other case. The form must fit that side
of the pattern which we wish to come next the cope. Forms of an irregular or difficult shape are often advanta-

## Ficy. 190.


geously made by sim-
ply pouring plaster of Paris into the patterns for which they are intended. A great deal of thin work is formed by dry sand coring, often from necessity but when practicable the dry sand core is discarded and the pat tern made to leave its own core. This insures greater accuracy, is cheaper, and causes the interior surface of the casting to be the same as the exterior. When dry sand cores are employed, there is no difference between thin work and thick, and therefore the methods described in former pages are a sufficient explanation of the process.

## Duties of an Engineer in the Care and Managemen

 of a Steam Boiler.The following instructions may be of little importance to skilled engineers, as such are supposed to be thoroughly versed in all the matters discussed; but to young and less experienced engineers, we believe that the directions, from the Indianapolis Mechanical Journal, will be found useful.
The first duty of an engineer when he takes charge of an engine and boiler is to examine his boiler and see that the water is at the proper level. The water should be kept up to the second gauge whilst working, and up to the third at night. The reason why the water should be raised at night is to prevent it from becoming too low from leakage or
evaporation. In case the water should become dangerously low, the engineer should immediately draw the fire and allow the boiler to cool, and not admit any cold water to the boiler or attempt to raise the safety valve, as it would be positively dangerous. The reason why it would bedangerous is, that it would lessen the pressure in allowing the steam to escape from the boiler, thus allowing the water to rise up and come in contact with the overheated iron, and probably cause an explosion. In case the water supply should be cut off from the boiler for a short time, he should cover his fire with fresh fuel, stop his engine, and keep the regular quantity of water in the boiler until the accident is repaired and the water supply renewed. To get up steam, the engineer should first see that the water is at the proper level; he should then remove all ashes and cinders from the furnace and cover the grate with a thin layer of coal; and after placing his wood and shavings on the coal he will be ready to start his fire. The advantage in placing a covering of coal on the grate before the wood or shavings is that it is a
saving of fuel, as the heat that would be transmitted to the bars is absorbed by the coal, and the bars are also protected from the extreme heat of the fresh fire. An engineer should allow his fire to burn gradually when commencing to get up steam from cold water, as by allowing the fuel to burn very rapidly some parts of the boiler become expanded to their utmost limits, while other parts are nearly cold. Of course, a great deal depends upon the time in which he has to raise his steam. An engineer should regulate his fire at a uniform thickness, and not allow any bare places or accumulation of ashes or dead coals in the corners of the furnace, as these places admit great quantities of cold air into the furnace, and render the combustion very imperfect. An engineer should avoid excessive firing as much as possible, as it is attended with more or less danger, because the intense heat repels the water from the surface of the iron and allows the boiler to be burned. He should keep about three inches of anthracite coal and about five inches of soft coal on his fires, but he should regulate the thickness of the fire according to the capacity of the boiler. If the boiler is too small for the engine the fire should be kept thin, the coal supplied insmall quanti-
ties and distributed evenly over the grate, and the grate kept as free as possible from ashes and cinders; but if the boiler is extra large for the engine, the thickness of the fire makes but little difference. If the fire becomes very low, he should neither poke nor disturb it, as that would have a tendency to put it entirely out; but he should place shavings, sawdust, wood or greasy waste on the bare places, with a thin covering of coal; then, by opening the draught to its full extent, the fire will soon come up. If it shouid become necessary to burn wood on a coal fire, it is always best to make an opening through the coal to the grate bars, so that the air from the bottom of the furnace can act directly on the wood and increase it combustion. He should give great attention to the rerulation of the draught in the furnace, as it is one of the most important parts of an engincer's
duties, for in fact it is next in importance to the regulation of the water in the boiler.

It is well known that immense quantities of fuel are recklessly wasted by ignorance and carelessness in the manage ment of the draught. He should not have any more draught at any time than would produce a sufficient ccmbustion of the fuel to keep the steam at the working pressure, as by opening the damper to its utmost limits great quantities of
heat are carricd into the chimney and lost. An engineer canheat are carricd into the chimney and lost. An engineer can-
not carry out this plan in all cases-only in furnaces
and boilers that are sufficiently large to furnish the necessary amount of steam without forcing.
Of course, where the boiler is too small for the engine, or has not sufficient heating surface, it is impossible to econo mize fuel. In some cases it is a good plan to throw a jet of steam under the furnace bars when the draught is insufficient to produce the necessary combustion of the fuel. It is con idered an advantage, before clearing a fire, to throw some water under the grate bars, as the oxygen of the steam thus generated under the furnace will unite with the oxygen of the atmosphere, and insure a more rapid combustion of the fuel after the fire is cleaned.
Steam or water should not be thrown under the grate bars of locomotive boilers when such boilers are used for sta tionary engines, as steam or water in the ash-pit forms a ly with the ashes, and corrodes the iron and destroys the wate legs of the boiler. An engineer should always keep his pit clean, as by allowing the ash pit to become filled with ashes and cinders the air becomes heated to a high temperature before entering the fire, which naturally interferes with the combustion of the fuel. The grate bars also become over combustion of the fuel. The grate bars also become over
heated, and in many cases badly warped or melted down. He should at all times watch his safety valve carefully, and keep it in good working order. He should do this at leas once a day; the morning is the proper time, and then he will feel safe during the day. We have often seen safety valves with all kinds of weights on them, and it at once gave us poor opinion of the engineer. No first-class engineer will do this. It should be one of the main reasons for discharging him. In blowing out a boiler, remove all fire from the furnace, and see that the steam is at the proper pressure furnace, and see that the steam is at the proper
say from 45 to 50 lbs . Always close the damper
say from least one hour should pass between drawing the fire and
At blowing out the boiler. This will allow the furnace to cool and prevent the boiler from being injured with the heat after the water is all blown out. The higher the steam pressure the higher the temperature of the iron, so that by blowing out the boiler under a high steam pressure the change is so sudden that it has a tendency to contract and cause the boiler to leak. The boiler should not be filled with cold water im mediately after blowing out, as the introduction of cold water into the boiler before the temperature of the iron becomes lower would, in all probability, cause the boiler to leak. The boiler should be blown out whenever any appearance of mud is found in the water. When fresh water is boiled, it is supposed to deposit its mineral, and after that it is not advisable to blow out the pure water and fill the boiler with water holding matter in solution and suspension; and for this reason once in two or three weeks is often enough to blow out the boiler. When filling the boiler, some cock or valve in the steam room should be opened and allow the air to escape. If not, the air would retard the ingress of the water, and also collect in the steam-room of the boiler, and prevent the regular expansion of iron when the fire is tarted.
The st $m$-room in a boiler is that portion of the boile ccupied by steam above the water. The water room is that portion of the boiler occupied by water. The fire line of the boiler is a longitudinal line above which the fire cannot rise, on account of the masonry by which the boiler is sur rounded. The tubes of a boiler should be cleaned at leas once a week; all ashes and soot shculd also be removed from the outside of the boiler. This all makes a great saving in fuel, as it allows the fire to act directly on the iron. Boilers should be cleaned at least once in three months. All stays, braces, seams, and angles of the boiler should be examined carefully. He should also sound the shell of the boiler with a very light steel hammer. It is a good way to determine the condition of the iron
The steam guage should he tested at least once a year. It should be done by a test-gauge, made expressly for the pur pose. The water gauge should be kept clean, inside and out and all points belonging to same. By opening the drip cock and closing the water valve and allowing the steam to rush down the glass, the steam will carry out the mud and sedi ment. They should also be swabbed out with a piece of cloth or waste on a small stick when the boiler is cold; but are should be taken not to touch the inside of the glas with wire or iron, as an abrasion will immediately take place.

## Decay of Timber.

Wet and dry rots are the two forms of decay which attack timber that is exposed to the action of the weather, and the cause of both may be said to be heat with moisture. Confined air and evaporation cause dry rot, and imperfect vaporation wet rot to a greater or less degree.
Investigation shows that as a preventive against these rots the timber should be well seasoned, and if used where liable to be under the influence of sun and rain should be well well painted, or, if not painted, should be impregnated with linseed or oil of tar. The best preventive, however is found to be that of allowing a free circulation of air around the timbers, and the walls to be allowed to dry thoroughly before the introduction of the timbers; should the timbers have taken either of these rots very little can be done to preserve them. In case the rot is perceived to be at the end of beams only-where in fact it generally commences-the best method of preserving the rest of the timbers is to effectually cut away the decayed portion and scarf with sound; if, however, this should not be practicable, the wood may be scraped and cleaned of all fungus or extraneous matter and then impregnated with any of the usual oils.-Cincinnati Trade List.

## IMPROVED FIRE ESOAPE.

We noted last week the necessity existing for some simple and efficient fire escape, which could be rolled in small compass so as to be conveniently stowed in the traveler's satchel or trunk. The invention illustrated in the annexed engrav ings aims to supply this need. It consists of about a hundred feet or less of wire rope, one end of which is turned up to form a loop which is secured by wire seizings. In this loop, which is lined with leather to prevent chafing, a spring hook is secured. Along the rope, crossbars or rests are lashed with wire, at intervals of about 15 inches. These bars are of iron, having a por tion of their surface flattened near the centers on one or both sides, and are inserted through the strands of the rope (Fig. 2).
The apparatus can be very quickly got ready for use, as it is only requisite to screw an eye into the woodwork or flooring of the room, attach the snap hook, and lower the escape out of the window, whence it forms a ladder, Fig. 1. The inventor also provides a strap, Fig. 3, which carries a staple to which, after the strap is passed around a trunk, the end of the fire escape rope is attached. The trunk is thus easily lowered; and after reaching the ground, it serves as a means of steadying the ladder. By the same means, women, children, or invalids may be lowered from windows.
Patented through the Scientific American Patent Agency, October 24, 1876. For fur ther particulars, address the inventor, Mr. H. R. Houghton, West 42d street, New York city

Age of Labor-Saving Appliances.
The Manufacturing andTrade Review thinks that the greatest reason why there is such an over-proportionate abundance of all kinds of products as compared with former times, and comparatively so few workmen are employed, is that these products are the results of mechanical appliances, one of which does the labor of numbers of workmen. Instead of hoes and spades, and sickles, and scythes, and flails, the cultivators, planters, reapers, and mowers, and thrashers are used. So with the production of the nail, horseshoe, cutlery, tools, clothing; in fact, what is not made by machines for the purpose is very far behind the age. The business of the world now is inventing, improving, and running machinery and appliances to make machinery and tools, and in producing the articles they make; and the aim of the present workman must be to thoroughly know the use and care of machinery, the strength and adaptability of materials for the manufacture of appliances. If the world seems to be already supplied with all these, then his business is to possess the machine or appliance and use it in producing the thing which his taste and judgment may suggest. It is useless to resist this march of machinery. Only the man who accepts, adopts, and enters most heartily into its use and product, will keep abreast of the present progress.

## IMPROVED CALCULATING MACHINE.

The drudgery of mental computation, of all labor, is perhaps the most enervating and uninteresting; and an effectual device to remove or even lessen the mental effort will be readily appreciated by mathematicians, engineers, bankers, actuaries, and accountants.
The calculating machine, properly so called, must not be confounded with the simple slide rules, adding machines of various kinds, interest tables, and other devices called by the same name. This instrument is a piece of mechanism that performs its task in a direct and complete manner, taking in a great range of work, and using and giving numbers at full length and in plain figures.
The construction and operation of the apparatus as illustrated herewith are both simple. There is an upper cylinder, which is turned by the crank, and which itself drives a smaller shaft underneath. A slide, that can a smaller shaft underneath. A slide, that can
be set in eight different positions on the cylinbe set in eight different positions on the cylin-
der, carries eight figured rings that can be set der, carries eight figured rings that can be set
to represent any number of eight or less to represent any number of eight or less
decimal places. Each turn of the crank adds the number set up on the rings to the number represented on the ten recording wheels carried by the lower shaft. The multiplication process will best be understood by an example. To multiply 347 by 492, the three upper rings are set at 3,4 , and 7, respectively. The cylinder is then turned twice to multiply by the units figure of the multiplier.
If now the slide is carried along one notch, where each ring [f now the slide is carried along one notch, where each ring will act on the next higher recording wheel, and turned 9 times, 347 will be multiplied by 90 , and the product at the same time will be added to the product already scored. Another shift of the slide and four turns will complete the operation, and show the result, $170724=(347 \times 2)+(347 \times 90)+(347 \times 400)$
upon the recording wheels. A half turn of the crank back wards erases this result, bringing all the wheels to 0 , ready for the next operation.
Division is the reverse of multiplication. The dividend set up on the wheels, the divisor on the rings, and the quotient records itself on the upper recording wheels. The machine of the size illustrated will use numbers of eight or les figures, and show the result in full, if not over ten figures, nd its upper figures if more than ten places are necessary The dimensions of the instrument are $13 \times 5 \times 7$ inches, and
claimed to have an advantage of three to one over common logarithms; and it is quicker and easier to use natural num bers and natural sizes, tangents, etc., on the machine than to use the common logarithmic method.
The patentee and manufacturer is George B. Grant, 94 Beverly street, Boston, Mass. He will supply any further information.

