WORK

An Illustrated Journal of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

VOL. IV.—No. 197.] SATURDAY, DECEMBER 24, 1892. [PRICE ONE PENNY.

WORK WORLD.

A WOMAN has been enrolled as a member of the London Society of Compositors. A new departure indeed!

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A granite bridge to be erected at Ruther-glen, Glasgow, will have three arches, the centre span being 100 feet and the side spans 90 feet each.

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A new telescope is being made for the Greenwich Observatory. It will be nearly 30 ft. in length. The large lens now nearly completed is 28 in. in diameter.

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Gauge and lamp glasses made by combining two kinds of glass are reported to stand great and sudden changes of temperature better than those made of glass homogeneous throughout.

* *

Magnolia metal has been awarded the gold medal at the Italian-American Exhibition lately held in Genoa. This is the third time this alloy has obtained the highest award in its class at various exhibitions.

* *

The largest artificial stone in the world is said to be the Bartholdi Statue of Liberty, near New York Harbour. In its formation more than 500 cartloads of sand and 20,000 barrels of cement were used.

* *

About the latest idea for using aluminium is for making tobacco-pipes. The result is a pipe much lighter than one of similar size made of briar-root. The metal bowl is lined with meerschaum, a non-conductor of heat.

* *

Experimental work in connection with the Observatory on Mont Blanc shows that the crust of snow is so thick, that an attempt to make foundations on the solid rock has been abandoned. It has been found that the snow itself forms a sufficiently firm basis on which to erect buildings.

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To remove a deposit of nickel when the coating does not adhere well, or if it is necessary to re-nickel the piece, plunge the article in an oxidising liquid composed of potassium bichromate, sulphuric acid, and water in the proportions used generally for batteries. Take out more or less quickly, according to the thickness of the deposit, wash, and, if necessary, repolish.

* *

The distribution of hot water on the principle of the penny-in-the-slot machines has been successfully undertaken by a company in Paris. Small edifices, resembling the familiar "kiosques," have been erected, and the automatic delivery of a couple of gallons of water heated to from 140° to 160° Fahr. is obtained by inserting a five-centime coin (a halfpenny) in a convenient slot, and pressing a button.

* *

The water supplied from these automatic machines is heated at the time it is being drawn off, and not maintained at a high temperature as might be supposed. The action of the mechanism is to turn on a powerful gas-flame, which acts on a coil of small tubing, presenting a very large heating surface. The water contained in this coiled tube is quickly heated, and by drawing off slowly even boiling point may be attained.

* *

The largest gas-holder in the world, and the first six-lift holder erected, is now in use at the East Greenwich Station of the South Metropolitan Gas Company. This holder is 300 ft. in diameter, and has a capacity of 12,000,000 cubic feet. The novelty—a striking one—is that the two upper lifts rise above the framing to a height of 60 ft. The floating vessel of the holder weighs 1,300 tons, and the outside framing 900 tons.

* *

The printed tins in which tea and other comestibles are sold undergo several processes in production. Each colour in the design is taken off a lithographic stone on to a "blanket," which is then pressed upon the tin by passing both between rollers. The tin is "stoved" after the application of each colour. When the design is completed upon the tin, it is varnished with copal, and again "stoved." The tin is, of course, printed and stoved before it is made up into the shapes required for the market.

* *

Considerable interest is centred in the shoe-making industry on the question of the manufacturers providing indoor workshops, and so relieve the workers from working at their own homes. At Northampton, Kettering, and other centres of the county, the manufacturers have under consideration the demand by the men for them to find indoor shops within three months. The men, through their unions, have, by considerable majorities, voted to press their claims for the indoor shops. Should the manufacturers consent to their demands, the building trades will be benefited, as many new shops will have to be erected.

* *

If the polished surface of an alloy is etched with dilute nitric or sulphuric acid while under the influence of a weak electric current, and then examined in reflected light, figures are seen which vary with the composition of the alloy, with the temperature of fusion, and with the nature of the mechanical properties it has undergone, but which are characteristic for any definite alloy. These images may be best studied in enlargements made by photography. As examples in bronzes and aluminium gold, the grooves take the form of filaments, while in phosphor-bronzes the figures are like fern leaves or branches of fir. It is stated that they form a reliable test whereby the nature of any alloy can be determined by the simple inspection of an etched surface; and further, that they at once show whether the alloy has been forged, stamped, or undergone any mechanical treatment.

* *

West End London shoemakers do not work like men in other trades, in their masters' workshops, but have to find their own "sittings," as they are called. These occupy a space in a large room where, perhaps, some twenty or thirty men have sittings. Each man is allotted bench space for his own seat, with sufficient room to pull out his threads at arm's length without touching his neighbour. This means about 5 ft. of frontage and 4 ft. depth. This space used to be let by a landlord at a rental of 1s. per week for each man, and has proved to be much better for the men than working at their own homes. Now the men rent a whole shop, and buy all things for it, such as stove, skiving machine, etc. These become shop property. The men pay the 1s. per week just the same; but generally at the end of the quarter, after all is paid, there is a surplus to be divided. There is something of the co-operative idea in this arrangement, and workers of London would do well to apply the principle in further directions where they stand affected.

ELECTRIC PENDULUM.

BY J. BROX.

INTRODUCTION — CLOCKWORKS—PARTS OF PENDULUM—PARTS OF CONTACT BREAKER—FIXING —ACTION OF PENDULUM—FINAL REMARKS.

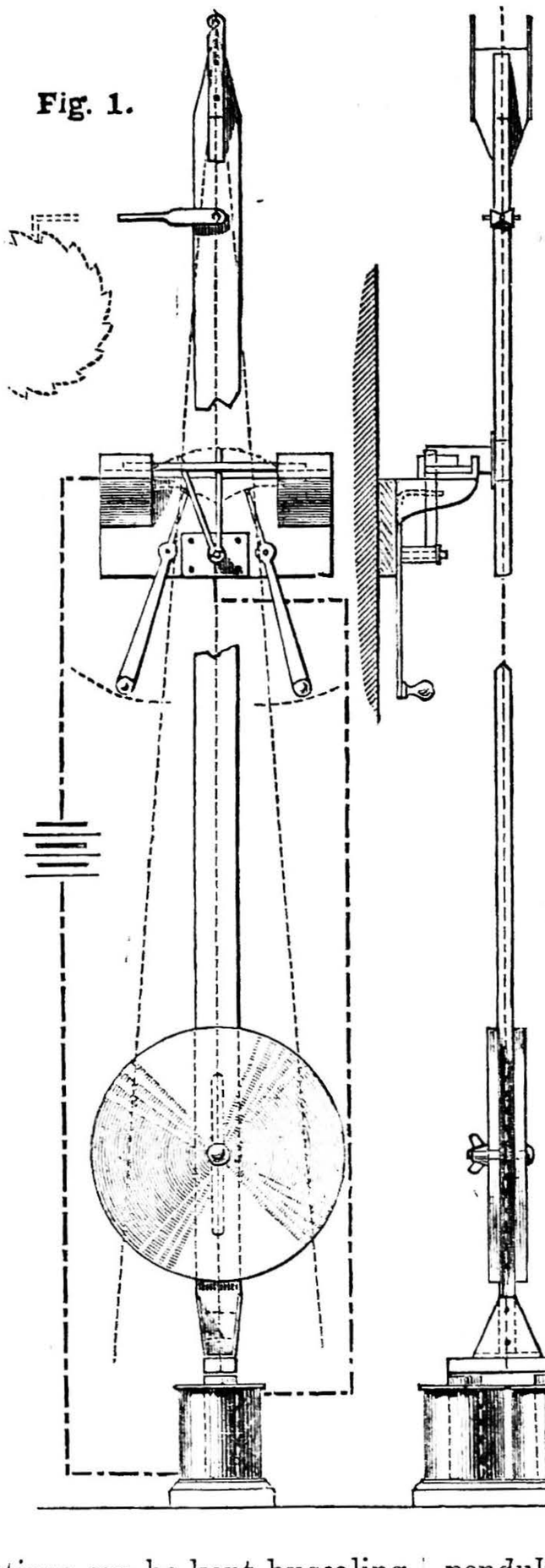
Introduction.—In this article it is not proposed to go into the construction of clocks, although some hints will be given for applying an electric pendulum to clockworks in general; but a full description of a pendulum driven by electricity will be considered. The great difficulty to be overcome in designing a pendulum of this sort, is to make it automatic and self-regulating; to ask for the current only when it is required, and to cut it off at the proper moment. All these troubles are got over by this pendulum that it is proposed to put before you.

It has been found from experience that when a short pendulum is used, it is somewhat greedy, and asks for a little too much electricity. The best form is a long heavy one, such as can be well used in a grandfather's clock; some very pretty cases for which have appeared in the back numbers of WORK, which would be well suited for this purpose by those who wish to make as much of the clock complete as they can.

The drawing is all to scale, but no scale has been given, so that by choosing one to your own convenience true proportions can be kept by scaling off the design.

It will be seen that in Figs. 1 and 2 the pendulum is shown broken; this has been done to save space. The true length should be half as long again from the armature at the bottom to the hangers at the top. The construction of the pendulum and works also is of the simplest kind, being nothing more than a strip of hard wood, two thick discs of lead, with a small nut to adjust them with, and nearly all the rest of the work cut out of sheet brass. By doing this it brings the pendulum within the reach of those who are not blessed with the good things of this world, without in any way interfering with the demonstration of the system upon which it works, leaving those who wish to put more work and finish into it, to do as they please, in such matters as a delicate adjustment to the bob, hangers, etc.

Clockworks.—It is possible to use almost any kind of old clockworks. One has been made from the inside of an old cheap round American clock in the following way:—The spring and the wheel attached to it were removed, as also were the balance-wheel and spring, etc.; then, beginning with the wheel and spindle upon which the small hand is fixed, a train of wheels was retained which would work with a pendulum of a given length, of course taking into consideration a ratchet-wheel, which was cut out of a piece of sheet brass, having the requisite number of teeth, and fitted on to the shaft of the last pinion in the train of wheels. This ratchet-wheel was driven by an arm from the pendulum, as shown in Fig. 1 by the small dotted lines in the left-hand top corner; the only other wheels in the old clock which were kept were those in connection with the long hand; the ratchet-wheel was also furnished with a back catch to prevent it slipping back by the friction of the ratchet arm on the return stroke. The whole was then placed in a suitable case, and has kept the best of time for more than a year.



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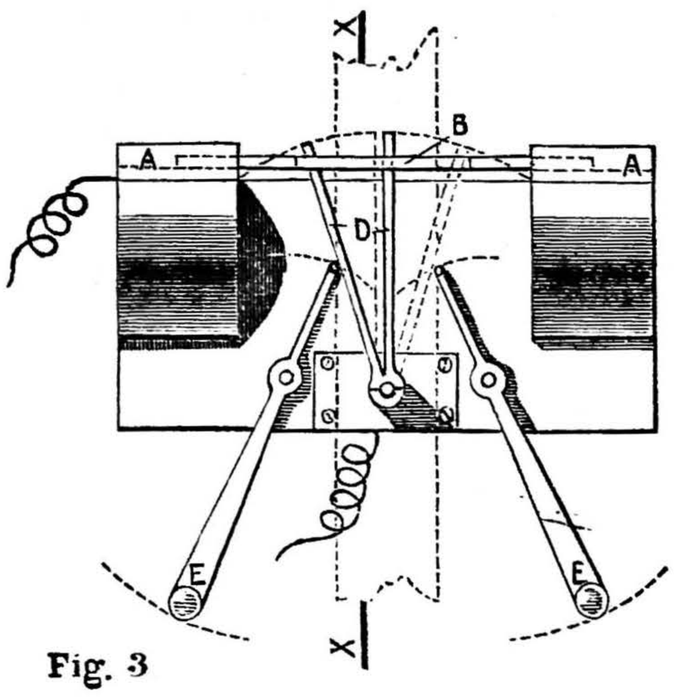
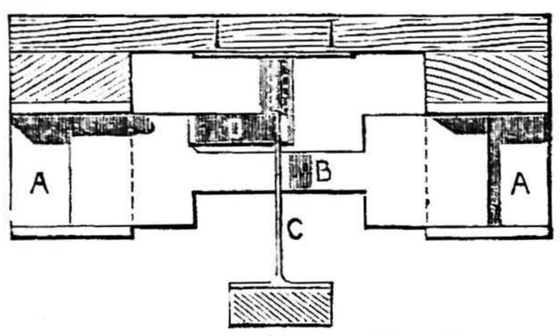


Fig. 3



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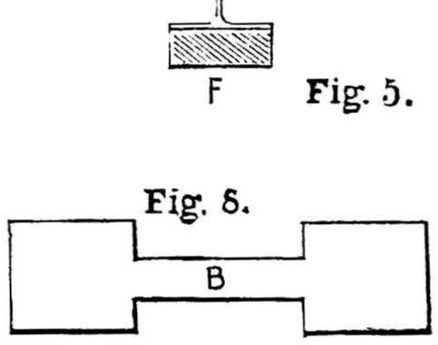

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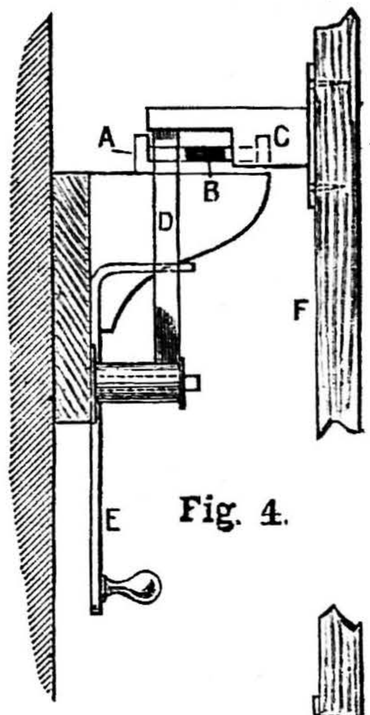

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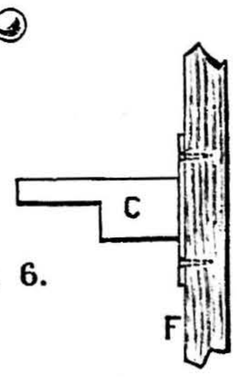

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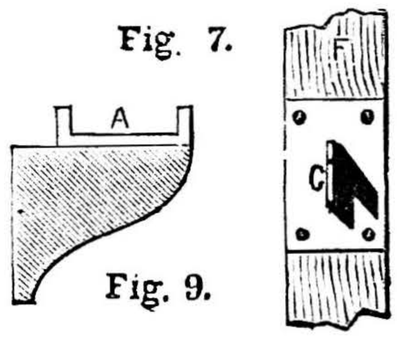


Fig. 9.