New Theory of the Origin of Petroleum
The origin of the immense quantities of hydrocarbon oils which are found saturating strata of sand stones, or pent up in cavities of the older rocks, or escaping to the surface and collect ing upon pools of water, has been the subject of frequent discussion. The theory generally accepted, and endorsed by such names as Hunt Newberry and Silliman, is that it is of organic origin, either vegetable or mineral It has even been suggested that the bad smell ing petroleum of Canada owes its origin to decayed fish. According to T. Sterry Hunt (American Journal of Science, March, 1863) "the pyroschists of Bosanquet belong to the Devonian series, and contain the remains of land plants, so that a partially decayed vege tation may be supposed to have been th source of the organic matter which is inti mately mingled with the earthy base of the rocks; **** but in the pyroschists of the Utica formation, the chief organic remains to be detected are graptolites, with a few brach iopods and crustaceans."
In view of these facts we are not a little surprised at the new and yet plausible theory advanced by the distinguished Russian chem ist, Mendelejeff, before a meeting of the Chemical Society of St. Petersburg. The appear ance of oil on the surface of the earth proves that it has a tendency to rise through the various strata of the earth, and this is no doubt due to its being lighter than water which, being everywhere present, forces it up ward. For this reason we are compelled to suppose that it was formed lower down in the earth than the places where it is now found Another reason for this belief is that the sand stones, in which much of this mineral oil is found, contain no charred organized remains, which must be present where the oil was produced, if it be of organic origin. Since pe troleum is found in the Caucasus in tertiary trole in Pensylvania in the Devonion and S and in Pennsylvania in the Devonian and Si lurian, its origin must have been in the olde rocks at a still greater depth. But in thos ancient periods, like the Silurian, not many organized beings could have existed. Hence Mendelejeff thinks that it is very improbable it contains but eighty working pieces of mechanism, none that petroleum is the product of any decomposed organic of them small or delicate. Made mostly of brass and iron, its matter. smaller parts are of steel, portions of which are tempered Its results are shown in plain figures, stamped on unpolished silver-plated surfaces and filled in black. All prominent parts are nickel-plated and polished
The machine was invented in 1870, but was not manufactured for general use until this year. It was introduced to the public for the first time at the Centennial Exhibition; and the official report, signed by such well known men as and the official report, signed by such well known men as
President Barnard, of Columbia College, Professor Hilgard,


NEW CALCULATING MACHINE.
of the United States Coast Survey, Professor Joseph Henry Professor J. C. Watson, and Sir William Thomson, says " It is simple in construction, not liable to get out of order its use greatly saves the mental labor of computation, and lessens the liability to error. It is deemed superior to all other instruments of its class yet produced." Other well known experts state that a saving in time of more than xty per cent is effected over ordinary methods.
Upon work of four or five decimal places, the machine is

Mendelejeff starts with Laplace's theory of the formation of the earth, applies Dalton's law to the original gaseous condition of the constituents of the earth, and calculates the probable arrangement of the metals in the earth from the density of the globe and the vapor density of the ele ments. Starting with the assumption, which is not im probable, that iron is the most abundant of metals, since it is present in large quantities in the sun and in meteorites, and admitting the existence of carbon com pounds of this metal, not only will it be eas to explain the formation of petroleum, bu one can understand all the peculiarities of its occurrence in those places where the earth's strata has been broken by the elevation of mountain chains. Breaks made in this way permitted the water to permeate to the car bonaceous metals; and at the high tempera ture, and under heavy pressure, it acted upon them, forming oxides of the metals and satu rated hydrocarbons. The latter rose as vapors to the higher strata, where they were condensed, saturating the porous sandstones which are capable of absorbing many oily products.
Many other phenomena of nature are ex plained by this theory of the formation of petroleum, such as predominance on the earth's surface of elements with smallatomic weights the occurrence of oil in straight lines or arcs of huge circles, its dependence upon volcanic action, which has been noticed by Abich and others, the magnetism of the earth, and many other natural phenomena.

## Salicylic Acid.

M. Blandeau, of Paris, states that, according to dentists, his agent has injurious effects on the teeth. English obervers have noticed its effect on the bones, and necrosis of the tibia has been assigned to its use. It evidently possesses con iderable affinity for the calcareous salts of bone, and we se the urine loaded with lime salts in an ultra-physiological proportion, from the internal use of the acid. The salicylate of soda presents the same dangers; and too much caution cannot be taken in the use of any salicylic preparation.

BABY BRUTES.
The Central Park menagerie, or rather Mr. P. T. Barnum, who is the proprietor of most of the animals exhibited free to the public during the winter, has recently become possessed of a litter of panthers, two lions, a baboon, and a dromedary, all born in the cages. Of the baby lions and panthers, en gravings are given herewith. The lions are now nearly four months old, and are about as tall as a moderate-sized terrier dog. They are exceedingly fat, and, like all young of their species, are covered with a short downy fur, profusely mottled. They possess, in brief, all the characteristics of kittens, except gracefulness of motion; for they are the personification of clumsiness. Their legs are thick, short, and bent, their paws, which already possess formidable claws, appear too large, and their bodies are long and ungainly. The temper of the infants, despite their innocent and childlike expression, is none of the best; for they show ranges of white sharp te and spit viciously on any stranger approaching their cage. The cubs are of especial interest to zoölogists from the fact of their being the offspring of a cross between the Asiatic and African species of lions. This
mingling of breed has not before been attempted, and the mingling of breed has not before been attempted, and the
characteristics of the young will be carefully watched. characteristics of the young will be carefully watched.
The panthers are of the ordinary variety, peculiar to this country. As is the case with most untamable brutes, they breed unfrequently in captivity. The cubs are of the same age as the young lions; and were it not for their peculiar markings, resembling closely those of some species of young deer, they might well be mistaken for good sized cats. Their behavior, when stirred up, is a ludicrous mixture of fear, curiosity, and defi ance. A slight poke from the end of a cane causes the cub touched to beat a speedy retreat toward the mother then it turns and watches the stick with intense interest, relieving its feelings by an occasional spit. Finally one paw flies forward, and a spiteful dig is administered, and then another retreat takes place. This is continued as long as the intruding object remains in the cage.
It is curious to notice, both in the lioness and in the panther, that peculiar pride in showing their offspring which the domestic cat manifests in the most unmistakable manner. It seemed also as if the old animals regarded raps on the bars of the cage, or the introduction of canes to induce their progeny to take better attitudes for sketching purposes, in the light of grateful attentions; as, no matter how much the young ones spit and scratched, the mothers never showed the slightest resentment, but quietly crouched and stared at the interloper in abstracted calmness. The writer saw the lioness deliberately wake up her cubs, who were cuddled into an undistinguishable ball of fur, and spread them apart with a blow of her paw for no reason that could be divined other than that she wished to display them. They manifested no hunger, but sat up, as they are shown in our engraving, and blinked like suddenly awakened babies, until their eyes became accustomed to the light.

## Plating of Iron and Steel with Nickel and Cobalt by Immersion.

Mr. F. Stolba-in a German periodical which we should be glad to give credit to, if there were not six words and fifty-seven letters (including forty-two consonants) in its name-proposes the following simple process for nickel-plating polished iron and steel articles. To a dilute solution ( 5 to 10 per cent) of as pure chloride of zinc as possible, there is added enough sulphate of nickel to color it strongly green. This is heated to ebullition n a porcelain vessel. The objects, being completely cleaned of grease, are then suspended in the liquid so that they touch each other as little as may be; and the boiling is kept up for from half an hour to an hour, water being from time to time added in place of that evaporated. The nickel is precipitated in a brilliant white layer wherever the surface of the object is not greasy or rusty. The operation
can be continued for several hours if desired; but the plating will not thus be rendered much thicker.
After removing the objects, they are washed with water holding chalk in suspension, and carefully dried. They may afterward be cleaned with chalk, and they take a fine yellow-ish-toned polish. The chloride of zinc used should contain no metal precipitable by iron. When it cannot be obtained of sufficient purity, it may be made by dissolving zinc scraps in hydrochloric acid, and allowing the solution, containing an excess of metallic zinc, to rest, in order that the metals precipitable by the zinc may separate. Filter at the end of 24 hours, and the solution is ready for use; each portion of zinc dissolved corresponds to about $2 \cdot 1$ parts of chloride of zinc
The sulphate of nickel should also be as pure as possible, and the cold solution should not precipitate when a plate of iron is plunged in it, as would happen, for example, if it contained copper. When during the operation the liquor becomes a pale green, owing to the precipitation of nickel, more sulphate must be added until the intense green is regained. When the used liquid is exposed to the action of the air, it deposits hydrated oxide of iron, coming from the dissolved metal. It should be filtered, and more chloride of zinc and sulphate added, when it may be again used.

In the same way, polished iron and steel objects may be vered with a brilliant plating of cobalt, by using a sulphate of cobalt solution. The appearance of this plating differ little from that of polished steel. The distinguishing char acteristic is the light rose-colored tint. The author states that the plating wears well.

New Class of Blowpipe Reagents
Of all methods of analysis, that performed in the dry way by means of the blowpipe deserves the palm on the score of simplicity. The reagents are only four or five in number the apparatus so small and portable that it can be carried in the breast pocket; and yet in most cases, with a little skill, the results are quite as satisfactory as those obtained in a completely equipped laboratory. There are, however, some cases, unfortunately but few, where the blowpipe reac tions are not as simple as might be desired: such are those


YOUNG LIONS IN CENTRAL PARK, NEW YORK.
with boron and the iodides; but Messrs. Ihles and Devereux recently have overcome these. One necessity of every blowpipe set has always been a bottle of strong mineral acid for decomposing carbonates, detecting limestones, etc. On a journey, as at all times, acids are unsafe companions in pocket or portmanteau. A recent discovery of Dr. H. Car rington Bolton helps us over this quicksand, and enables the analyst to dispense with liquids entirely. The new departure (which is original, we believe, with Dr. Bolton) consists in the use of dry crystalline organic acids, such as tartaric, citric, and oxalic. When required for use, a few crystals are thrown into water; the mineral to be tested, which must be in a very fine powder, is introduced; and then, with or with


PANTHER AND HER YOUNG, CENTRAL PARK, NEW YORK.

Dangers from the Dead
That the dead should kill the living seems a paradox; yet othing is more true. Indeed, we venture to say that ever year, in our land, corpses murder more people than assassin do. Not only have intramural interments poisoned whole blocks and quarters, not only has drinking water contami nated by graveyards yearly spread disease and death through country hamlets, but, before the process of decomposition commences, there is often a great and pressing danger from infectious disease. We quote a recent instance
'Dr. Goldie, the Medical Officer of Health for Leeds, Eng and, in his report to the local authority, states that ever one of thirty people who attended the wake of an Irish girl who recently died in that town from typhus fever, were at tacked by the same disease, and no fewer than nine of the ases ended fatally."
So strongly have the needless dangers of exposure at fune rals impressed the medical mind, that the Health Board of New York have now issued a circular recommend ing that no public or church funerals should be given to persons dying of either diphtheria, scarlet fever measles, or whooping cough
In Chicago, also, where scarlet fever and diphtheria have been severe this past winter, the recommendation of one hundred medical men in council was in these words:

There should be no public funerals of any patien who has died of any infectious or contagious disease Remember that the separation of the sick person from the well is the most certain means of preventing the spread of the disease."

A writer in the Baltimore Physician and Surgeon, last December, went so far as to advocate the passage of a law on the subject (the average American man looking upon a "law" as the cure-all on every occasion). He thought it should embody the foliowing provisions:

1. Whenever any one dies of contagious disease, the publication announcing the death should state the cause of death.
2. No person except the immediate family should be permitted to attend the funeral, and the handling and urying the body should be intrusted to persons who devote themselves to that business.
3. A sufficient number of carriages should be kept for the special purpose of attending these funerals, and the hiring hem for other purposes should be prohibited, under the se crest penalties.
These are good suggestions, but people should learn and ohey them out of a natural sense of sanitary propriety, no out of obligation to a statute.-Medical and surgical Reporter.

## On Vegetarianism

A discussion on this subject took place at a recent meeting of the Medical Society of London. True vegetarians, it wa urged, eat neither butter, eggs, nor milk.
Sir Joseph Fayrer related his experience of the effects of this diet among the natives of India, and said he had no doubt that people could live on vegetables alone. He had seen some of the finest specimens of the human race, as regards strength, power of endurance and physical development, among the inhabit ants of the northwest provinces of India, who were pure vegetarians; but he accounted for their condition from the fact that their food consisted chiefly of leguminous seeds, such as peas, beans, and the like, which contained a larger amount of nitrogen than other vegeta bles.

The President, Dr. Buchanan, remarked that in the discussion several factors should enter-as age, which was a considerable cle ment, as no doubt people advanced in year appear to thrive on a vegetable diet, whereas children require almost a pure animal dict. Again, climate was a great factor; and in the treatment of disease it could be strongly ad vocated; while, lastly and chiefly, temper
out heat, as the case may be, solution is accomplished. The facility with which the mineral dissolves in one or the other acids aids to determine its name. Even sulphides and silicates may, in several cases, be brought into solution by organic acids; and when the acid alone fails, it can be mixed with saltpeter (potassic nitrate) and the mineral thus decomposed.
A new field of very wide extent and unlimited interest opens here, and we hope Dr. Bolton will explore it to its furthest boundaries. Perhaps a new kind of analysis will be developed, to which we would give the term organo-wetish dry testing.

Somebody has perpetrated the following on Captain Eads work on the Mississippi: "Those willow mattresses at the mouth of the Mississippi make the bed of the river more comfortable, to be sure. But still the shipping don't lie there nearly as long as formerly. If they are bound to New Orleans, they 'get up' as soon as possible."

Zinc, it is said, may be purified by precipitating its sulphate with an alkali, mixing the oxide thus produced with powdered charcoal, and exposing the mixture to a red heat in a covered crucible.
ance must be strictly enforced, avoiding ex
cess in the use of animal food, and taking, in fact, a middl course.

A Torpedo that Travels 275 Miles an Hour.
The most terrible invention for warfare that has ever been devised-if we may trust the reports of our English con temporaries-has recently been submitted to the Admiralty by a clergyman the Rev. C. M. Ramus. The Whiteal fish torpedo has already proved its capability of travelling beneath the surface of the sea at the rate of 20 miles per hour; but the "rocket float," as the new machine is called weighs 50 tons, and is propelled on the surface at the rate of 275 miles per hour for a distance of four miles. The appar atus is a timber or iron vessel, the bottom of which is a se ries of inclined planes. In the head is the explosive, and enough gun cotton can be carried to blow up the largestironclad in existence, while the rocket, by the combustion of which the craft is impelled, is laid along the deck. The vessel is said to be easily guided by a rudder of very thin sheet metal.
If the coming British experiments substantiate the fore going, it would seem that armor-plated ships have had thei day, and that the naval vessel of the future should be of cork.

## [FOr the Scientific American.] CUTTING RIGHT OR LEFT HAND THREADS WITH RIGHT HAND DIES.

If there were any one mechanical operation that it would seem the height of absurdity to attempt to accomplish, it would appear to be that of cutting a triple left hand thread with an ordinary pair of right hand dies; but it has bee done, and, indeed, is very easy of accomplishment.

A short time since Mr. J. J. Bingley, Master Mechanic of the Hanover Branch Railroad, wrote to me, saying that a workman in Hanover, Pa., had accidentally cut a treble left hand thread with a pair of right hand single thread dies, and requested a solution of the mystery. Upon request, Mr.


Bingley forwarded both the screw and the dies, and the mystery was readily solved, resolving itself into a mechanical operation which may in many cases be turned to excellent account. In Fig. 1 are shown the dies, and in Fig. 2 are a single righ hand and a treble left hand thread cu with them. The machinist who cut the first treble left
hand thread did so from a combination of manipulative errors, each one of which was necessary to his accidental discovery. First, the dies with which he operated were of a wrong shape and secondly, the iron upon which he cut the thread was larger in diameter than such a pair of dies should be applied to; thirdly, he wound the dies the wrong way; fourthly, he put a pressure upon them in a direction wrong with relation to the direction in which the dies were wound upon the work.
Referring to the first point: Dies for use in hand stocks, that is to say, adjustable dies that are made in two pieces, and are intended to. pass more than once along a thread before fivishing it, should be, and are almost universally, cut with a hub or master tap larger in diameter than the bolt they are intended to cut threads upon, for the following

Fizo. ${ }^{2}$.
 reasons: In Fig. 3 is shown a pair of dies tapped with a $\frac{3}{4}$ inch master tap or hub, and in Fig. 4
is shown the same pair of dies, opened out and placed upon a $\frac{3}{4}$ inch bolt. Dies made in this manner, it will be observed, when opened out to take the first cut upon the bolt, have nothing to steady them, since only the very corners of the teeth contact with the bolt; and the sides of the thread and the length of the teeth of the die have a great deal of clearance upon the bolt, and the consequence is that they operate very unsteadily until the thread is cut to some depth upon the bolt. The edges of the teeth, at A and B, perform all the cutting duty; and as the thread approaches completion upon the bolt, the friction becomes very great unless the dies are given clearance in the thread. It is usual, therefore, to cut such dies with a master tap of larger diameter than that of the bolt upon which the dies are intended to operate. How much the excess of the diameter of master tap should be is a disputed question. In some cases an amount equal to twice the depth of the thread is used, and in others once that depth is preferred. The dies shown in Fig. 5 are twice the depth of the thread larger in diameter than the size of the bolt; and as a result, when placed upon the bolt, the teeth fit closely to it, and therefore operate very

Hig. 4.

steadily, the cutting edges being in this case at C and D . It is obvious that here the dies require to close nearer together than would otherwise be the case; hence a piece of metal equal in thickness to, or rather more than, twice the depth of the thread is placed between the dies while they are being drilled and cut by the master tap. With dies cut in this manner, the sides and length of the teeth fit so closely to the thread, as shown in Fig. 6, as to preclude the possibility of their cutting a thread any different from that of their own
teeth, and the cutting edges are well supported by the metal behind them; whereas, in dies cut as shown in Fig. 4, the teeth are very liable to break off, as well as to dull very rap idly. Therefore it is that such dies are wrong in construc ion. The dies sent to us by Mr. Bingley are of this con truction; and it will readily be perceived that, even when applied to bolts of the same diameter as the die itself, the teeth bear upon such fine points, and the back of them is so well clear that, by taking a very fine cut and putting a pressure upon them, they would act as chasers, well canted over; and they would travel in whichever direction the pressure determined. As the die teeth, however, enter the bolt, the sides of the thread would come into play, and would steady and force the dies to cut correct grooves.
These dies are tapped with about $\frac{1}{4}$ inch taps, and the iron upon which the right and left hand threads are cut is fuil $\frac{5}{16}$ inch in diameter; and as a consequence, we have the condition of things shown in Fig. 7, in which the very points dition of things shown in Fig. 7, in which the very points
of the teeth only have contact with the bolt. As a result, the thread may be cut the full depth, without the sides of the thread upon the bolt and those upon the die coming into contact at all. If, then, the dies are placed upon the bolt, and set to take a very light cut, the direction of the up or down pressure placed upon the dies will determine the direction in which the dies will travel and the thread be cut If the dies are wound from right to left while pressed downwards, the thread cut will be a left hand one, and vice versa and whether the thread so cut will be a single, double, treble or quadruple one, depends upon the size of the bolt and the amount of the pressure; for though the size of the bolt may afford sufficient clearance to the sides of the die teeth to cut a quadruple thread, yet, if the vertical pressure placed upon the die moves it at the necessary speed, only a double thread will be cut. In other words, the thread cut will be in all cases proportionate to the amount of vertical movement of

Fig. 6.
Fing:7.

the dies. Of five threads cut with the dies shown in Fig. 7 three were treble left hand ones, one was a double left hand and one a single right hand one. I find as a rule that the thread is apt to be as coarse as the clearance between the threads will permit; and this occurs because of the difficulty of judging the exact amount of vertical pressure necessary to cut any particular pitch. And since the pitch of the thread cut cannot in any event exceed such an amount as will bring the sides of the threads into contact, it becomes easier to cut that extreme pitch than any less one. In cutting the left hand threads, it is necessary to reverse the natural order of things by moving the dies backwards when the pressure is placed forwards, and vice versa. By a simple attachment to regulate the vertical motion of the dies when starting, the double or treble threads might be cut with accuracy and certainty.
J. R.

On the Use of Tannic Acid for Testing Potable Waters.
The importance of using pure water, in order to prevent disease and death, cannot be too frequently impressed upon the minds of the public. At all seasons, but more especially in the spring and summer months, persons who use well water are in danger of taking into the system the germs of typhoid and other fevers. These dangerous constituents
seldom influence or mar the taste of the water, seldom influence or mar the taste of the water, and are not
suspected until they have lain one or more victims on a beit of sickness.
In a recent number of the Journal für Practische Chemie, Hermann Kämmerer says, in regard to the reagents employed by chemists for testing potable water, that for the most part they merely show the presence in water of organic matter but some kinds of organic matter may be present in large quantities without causing epidemics or sporadic diseases. Most methods for the chemical analysis of water do not determine the nature of the organic matter which is dissolved in the water, and, at most, a conclusion is drawn as to the presence or absence of nitrogenous organic matter from the odor emitted on charring the residues left by evaporation of the water. This is very uncertain, because the presence of two kinds of compounds frequently frustrates this distinction, or the presence of a large amount of nitrates pre vents the production of