Fig. 7.

Electric Pendulum. Fig. 1.—General View of Pendulum. Fig. 2.—Side Elevation of same. Fig. 3.—Elevation in Detail of Tumbler, etc. Fig. 4.—Sectional Elevation through X X of same. Fig. 5.—Plan of same, Regulating Levers omitted. Fig. 6.—Catch on Pendulum. Fig. 7.—Front View of same. Fig. 8.—Contact Slide. Fig. 9.—Guide for same. Letters A, B, C, etc., refer to Analogous Parts.

Parts of Pendulum.—Before going into the action of the pendulum, it would perhaps be advisable to give a short description of the chief parts, and in doing so the simplest forms will be adhered to. As has been stated before, the pendulum shaft can be made of any kind of hard wood, etc.; the bob and hangers being left to the discretion of the reader. At the lower end of the shaft is fixed a soft iron armature, in such a way that it is square to the length, and at right angles to the line of motion of the pendulum. Directly under the armature is placed an electro-magnet; the size by proportion in Figs. 1 and 2 is shown amply large enough, as it does not require much force to keep a pendulum with a short stroke and doing light work in motion, and in working it is better to have a few mild impulses at short periods than one very strong one at longer intervals, as it makes the motion more regular and smooth.

The other part of the pendulum of importance is the catch, shown in Figs. 4, 5, 6, and 7, and marked C, which is best made of steel, in order that it may be as thin as possible. The position of this catch will be shown hereafter.

Parts of Contact Breaker.—Upon a suitable piece of hard wood, as in Figs. 3, 4, and 5, the whole of the mechanism of the contact breaker is fixed, except of course the pendulum catch, C. At each top corner of this wooden bed two little brackets of hard wood are fixed, and upon these the contact guides, A, in Figs. 3, 4, 5, and 9, are fixed. These must have their inner surfaces true, square, and level to each other; and underneath one of them must be fixed a short length of covered copper wire for connection. In these two guides is placed the contact slide, best shown in Fig. 8, but also in Figs. 3, 4, and 5, marked B; the bottom of the contact slide must be true, so that it may make perpetual contact between the two guides, although free to move backwards and forwards. The inner corners of this contact slide should be covered with two small slips of platinum, as also should be the outside of the tips of the tumbler marked D, and best seen in Fig. 3. This tumbler, as can be seen in Figs. 3, 4, and 5, is a V-shaped piece of metal, working freely on a pin, the back part of which pin is connected to a short piece of covered copper wire. E, E are two regulating levers with turned-up points, to catch the tumbler, D, seen in Figs. 3 and 4.

Fixing.—After having determined upon the length and swing of the pendulum, the small wooden bed, upon which are fixed the tumbler, slide, etc., should be placed at the back of the pendulum, at such a distance from the top of it, that the length of the

swing at that place shall be equal to the openings of the contact slide, B, when in the exact centre between the guides, A (See dotted lines in Fig. 1.) The catch, C, should be placed on the back of the pendulum shaft at such a place, that the narrow part of the catch just touches the upright tip of the tumbler, D, and the wide part catches the outer lips of the contact slide, B, when in full swing. (See Fig. 4.)

The regulating levers, E, should be turned until the tumbler falls on both sides, so as to touch both the inner lips of the contact slide, B, and the turned-up points of the regulating levers. (See Fig. 3.)

If a ratchet arm and wheel are used to drive the clock, the arm should be placed at the top of the pendulum, where the length of swing is just longer than the pitch of the ratchet-teeth.

In Fig. 1 will be seen the manner in which the whole is connected up to the battery, by the thick dot and dash line; these connections can be made in any way that is convenient, as long as the system remains as shown.

Action of Pendulum. — In considering the action of the pendulum it will be as well to imagine it in full swing—that is, beating at the length you have designed it. You will now find that as it passes the centre the narrow part of the catch, C, touches the upright arm of the tumbler, D, and lifts it over to the other side, then the pendulum proceeding on its way, the wide part of the catch, C, comes in contact with the outer lip of the slide, B, and pushes it a little on one side, so that the tumbler falling misses the slide and rests upon the point of the regulating lever, at the same time placing the other arm of the tumbler in an upright position, and in the centre. As the pendulum returns we will imagine that it has lost some of its impulse; this time, as before in passing the centre line, the narrow part of the catch, C, touches the other arm (now upright) of the tumbler and pushes it over. The pendulum then proceeding fails now to touch the slide, B, having lost impulse, so that instead of the tumbler falling upon the point of the regulating lever, E, it falls on the inner lip of the contact slide, B. This completes the circuit, and when the pendulum returns it finds that contact has been made, and so receives fresh impulse from the magnet; but again as the pendulum passes the centre the catch again touches the upright arm of the tumbler, which breaks the contact at the moment the pendulum is in the centre and the armature over the magnet, so allowing it to go on its way. This action is repeated over and over again. Every time the pendulum fails to complete its given length of stroke, on either side, contact is made between the tumbler and the slide, and it receives more power. Every time its impulse is too great it pushes the slide out of the way, causing the tumbler to fall upon the points of the regulating levers, and thus keeps the current broken. It will be seen from this that the length of the stroke can be very delicately adjusted by means of the regulating levers; the time of each stroke, of course, is regulated in the usual way by altering the pendulum bob.

Final Remarks. — In constructing this pendulum it will be found best to keep all the mechanism, such as the tumbler, slide, etc., as small as possible—it prevents clatter. Those who have good tools at their command can make many improvements on this system, such as substituting a delicate balance-wheel with two short radial teeth or lips, instead of the V tumbler, etc. But whatever alterations are made, great care must be taken that all the contacts fall good and true; in this way the clock can be made very silent. But those who are differently situated, and are obliged to make the pendulum from scraps, etc., must not be disappointed if it makes about as much noise as one of the old-fashioned wooden American clocks.

The battery to drive the pendulum depends greatly upon circumstances—a long heavy one can be driven by any dry battery. A Fuller is at present driving rather a greedy one, with a short pendulum, and is doing its work well. One of the great advantages of this system is that the constancy of the battery in no way interferes with the regular working of the clock, as the pendulum only asks for the current when it is wanted. It is now hoped that all, even the humblest, can set themselves up with an electric clock that can be relied upon.

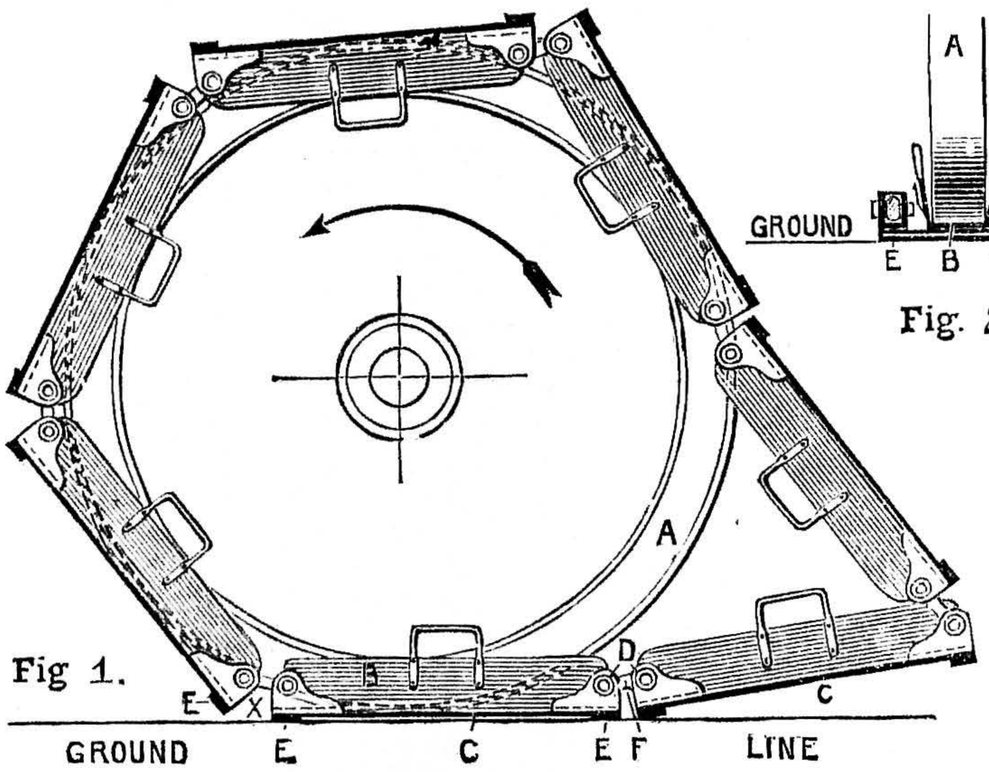


Fig 1.

Fig. 2.

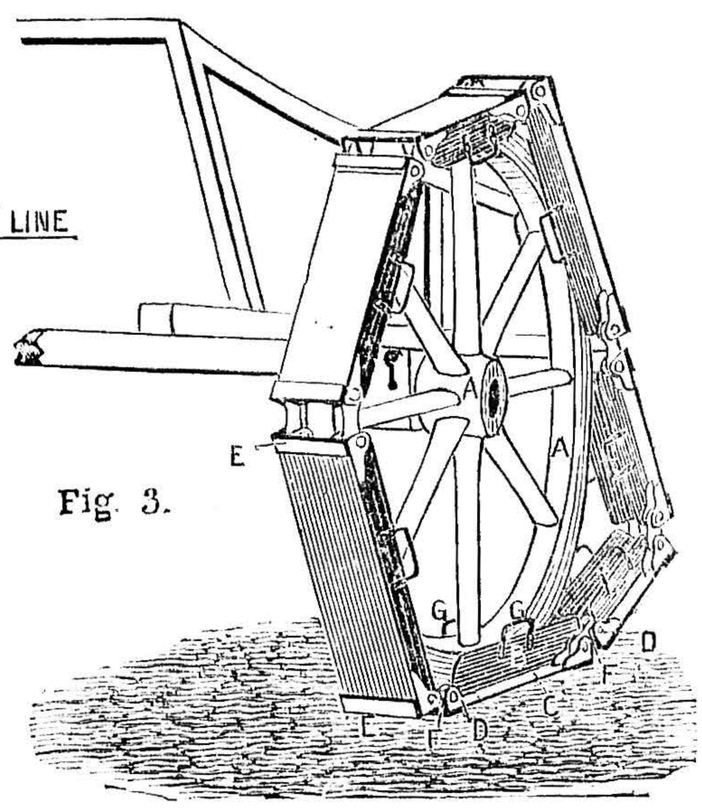


Fig. 3.

Portable Roadway for Carts. Fig. 1.—Side Elevation of Wheel and Slippers. Fig. 2.—End Elevation of Slipper and Wheel at X. Fig. 3.—Perspective View of Portable Roadway on Cart Wheel.

A PORTABLE ROADWAY FOR CARTS.

BY P. B. H.

MOST readers of WORK know how difficult it is for horses to draw heavily-loaded carts over soft and yielding roads, but more especially over sand; the cause being that the surface of the wheel in contact with the roadway is so small, being actually at first only a line, which gradually grows, however, into an ever-increasing surface as the wheel sinks deeper into the yielding sand. Now, if a broad-surfaced, unyielding roadway could be laid for the carts to pass over to do away with the difficulty; and if the traffic was great, and went backwards and forwards between two *fixed* points, this would be in most cases done; but when the destination of the cart varies, such a plan would be too costly. In this case it would be the best for the wheels to carry their own track or roadway themselves, if it could be arranged.

Having lately seen such a contrivance at work on the extensive and yielding sands of a northern seaside resort, I make no apology for sending sketches and account of the same, as it will be interesting as a novelty to most readers, and it may prove useful to some in the future; as, besides the novelty, it is in daily practical use, working on the sands, and only needing one horse to draw the cart when heavily loaded, where, without this arrangement, two or three horses would be required.

Fig. 1 is a side elevation of the wheel and seven slippers. Fig. 2 is an end elevation of one slipper and wheel, showing trough in which wheel runs. Fig. 3 is a perspective view of one wheel and side of cart.