For hygienic purposes, it is very frequently of the greatest importance to know whether water contains putrefactive matter, especially of animal origin, since the present state of cience points to these as the probable bearers or producer of the real causes of disease. Hence the introduction of re agents which shall enable us to detect animal matter with certainty, and also its approximate quantity, is exceedingly
desirable when testing water for hygienic purposes. Käm-
merer believes that tannin or tannic acid is a very valuable reagent for this purpose. Tannin is really a group reagent for a large number of bodies of animal origin, which readily suffer decomposition or decay, such as albumen, gelatin, etc. These can easily find their way into the water of the soil, rendering it impure, and, according to our present views, must render such water very dangerous.
Tannin has been recommended before this as a test for water, but has as yet attracted but little attention, although Kämmerer proceeds to prove that it is very excellent for this purpose. He thinks it would be very interesting to prove directly whether putrefactive matter be present in well water which is near enough to receive the drainage of graveyards, factories where glue, blood, and similar substances are used, and in many other cases.
Lefort recently directed attention to the probable presence of gelatin or glue in water from churchyards. In an analysis of water taken from a well at a distance of ten rods from the churchyard of St. Didier, made by him in 1873, he btained a residue, which, when boiled with hydrochloric acid, and on charring, emitted an odor which he thought could only be produced from glue. Lefort does not seem to have sought or obtained any further reaction characteristic of gelatin.
When analyzing three specimens of well water from a churchyard in St. Leonhard, near Nuremberg, Kämmerer observed a similar reaction of the residues of evaporation and then tested the water directly by means of tannin. For this purpose 18 cubic inches of the water to be tested was placed in a glass cylinder; to each sample was added 018 cubic inch of a freshly prepared, cold, saturated solution of tan in, and left standing in vessels closed and airtight. The first ample instantly became cloudy by the separation of a rapid y increasing, curdling precipitate, which, at the end of an hour, formed a thick gelatinous precipitate, and after stand ing for days did not settle clear and colorless. The sampl from the second well acted in a similar manner; at the end of an hour there was a heavy, gelatinous precipitate, which soon took a gray, then light green, and finally dark green color, due to a trace of iron in the water. The third sample retained its clear appearance a loncer time, and in the first four hours only a slight turbidity could be observed, yet in four hours only a slight turbidity could be observed, yet in
24 hours a thick starchy precipitate had formed. The organic 24 hours a thick starchy precipitate had formed. The organic
nature of the precipitate was undoubted, but was further nature of the precipitate was undoubted, but was further proved by charring it, when it gave off, like the residue from evaporation, a strong odor of burned horn, and left behind a very small amount of ash in proportion to its volume. For the purpose of testing for volatile organic acids, sulphuric acid was added to a few quarts of each sample of water which was then distilled off to one fifth its original volume; a very small quantity of the tannin solution added to the residue caused an immediate coagulation to a stiff jelly also in the residue of the water from the third well, which, when reated directly with tannin, was not entirely precipitated for 24 hours. Since sulphuric acid precipitates tannin from its aqueous solution, and this precipitation looks milky and is difficult to clarify, it was thought possible that the strong reaction in these residues might be referred to the precipita tion of the tannin by the sulphuric acid. But this supposition did not agree very well with the volume of the precipitate, which seemed disproportionately larger than the quantity of tannin employed. Comparative experiments were made with tannin precipitated by sulphuric acid, and gel tin precipitated by tannin, and showed that, on heat ing, the tannin dissolved in the sulphuric acid and wate before it reached the boiling temperature, and, on cool ing, was precipitated again and soon settled, leaving th liquid clear. The precipitate formed by tannin in a solution of gelatin is not dissolved by dilute sulphuric acid even when boiling, but seems rather to increase. The precipitate formed by tannin in the residues from distillation reacted precisel like the latter; on heating to boilngg, they seemed rather to ncrease than to diminish.
After he had found, by further experiment, that the tur bidity produced by tannin solution in the three samples of water were not caused by albumen, but by gelatin, Käm merer feels that he is justified in drawing the following conclusions:

1. There can no longer be any doubt of the presence of gelatin in well water. In some cases it is found in compar atively large quantities.
2. Tannin is a suitable reagent for detecting this and imilar substances, and this test ought never to be omitted in analyses of water for hygienic purposes.
3. The presence of salts and other compounds found in water may retard the precipitation by tannin. To judge of the purity of water from the tannin reaction, it must stand $t$ least 24 hours.
4. Every water that suffers considerable turbidity with tannin must be held to be dangerous for drinking. It seem to make no difference whether the precipitate falls at onc or only after some time, as the time depends less on the sub. stance to be precipitated than on the other substances dissolved in the water which retard the precipitation.

## Bichromate of Potash an Antiseptic.

M. Langeroy states that one per cent of bichromate of potash in water will prevent putrefaction in animal and vegeable substances immersed therein. Meat, after being kept in the solution for several months, becomes like gutta percha and the author has struck medals from pieces of it. It is no longer eatable, however, and it is even said that dogs refuse to touch it.

Curiosities of the Railway Ticket Manufacture.
Chambers' Journal gives the following interesting accoun of how railway tickets are made at a celebrated factory in London, that of Waterlow \& Sons:
Like many other great establishments, Messrs. Waterlows has grown from a small affair to gigantic proportions. Be ginning with law stationery, then advancing to account book manufacture, then to various kinds of commercial printing, it has gone on, step by step, until at present it gives employ ment to between three and four thousand persons.

One of the factories, consisting of a lofty building surround ing an open quadrangle, is devoted to ticket making and printing, chiefly railway tickets; and to the process as car ried on there, we will now direct our readers' attention
The paper for tickets is made of a slightly spongy texture, well fitted to take paste. It is known technically as middles, and is the foundation for two external surfaces of paper brush has long been discarded A cleverly constructed ma chine pours out a stream of paste on two rollers, under or over which pass two sheets of paper, each of which becomes thoroughly pasted on one side. These are then quickly applied to the surfaces of the middle. The paste caldrons, in a compartment by themselves, have a vigorous appetite for flour, alum, and water, and pour forth volumes of steam. To show what "a bit of paste" may become when multiplied by millions, it will suffice to say that thirteen sacks of flour per week are used in this one factory! After the pasting, each sheet of cardboard, large enough for one hundred and twenty-five railway tickets, is, with others of the same kind, subjected to flat pressure, rolling pressure, and heat, until the surface papers are firmly and smoothly attached to the middle; exposure to a high temperature in heated chambers thoroughly dries them. Cutting machines sever the sheets into single tickets, the well known railway ticket size, all precisely alike-in dimensions.
Next comes the printing. Messrs. Waterlow adopt four different commercial systems in the supply of these tickets. In the first system they manufacture the tickets throughout for the railway companies, who issue them ready for use to the booking clerks at the several stations. In the second, they partially print the tickets, leaving the companies to finish them according to the varying exigencies of the traffic. In the third, they sell the blank tickets, properly prepared and cut, to the companies; the printing in this case being wholly carried on by the companies. And in the fourth, they sell the machines to the companies, with a license to use them.
A pile of about five hundred blank tickets is placed in an upright tube or hopper, with just room to sink down readily. The bottom of the tube is open, allowing the lowermost blank to rest upon a flat metal plate. A slider, with a rapid recip rocating horizontal motion, strikes the lowermost blank dex terously aside to a spot where it can be printed on the back with those cautions, instructions, and references to by-laws which most companies deem proper to communicate to the public. Another sharp stroke drives the blank farther on, where the printing and numbering of the front or principal surface are effected. When the blank is printed on both surfaces, it is struck onward again, and comes underneath an exit or delivery tube, just the same height and dimensions as the hopper or feeding tube. Up this it is driven by a series traveling horizontally from tube to tube, and vertically up the delivery tube, each ticket acts as a kind of cardboard policeman, saying to its predecessor: "Move on, if you please." And they do move on, all undergoing some process or other at each stage of the movement. As the pile in one
tube lessens, so does that in the other increase in height, like the two columns of liquid in a syphon. The whole pile can be removed from the delivery tube at once by a dexterous hand; but woe betide the luckless wight who "makes pie" (as the printers call the dropping and disordering of types in composing or distributing); for if a single ticket be disarranged, e
As to the various colors displayed on railway tickets, some depend on the use of colored sheets of paper in the first instance; some on the production of stripes of color in a way bearing a resemblance to the making of colored stripes on earthenware or stoneware in the pottery districts; and some by a process more nearly ressmbling ordinary printing. One of the companies adopts a particular diagonal red line on all tickets, distinguishing them from other tickets which have to pass through the railway clearing house.
The automatic action of the machine or machines is very beautiful. For numbering each ticket, a peculiarly constructed wheel is used, which changes its particular digit every time a new blank is presented to it; and thus the consecutive numbers are produced on a series of tickets with unerring accuracy. $\boldsymbol{A}$ tell-tale index and a tell-tale bell, both
automatically worked, give information as to the number of automatically worked, give information as to the number of tickets printed, and the readiness of the machine to take in more food; but it is a matter of practical detail whether and when these tell-tales shall be deemed necessary. To give the reader an idea of how nicely this mechanism is adjusted, it refuses to work unless all the tickets are exactly of equal size, nicely squared, and in perfect order. It strikes one as being almost like a thing of life to see the machine detect a ticket from which a piece has purposely been torn off one end; its language is virtually: "Thus far shalt tho go, and no
farther," for its prints as far as the defective ticket, and there farther," for its prints as far as the defective ticket, and there
stops.

As neither human fingers nor automatic machines are absolutely infallible, errors in numbering may occur in spite of all precautions. These are detected in a singular way. All
the tickets in one series are made to pass through a machine with a velocity which the eye can scarcely follow. When stopped, the numbers are tested by two little index plates or wheels; if the same number is denoted on both indexes, all is well; but if any error has crept in, the index notifications differ, and afford means for determining at what part of the series the mishap has occurred.

A sheet of cardboard is certainly not a ponderous sub stance; but it is surprising how weighty the packages become when large quantities have to be dealt with. The tickets ar tied up into small compact rows (string and tying being pe culiar), and then packed into cubical masses in tin-lined boxes or cases-so firmly and closely pressed as to be as dense as a mass of wood. About fifty thousand tickets weigh one and a quarter hundredweight. The factory turns out two and a half millions of printed tickets (railway, steamboat, refreshment, etc.) per week, and ten millions of smoothly prepared but unprinted tickets; these numbers multiplied by the fifty-two weeks in a year, give a total annual production of something like six hundred and fifty millions, weighing upwards of sixteen thousand hundredweight! If these tickets be taken at two inches in length, and if they were laid flat, end to end, they would reach- But we leave our junior readers to exercise their arithmetical skill in solving this problem: merely hinting that it would require many voyages from England to America, and back again, to cover a distance equal to the length of this cardboard ribbon. From such small beginnings do great results ensue.

The Niagara Railway Suspension Bridge.
It is said that a curious spectacle is daily presented at the Railway Suspension Bridge, near Niagara Falls, N. Y Whenever a passenger train arrives, weighing in all, say 150 tons, the passengers are ordered out of the cars and requested to walk over the bridge, on the pretence of better safety; but at the same moment, and while the passengers are on the bridge, the heaviest freight trains and locomotives, weighing 230 tons or more, are passing over the upper floor of the same bridge, directly above the heads of the passengers.

It appears that the Great Western Railway Company is the lessee of the bridge, for which, by agreement, they pay fifty-five thousand dollars a year rental to the Bridge Com-
pany. Owing to the fall in the price of materials, the Great Western might now build a new bridge, of their own, at a cost the interest whereof would be considerably less than the present rental. But the only way to escape this rent is to break the lease: which might be done if the bridge should be decided by the referees to be unsafe, not otherwise. The Bridge Company lately caused a most careful examination of the bridge to be made by several of the ablest engineers, whose report, recently published by us, showed that the structure was in splendid condition as to strength and safety. But the Great Western Company still aim to get a decision of the referees, one of whom they have appointed, one has been selected by the Bridge Company, while the third remains to be chosen by the other two. They have not yet been able to agree upon the third referee. In the meantime, it is supposed that the object of the Great Western Company in compelling the unfortunate passengers to bundle out and walk the bridge at every trip is to create a public opinion, in advance, against the safety of the bridge, in the hope of thus influencing in their

Transmitting Photographs by Telegraph.
A French savant has proposed some method by which a photograph may be transmitted from one place to another by the agency of the telegraphic wire; but we have not yet been able to learn anything of the means proposed to be adopted for securing so desirable an end.