From these three figures the arrangement should be perfectly clear; and as each of the seven slippers is an exact counterpart of the other, a description of one will do for all. The wheel A runs in segmental troughs, B—not quite continuous, to allow for bending round wheel—which are made of wrought-iron, $\frac{3}{8}$ in. thick, slightly wider than the wheel at the bottom of trough; but the sides form an angle (as shown in Fig. 2). These troughs, B, are riveted to flat wrought-iron plates, C, $\frac{1}{4}$ in. thick, rather longer than the trough, and considerably wider to allow for the small fixings, D, riveted at each corner. The plates, C, are strengthened also by having transverse strips of wrought-iron, E, riveted at each end, underneath plates, C. The rivet-holes are countersunk, and no rivets project out from the plates. The fixings, D, are all drilled for $\frac{7}{8}$ in. pin to hold the small links, F, the diameter of which is about 1 in., and they connect each slipper to its neighbour. Each slipper is supplied with a pair of wrought-iron handles, G, to facilitate its removal, and also to act as guides to a certain degree.

Where this arrangement is used the wheels of the cart should be vertical, and not inclined, as in most general use. As I mentioned before, one horse can draw a loaded cart without any extraordinary exertion over the yielding surface of sand; and on examination, the slipper, with the exception of each end, which sinks in about $\frac{3}{4}$ in., makes very little impression on the soft road-bed. I may here state that this is not a very noiseless contrivance, but it is not very irritating; and the noise can be borne on account of the tractive power gained by its use. Since writing this article I have been informed that such a contrivance is used on the wheels of some of our numerous lifeboat carriages.

CARPENTRY FOR BOYS.

BY McDONALD.

PLAIN FRAMING (*continued*).—A RABBIT-HUTCH: MATERIAL AND CONSTRUCTION — BRACING — ROOF—DOOR.

LIKE our workshop, the subject of this paper is rough, and not difficult to execute: it is a rabbit-hutch—an article, by-the-bye, which is frequently nothing better than an old box turned on its side, with a piece of wire netting placed in the front to serve as door and window.

Lots of youths, however, would prefer something tidier and more comfortable than a box—such as we have in the sketches. At the same time, the expense is not very great, and the making of it affords good exercise at this stage. It is intended to accommodate a pair of rabbits, but, of course, the design may be altered to suit other requirements.

The tools needed for such a thing as this are, chiefly, a rule, a square, a cross-cut saw, a rip-saw, a chisel or two, and a hammer. The sketches should pretty well explain the arrangements.

Referring to the plan (Fig. 2), it will be seen that there is a small trap in the floor at *m*, which can be lifted out for cleaning purposes, and all refuse swept down into the box kept underneath, at *o* (Figs. 1 and 3). The trap is also perforated, and the floor should have a fall towards it, so as to drain off water or other liquid into the box. The sleeping places, or caves, are placed at the back, as secluded as possible from the door. To facilitate their sweeping out conveniently from the door, their inner sides are hinged, and fastened to the floor when in position with small buttons or slip-bolts. These are shown in Fig. 5. A tiny rack, made of bits of wire, is set at E (Fig. 2), to hold clover or other herbage. This also is easily reached from the door. Abundance of ventilation is procured by the door and the perforations in the gables (shown at Figs. 3 and 4). The latter may be made larger or smaller, as may be desired.

Material and Construction.—The material used in this little structure may be white or coarse yellow pine, all from the saw. According to the drawings, the sizes and quantities are, roughly: Four corner-posts, 3 ft. 8 in. × 3 in. × 3 in.; two door-posts and one back-post, 3 ft. 8 in. × 2 in. × 2 in.; four side sills, top and bottom, 5 ft. 4 in. × 2 in. × 2 in.; four end sills and one joist, 3 ft. 2 in. × 2 in. × 2 in.; four diagonal braces for ends and two for back (as indicated by dotted lines on Fig. 5), 4 ft. 3 in. × 2 in. × 2 in.; six rafters, 2 ft. 3 in. × 2 in. × 2 in.; three collars, 1 ft. 10 in. × 2 in. × 1½ in.; and about eighteen square yards of ⅝ in. rough sarking, for floor, roof, side and end covering, and inside divisions.

If the hutch is to be kept outside or exposed to the weather, the roof covering must be overlapped; and in doing so, it makes a firmer job to reduce the boards a bit towards the edges by the jack-plane, as at Fig. 7. Either that, or it may be put on plain, and covered with felt-cloth.

The side and end boarding is simply nailed up and overlapped, as at Fig. 6. The floor and inside divisions are boarded close. The longitudinal division is fixed to the end boarding and to small fillets nailed up the corners. The central one is a board set up on end, and fixed to the back-posts and to the other, with fillets in the corners also. The floor can be made to incline towards the trap by putting a rind of sarking below each end on the sill-plate, and keeping hard down on the joist. The trap is formed by cutting a piece out of a flooring-board, bevelled all round. This, together with the rest on the joist, is sufficient to keep it flush with floor. The bottom sills are notched into the posts, as shown at Fig. 11. They are kept up a few inches from the ground, and the boarding cut flush with their lower sides, to give ventilation underneath, and to admit of the refuse-box being used. The top runners are halved at the corners, and nailed down on the posts. The door-posts and back-post may be mortised and tenoned into the sills, or they may be put in with square joints, cheek-nailed, as directed for our workshop.

Bracing.—An addition to the framing employed in our workshop is here introduced — namely, the diagonal bracing, shown in Figs. 4 and 5. The object of this, as may be understood, is principally to stiffen the angles and keep them right, but, at the same time, it gives increased scope for nailing the boarding, and so strengthens the structure both ways. Not that this erection, any more than the former one, requires very great strength in the construction, but in all framings of any magnitude or substantiality bracing ought to be used; and this the learner must understand.

In our example, that in the back and ends, in which the braces act in opposite directions, is double bracing. A specimen of single bracing is shown in the door, where the two act in the same direction. The former is by far the best. The mode of fixing here is — square, well-fitted joints, cheek-nailed at the corners, and halved at the intersections. In good work, however, it must be borne in mind the corners are fixed by oblique mortises and tenons.

Roof.—The roof adopted here is also different from our last. It is that known as a pitched roof, whereas the other was a lean-to. Here, instead of single rafters crossing the entire span, they are in pairs or couples, notched together at the crown, and secured lower down by a collar-piece. This is also notched on the couples about one-fourth of its thickness, but no notching is taken out of the rafters, as that would weaken them. The couples are all made first on the bench—or, when large, on any convenient platform—then set up, and the sarking nailed on. A bit of rounded rind is nailed on the ridge by way of finish, and to cover the joint of the boards.

Door.—For light and ventilation, the door of a rabbit-hutch is frequently made of wire netting fixed to a light frame, but in this case we have a sparred one. Its con-

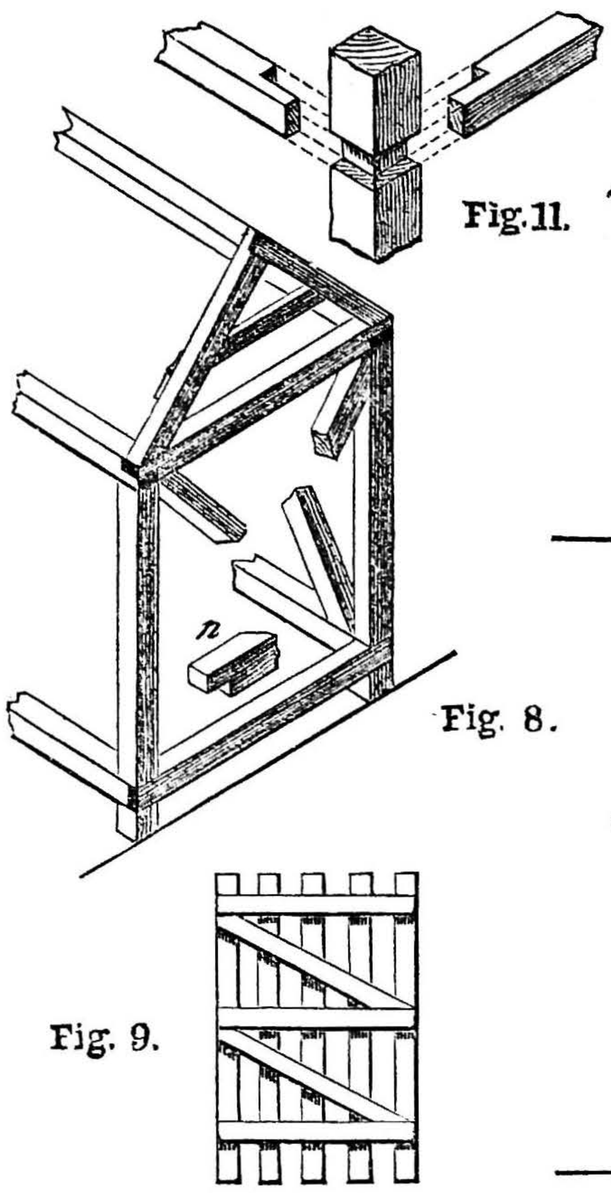
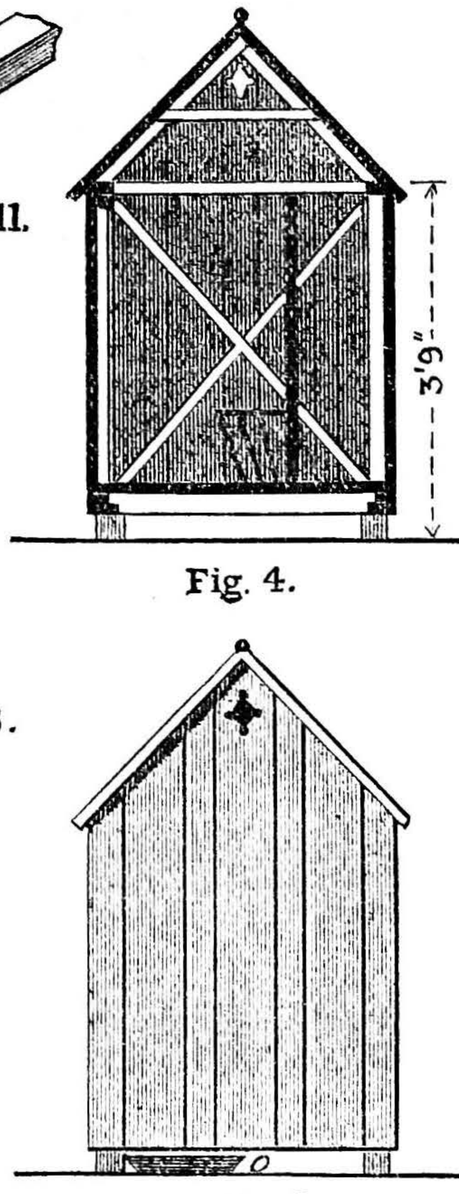


Fig. 8.

Fig. 11.

Fig. 9.



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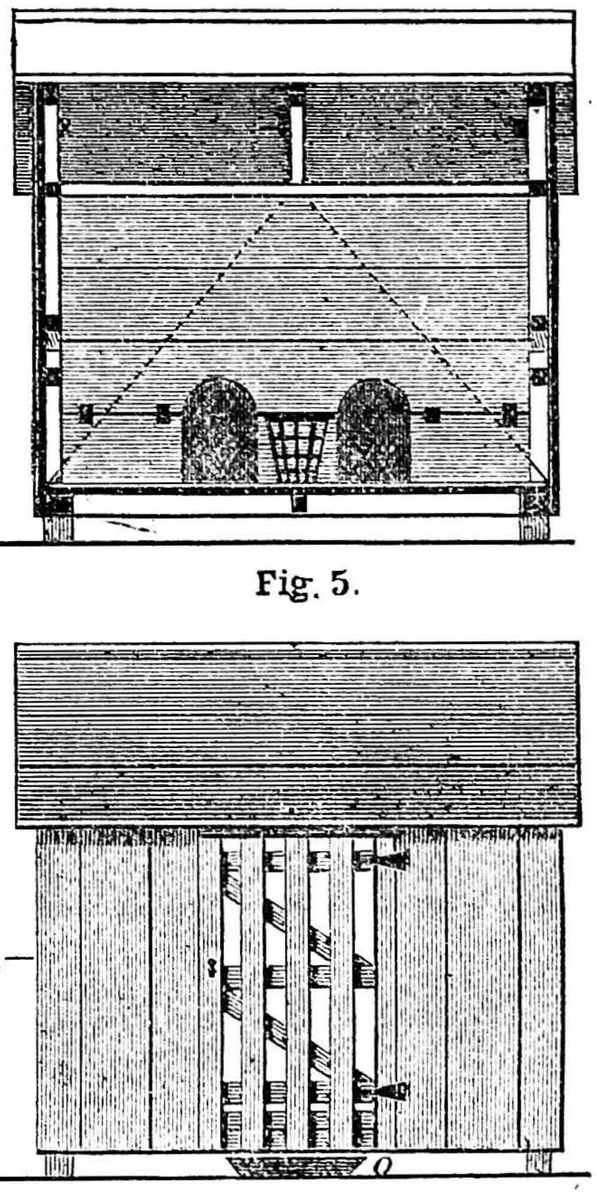

Fig. 5.

Fig. 3.

Fig. 1.

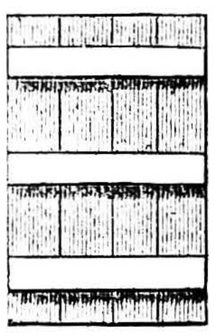

Fig. 10.

Fig. 6.

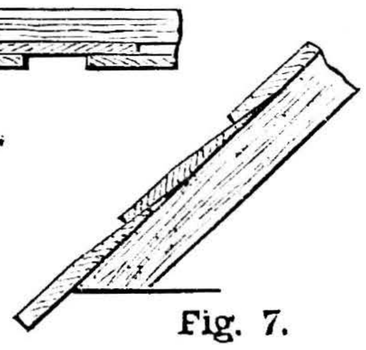

Fig. 7.