We are, however, says the British Journal of Photography, in a position to give details of a method by which a photograph may be transmitted with the "speed of thought" to any part of the world with which the sender is placed in to compliance with certain modifications by which the original character of the picture, as a photograph, must be slightly altered, although this alteration is not necessarily any greater than that to which it has to be subjected before it meets the eye of the public as an engraving in any of our illustrated riodicals.
Rather more than twenty years since, Mr. F. C. Bakewell, the author of a well known treatise on "Electric Science" and other philosophical works, invented what he termed "the copying telegraph." By means of this system the very handwriting of the person who wrote a message could be transmitted in facsimile to his correspondent, all errors in
transmission being avoided owing to the fact of the message being traced by mechanical agency from the original document. To render clear our description of a method by which a photograph can be telegraphed, it is necessary that we should give a brief account of Mr. Bakewell's clever in-

Premising that paper can be prepared with certain chemicals (such as a solution of prussiate of potash and hydrochloric acid) which are decomposed by the passage of an electric current, the decomposition resulting in a visible mark at any or every place where a sharp point in the elec-
tric circuit is allowed to touch the paper, it will be readily tric circuit is allowed to touch the paper, it will be readily
comprehended that to bring such a sharp point in communi-
cation with the paper so prepared is a feat that can very easily be accomplished at a point distant thousands of miles Mr. Bakewell's invention consisted in causing the communi cation to be written on tinfuil with an ink which was a non conductor of electricity. I he letters thus written formed on the surface of the metal a number of non-conducting marks. If, now, this sheet of tinfoil, previously trimmed to a defi nite size, be wrapped round a cylinder which will just suffice to permit of its going once round: if, further, this roller placed in the electric circuit, be made to rotate at a definite rate of rapidity, and with a spiral or progressive motion from one end to the other in relation to a fixed point: it will be obvious that if this latter point be a needle mounted with sufficient elasticity to rise and fall as it passes over the heights and hollows of the letters which rotate underneath its point (which must be blunted so as not to scratch), a cur rent of electricity will be transmitted to a distance which will be continuous only in the ratio of the immunity enjoyed by the ground, or tinfoil, from the breakages caused by the constant interruption of the non-conducting ink with which the message is written
The drum or cylinder containing the communication be ing rotated, spirally, at one end of the telegraph wire, it now remains to be shown how the message is received at the other end. A cylinder, of precisely similar dimensions to that round which the communication is to be sent, must be ready at the receiving end of the wire, and round this must be wrapped a sheet of paper prepared in the way we hav indicated. It, too, like the former cylinder, must be pressed upon with a needle-point tracer, and, like the original, it must also be made to rotate at a certain velocity previously determined upon, and, finally, it, too, must be made to move slowly from end to end, so that the point shall pass over it in a continuous line or spiral. It only now remains that all things being ready, the clockwork be started, when th former roller will rotate under a point which is transmitting electricity subject to the interruptions caused by the letters of the message. As the paper on the receiving roller is traveling both in a circular and lateral direction at the same rate, it is evident that every touch of the tracer on the origi nal communication will be rendered visible on the blank paper at the other end of the wire, the only difference being that, whereas the original communication is dark on a white ground, the message is received in light letters on a dark ground.

To transmit a photograph in accordance with the principle here laid down, it is first of all necessary that it be converted into lines. With our present knowledge of electrical com munication, we must not expect the electric current to discrim inate between thick and thin non-conductors; and until this has been achieved, if it ever will be, graduated tints must remain in abeyance. To convert a photograph-a portrait, for example-into lines, a print should be made on silver paper in the usual way, and this must be traced over with black ink, using a fine pen. When the tints have in this manner been translated into lines, the photograph is im mersed in a diluted solution of bichloride of mercury in hydrochloric acid, by which the photographic image will disappear, leaving the pen-and-ink drawing only visible. If from this a negative be taken and a print in carbon be made upon a sheet of tinfoil, all the electrical conditions requisite for effecting the transmission of this drawing to any distance will have been complied with. The gelatin which forms the blacks, or lines, of the carbon print is a non-conductor; the base, on tinfoil, upon which the print has been developed, or to which it is permanently attached, is a conductor, and nothing else is required in order to effect the transmission of the picture in the manner we have described.

The accuracy of any likeness thus transmitted will depend upon two things: First, the fidelity with which the artis who is employed to make the pen-and-ink tracing effects his work; and, secondly, the adoption of such means as will insure both cylinders (the transmitting and receiving cylinders) rotating with a similar degree of speed-a matter involving no difficulty whatever.

## DECISIONS OF THE COURTS.

United States Circuit Court-District of Connecticut. FIRE ARMS PATENT.-THE ONITED STATES RIFLE AND CARTRIDGE COM-
PANY $\operatorname{et}$ al.



Inventions Patented in England by Americans. From March 31 to April 9, 1877, inclusive.
Boot Making Machinery.-S. Henshall, Philadelphia, Pa.
Controlling Cranes, etc.-T. A. Weston, Stamford, Conn. Controling Cranes, ETc.-T. A. Weston, Stamford, Conn.
ExERCISing Apraratus.-G. W. Wood, New York city. Exiaust Nozzle.-T. Shaw, Philadelphia, Pa.
Flange Machine.-C. Miller et al., Pittsburgh, Lamp Globe, etc.-Meriden Glass Company, Meriden, Conn. Mower.-J. R. Parsons, Hoosick Falls, N. Y. Recovering Tin from Scrap.-N. S. Keith, Brooklyn, N. Y
Refining Sugar.-F. o. Matthiessen, Irvington N. REFINING SUGAR.-F. O. Marthessen, Irvingto
Roviva TwisTER--J. S. Kirks, Chester, Pa.
SCRAP Book, ETC.-B. J. Beck, Brooklyn, N. Y. SCRAP Book, ETC.-B. J. Beck, Brooklyn, N. Y.
Shuttie.-D. H. Chamberlain, Boston, Mass. Stench Trap.-J. H. Mackie, Oakland, Cal.
Time Globe.-L. P. Jewet, Glen's Falls, N. Y. Trimming boot Heels.-J. H. Busell, Boston, Mass
Trunk, etc.-W. S. Soule et al., Mass.

## ERent Anmerican and furcign equtents. <br> NEW HOUSEHOLD INVENTIONS.

IMPROVED COFFEE POT.
Richard L. Nelson, Orange Court House, Va.-This invention is an improvement upon that for which letters patent have been lately granted to same party. The objects aimed at in the present improvement are to ren-
der the former " drip attachment " more compact, to lessen the number of parts composing it, to reduce the cost of the same, and to lessen the time required for making coffee.
improved scrubbing machine.
Peter Byrne, Jr., Norwalk, Wis.-This machine consists of a wheeled frame, carrying a reciprocating scrubber and mechanism for operating it;
also a water holder, which is connected with the scrubber by a flexible tube, and a mop and pan, for taking up the water that has been used in the scrubbing operation. The machine is pushed about on its wheels, so that scrubbing operation. The machine is pushed about on its wheels,
the floor is both scrubbed and mopped as the machine advances.
improved mosquito net frame.
Johann F. Volle, Houston, Téx.-This invention consists mainly in ver-
tical posts or rods, swiveled to the head of a bedstead and having horizontical posts or rods, swiveled to the head of a bedstead, and having horizontal arms to which the net is attached by means of sliding rings. The in-
vention further consists in connecting the said arms by a crossbar or rod which is adapted to slide thereon, and to which the net is likewise at-
tached in the same manner as to the swinging arms. The invention further tached in the same manner as to the swinging arms. The invention further relates to the peculiar arrangement of cords for ad.
swiveled posts and extending or retracting the net.

IMPROVED SPRING BED BOTTOM.
William M. Edmans, Troy, N. Y.-This invention consists in wire springs, bent into forked or branched form, having their ends turned upward, to enter the lower side of the end rails of the bed bottom. The upper outer corners of the end rails are rounded off, and the springs are curved inward
above them. The ends of the springs are bent upward at right angles, to above them. The ends of the
improved lamp shade holder.
Hiram L. Ives, Troy, N. Y., assignor to himself and T. Henry Dutcher, of same place.-This is an improved illuminating shade holder for lamps, by which different sized shades may be used, and a more perfect combus-
tion and brighter light without the use of a chimney produced. The holder is made of inverted conical shape and of transparent glass, the angle of the sides being so arranged that the rays of light are reflected from the shade at the opposite side of the holder. The upper circumference of the shade holder is provided with two flanges, of which the inner flange is supported
on an inclined collar, and slightly below the level of the outer flange, so on an inclined collar, and slightly below the level of the outer flange, so
that a shade seated on the inner flange will almost touch the outer flange that a shade seated on the inner flan
and form a neater finish therewith.
improved knife-scouring pan
David H. Cassel and George W. Zint, Crestline, O.-This is an improved pan for the convenient scouring of knives and forks; and it consists of a sheet metal dish or pan with inclined center plane or rest piece for the knives and forks, and a front partition, providing a receptacle for the scouring powder. The scouring powder is taken up and applied directly to the he spent powder is dropped from the rest piece into the spaces at both sides of the same. The inventor claims that the scouring of knives and forks is by this pan accomplished in a neater and more convenient manner,
the pan forming a clean and readily available device for that purpose. IMPROVED BUTTER DISH.
William H. Fitch, Brooklyn, N. Y.-This butter dish or plate is stamped up of a sheet-metal blank in the customary manner. The sides of the dish by outwardly projecting mouldings, which are thrown beyond the outside edge of the dish by narrow tapering sections, that extend at right angles, or nearly so, from the sides. This outwardly projecting section serves not only to stiffen the sides, but mainly for the purpose of providing for the
surplus stock at the corners, and avoiding the creasing or wrinkling of the sides by the too large quantity of stock at the rounded off corners. The throwing or bulging out of the corners has the additional advantage of requiring less power in stamping the dishes, so that two or more may be stamped up by the same blow, and of producing a smooth, stiff, and dura-
ble dish of uniform appearance, and without the objectionable folds or ble dish of uniform appearance, and without the objectionable fo
creases that are generally found in sheet-metal dishes of this kind. IMPROVED PROVISION SAFE.
Ezra Webb, Brooklyn, N. Y., assignor to Mrs. S. E. Shutter, New York city.-This invention is intended to be placed in a window when there may an to be so constructed that it may serve also as a refrigerator. A safe has wire cloth in its front and back, so that the air may pass through it freely. The top of the safe is made inclined, so that the rain may run off
it freely. The front of the safe may be provided with a single door or with double doors, as may be desired. In the bottom is placed a pan in which may be placed a rack to receive ice, shelves being placed in the upper part of the said compartment. The drip water from the ice chamber may be received in a pan or other receptacle, or may be conducted away by a pipe.

## IMPROVED WASHBOARD.

William Serviss, Sidney, O., assignor to W. M. Serviss \& Co., of same the object being to provide a washboard that will not warp when subjected

## to the act repaired.

## NEW WOODWORKING AND HOUSE AND CARRIAGE

BUILDING INVENTIONS

## IMPROVED FELLY.

William A. Wharton, Belle Centre, O., assignor to himself and H. E Lambert, of same place.-In this invention, a section of felly, is made from malleable iron, or any other suitable metal, so as to present the same ex-
terior form and appearance as the ordinary wooden felly; but from its peripheral or tire side it is chambered out to lighten and cheapen it. Hole are made in it to receive the spokes, and from one of its ends a dowel projects, and in the opposite end a hole is made to receive the dowel of the
adjoining felly section. These holes may be provided in both ends of the felly section, and a pin or bolt used to connect the adjoining ends of the fellies, if desired. A block, having the same form as the transverse section of the felly, provided with a central opening for receiving the dowel, is placed between the ends of the felly sections when the wheel is made; and when the spokes become worn, so that when it becomes necessary to contract the rim of the wheel, one or more of the spokes farther into the
moved and the rim contracted, so as to force the sper moved when the tire is shrunk on.
improved fastener for meeting-rails of sashes.
William T. Doremus, New York city.-This is an improved window sash stop, so constructed as to operate automatically to fasten the sashes when
they are closed, so that it is impossible to close the window and leave the they are closed, so that it is impossible to close the window and leave the
sashes unfastened, and which may be also used to lock the sashes, so that sashes unfastened, and which may be also used to lock the sashes, so that
they will not shake and rattle with the wind. The invention consists in they will not shake and rattle with the wind. The invention consists in plate having upwardly projecting inclined flanges and shoulders upon its
sides. The stop is so formed that, when left free, its weight will cause it lower forward corner to project, so that when the upper sash is raised into place, or the lower sash is lowered into place in closing the window, the
corner of the stop will be over the top rail of the said lower sash, and the corner of the stop will be over the
window will be securely fastened.

## NEW MISCELLANEOUS INVENTIONS.

improved coin tray.
Albert A. Hyde, Wichita, Kan.-This is an improved tray for the use of
bankers and others using large quantities of coin, to enable them to bankers and others using large quantities of coin, to enable them to
have the coin in a convenient shape, and to facilitate the removal of the have the coin in a convenient shape, and to facilitate the removal of the
coin from the tray when desired. The sides of the tray are attached to coin from the tray when desired. The sides of the tray are attached to forward inclination, to prevent the coin from falling out at the open rea side. The interior of the tray is divided into compartments by vertical partitions, which are attached to the bottom and the front. The partitions are so arranged that the compartments may correspond in width with the diameter of the coins to be placed in them. The bottom of the tray is graduated or made of different thicknesses, so that each pile of coin, when made level with the top of the tray, may contain even dollars, and may thus
prove the count or render the counting of the full piles unnecessary. A handle is formed upon or attached to the rear edge of the bcttom for convenience in handling the tray. A lifter is used for removing the piles of coin
from the compartments of the tray. The forward end of the lifter is con from the compartments of the tray. The forward end of the lifter is con
caved to rest against the side of a pile of coin, and to the lower edge of the forward end of said coin-lifter is attached a thin metal plate, to be slipped beneath a pile of co
once when desired.
improved station indicator.
John Peter Schmitz, San Francisco, Cal.-This apparatus is simple in construction, and operated by the driver of the street car, or brakesman of
the steam car, on which it is placed. Itindicates the streets or station passed on the route by the names thereof appearingthrough a slot in the side of the case containing the endless traveling apron on which the names are printed. The apron passes around suitable rollers.
improved water elevator
Abraham Vantrump, West Elkton, O.--The buckets on an endless chain empty into a trough above the platform, with exit-spout to keep up a stead which is of advantage in summer, as there is no water wasted, and the
whersing the motion of the elevar same is always obtained fresh and cool, while it prevents in the winter sea son the freezing of the contents of the buckets.

IMPROVED COTTON CHOPPER.
John P.Harrisson, Aberdecn,Miss.-This cotton chopper is so constructed as to chop the crop to a stand by being drawn across the field. The hoes may be adjusted wider ap
stalks desired to be left.
thproved level.
observation from top and side during use; and it consists of a level and plumb having indicators, which are operated by a weight hung to the center shaft of the side indicators, and working at the same time a top indicator by bevel gear connection. A vertically supported shaft, that passes
through the top dial, carries an index hand at the upper end, which through the top dial, carries an index hand at the upper end, which
hand is in line with the side indicators when they are in vertical position but follows the motions of the side hands in exact manner so as to in but follows the motions of the side hands in exact manner, so as to in-
stantly indicate whether the rule is in level or plumb position or not. The joint working of the index hands facilitates the use of the implement, as
the positions of the hands may be seen at a glance from the side or top the positions of the hands may be seen at a glance from the side or
without necessitating stooping down to observe the side indicators. improved horse collar.
Hezekiah W. Whitney and Charles F. Whitney, Oswego, N. Y.--This horse collar is from parts of peculiar form, secured together by means of rivets and stitching, so as to form a durable and comfortable collar. The
face of the pad, or part of the collar that comes into contact with the horse's breast, is cut with a convex outer edge and a curved inner edge The ends of the face part are cut diagonally to fit the other portions of the collar to which it is attached. The threads of the stitching draw the inner
and outer surfaces of the collar together, forming one crease for receiving and outer surfaces of the collar together, forming one crease for receiving
the hames, and another for relieving the pressure on the breast of the horse and preventing galling. A flat surface is formed for relieving the horse's breast from pressure. This surface is quilted to prevent it from becoming convex.

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED WINDMILL
Daniel Nysewander, Springfield, O.-This invention consists in the combination of two segmental gear wheels, two regulating vanes, and an adof the flaring flanges with the edges of the wings of the wind wheel; in the combination of brace bars with the flanges and the wings of the wind whee, and in the combination of upright bar, cross bar, hinge bar, and out engravings.

IMPROVED COTTON PRESS
James Templeton, Florence, Ga.-The object of this invention is to
tion, by which the packing and baling of cotton or other material are fa
cilitated and accomplished with less dangerfrom the fulcrumed lever. The invention consists of a lint box, filled from the top, and is operated by a upwardly moving follower and sliding top panel. The base frame of the cotton press is supported on cross sills, and provided with uprights that are braced in suitable manner to the base sills, and s.rengthened by latera pieces, so as to form a strong and rigid support for the lint box. The lin box extends either through the floor of the building from the lint room down to the ground, or the same is provided, when the press is put up out-
side of the shed or building, with a platform around the lint box, at suitabe height above the base frame or sill.
improved machine for winding hay into rolls for FUEL.
Ebenezer Harding, Delavan, Minn.-This machine winds hay or straw into rolls or twists for the purpose of using the same in a compact and con de, in combination with a sliding and lever-acted pressure roller the being wound upon the spindle, which is withdrawn when the roll i inished. After the hay is attached to the spindle by bein $\sigma$ wound once o twice around the same, the spindle is revolved by one hand, and the rolle pressed at the same time tightly, by the lever, with the other hand, against he hay, so as to form a closely wound roll of hay or straw, of any desire is withdreund the spindle. When the hay has the requirad size, the spindle is withdrawn, by pulling the crank sidewise, and the roll removed. The surplus hay or straw is worked up quickly into rolls of compact of which may be used in convenient manner as fuel, in place of wood, and burned in any stove.

## NEW AGRICULTURAL INVENTIONS.

improved corn planter
Harrison Wagoner, Coshocton, 0.-This planter is so constructed as to open a channel to receive the seed, drop the seed at uniform distances apart, cover the seed, and mark the rows, so that the planting may be done
in accurate check row. By this construction the dropping slides are drawn back to drop the seed with a slow movement, and are pushed forward to gain receive seed with a quick movement, so as to jar the seed and insure the filling of their dropping holes.

IMPROVED PLOW
Robert B. Thomson, Dansville, Mich.-This plow consists of a combinaion of a mould-board, point, landside, forward standard, rear standard, and beam. The standards are made with bends or offsets near their uppe of the forward standard has a forward projection or arm formed upon it hrough which passes the bolt that secures and pivots the beam to the sai tandard. Upon the upper end of the rear standard is formed a projectio or plate, which is made in the form of a section of a circle. The forwar dge of the plate is concaved, and has a flange formed upon its lower sid receive the hook of the hook bolt. which passes up through the rearen of the beam, so that by loosening the nut of the bolt the rear end of th low beam may be moved from or toward the unplowed land, to adjust the pendent of the beam, and may be adjusted up or down and toward or from the land, as may be desired. The handles are connected by rounds the lower ends of which are secured to the landside and mouldboard by bolts, the upper bolts passing through slots, so that the rear ends of the handles improved corn planter
Charles L. Goethals, Los Angeles, Cal.-This machine is so constructe to open a furrow to receive the sced, drop the seed, and cover it. Th new feature consists in the lever which works the dropping slide. IMPROVFD DITCHING MACHINE.
Thomas N. Turner and Santford Turner, Rushville, Ind.--The sides of the ditch are cut by colters, the lower ends of which are attached to the forward corners of the share. The cutting edge of the share is made $V$ shaped, and its rear part is inclined upward, so as to deposit the dirt upon deep may be taken from the bottom of the ditch at each passage, and b assing back and forth a sufficient number of times the ditch may be sunk o any desired depth.

IMPROVED CORN SHELLER
Herman Neubert, Ironton, $\mathbf{O}$.-The forward part of the shaft is divided into four branches, to the outer ends of which is attached a ring plate
Upon the inner edge of the ring plate are formed four knives, the edges of pon the inch are inclined, and which are bent into such a shape that their said dges may rest upon the ear diagonally. To the branches of the shaft, a a little distance from their ends, is attached a ring plate, upon the inne edge of which are formed lugs which are bent forward at right angles t extend along the ear longitudinally. A tube keeps the kernels from scat tering as they are removed from the cob by the knives and lugs.
improved hand corn planter. William E. Seelye, Anoka, Minn.-The lower part of the front of the seed chamber when a plunger is raised, and is pushed outward to allow the seed
to dropinto the ground when the said plunger is pushed down. The lunger is attached to the lower end of a bar, that slides up and down upo he inner surface of the back of the chamber and seed box, and is concted with the lower end of a handle which slides upon the outer surface saia in the two bolts. The bolts pass through a longitudinal slo the said slot. The block or blocks keep the bar and handle at the prope distance apart, and also prevent the side edges of the bar from wearing the sides of the chamber.

IMPROVED CORN-GUARD FOR PLOWS.
Edward B. Murphy and Charles D. Bramell, South Point, Mo.-This is an improved device for attachment to the beams of plows to prevent soil cylindrical casting thrown against the young plants. It is a hollow ower sides of which areformed lugs to receive bolts which pass above an below the plow beam and through the ends of a bar placed upon the othe A spring holds the guard plate down to the ground and, at the same time allows it to rise to pass over an obstruction. The device may be attache to the beam of a shovel plow, a turn plow, or any other desired kind of a plow.
improved corn planter.
H. William Meyerhoff, Waverly, Iowa.-This invention relates, first, to the means for changing the angle of the tongue to the frame of the planter, for the purpose of varying the depth at which the furrow-openers deposit the seed in the ground; secondly, to the mechanism for reciprocating the seed slides, and the arrangement of a clutch for throwing the same into,
and out of gear with one of the transporting wheels; and, thirdly, to making the driver's seat adjustable by a particular construction.

IMPROVED PLOW.
Daniel P. Ferguson, Jonesborough, Ga.-This invention is an improvement in the class of plows having pivoted adjustable standards, and it relates to the employment of a curved or angular notched brace for the plow
standard, and a weighted key for confining the brace. The invention further relates to the provision of a slotted stay-piece for preventing the share or shovel turning on the bolt by which it is attached to the standard.

## 

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and appearance as Whole-Pulleys and Whole-Collars Yocum \& Son, Drinker st., below 147 North Second st.

## (4) a $x^{2}$

It has been our custom for thirty years past to devote correspondents; so useful have these labors proved that the Scientific American office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large
is the number of our correspondents, so wide the range is the number of our correspondents, so wide the range
of their inquiries, so desirous are we to meet their wants of their inquiries, so desirous are we to meet their wan employ the constant assistance of a considerable staff or access to the latest and best sources of information. For ezample, questions relating to steam engines, boil-
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able and prominentpractical electricians in this country. Astronomical queries by a practical astronomer. Chemi-
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cAN. These, with the replies are printed; the remaincan. These, with the replies, are printed; the remain-
der go into the waste basket. Many of the rejected der go into the waste basket. Many of the rejected shoulcl be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few
of them are thoughtful enough to inclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a
dollar or more, according to the nature or importance of he case. When we cannot furnish the information, th money is promptly returned to the sender.
A. B. W. should put his questions as to saw T. J. P. will find directions for setting a boiler on p. 339 , 1.J.

vol. 33.--J.G. E. and many others are informed that | there is no formula for the horse power of a boiler.-E. |
| :--- |
| L. N. will find directions for the decalcomanic process | on p. 275, vol. 34.-O. C. S. can gild the devices on china cient data as to the wire becoming brittle by exposure to the atmosphere.-T. W. will find directions for making oxygen on p. 75, vol. 32.-A. H. (of Niedergrund, L. F. C. should give his tinplate a coat of oil paint,and