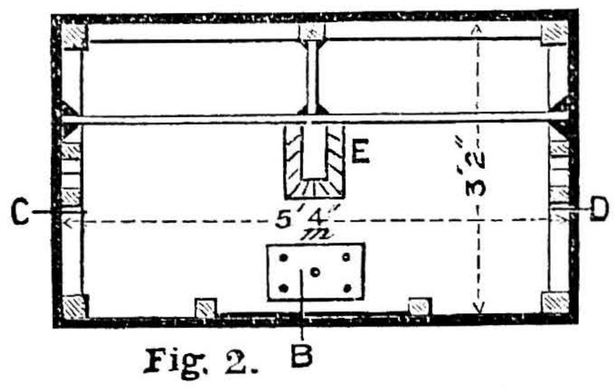

Fig. 2.

Carpentry for Boys. Fig. 1.—Front Elevation. Fig. 2.—Plan at A. Fig. 3.—End Elevation. Fig. 4.—Section at B. Fig. 5.—Section at C D. Fig. 6.—Boarding on Sides and Ends. Fig. 7.—Roof Boarding. Fig. 8.—View of Part Framing. Fig. 9.—Back of Door. Fig. 10.—Ordinary Ledged Door. Fig. 11.—Joint of Bottom Sill and Corner-post.

struction is quite simple. The spars are ripped out of sarking-boards, and nailed to the bars and braces on the back. These are also of sarking. Doors of this class are called ledged doors. Generally, the boards are grooved and tongued on the edges, and driven up close, as at Fig. 10. When braces are put in, such doors are said to be ledged and braced. In all ledged doors the nails should go right through the bars, and have the points turned in or clenched on the back. The door of our hutch is hung with a pair of small T-hinges.

OXYGEN IN GLASS-MAKING.

THERE has been little or no improvement in glass-making during the last twenty years. The employment of furnaces with gas generators, saving 30 to 35 per cent. of fuel, was the last improvement in this interesting branch of trade. Recent experiments made in England give hope of something better.

By directing a current of pure oxygen into the fused glass, the combination of the substances in fusion is accelerated, and, in consequence, liquefaction of the glass. The speed of the fusion makes it possible for the melting-pots to remain longer in use without damage. The economy resulting is reckoned at 30 per cent. Several English glass-works have already adopted this new mode of manufacture.

According to the *Revue de Chimie Industrielle*, the following conditions must be observed for a rational application of oxygen to the manufacture of glass :—

Gas contained in steel tubes at a pressure of 120 atmospheres is expanded by means of a regulator, which allows of its regular expansion at a uniform pressure of 2½ atmospheres. It is conveyed into the melting-pot containing glass by a platinum tube with a spiral end on the lower extremity, and perforated with four holes underneath.

The oxygen should, firstly, pass slowly into the glass, then quickly, and, finally, with great speed ; the evolution of gas should be regulated according to the state of the fusion.

According to the remarks communicated, the manufacture of 225 lb. of window-glass requires about 1,050 pints of oxygen.

Glass melted with oxygen is, according to workmen, easier to work ; but the difference is principally apparent in casting plate-glass. The glass runs with much greater speed, and blisters are much less numerous. —*Cosmos.*

HOW TO HANG A GRINDSTONE.—As some workmen prefer to grind their tools at home, it may be useful to give a hint or two how to hang the grindstone on its axle to keep it from wobbling from side to side. The hole in the stone should be at least ⅜ in. or ½ in. larger than the axle-tree, and both axle and hole square. Then make double wedges for each of the four sides of the square, all alike, and thin enough so that one wedge from each side will reach clear through the hole. Drive the wedges from each side. If the hole through the stone is true, the wedges will tighten the stone true. If the hole is not at right angles to the plane of the stone, it should be made so; but as this may be difficult to a novice, the difficulty can be surmounted by altering in the taper the wedge which corresponds with the irregularity in the hole. These particulars must be carefully carried out, and a properly hung grindstone will be the result.

SKATES: HOW TO GRIND AND REPAIR THEM.

BY N. MACLEAN.

INTRODUCTION — POPULAR SKATES — THE ACMÉ SKATE—THE WHITTLESEA RUNNER SKATE—THE NO-TOE SKATE—THE CANADIAN SKATE —HARDENING-UP LONG-BLADED SKATES—REPAIRS OF SKATES—THE CLOG—GRINDING—BRAZING — RIVETING — HEEL-SCREWS — TOE-POINTS—LEATHER STRAPPING : ITS TREATMENT—CONCLUSION.

THE approaching advent of King Frost, who, it is hoped by all lovers of skating, will bridge rivers, canals, ponds, and marsh waters with his usual translucent covering, forming a roadway on which the tired artisan, the overworked brain-worker, and the *ennuyéd* dweller in cities can win back mental and physical strength by the aid of this exhilarating exercise — with this end in view, skating men, women, and boys will begin to look out their skates, to get them into proper order for the coming season, and to ascertain what repairs, if any, are required.

Before proceeding further, it may be as well to glance at the illustrations, in order

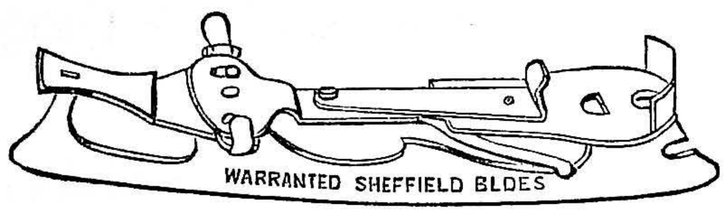

Fig. 1.

Fig. 2.

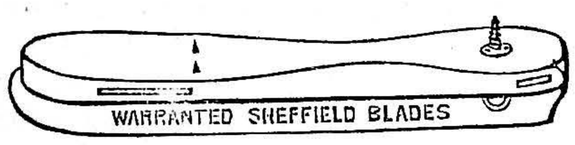

Fig. 3.

Fig. 1.—American Acmé Skate. Fig. 2.—Whittlesea Runner. Fig. 3.—No-toe Skate.

to become acquainted with some of the leading forms of skates—for the patterns are almost endless—and to briefly explain their principal characteristics.

Fig. 1 is known by the name of the "American Acmé" skate (a patent), the chief factor in which is that it is entirely of metal. Fig. 2 represents the "Whittlesea Runner," the peculiarity of which is that it is higher at the heel than at the toe, and is largely used by professional skaters for racing purposes on the Lincolnshire marshes and other long stretches of ice. It will readily be seen, even by a non-skater, that this pattern of skate is useful only for straightforward skating. Fig. 3 shows the "No-toe" skate, the face of the blade describing a gentle convex curve from the flat, commencing 2 in. from the toe.

There are, of course, many other makes of skates, in almost endless variety, made according to taste for individual skaters, and also for the various markets of the world ; and passing allusion may be made to the Canadian skate, which is 20 in. in length, and in which the chief difficulty is the hardening without warping.

The hardening of long-bladed skates is only accomplished by makers of experience in the usual way—that is to say, the blade is heated to a cherry redness, and quenched in water, giving the blade a peculiar sweep through the water, which ought to be seen to be properly understood.

But as skate-making is only practised at certain seasons of the year—being, in fact, a joint trade with joiners' tool-making —a visit to a Sheffield file-hardening workshop would probably be the best course for a country tradesman to adopt; and I should be pleased to give the name (through the editor) of a good Sheffield workman, who, for a pecuniary consideration, would instruct him in the art of hardening long articles of steel.

The repairs of skates most commonly required are re-grinding, riveting of broken blades, renewal of heel-screws and toe-points, and the leather strapping, the clog or wooden portion of the skate usually outlasting the blade ; and, as a matter of fact, it would be almost useless for a non-expert to attempt the manufacture of the clogs, looking at the affair from an economic point of view.

We will now attempt to deal with the re-grinding. The stone used for this purpose is usually about 30 in. in diameter, and 8 in. or 9 in. wide, and is run at a most moderate speed. It is "raced" or trued-up on the face perfectly flat. The skate is now held on the stone crossways and *upright*, and ground till the edges are perfectly sharp, and an almost imperceptible curve in blade till within 2 in. or 3 in. of the toe and heel.

The sharpness of the edges is most important, as every skater ought to know, as every stroke is taken either from the inside or outside of skate-blade ; and if the edge of the blade will not take a firm grip of the ice when making a stroke, it is a sure sign that re-grinding is required.

I may here mention an apparent anomaly in the fact that all common skates are made of steel, all the more expensive manufactures being of iron, steel-faced to the extent of ¼ in. in depth. In the former case the steel blades are left unhardened, and consequently lose their sharpness of edge very quickly; in the latter, the steel portion is hardened, the iron back developing considerable elasticity, and also compensating to a large extent for sudden changes of temperature.

The re-grinding being done, the "glazing" or polishing remains. The "glazing" is done on a buff-wheel, 12 in. × 1 in., fed with crocus, a high degree of polish being obtained, care being taken to preserve the sharp edges of the blade. The common qualities of skates are left unpolished.

The repair of broken blades is usually accomplished in two ways—*i.e.*, by brazing and by riveting. If brazing tools be handy, this is the quickest method of joining ; but riveting will make the best and most lasting job. In riveting a break, care must be taken to drill your holes *above* the hardened steel portion of the blade of the skate, or you will spoil your drills.

Here I take it that only best and highly prized skates will become the subjects of your tender consideration, as common goods are—well, rubbish!

For riveting, provide yourself with some soft rolled brass of $\frac{1}{32}$ in. in thickness, and some steel wire the size of the drill. Now cut out two pieces of brass, about 2 in. long and about ½ in. wide, or as much wider as the width and position of the breakage on the skate-blade will permit. Now drill a hole right through the skate-blade and the two brass plates, and pin them loosely together. Now fit together the two points of breakage, and secure them in the vice, and drill the second hole opposite to the first, on

the other side of the breakage, in a similar manner to the first. Then see to the perfect alignment of the skate-blade: in other words, take it to a good light, shut one eye, and look *down* the blade; then reverse the position, and look *across* it. There only remains now to tighten up your first two rivets, looking again down and across the blade to see if it has shifted. Then drill the remaining holes—sufficient to make a firm job. Rivet them neatly, clearing off the surplusage of rivet-heads with a file. In every case, re-riveting ought to be followed by re-grinding.

The renewal of heel-screws—unless you have laid in a stock, anticipating a good demand for this variety of repair—must be left in a great measure to individual ingenuity.

The first thing to be done is to extract the broken screw. Now take an ordinary wood screw, and, holding it in the hand-vice, measure off the length over all; cut it off, and with a saw-file get it into shape, and screw it home. The "toe-points" of the clog seldom break, but more frequently get bent, and, in trying to bring them once more to the upright position, invariably break off short. The easiest way to renew these is to drill, with a fine drill, a hole through the clog, file up to a point, and harden (the point only) 1 in. or so of the aforesaid steel wire, and drive in from the under side of the clog.

The leather strapping now claims our consideration. How often do we find, on looking up skating tackle, that the leathers are all shrivelled, hard, and in many instances cracked—ready to break upon the smallest pull being given? This should not be. What would be said of a groom who never overhauled his saddle-room until his master's hunting appointments were required? There are many ways of keeping leather strapping soft and pliable, but beware of saddle-paste! Saddle-paste is good for saddle-seats, but should never be used on straps. Of two good things—dubbin and soft-soap—we prefer the latter; although dubbin preserves the brightness of the buckles, which, if the sponge with which the soft-soap is applied be not *too wet*, will do equally well. The plan we adopt for skate leathers is to wring out a moderate-sized sponge—one which can be doubled up in the hand—and place in the middle a small quantity of soft-soap. Now hang on a convenient hook the strap buckle, holding the other extremity in the left hand, and with the right work in the soft-soap. If the straps are hard, this should be done every day for a week, hanging them up in a dry place. New straps treated in this manner can be easily manipulated by cold fingers.

We have purposely refrained from going into particulars of repairs appertaining to the "Acmé" skate, thinking that these repairs may be more effectually done by the makers. However, the foregoing remarks apply in an equal measure to the "Acmé" as well as to other styles of manufacture, judgment being exercised according to the nature of the repairs required.

A hard winter, joyously looked forward to by skaters, brings in its train innumerable hardships for outdoor workers. May I, then, without unduly lengthening this paper, be allowed to call attention to one means of earning a nice little wage by the temporarily unemployed?

The arrangement I have seen carried out in this district is for one man to find capital for a co-operative working company of men. The capitalist goes to the owner of a pond, mill-dam, section of canal or river, and bargains for the use of the ice for so much money paid down.

The next thing to be done is to get together as many men as the acreage of the sheet of ice will employ. Some of these men are supplied with brushes for sweeping the ice; others with gimlets and leather-punches for punching holes in the straps. These men perambulate the ice with a chair, inviting ladies and other individuals (temporarily helpless from frozen fingers) to sit down and have their skates put on for the "small fee of 1d."

The financier, who should be a good and rapid skater, will look after the interests of the "firm," issuing little coloured tickets—one colour for an hour or two's spin, and the other colour for the day-tickets. The proceeds of the day are divided at the close.

Of course, there are many other methods by which an income may be earned in connection with the pastime of skating. Torches might be provided and sold at a profit at night. A tent, provided with a rough counter and a few temporary seats, in which a rest and a cup of good tea or coffee might be obtained by the skaters, and discussed round an open coke fire, would be, I think, a certain source of income.

PRACTICAL PAPERS ON PLUMBING.

BY R. A.

PIPE BENDING (*concluded*)—TRAPS AND THEIR USES—SOME FORMS OF TRAPS ILLUSTRATED AND DESCRIBED.

AN appliance for bending pipes from 1 in. to 2 in. diameter, which many of my readers may find useful, is Billings' patent pipe bending device (Fig. 29); it is, like many of our tool novelties, of American origin, and consists of a strong spiral coil of wire; it is made of crucible steel, finely tempered, and the bending operation is performed as follows: the tool is inserted in the pipe to be bent, thus practically performing the same office as the filling with sand or water, the spiral core keeping the pipe from flattening or "kinking" during the operation of bending; the bender is withdrawn by giving a slight turn to the left, which slightly reduces its diameter, when it can be drawn out. The loop at the end is for this purpose; a little oil should be used with it. These benders are made in various sizes, and are useful appliances for jobbing men. It is obvious, however, that pipes bent in this way will be rendered thinner at the back by reason of the stretching at that part, as explained in the last paper.

Bending with Balls and Followers.—This is a method that was followed a deal more years ago than it is at the present day. It is not considered a good way by first-class plumbers, for reasons that will presently appear. It is done in this way: the piece of pipe to be bent is pulled round a little till it dents in the throat; two or more hard wood balls, slightly smaller in diameter than the bore of the pipe, are then inserted in the pipe, and driven past the bend by means of some short round blocks of wood, called followers (Figs. 30 and 31 show a ball and follower); this takes out the dent caused by the bending (Fig. 32 will assist the reader in understanding the process); the pipe is then bent again, and the process repeated until the required angle is obtained. The objections to this method of bending are that the pipe is weakened at the heel of the bend, and also that it is liable to damage by the edges of the followers catching in the angle of the bend. I myself am of opinion that the latter objection is rather fanciful, as, if the followers are well rounded off, as shown at Fig. 31, and both them and the balls well greased, there is very little fear of that happening. Of course, if this method is adopted, a set of balls and followers will be wanted for each size pipe that it is required to bend: most useful for lead pipe, 1½ in. to 3 in. diameter; above or below these not recommended.

Traps.—We now come to the study of one of the principal articles in use in plumbing and sanitary work. A trap briefly described is, broadly speaking, a barrier of water placed in suitable places to prevent the escape of foul smells into the house or apartment. Traps are made of lead, earthenware, and cast iron; the situations in which they are or should be placed are as follows: at the outlet of w.c.'s, at the connection of the soil-pipe with house drain or with the sewer, under urinal basins and slop hoppers, beneath sinks, lavatory basins, and bath wastes, and so on. I suppose it would take many whole numbers of WORK to illustrate and describe all the various traps in use at the present day; this, however, is not needful. Many of them closely resemble each other, and many are traps only in name; I shall, therefore, confine myself to some of the most useful and well-tried traps, also mentioning some that should not be used. First of all, let us ask the question, What are the most essential requirements of a trap? I reply as follows: a trap should be self-cleansing; it should be of such a shape that the water barrier which it contains (and which we technically term its "seal") should be changed as far as possible each time a discharge is sent through it. It should have such a seal as will be least liable to be lost through the various causes which induce loss of seal; it should be simple in construction, and accessible for cleaning. We will, for our first study of a trap, take what is known as the **D**, or ᗡ, as some people prefer to express it in print, which, after all, is correct, as it shows it in its natural position when fixed. This is an unsanitary Goliath that hygienists and sanitary reformers have been slinging at for the last twenty-five years, and he is not dead yet, though I think almost at his last gasp, metaphorically speaking. I will add my little pebble to the rest, and if I cannot say anything new, I will at least say what is true concerning it. It is a trap that, *in general use*, is not, and never can be, self-cleansing, as I will endeavour to show. In the first place, it offers a very large surface for foul matters to adhere to, the total superficial area of a full-sized **D** trap being about 3 ft., more or less. Fig. 33 will illustrate this; it shows patterns of the various parts of a **D** trap: A is the band; B the top; D dip pipe; C, cheeks (of which, of course, there are two). Fig. 34 shows the trap as a whole, showing their positions.

In the next place, from its construction it offers lodging-places for filth where, as easily can be seen, no water flush can ever reach with any cleansing action: viz., in the corners, at the back of the dip pipe; the inside of the top and the outside of the dip pipe are also parts that cannot be scoured by a flush of water sent through the trap. These are not random assertions, but facts which have been proved to demonstration, both as experiments and in actual practice. I have seen these traps completely choked with a gradual accumulation of filth. Advocates of the **D** trap, on account of some qualities it possesses, of which I will speak

further on, have endeavoured to overcome these inherent defects, and have succeeded in doing so to a limited degree by narrowing the band, by keeping the dip pipe close back to the band, and making it the full width of the trap; a **D** trap thus made can certainly claim to be "improved," but not "perfected," for though the fouling surface is thereby lessened, the parts unscoured by water remain the same.

Another defect in this trap is that it can get into a very bad state without showing any signs on the exterior, even if that could be seen: which is seldom. For instance, should the dip pipe be eaten into holes, as is sometimes the case, the seal of the trap is rendered useless, as sewer gas would have free access to the house through the holes in the dip pipe, as shown by the arrows in Fig. 35. I think these are sufficient reasons for the condemnation of the **D** trap as unsanitary and dangerous; in fact, one eminent sanitary authority has said that the use of them ought to be forbidden by legislative enactment. The one redeeming feature about them is that they are very tenacious of their water seal, being more proof against syphonage, waving about, and momentum than probably any other trap known, especially in certain situations.

Nearest approaching the **D** trap in its non-liability to syphon, etc., is the anti-**D** trap, invented by Mr. S. Stevens Hellyer, of the well-known firm of Dent & Hellyer, whose services to the cause of sanitary reform in general, and to plumbers in particular, are beyond praise. Himself a thoroughly practical man, he has, by voice, pen, and practice, for many years advocated all that is good and useful in sanitary matters, and not a few inventions stand to his credit. To return from this digression, however, to the trap in question, it is illustrated at Fig. 36, and its principal features are that it is perfectly self-cleansing, that if ventilated it is perfectly proof against syphonage, and that the water it contains is comparatively very small in quantity, yet gives a seal of about 3 in. It is also termed the **V** dip trap, from the manner in which the seal is formed. Its cleansing properties are due to its shape, which, as will be noticed on reference to the section (Fig. 36 A), is somewhat peculiar, being larger at the top than anywhere else, tapering downwards till its smallest section is at the bend, and then enlarging slightly and merging into a square outlet: considered the best shape, as allowing matters to flow away more freely. These traps are made of cast pure pig lead, and are of good thickness and suitable for many classes of work, including closets, sinks, baths, etc.

Figs. 37 and 38 show two classes of trap in very common use. Fig. 37 is known as the half **S**, and by some termed a **P** trap, though incorrectly: it is, however, more generally spoken of as a **P** trap in the trade, especially by closet manufacturers—I suppose for shortness.

Fig. 38 is the full **S** trap; they are made in scores, of slightly varying shapes and forms, by various makers, some of which are the subject of patents. They possess the merit of being self-cleansing, but are easily syphoned out. The **Q** trap (Fig. 39) is a modification of the **S** trap; it is also sometimes termed the three-quarter **S**. These are the principal traps in use for closet-work.

There are the same things made in small-sized pipes for sinks and other similar purposes. Figs. 40 to 43 show some of them as made by Dubois' patent; they are solid drawn without seam or solder, and are a great boon to plumbers. Claughton's patent traps are of similar kinds and shapes, but are cast in two halves and burned together. It will occur to my readers that all these patent cast and drawn traps must have made a vast difference in plumbing work, which is actually the case; very few plumbers now make their own traps, except for special jobs where some variations from the ordinary shapes are needed. The **D** trap is still made to a limited extent, but even these are to be had in cast lead (Pullens' Improved). I do not, therefore, propose to describe the making of traps, unless specially asked and class of trap stated, when I will briefly do so in "Shop," believing that I can occupy my space with more valuable information on other subjects.

Another trap in frequent use that is a delusion as regards its trapping qualities is the bell trap, seen in nine out of ten of our cottage sinks, and very frequently in houses of a better class. By referring to Fig. 44, which shows it in section, readers will understand the objections to it. (1) It is not self-cleansing; it accumulates filth in the recess, A, in which the trapping water stands. (2) Its insufficiency of seal, which is seldom more than $\frac{1}{4}$ in. or $\frac{1}{2}$ in.; this is easily lost by evaporation or other causes. (3) That as it is usually made for sink-work, it is soon choked up, and to avoid trouble it is oftener left off than on, unless the grating is fixed. A round pipe trap or small anti-**D**, fixed about 10 in. from the sink, is far better; this gives the water a drop from the outlet of sink, which assists in forcing sediment, etc., out of the trap. Other kinds of traps will be dealt with in the next paper.

Fig 29.

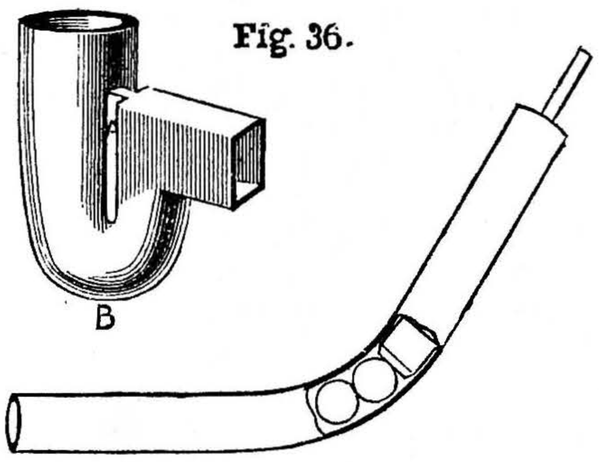

Fig. 36.

Fig. 32.

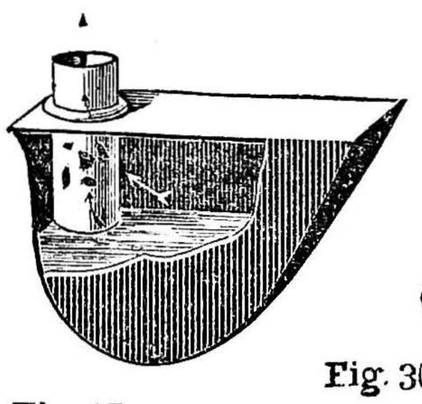

Fig. 35.

Fig. 33.

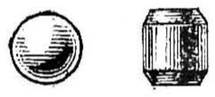

Fig. 30.

Fig. 31.

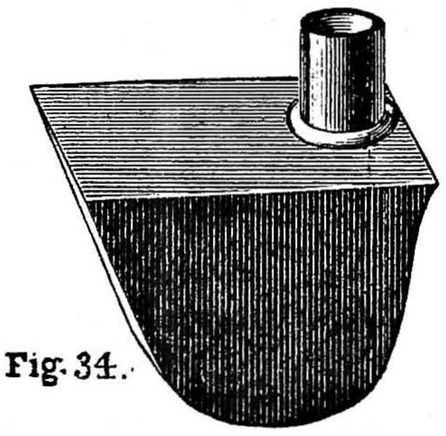

Fig. 34.

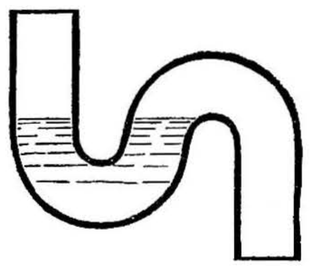

Fig. 38.

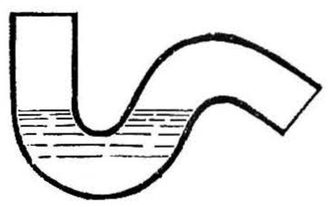

Fig. 39.

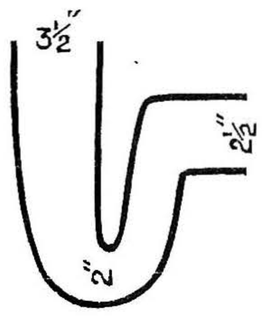

Fig. 36A.

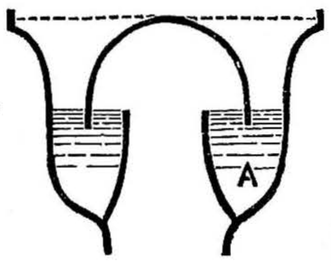

Fig. 44.

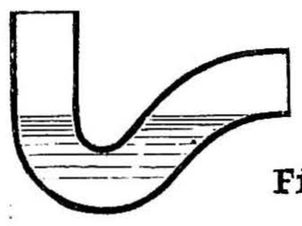

Fig. 37.

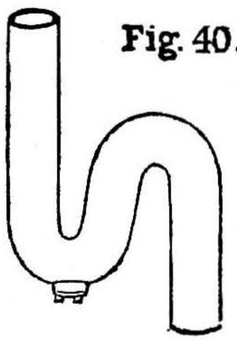

Fig. 40.

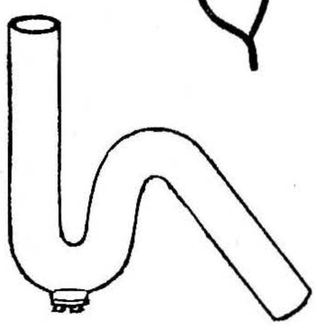

Fig 41.

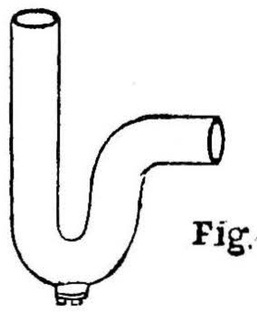

Fig. 42.