Len letit dry. He can then fasten cloth to it with waterproof glue; see p. 43, vol. 32. For a description of the
compound engine, see p. 243, vol. 32.-D. McI. will find n p .218 , vol. 34, directions for making the so-call vertised in our columns.-W. G. W. will find directions for nickel plating on p. 235, vol. 33.-J. O. F. will find
instructions for making friction matches on p. 75, vol. 29.-C. W. will find a recipe for a cement for mending crockery and glass on p. 379, vol. 32. For mending boots, see p. 203, vol. 30.-H. C. B. is informed that tatIndian inks. For removing the marks, follow the direc tions on p. 331, vol. $30 .-\mathrm{S}$. H. will probably find that
any good cheese, that is soft, will do to make cement.S. will find that the cement described on p. 80, vol. 31, locs not dissolve in water and does not become brittle
with age.-J. M. McG.,Jr., should read Paddlefast's with age.-J. M. NcG., J.., should read Paddlefast's arti-PLEMENT.-H. \& R. can dissolve rubber by the process described on p. 119, vol. 28.-J. W. S. can sensitize a piece of paper or metal by the process described on p. 132,
vol. 35 . As to changes of color by heat, see p. 01 , yol 36. As to a weather glass, see pp. 35 , 67 , vol. $36 .-\mathrm{P}$. locs not give sufficient data as to the hammering in his boiler.-W. C. P. is informed that the preparation is to
le taken internally. The human hair is referred to in ce taken internally. The human hair is referred to in
the question.-T. S. will find directions for fastening ubber to iron on p. 409, vol. 33.-S. R. C. will find a description of a gyroscope on p. 91, vol. 31.-T. K. \& B.
should know better than to believe in the possibility of an instrument indicating where gold lies buried in the earth.-C. W. K. is mistaken as to the horse power of the enginc. See p. 33 , vol. 33.-W. T. K. can bleach
ivory by the process described on p. 10 , vol. 32 -W vory by the process described on p. 10, vol. $32 .-$ W. S.
will find answers to all his queries as to lightning rods on p. 277, vol. 35.-H. R. will find directions for silver plating without a battery on p. 299, vol. 31.-R. M.
will find a formula for the power of an engine p. 33, vol. 33.-A. I. will find on p. 153, vol. 31, directions for bluing gun barrels.-W. A. W. will find something on the expansion of mercury by heat on p. 354, vol. 26.
-O. B., A. G., A. J. B., J. C., R. D. E., F.J. W., N. B., A. B., A. G., A. J. B., J. C., R. D., R. B., C. W., F., C., W. W. McL.,
A., jects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for
(1) W. W. H. asks: P'ease tell me the ultinate weight that the two following girders will bear
One is a cast iron girder, nearly of the Hodgkinson pro portions, 7 inches wide at base and $81 / 4$ inches high; and the other is a wrought iron girder or flat bar size, 5
inches $\times 3 / 4$ inch. Both girders being fixed and an chored in strong walls, and the span 20 feet. Please
give an arithmetical and not an algebraic calculation. ing loads would be: Cast iron beam, about $3,000 \mathrm{lbs}$ wrought iron beam, about $2,300 \mathrm{lbs}$.
(2) F. A. B. asks: What is the weight of missile, and the greatest distance that the bolt could d at the Centennial? A. Weight of ball, $1,200 \mathrm{lbs}$. Prob able range, between 4 and 5 miles.
(3) F. B. asks: 1. As a boy swings a bucket of water over his head and it does not fall out, how
fast would a 10 foot flywheel with glooular cavities on inside rim facing center of wheel have to turn to hol Would there be a different effect if the balls were com posed of different materials, as wood, stone, or iron? rial. 2. On the principle of a top, a heavy wheel can b turned readily after starting. What difference will it make if, instead or̀ a wheel, it should be as a large gov-
ernor with heavy balls on arms 8 or 10 feet long, and ernor with heavy balls on arms 8 or 10 feet long, and
how much more power would have to be expended to raise those bails on a spiral incline to near the level of their attachments? A. The height of the balls varies as the square ofthe revolutions. 3. Suppose a perpen-
dicular shaft, moved by cog or belt gearings, had four dicular shaft, moved by cog or belt gearings, had four or more balls suspended by chains instead of stiff arms,
would they not assume a similar position? A. Yes, would they not assume a similar position? A. Yes,
other things being the same. 4. Suppose a tube arother things being the same. 4. Suppose a tube ar
ranged to turn and describe a circle, with outer cnd closed, but with an opening below, no wider than the cross sect held there by springs or ctherwise until great velocit was acquired and then released, would it not remain
there? A. Yes, as we understand your meaning. 5. there? A. Yes, as we understand your meaning. 5. I
have seen a performer manipulating a top which at one time appeared to turn when standing out at right angles rom the perpendicular stick that supported it. Wh overcome the attraction of gravitation. 6. Does such a top weigh any less acting in that position than when at
rest? A. No; it weighs just as much when revolving as when not.
(4) H. T. P. asks: Which has the most steam-generating capacity, and which is capable of
the greatest resistance, a single boiler 60 inches in dimeter and 18 feet long or two boilers each 36 inches in diameter and 18 feet long? A. Generally, the two he greatest pressure.
(5) A. S. D. says: I have a canal about two miles long, which I use as a head race for water power
Itruns aiong the foot of a hilr and heavy dirt into it. How can I clean it out without drawing off dredging machine.
(6) W. O. R. asks: What is meant by the pitch of a steamer's propeller being 3 feet? A. It means that, if the propeller were working without slip, like a evolution.
(7) J. A. O. Q. asks: Does not the Great Eastern consist of three complete ships? A. Nc; but
the vessel is built with a double hull, and is divided by bulkheads into several
(8) W. D. S. says: Three men want to carry a bar of iron 9 feet long, weighing 300 lbs . One place a bar so that an equal weight (or 100 lbs.) will fall on each man? A. Three feet from the other end of the
(9) J. T. H. asks: Is tallow a good lubriant for cranks making 200 revolutions? Would oil bc better? A. Oil is generally better than tallow for crank pins, and there are some special forms of lubricants that a high velocity. In anengine by 14 inevolutions, wis danger of breaking the wheel by placing a weight sufficient to balance weight of pistons? A. We think there
will be no danger in attaching the counterbalance. (10) W. M. K. says: What is the rate of incease of friction in proportion to speed of a thin smooth body (such as a propeller blade) in passing
through water? What proportionate amount of power vould be required to double any given number of revon moderate limits, the power is supposed to vary ap proximately as the cube of the number of revolutions, but the exact law of the variation is not definitely settled; and when the spced becomes very great, the power is supposed to increase in a higher ratio than the cube,
butexperiments have not been sufficiently extended to tablish a general law.
(11) G. B. says: Two bodies of metal of equal weight are to slide over a planed surface. One these bodies has a bearing surface (supposed to be a
perfect friction contact), upon the table it slides on, of square feet; the other body has a bearing surface nlid 6 square inches. Wine the body having 6 square feet bearing than it wil to slide the one having only 6 inches, or will the re-
quired moving power be equal? A. According to the quired moving power be equal? A. According to the weight and not upon the area of contact. This rule, however, has some limitations, especially when the area
of contact is so small that the pressure per square inch uficient to produce abrasion.
(12) H. D. M. asks: Is the phosphorus lamp described on p. 266, vol. 31, of any use? A. The phos-
porus lamp may be made and used as directed in the answer, but the light which it emits is extremely weak -a mere phosphorescent glow. It is sufficient, howwatch, held close to it, so that with ordinary eyesight the time may be noted in the absence of other lumi-
(13) S. asks: Is there anything that will crase India ink lines from drawing paper? A. Nothing that we know of, except a good steel eraser or sanded
(14) R. H. \& Co. say: 1. In our busines路 support of lightning rods, and we galvanize them to
prevent rusting. When we use them, we find the cast prevent rusting. When we use them, we find the cast
iron so brittle that a great many of them break. We can so brittle that a great many of them break. We ing makes them brittle. Are we right? A. Galvanizing
iron does not make it brittle. 2. Is it necessary to throw articles that are galvanized into cold water immediately
after taking out of the vat? A. No. They should not be thrown into cold water
(15) B. F. A. asks: How can I stain wood blue, the shade of the field in the American flag? A. copper in water, and then go over the work with a hot solution of carbonate of soda ( 2 ozs. to 1 pint water) 2. Boil 1 lb . indigo, 2 lbs . woad, and 3 ozs . alum in 1 gallon water, and apply with a brush.
(16) C. M. T. asks: What will make photograph paper so transparent that it can be painted in oil
colors on the back of a picture, so as to give a life-like lor to picture, or what preparation will make the paper perfectly transparent? A. Try Canada balsam. Paper cannot be mal
(17) C. D. H. says: Our water supply is from springs, and is soft. Abouttwo years ago, plain iron
pipes were laid; and the 1 inch pipes have become so flled pipes were laid; and the 1 inch pipes have become so filled
with a very hard rust or scale as to nearly cut off the supply. It forms in irregular masses, and adheres very firmly to the pipe. Is there any known method of preventing or removing the same without taking up the pipe? A. We do not know of any practical method for (18)
(18) C. K. asks: Can a good polish be put on copper by the recipe given on p . 326, vol. 32 , and will
it last a reasonable time? A. The recipe has been well recommended, It is better to use a larger proportion of lcohol than is there indicated. See also p. 242, vol. 34.
(19) B. C. M. asks: How is pyroligneous acid (wood vinegar) made? A. It is obtained by distillingwood in iron retorts, resembling those used for making illuminating gas. The condensed products of the
distillation contain, with tar and numerous other bodies crude pyroligneous acid or wond vinegrs other bodies, a well conducted distillation to about 7 or 8 per cent of the wood employed. The gas that accompanies the liquifiable distillates is conducted to the furnace under the retort, and serves to continue the distillation without other fuel. In purifying the acid, it is first saturated with lime, evaporated to dryness, roasted at a
moderate temperature so as to free it from volatile moderate temperature so as to free it from volatile
matters, and decomposed in a retort, having a helm of copper and a condenser of tin or silver, with hydrochloric acid ( 90 parts acid to 100 acetate of lime), and the acetic acid distilled.
(20) G. B. L. says: I built an oil house last fall, and lined it inside with inch boards, packing space The oils on hand are coal oil, seal, etc., also turpentine and benzine. The leakage floor, and most likely the sawdust has absorbed whatever came in contact with it. Is there any danger of
spontaneous combustion during the heat of summer?
(21) A. H. says: Your correspondent, P., p. 212,vol. 36, seems to overlook the fact that a lightning rod having the deep earth terminal generally recommended by scientific authority, and which he does not of a rod terminating "at or just beneath" the surface, such as I understand him to recommend. For, before reaching the deep terminal, the rod would come in confind there or elsewhere a better conductor, the greater portion of it would leave the rod for that conductor, inconstructed rod term rod to the end. With a properly surface, buried in contact with such worthless scraps of metal as the clippings from tinshops, old tinware, etc.,
or fine charcoal, or both, in constantly (not "almost always, during a thunderstorm") moist earth, which in lar bottom: there is little probability that the eco ricity will leave the rod to "pass off on the wet sur-
(22) J. P. says, in reply to D. W.'s query st to the sudden weldirg of a millstone spindle to its year or two of its publication, may be found an account of a similaroccurrence. A spindle (I think it was of a millstone) was suddenly welded to the support upon which it was running, in the very same manner, as in the case mentioned in your paper. Tbe
in the year 1827, or the first half of 1828 .
(23) W. D. says, in reply to D. W.'s query as to the welding of a millstone spindle to its step: I
have seen this done a good many times. To prevent it, plane a groove in thestep $1 / /$ inch wide and $1 / 4$ inch decp; harden the foot of the spindle and step as hard as possible, polish both after hardening, and you will have no
trouble about welding together. The oil running through trouble about welding together. The oil running through
the groove prevents its welding. Use the best of sperm (24) W W T
(24) W. W. T. says, in reply to the query about the welding of mill points to their steps: $I$ have
had several such jobs to repair. The weld is perfect, and has always broken when struck in a different place from the point of union. I have to anneal the step and
turn off the part cf point left; and I find no check or ine mar'ing the place of contact
(25) B. A. J. says, as to the sudden welding a mill spindle to its step: I once had a spindle act in a way while running in a cup of oil.
(26) W. C. says: Please give me a recipe for making powder for mining coal? A. Coarse-grained
gunpowder is usually employed. The materials are first perfectly dried and separately reduced to impalpable powgers. These are then sifted together, moistened with water, and ground for some time between large millstones kept constantly moist with water. The wet
powder is then collected into large lumps and carefully dried. These lumps are grained by bringing them in contact with sharp teeth fixed upon the periphery of a revolving wheel, and agitating in suitable sieves to sep-
arate from the finer powder. The powder consists of 76 parts of niter, 13 parts of charcoal (often mixed with a little wood pulp or sawdust), and 11 parts of sulphur.
(27) J. R. Y., Jr., asks: Please give me a recipe for a wash that will remove or hide marks an stains on hard finished house walls. A. We do not
know of anything better than clean water to wash them Sometimes $i$ is necessary to cover them with kalsomin. With bad stains over a large surface, it is best to tak off the hard finish and renew it carefully in those places.
(28) C. D. R. asks: Please give me recipes for making turpentine japan or paint dryer, ben zine japan or paint dryer, and rubbing varnish for cabi net makers' use? A. For turpentine dryer, take linseed oil 1 gallon, put into it gum shellac $3 / 4 \mathrm{lb}$., litharge and
burnt Turkey umber each $1 / 2 \mathrm{lb}$., red lead $1 / 2 \mathrm{lb}$., sugarof burnt Turkey umber each $1 / 2 \mathrm{lb}$., red lead $1 / 2 \mathrm{lb}$., sugar of lead 6 ozs. Boil in the oil until all are dissolved, which
will require about 4 hoars; remove from the fire and stir in 1 gallon spirits of turpentine. For benzine dryer, take linseed oil 5 gallons, add red lead and litharge each $31 / 2 \mathrm{lbs}$., raw umber $11 / 4 \mathrm{lbs}$, sugar of lead and sulphate of zinc, each $1 / 1 \mathrm{lb}$. Pulverize, and boil in the oil as beore. When a little cooled, thin with benzine, 5 gallons or rubbing varnish, use a solution of pure, bleache on cloth and a a a and apply with
(29) J. H. R. asks: What is the advantage poand engine directly above the low of a marine com A. All builders do not adopt this plan. Without being able to speak officially for those who do, we imagine that they consider the principal advantages to consist in economy of space and weight.
(30) W. K. D. says: I have an acquaintnnce who has an open fireplace in his office, and claims
hat during the forenoon the sun comes into the room and deadens the fire. Is this true, and what is the cause? A. We do not believe it is true, but probably the ffect of deadening is produced to the eye by the su
(31) J. A. C. says: I have a boiler made of arst class iron, which commenced leaking in one of the joints. This continued until every joint was leaking.
We then patched the seams, but in a short time the leaking commenced again. The water for our boilers was pumped from a wêli into a water for our boilers warmed by having the exhaust pipe extend into it. Our boiler maker says that the leaking was caused by the oil which was carried from the cylinder by the exhaustpipe into the water in the tank and thence into the boilers, this is not so, please give me the correct reason? A. form a decided opinion. The boiler makcr's explana on points to a possible cause, while it is more likely that the trouble is due to failly construction, careles management, or to the use of bad water.
(32) W. E. W. asks: 1. How can I tell the weight of a flywheel where I know the diameter number of cubic inches in the wheel by 0.2604 , to get the approximate weight in lbs. 2. Is there a rule by which the weight of a wheel is regulated for any given hors power? A. No general rule for the size of flywhee will answer under all circumstances. We could not treat end a good discussion in Rankine's "Machincry and Millwork."
(33) J. E. C. says: I see it stated in an ar cle on machine belts, in the Science Record for 1876 p. 331, that a belt wrapped one quarter round a pulley
has only one fourth the power of what it would have if wrapped one half round. As an illustration of the abov is given a man with a rope taking turns round a post, and states what a great power is gained according to
the number of turns the rope is taken around the post I have also known of pulleys being increased in diame ter, so as to make the belt stick better and thereby have greater power. But according to one of the laws of friction increase of surface does not produce increase of riction. How do you account for the power gained in the above cases? A. This is not contrary to the laws of friction in relation to bodies that are flexible. In these ases, it is shown that the friction depends on the angle fos on treat (8) M. W.
(34) M. A. W. asks: 1. Will a steam boil er 4 feet long by 24 inches diameter, with a firebox 4 ne inch flues be large enough to rup on long, with cylinder, $3 \times 6$ inches, with 80 lbs. boiler pressure at 200 revolutions per minute? A. We think the boiler wil nswer. 2. Am I correct in estimating said engine at 3. Would the above Actual power will not exceed 1 horse the driving wheels 5 feet in diameter, with gear wheel of 4 revolutions of the driver to one of the driven What speed could I obtain on moderately good roads A. 4 miles an hour. Your idea as to revang an of contained no novel features.
(35) C. A. C. asks: 1. How can I varnish olored mechanical drawing, so that the paper and draw ng will not be marred by the operation? A. You must use can probably obtain from some one who mounts show ards. 2 . What must be the circumferential velocity of an iron disk (not serrated) to sever a bar of cold iron?
(a) L. C.
(36) L. M. C. says: I am nineteen years of age, and myambition is to learn to be a competent prac rise me to pursue in order to obtain that end? A. Yo should try and get employment as a fireman on a loc motive. whate the prodace a higher note on whistle? A. Generally, yes. 2. Will compressed air poduce the same note on a steam whistle as steam does the pressure being alike in both cases? A. The sound often clearer when air is used. 3. What is the best way to stop foaming in a steam boiler? A. It is often aue to the construction of the boiler, or the arrangemen water or too strong a fire. The causes will doubtless suggest the remedies.
(37) J. O. says, in reply to D. W.'s query s to the sudden welding of a mill spindle and its step hardened steel under excessive friction the uniting of sence of lubricant. The foot of a steel pointed shaft running at 180 revolutions a minute in a steel step and ransmitting some 25 or 30 horse power, brought a water wheel to a sudden stop. The uniting was preceded by pricking noise, similar to that made by an electric en ine. Upon removing the shaft, a ridge of steel taken rom chisel or file wound on the foot of the shaft; and n only be removed by a grindstone Hordy and it could o be felt. I believe the parts welded by wearing parts to perfect surfaces, and then excessive frictio completed the job
(38) J. H. P. says, as to the welding of the pindle to the step plate: I think that the end of the pindle had worn a little hollow in the step plate, hav ing the same curvature with itself. The pressure of the air and oil, and the two had come into actual contact (a9) D. H. ays: The plece.
(39) F. D. H. says: The statement of D.W. as to the welding of a mill spindle point to its step can be erified by three precisely similar cases, which have been brought to us for repairs. He is undoubtedly in error in egard to the point being well oiled. If that were the
case, it would indeed be a remarkable occurrence; but when running dry such things occasionally happen. In very instance that has come under our notice the weld was a per
pieces.
Minerals, etc.-Specimens háve been re ceived from the following correspondents, an examined, with the result stated
J. A. S.-It is iron pyrites or sulphide of iron. See p. , vol. 36.-W. R. S.-A quantitative analysis of fir material will be required. Send by express.-B. F.T. It is indurated clay, containing markasite. See p. 7 ,
ol 35 . It is of little value.-H. A. W.-Quantitativ vol. 35. It is of little value.-H.
analyses cost from $\$ 10$ to $\$ 30$ each.