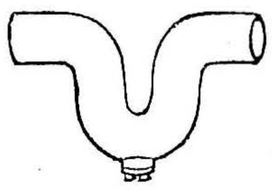

Fig. 43.

Plumbing. Fig. 29.—Tapering Coil of Wire. Fig. 30.—Ball. Fig. 31.—Follower. Fig. 32.—Diagram showing Bending with Balls and Followers. Fig. 33.—Patterns of Various Parts of a D Trap. Fig. 34.—D Trap. Fig. 35.—Ditto, showing defects in Dip Pipe. Fig. 36.—Anti-D Trap. Fig. 36 A.—Ditto, Section. Fig. 37.—Half S Trap. Fig. 38.—Full S Trap. Fig. 39.—Three-quarter S Trap. Figs. 40, 41, 42, and 43.—Dubois' Drawn Lead Traps. Fig. 44.—Bell Trap.

GREAT ELECTRIC LIGHT.

THE great light which is to illuminate the World's Fair grounds is perched on the high tower of the Transportation Building, and is the largest and strongest in the world. It has been made by Schuckert & Co., of Nuremberg. The light is what is known as a 4-ft. reflector—that is, the great magnifying-glass through which the rays are thrown to such a distance is 4 ft. in diameter. The direct power of the light is 150,000 candles, without any glass whatever. With the big glass, however, the power is magnified to 160,000,000 candle-power. The carbons used in the radiator are 12 in. long, and $1\frac{1}{4}$ in. in diameter. They are fastened inside the lamp merely with two upright pieces of steel. The lamp itself is operated on a sort of carriage, something after the manner of a Maxim gun. It can be turned in any direction, and can be tilted so that the rays will ascend vertically. When the full power of the light is turned on, the city of Chicago can be viewed.

NOTICE TO READERS.

NEXT week's WORK (No. 198) will contain, among other illustrated papers, the following:—

WATCH AND CLOCK CLEANING AND REPAIRING.
HOW TO MAKE A HARMONICON.
EXPERIMENTS WITH INDUCTION COILS.
DESIGN FOR INLAID WORKBOX.
SLATING FOR SLATERS.
READILY-MADE FERN OR FLOWER TABLE.
SPECULA FOR NEWTONIAN TELESCOPE.
MAKING BRITISH FLAGS.
SWEDISH WEAVING.

*** The Editor makes this intimation in the hope that readers, having friends interested in any of these subjects, will bring the same to their notice.

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

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

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

WORK correspondents are wanted in every Town.

FEMALE EMPLOYMENT.—He would be a very hard-hearted man who would seek to exclude women from the various industrial fields that they now occupy. Still, there is an element in the case that is not altogether favourable to what is supposed to be the advanced view, and this element is being forced upon our attention more and more every day: the marriage rate is declining, and has been declining for some years now. Of this persistent decline no satisfactory explanation is given. We offer one—viz., that it is due to the extension of female employment. When women do the work, how is it possible for them to get husbands to keep them? The men are thrown out of work, and, of course, cannot marry. If the ladies who are filling our offices had stayed at home, or taken to house-work by way of preparing themselves to become wives, men would be now in these offices and would require wives.

PARAFFIN LAMPS.—One can scarcely pick up the daily newspaper but that it contains an account of some accident caused by the careless handling of paraffin lamps, and only recently in the neighbourhood of Birmingham a family of father, mother, and two children lost their lives in a night by the upsetting of a lamp such as is commonly used by the poorer classes. Owing to the many improvements in the better class lamp-burners, thus enabling them to give a brilliant light, coupled with the artistic shapes of the oil vessels, they are finding more favour amongst the upper classes even in preference to gas or the electric light. What we wish to call particular attention to is the flimsy and ofttimes dangerous nature of the oil vessels used in the cheaper kinds—made for the most part entirely of glass—which find a too ready means of distribution through the medium of "tea-shop presents." Where children are about, these lamps are highly dangerous, and at all times ought to be handled with care. We would rather advise our readers to have nothing to do with them, but to select only such as have stout metal stands, or those made entirely of metal. Better still, as a further safeguard, adopt a more extensive use of hanging lamps either from the ceiling or against the wall. We would heartily commend to the notice of our readers and manufacturers a system of making the oil vessels entirely of metal.

THE UNWILLING WORKMAN.—The unwilling workman is he who does work because he is compelled to do so by circumstances over which he has no control, nor any genuine desire to obtain control. He works because he must do so or starve, or at any rate suffer some kind of privation. He has no interest in his work. It may "go hang," as far as he cares, and he shirks it at every available opportunity. He does not like work at all, and is frequently wishing some old uncle will die and leave him a fortune, so that he shall never have to work again. He can never wake in the morning until someone more wakeful than himself tries to rouse him to a sense of his duty, and then his troubles for that day begin. His eyes fairly ache with drowsiness, and must be vigorously rubbed open with his fists; his scalp itches as if it was afflicted with one of the ten plagues of Egypt, and has to be well scratched with his finger-nails; his lower jaw frequently drops in a prodigious yawn; every limb in his body seems to him to be rheumatic; and it is only by dint of repeated exertions on his part and that of his good angel (who, truth to tell, does the largest part) that he can get out of bed in time to hurry on his clothes and scramble into the workshop. When there the pain in his limbs returns, and his lower jaw relaxes. It gives him pain to make the slightest movement in the direction of work; but the hard-hearted foreman or master fails to notice his sufferings, and puts down his slow movements to the account of laziness. Should a strike be projected, he is one of the first to support the proposition "to play," and it is such workmen as himself that bring strikes into contempt. He is also among the first in the ranks of the unemployed, and no one wonders more than himself how it is that such a good workman is out of employment. He is usually the loudest talker about the "rights of man" and the "veniality of the aristocracy." In fine, he esteems himself always a badly-treated man, who has never had his dues, and this opinion is shared by many others, but on different lines of thought to those held by him. The disease he suffers from is one affecting that inscrutable part of a man, denominated the will. The cure of the disease may be effected by giving him interest in his work. This may be administered to some constitutions in the form of piecework; but we have known this to fail in others, whilst there is always the danger of fostering another disease named selfishness. Profit-sharing is a far better form of administering interest than piece-work, and profit-sharing with co-operation has been known to effect a perfect cure in most cases. That man, however, is the most healthy who creates for himself an interest in his work, be it ever so humble or so badly paid; and the workman who loves his work will make the best co-operator in the good time coming, when profit-sharing will be the rule instead of an exception.

DESIGN AND DECORATION OF ALL AGES.

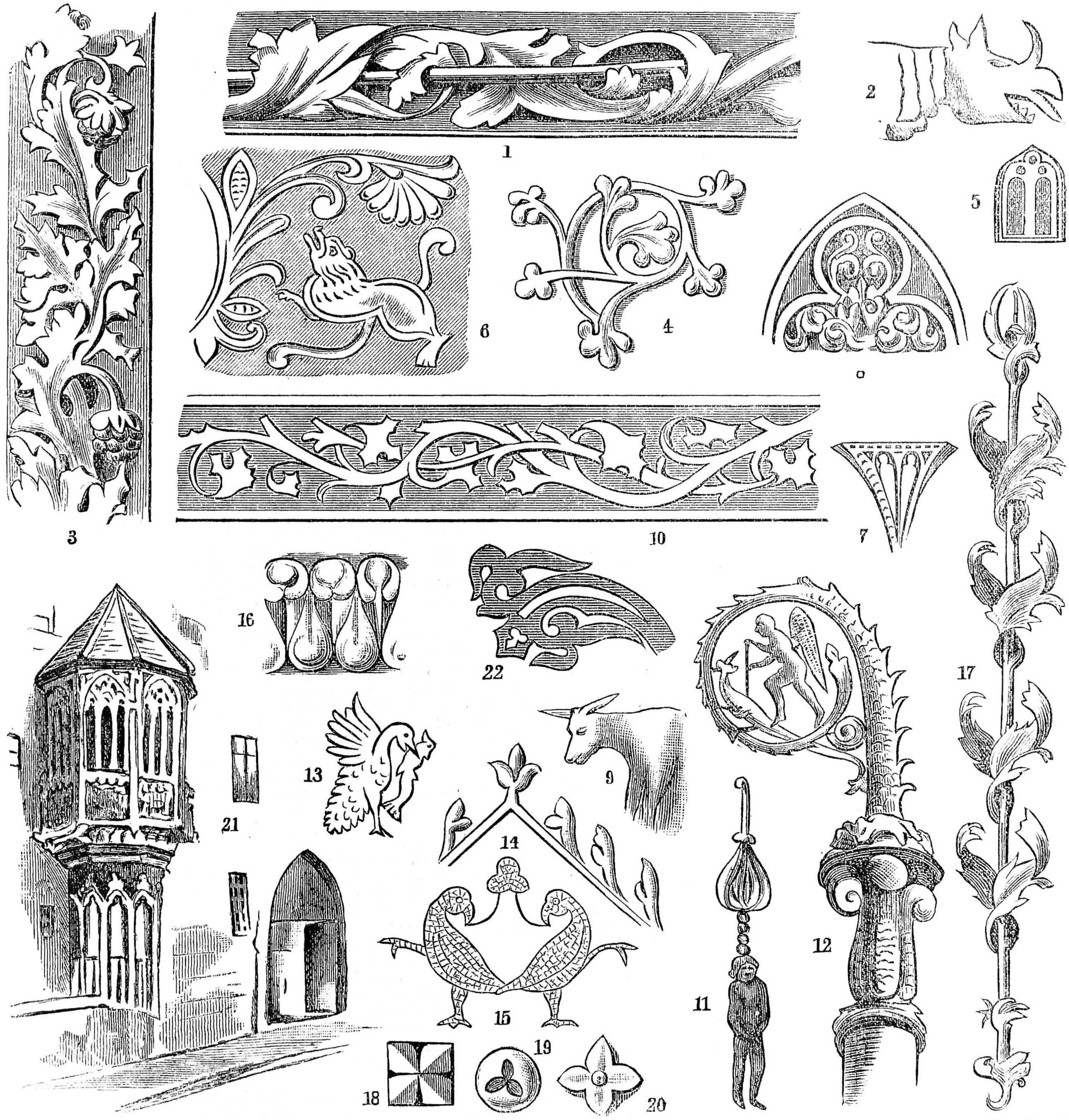
BY M. H. C. L.

MEDIÆVAL.

THE Art of the Middle Ages is especially interesting and instructive for us English people, because it is our own indigenous art. From this point of view it appeals to us as no other can. The Anglo-Saxons had, it is true, their art, but it was chiefly, if not entirely, copied from that of the Celts; while in the Middle Ages, as the fusion of the Saxon and Norman races became more and more complete, our own national life sprang up, and with it our national art.

The great new school of the Mediæval period was the Gothic. There was a beautiful old tradition that the idea which we see in our Gothic cathedral, with the pointed arches, which mark this style, and high mysterious vaulted coop, was taken from the forest aisles in which the people of the North had wandered for so many centuries, and where they had formed their first mystic yearning after the God they knew in Nature alone.

So poetical is this notion, that one would prefer clinging to it rather than searching out the actual process — matter-of-fact enough — by which this new style was evolved. However, we must look at facts; and the facts appear to be these. The pointed arch was introduced into Europe by the Crusaders, who saw it in the Arabic



Mediæval Decoration. **Fig. 1.—Carving on Choir Stall of Ulm Cathedral. Fig. 2.—Gargoyle on Cathedral at Rheims. Fig. 3.—Stone Carving, Church of S. Juan de los Reyes, Toledo. Fig. 4.—Foliage carved on Tomb of Archbishop Grey, York Cathedral. Fig. 5.—Early Gothic Window. Fig. 6.—From Italian Leather Coffer: Fifteenth Century. Fig. 7.—From Church of S. Juan de los Reyes. Fig. 8.—Stone Carving from Notre Dame, Paris. Fig. 9.—From Font of S. Bartholomew's Church, Liége. Fig. 10.—Tyrolean Flat Carving: Fifteenth Century. Fig. 11.—Iron Bell-pull, Nuremberg. Fig. 12.—Pastoral Staff, Champ-levé Enamel, Thirteenth Century, Limoges. Fig. 13.—From Silver Box. Fig. 14.—Crockets and Finial. Fig. 15.—Mosaic, Orvieto Cathedral. Fig. 16.—Silver Beaker Embossed Work: German. Fig. 17.—Iron Bell-pull, Nuremberg. Fig. 18.—Early English Dog-tooth Ornament. Fig. 19.—Ball-flower, Decorated Style. Fig. 20.—Four-leafed Flower, Decorated Style. Fig. 21.—Window in Albrecht Dürer's Platz, Nuremberg. Fig. 22.—Iron Hinge Ornament from Door at Blutenberg.**

buildings ; the Christian architects gave it a more upward direction, increasing its beauty and suggesting a symbolic aspiration. The cusped arch was also an importation of the Crusaders, and this idea met with a happy development in new hands. All the "foils" came into existence thereby, and in architecture a much broader and more systematic use was made of the cusping, which had been simply a graceful but meaningless ornament of the Mohammedan arch. The tracery of Gothic windows, which we should like to think represented the branches of forest trees, are, as Ruskin too clearly shows, an evolution from the piecing of the solid mass of masonry with which the system of separated lights in one window began.

It has been said that Gothic architecture had its birth in the North. It is the style best adapted to countries where, under grey skies, and with a climate destructive to delicate surfaces, massive forms and grandeur of a building, as a whole, are what must be aimed at rather than vivid colouring or highly finished detail.

We work in sandstone where the Italian works in marble. We need steep-pitched roofs to let the snow slide down, and this necessity in the external form influences the interior, which again reacts on the outer part, necessitating buttresses and flying buttresses from the walls.

As with all other styles, the Gothic had its period of rise, of perfection, and of decadence. There is not space here for more than a flying glimpse at the different periods it went through in our own country. These were: The Norman (sometimes not counted as Gothic, as the arch was still round), with zigzag decoration ; the Early English, the chief ornament of which was the dog-tooth ornament (Fig. 18), and a prevailing feature the clusters of shafts, of which its columns were composed, as in Salisbury Cathedral ; the Decorated, where the severe simplicity of the earlier styles gives way to richness and redundancy of ornament. The ball-flower (Fig. 19) and four-leaf (Fig. 20) belong to this period and the Perpendicular, which came into vogue about the Elizabethan age, and is marked by the large use of straight lines, both vertical and horizontal, in the tracery of the windows, as well as in the general lines of the building. The last was a period of decadence, and since then we cannot be said to have had any genuine style of our own.

We have built on *réchauffés* from various lands and various periods up to the present day, when our artistic diet may be described as an *omnium gatherum*. The only really beautiful feature of the Elizabethan period was the fan tracery, which is the most beautiful decoration of a constructive nature ever devised for roofs.

Gothic architecture, in France, corresponded very nearly with the English Gothic, though there were certain national distinctions. The French churches were larger. Clustered columns and tracery of the Decorated order were rare in France, and when the debasement of English architecture produced the Elizabethan style, that of France went off into the Flamboyant.

The chief marks of the Flamboyant style are the wavy and flame-like traceries of the windows. The form thus produced was often used in wood carving. A *fleur-de-lis*, heart, or heraldic device was often frequently introduced at the top of a window. The mouldings—very important features in Gothic architecture, and best, of course, when the style was purest—became debased and feeble. By degrees the Flamboyant merged into the pseudo-classical style, and such was also the fate of the English Perpendicular. Gothic Decorative Art was simply Gothic architecture in little. The shrines and reliquaries were chapels in miniature. The crockets (Fig. 14) which adorned the gabled roofs appeared on the bishops' croziers (Fig. 12). The conventional foliage of early Gothic Art, which was carved in stone on the capitals, was also produced, with the slight difference of treatment necessitated by the different material in wood and iron work.

The idea of cusping, as has been said, met with a very full and beautiful development in Gothic Art. Here it early suggested the foliated form, so familiar to us now in our church architecture. The trefoil, quatrefoil, and cinquefoil are repeated over and over again, and show what great effects may be produced from one single motive.

So far, the Gothic style in England and France alone has been noticed ; for in these two countries it, as it were, started afresh, and consequently reached its finest and most characteristic development. But its influence was wide-spreading. It reached as far south as to Spain—where we have some beautiful specimens of Gothic architecture—and to Italy. In Italy, however, except in Venice, where it is not pure, the Gothic influence on architecture was small.

Romanesque and Byzantine art and architecture were still in vogue, and though in Germany the old style amalgamated with the new with happy results, the Italians were too satiated with the traditions of old Rome and its successor in early Christian work to take to so new and different a development of art. Moreover, the Gothic style was more suited to the materials and weather of the North than to the bright sunshine and delicate marbles of Italy. The Decorative Art of the Middle Ages did not begin with the Gothic period, but was carried on from the Byzantine and Romanesque. In the later Romanesque we find the highly decorated porch, which was later a Gothic feature ; and the fabulous human forms, the dragons, reptiles, beasts, and birds of the early Romanesque period were continued down in somewhat varying forms till the end of the Middle Ages.

The monks seem to have had a quaint and humorous fancy, and they loved to portray grotesque heads and queer impossible beasts. We find such in the gargoyle water-spouts (Fig. 2) which adorned the flying buttresses of Gothic churches, for which the legend that they represented evil spirits flying from the sacred building was invented. But equally odd and monstrous beings are sometimes found inside the churches, as in Beverley Minster, the nave of which is decorated with the most hideous and extraordinarily conceived bogeys. Early Romanesque and early Gothic foliage were conventional, but in a later period, in both styles, natural leaves and flowers were represented, sometimes with great beauty and fidelity. Fig. 3 shows a thistle border from a cloister of the Church of S. Juan de los Reyes, at Toledo, built by Ferdinand and Isabella. Fig. 9 is one of ten iron cows round the brass font of S. Bartholomew at Liége, of the twelfth century. The craftsmen of the Middle Ages were famous metal-workers. They cast bronze, engraved brasses—such as we see in the pavements of old churches—and embossed brass and silver. They worked in leather, embossing or incising the surface and boiling it down to a pulp, and using it as an elastic substance. Their work was in part in high relief, with sharp distinctions of light and shade, as in the stone carvings which adorned the buildings. But there was also good flat work done, and the early English wood-carving—such as we see on old chests of furniture—is of this order.

The finest wood-carving of the Middle Ages, however, was done in Germany, where the bold Gothic treatment of foliage produced the most beautiful results in undulated light and shade, and grace of flowing curves. Just such wood-carving is being done at the present day, under the auspices of Professor Herkomer, at Bushey ; there, too, iron-work such as was done in the old days is produced. Fig. 22 shows a hinge ornament of the fifteenth century from a door of a building at Blutenberg, now in that delightful treasure-house of Mediæval Art, the Museum at Munich.

Figs. 11 and 17 are from bell-pulls sketched in the museum at Nuremberg: another place where one would like to spend a lifetime, if it were not for the living fascinations just outside its walls. For Nuremberg—almost alone in the world—is still a mediæval town: the gabled and balconied houses, the beautiful church of S. Sebaldus, the old moat and walls, with their many gates and towers, take one back six centuries, and the streets seem as though they should be peopled with frocked monks, and bekirtled ladies and knights, and crusaders, and all the picturesque inhabitants of those romantic days.

It is impossible not to make a digression concerning Nuremberg, in writing of Mediæval art.

The staining of glass is an art which dates from the Middle Ages. The first specimens of stained glass, as is supposed, were made at the Monastery of Tegernsee and at Hildesheim. The best stained glass, as the best woven designs, embroidery, and illuminations—all of which arts flourished in Mediæval Europe—were coloured without shading, in avoidance of any attempt to destroy the effect of a flat surface, such as they were employed to decorate.

All these minor arts might be treated separately at length; that of illumination, for instance, which went through its distinct period with marked changes of style, from the beginning of enlarging and ornamenting the initial letters in the sixth century to the debased naturalistic and shaded ornament of the sixteenth. Space, however, fails; and with a few general words this paper must end.

The Art of the Middle Ages was, in the main, religious art, full of symbolism, in part handed down from early Christianity, in part fancifully invented by the monks to give a reason for existing forms—as when the trefoil was taken as an emblem of the Trinity. It was an aspiring ideal art tinged with mysticisms : the upward curves of the arches, the spires—an invention of Gothic Art—ever pointing up to heaven, are typical of the conception which found its expression in the Art of the Middle Ages.

SINCE the introduction of forced draught into boiler furnaces, several chemical industries have adopted coke-breeze and gas-house-breeze, a very inferior kind of fuel, three to four times the quantity of which has to be used in comparison to coal, on account of it not containing the same amount of volatile matter as the latter fuel.

SCIENCE TO DATE.

Snake's Meals.—M. Léon Vaillant has been observing the alimentation of the great anaconda of Central America now in the reptile menagerie at Paris. Since 1885 the snake has eaten, on the average, five meals per annum, consisting of goats, three rabbits, and one goose. The interval between two meals was, in one instance, two hundred and four days.

Proto-iodide of Carbon.—Moissan has succeeded in preparing a substance of the composition C_2I_4 by heating crystals of tetra-iodide of carbon in a sealed tube to 120°. A better method of preparation consists in reducing the tetra-iodide with silver powder. Proto-iodide of carbon is thus obtained in beautiful pale yellow crystals of density 4·38, fusing at 185°, and volatile without decomposition below their point of fusion. It is soluble in carbon bisulphide, carbon tetrachloride, and also in ether. It is a very stable substance, not being oxidised by potassium permanganate or nitric or chromic acids.

Azoimide.—A very interesting method of preparation of azoimide, N_3H, has been discovered by Professor Wislicenus. The reactions by which this substance has been hitherto prepared have all been of an organic nature and of some complexity. The new method is very simple, and only inorganic materials are used. Metallic sodium is heated in a stream of ammonia gas, and when it is completely converted into sodamide, the stream of ammonia is replaced by one of dry nitrous oxide, the temperature being about 200° C. By this method the sodium salt of azoimide, NaN_3, is obtained. On dissolving the product of the reaction in water, filtering, and distilling the filtrate with dilute sulphuric acid, a solution of azoimide in water is obtained. Other metals besides sodium may be used, but sodium azoimide is less explosive than most of the other salts of azoimide, and is best suited for practical use.

Magnetic Fields.—Professor Houston describes the following process for obtaining a map of the magnetic field at any place. A photographic plate is placed in the position where the field is required, and, while in the dark, iron filings are dusted over it. It is then exposed to light for a few moments, and, the filings being removed, it is developed in the ordinary way.

NOTES FOR WORKERS.

TWENTY MILLIONS of acres of land in the State of Washington are covered with a growth of wood which will cut an average of 25,000 ft. of mercantile lumber per acre. Much of it in the vicinity of Port Crescent will cut an average of 100,000 ft. and more to the acre, while single trees are common that will cut 3,000 ft.

THE best-wooded counties of England are Kent, Surrey, Sussex, and Hants. The area of the woodlands of this country is now 2,695,000 acres, some 134,000 acres having been added from 1888 to 1891.

IT is estimated that there are 11,000,000 acres of uncultivated land in the United Kingdom, all amenable to some kind of cultivation.

THE Electro Novelty Co., of Boston, have brought out a "two-mouse power" electric motor and battery, which is said to be a perfect model of the Edison dynamo.

SILVER CHLORIDE is readily soluble in ammonia, a solution of sodium thiosulphate (hyposulphite of soda), and a solution of potassium cyanide.

TOBACCO acts rapidly as a depressing agent, but its influence soon passes off. In one experiment, total work at 8.30 a.m. was 10·25 kilogrammetres, but eighteen minutes after smoking an ordinary cigar it fell to 6, and an hour after to 2 kilogrammetres. At 11.30 a.m. it had risen again to 10·25 kilogrammetres.

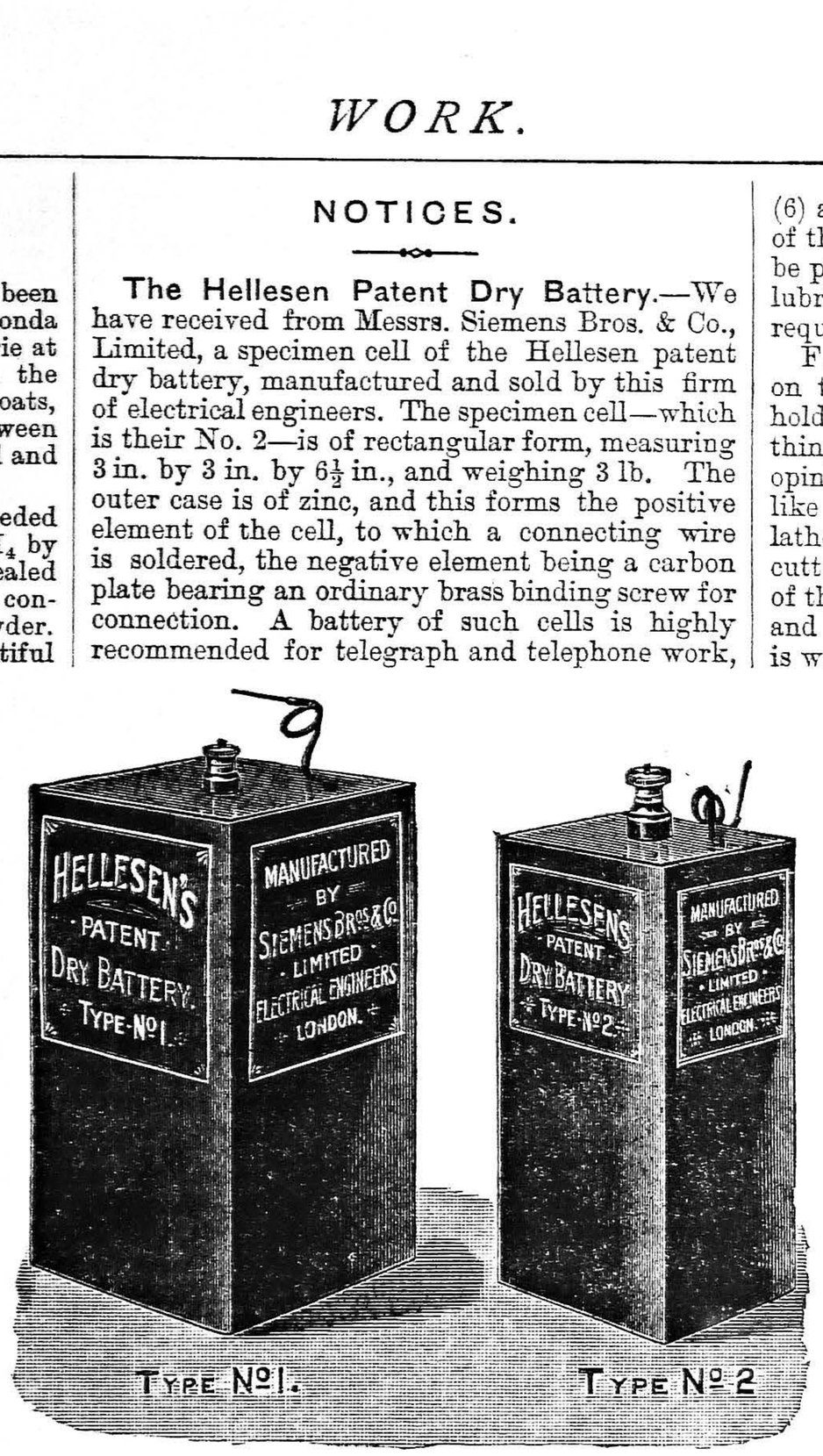
A GOOD seam of coal, from 7 ft. to 8 ft. thick, has been discovered on the banks of the Tenasserim River, in Burmah.