## COMMUNICATIONS RECEIVED.

 The Editor of the Scientific American acknowledges, with much pleasure, the receipt of original On the Valuation of Sugar. By S. W.On the Involute of the Circle. By L. D. On the Involute of the Circle. By L. D'A. On a Tidal Motor. By A. S.
On City Travel. By T. B. McC
On American Progress. By
Iso inquiries and answers from the followin F. B. M.-G. S. B.-P. P. P.-L. S. B.-A. K. B.

HINTS TO CORRESPONDENTS
Correspondents whose inquiries fail to appear should Ceat them. If not then published, they may conclude ddress of the writer should always be given. Inquiries relating to patents, or to the patentability f inventions, assignments, etc., will not be publishe ere. All such questions, when initials only are given, our paper to print them all; but we generally take pleas ure in answering briefly by mail, if the writer's address Hundreds of inquiries analogous to the followin re sent: "Who makes dynamometers? Where ca kworms eggs be obtained Who makes brewer machinery? Who sells tobacco-flavoring, compos prsonal inquiries are printed, as will be observed, in the cially set apart for that purpose, subject to the charg mentioned at the head of that column. Almost any de red information can in this way be expeditiously o ained.

## official

INDEX OF INVENTIONS FOR which Letters Patent of the United States wer Granted in the Week Ending April 3, 1877,

## EH BEARING THAT DATE.

plete copy of and in the aned cluding both the specifications and drawings, will be urnished from this office for one dollar. In ordering, nd remit to Munn \& Co., 37 Park Row, New York city.

Agitating and mixing, G. L. Witsil.
irr guns, dart for, Spring \& Robinso
nimal poke, R. E. Atteberry
Arm rest, P. R Wagor.
$\mathbf{x}$ helve shield, J. M.
Bag holder, J. Eberhard..........
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Bales, tightening bands on, M. Quin
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rrick machine. C. Schlickeysen.... Bridge, Avery \& Bartholomew. Bridge pier, Avery \& Ba
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Grain separator, E.
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Hinge for boxes, e
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Injector, J. Proeger ............................. Inssulated wire, H. Redding
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roning table, G. W. Hook
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Lamp, S. S. Newton
Lamp bracket, Sherwin \& H Hoople.
Lamps, center, Sherwin \& Hople
Lamps, center, Sherwin \& Hoople...................... 189, Lamp, night, H. W. Huntington...
Lamp or chanadelier, oill J. F. Lauth
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Leather goods, stamping, L. H.
Level, T. H. Burk
Lightning rod, L. D. .......... Level, T. H. Burk $\ldots$................
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Lock for sliding doors, W. C. Ro Lock for sliding doors, W. C.
Lock, master key. F. C. Yanda
Locking latech, H. A. Chase...
Meat tenderer, V. Lapham...
 Millstones, etc., balancing, C. E. B
Moulding machine, J. B. McCune
Mosquito net frame, J. F. Volle ............ ..............

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Parlor skate, H. L. True ................. Pencil sharpener, Roache \& Redding.
Pianoforte action, upright, F. Fricking Pictures, etc., preserving, L. T. Luther Pile driver, steam, T. T. Loo
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School desk, Cogger \& June.........
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Sewing machines, button holes, E. M
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Sheet metal elbow, N. I. Rothan
Shingle, metal, Locher \& Knispel
Sickle grinder, H. S. Stevens.
Silk, etc., dres
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Skirt supporter

Slate washer, R. De Haven..
Smoking pipe, B. A. Jonasson
Snapher
Snap hook, Nash \& Kempshall.....
Soap composition, Baxter \& Horro
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Steam and air brake, Taylor \& McCam
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Sugar boiling pan, etce, w. ©lough
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Table leaf support, W. F. Daly
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Telegraph multiple, G. Smith
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Thill coupling T. J.
Time globe, L. P. Juvet.......................
Tire heating apparatus, S. G. Reed (r).
Tobacco pipe, J. Davis. ...
Tool holder, T. Strobrige.
Towel rack and wall protector, E
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Traveling bag, safety, H. Collins
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Truck, brick yard, E. Remillard
Truck, brick yard, E. Remillard.
Truck, garbage, J. O. A. Bennett

Valve, automatic check, o. Collier
Valve, balance slide, T. M. Nagle...
Valve, steam pump, N. W. Wheeler


Ventilator, G. R. Moore
Ventilator, kitchen, J.
Ventilator, kitchen, J. A. Leeper..
Ventilator, railway car, S. Darling
Ventilator, railway car, S. Darling.........
Vessels, relieving stranded, H. F. Knapp.
Wagon brake lock, $S$. H. Miller
Vessels, releving stranded, H.
Wagon brake lock, S. H. Miller.
Wagon seat spring, B. F. Wells .

Windmill, D. Nysewander.
Windmill, E. Stata......
Windmill, E. Stata.......
Window blind, J. Miller ..
Window mirror, P. W. Ralifs.
Window screen, R. Calhoun

DESIGNS PATENTED.

## ,873.-CorRET.-M. Adler, New Haven, Conn. ,874 to 9,876. - CARPETS.-A. Baye, London, England

 9,879.-STOVES.-R. A. Culter et al, Peoria,
9.880.-CARPETS.-E. Daniel, Paris, France.
9.881.-MOTTO.-J. W. Fleischmann $9,881 .-$ Motro.-J. W. Fleischmann, Williamsburg, N. Y
$9,882-$ Hivaes.-F. T. Fracker et al, New Britain, Conn

 9,890.-SToves.-O. B. Keeley, Spring City, , Pa
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