THE recent Tasmanian Exhibition was a financial success, there being a credit balance of £1,500.

A METEORIC stone, about the size of one's fist, has been found at Cave City, Calaveras County, U.S.A., which contains a large amount of gold. Gold has never previously been found in meteoric iron, although other precious things, as red diamonds, have.

NOTICES.

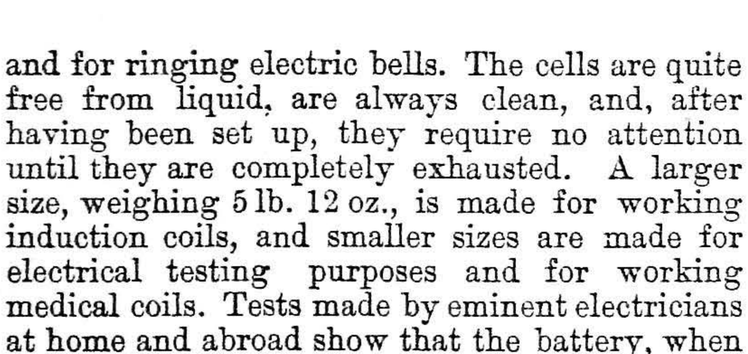
The Hellesen Patent Dry Battery.—We have received from Messrs. Siemens Bros. & Co., Limited, a specimen cell of the Hellesen patent dry battery, manufactured and sold by this firm of electrical engineers. The specimen cell—which is their No. 2—is of rectangular form, measuring 3 in. by 3 in. by 6½ in., and weighing 3 lb. The outer case is of zinc, and this forms the positive element of the cell, to which a connecting wire is soldered, the negative element being a carbon plate bearing an ordinary brass binding screw for connection. A battery of such cells is highly recommended for telegraph and telephone work,



Patent Dry Battery Types.

and for ringing electric bells. The cells are quite free from liquid, are always clean, and, after having been set up, they require no attention until they are completely exhausted. A larger size, weighing 5 lb. 12 oz., is made for working induction coils, and smaller sizes are made for electrical testing purposes and for working medical coils. Tests made by eminent electricians at home and abroad show that the battery, when fairly used, will last in working order for a long time, the E.M.F. of its elements being 1·5 volts, and the internal resistance of its cells varying with their size from 0·2 ohms to 0·65 ohms. The prices range from 4s. per cell for No. 1, down to 1s. 6d. per cell for No. 6, the price of a No. 2 cell being 2s. 6d. We can recommend this battery to all who may be seeking a good thing in the form of a dry battery.

Lathe Tool.—Mr. F. Price, the inventor of a new patent tool-holder, submits a specimen turning tool, together with its sharpener, for our examination. He claims for it the following advantages, viz.:—(1) It cuts with equal ease,



Price's New Patent Tool-holder.

forward, right or left, without altering its position in any way; (2) the circular end of the tool will last twelve times as long as an ordinary tool without re-sharpening; (3) it is easily adjusted to any height; (4) no skill is required in sharpening, as the cutting angle depends upon the diameter of tool and sharpener—for instance, if the diameter of the tool is half the diameter of the sharpener, an angle of 45° is given to the tool, and this, with a rake of 15°, gives to the work a cutting angle of 60°; (5) it saves a great amount of power, as the same angle is presented in every direction; (6) a side-rake can be given by resting it upon one of the angled under-faces; (7) the bottom end can be plugged and the central channel filled with a lubricant, which will keep it cool when it is required to do heavy work.

F. A. M., our specialist in lathe matters, writes on the above:—"I think Mr. F. Price's tool-holder is very ingenious, but it is one of those things that must be tested by actual work; opinions upon it will certainly differ, some will like and others dislike it; it is sure to interest lathe-men, and some will give it a trial. The cutters are easily made, yet not so easily as those of the Haydon bar; they are very firmly fixed, and the point, *a*, in the figure, where the holder is weak, will make it act partly as a spring-tool, and prove no disadvantage, since any yielding will tend to withdraw the tool from cut, and thus prevent digging in and chattering. The overhang of the tool is less than in the Haydon bar, which is an advantage. Being away from home I could not try the tool in my own lathe, so I took it to a small shop near by and saw it tried, when it cut freely and required but little power, the turner appearing well pleased with it; we also put the emery grinder in a chuck and tried its effect, but the lathe would not run fast enough to cause the emery to cut well, and I imagine, the grinder being of such small diameter, should run at a very high speed, say 5,000 revolutions per minute, to give a good result; in fact, I suspect the emery grinder would have to be mounted on a spindle of its own, away from the lathe, where no grinding ought to be done, and run at a much higher speed. All that the inventor claims for the tool may be granted except No. 4, where it is said that if the grinder be twice the diameter of the tool an angle of 45° is given to the edge, and this, with a rake of 15°, gives a cutting angle of 60°. The cutting angle would not be 45° unless the diameter of the tool bears the same relation to the diameter of grinder that the side of a square does to the diameter of the circle drawn around it. 45° would be too weak for the cutting edge, which could not be reckoned as 60°, because an inclination of 15° of rake, front or side, is given: an angle of 45° given to the tool edge means a cutting angle of 45° whatever be the rake of the tool. When, however, the diameter of the grinder is twice that of the tool, then the angle produced at the cutting edge is 60°, and this is very suitable for wrought iron, and will still be 60° cutting angle, even when a rake of 15° is given.

Woodwork.—"Second Year's Course of Manual Instruction in Wood," by Joseph H. Judd, M.Inst.C.E. (Moffatt & Paige).—This is a publication designed to follow up the author's First Course, to which we drew attention in an earlier volume of WORK. It cannot be denied that scope existed for a more advanced course, treated after the fashion of the previous book. Mr. Judd is Head Master of the Brighton Technical School, and therefore knows fully the requirements of teachers and pupils of elementary and technical schools. The present course will be found equally as practical as its predecessor, and, pending more definite information from the Science and Art Department upon the subject of Technical Education in Schools, Mr. Judd's practical teaching cannot but be useful and valuable. We anticipate a large sale for this eminently helpful manual.

Slöjd Carpentry.—"Practical Directions for making the High School Series of Slöjd Models," by Alfred Johansson (George Philip & Son).—This is a translation, by Mary R. Walker and William Nelson, of a Swedish book treating of the Slöjd system of imparting instruction in carpentry in schools, intended for teachers and students. The book is not to supersede the instructions of a teacher for those who are ignorant of Slöjd; the condensed notes are for the guidance of a pupil working with a teacher. The notes and work set out are admirable, and will go a long way to make Slöjd—the latest addition to the school curriculum—more understood and appreciated.

TRADE: PRESENT AND FUTURE.

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

DERBYSHIRE COAL AND IRON TRADES.—With the near approach of Christmas, orders are flowing in for fuel for domestic requirements, and the volume of business has materially increased. A better tonnage is being put on the rails for the Metropolitan and Southern markets, but a marked decrease is noted in the sales for general manufacturing purposes. Gas coal is in good demand, and heavy consignments are being despatched for many of the large works. The iron trade of the county is not so buoyant, orders being lacking for the various brands of pig iron, and a dearth of new orders for foundry work. The finished iron trade is brisk, and firms are well employed on building work and roofing. Specialities in malleable iron are in good demand.

COTTON TRADE.—It is now thought that the crisis in the great struggle will not be reached until the end of January, by which time it is considered the stocks of yarn will have become exhausted. The Federation of Master Cotton Spinners, at a meeting on the 9th of December, were of opinion that it was the duty of the trade to adopt short time to the extent of three days per week. If such a system were adopted as recommended, the financial position of the operatives would be affected to a large extent. A general system of short time throughout North and North-east Lancashire would mean that the special levies now being paid by the workpeople in these districts would cease; hence the unemployed operatives in the South would be deprived of a considerable monetary assistance. The decision is not binding on the North Lancashire employers, who will remain at liberty to please themselves whether they come to the assistance of the Federation or not. In Rochdale and district the working class is beginning to feel the effects of the lock-out, some of the societies having made appeals for aid to the general public; and although it is far better here than in the surrounding towns—in some of which great distress prevails—yet it is very bad here, and it is feared that it will go from bad to worse. In spite of the distress, the operatives remain firm, and there is no sign of either side giving way.

CYCLE TRADE.—A number of bankruptcies have come about in the cycle trade recently. These have resulted from the great numbers who have engaged in the trade, many of them knowing next to nothing about it, and the keen competition engendered in consequence. Cycle makers, in many instances, have realised the mistake of opening credit accounts with inexperienced dealers, ignorant alike of the practical and business (or financial) requirements of the trade. Makers are now looking for, and finding, a surer market for their wares in the hands of accredited ironmongers and hardware dealers, and it is expected the trade in cycles will develop considerably in this direction in the near future.

SHIPBUILDING TRADE.—This goes from bad to worse in Aberdeen, and about fifty men were discharged from one of the yards this week. The same yard, it may be added, is working short time. The total tonnage of the vessels built during the past twelve months was only 3,414, as against 6,724 in 1891, and 9,228 for 1890.

ENGINEERING TRADE.—Machine tool makers, locomotive builders, and stationary engine builders are experiencing a very marked scarcity of inquiries, and scarcely any work of moment is likely to come forward this year. Boiler makers are fairly busy, but prices are lower than have been obtained for a long time. An engine to drive the machinery in the British Section of the forthcoming Chicago Exhibition is being built by a Manchester firm.

IRON TRADE.—There are considerably more sellers than buyers in the Lancashire pig-iron market, while manufactured-iron makers report only a very small amount of business doing. Lancashire bars are still being quoted at £5 13s. 9d. to £5 15s., while for sheet, £7 2s. 6d. to £7 5s. is being asked.

HATTING TRADE.—A dispute in the wool-hatting trade of Denton commenced recently, and, the masters insisting upon a reduction of 7d. per dozen in the price paid to the hatters, the latter refused to work. Arbitration has, however, been accepted, and the dispute will be referred to the two members of Parliament of the divisions concerned.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTERS FROM CORRESPONDENTS.

Slot Machines.—J. C. K. (*Lisson Grove*) writes:—"The slot machine for automatic supply is an old affair. Two thousand years before the Christian era Heros the Egyptian, of Alexandra, refers to a drachmæ being put into a slot to turn the small sweeps of a water-wheel, to supply the worshippers at shrines with a modicum of purifying water."

Chucks.—C. C. E. (*Lincoln*) writes:—"N. M. will remember that all the ornamental chucks of my old French rose-engine had noses adjustable by four screws, and I think he concurred in the general opinion that their intended use was to more accurately centre work chucked approximately true in pitch. For that purpose they were of some little use, but nothing could be more objectionable for complex turning, from which every element of error or instability should be eliminated as far as possible; so, if it is necessary to affix the chuck nose by screws at all, by all means cut the screw upon it *after* it is fixed. The chucks upon my new lathe have steel backs and noses, are very strong, and if, after many years' use, any wear should take place, are very easily adjustable."—[I thank you for having called my attention to the noses of the chucks of your French rose-engine, and if my memory serves me, I remarked to you that the late Mr. Fieldhouse, the celebrated London engine-turner, who was only excelled by his contemporary, the late Mr. Alfred Deacon, constructed the noses of his chucks in a similar manner. But there the analogy ends; there is not sufficient play in my chuck to assist in adjusting the work as suggested in your note, but only to centre the nose. My contention is simple enough—that is to say, the central pin is not nearly strong enough; and the maker of the chuck evidently knew what he was about when he adopted the method of which my short article was the subject. I have not the slightest doubt that, in the execution of your particular work, such an arrangement would be unsuitable; the more so as, in your case, the work would be changed from chuck to chuck. At the same time, there is a certain amount of skill exhibited in being able to overcome the difficulties that arise where two or more chucks do not run quite so truly as might be desirable. In conclusion, I hope you will be able to find time to give the readers of WORK an account of your new lathe, if but a brief one.—N. M.]

Hand-power Circular Saw Bench.—A. R. (*Scorrier*) writes:—"I take the article in No. 184, p. 435, by CHOPSTICK to be a reply to my question. I was pleased to see the long-looked-for article. I suppose I am one of the 'carping critics' referred to by CHOPSTICK, as I criticised some of his communications to WORK. It is not probable that I shall be making a bench as described by CHOPSTICK, but as so much has been said in reference to the merits and demerits of a hand circular saw bench, I would like to hear from anyone making the bench as described by CHOPSTICK. After giving it a fair trial in cutting stuff 3 in. and 4 in. deep, he might write to WORK and say candidly which he prefers—the ripping with hand saw or turning the wheel. My motto is to live and let live—not live myself and, in doing so, kill my fellow-man. Pushing timber to a saw is not turning the wheel. In reference to there not being such a machine in the market, there have been hand-saw benches worked nearly on the same principle for years. with the cog gear precisely the same; and men that have much to do with machinery will know that to increase speed is to lose power. I hope CHOPSTICK will not take offence at this letter. I give him credit for the clear way in which his article was set out."

Slide-valve.—A CORRESPONDENT writes:—"In regard to the reply of F. C. to MANES, on p. 253, there must surely be a misprint in line 7; 'the *weight* of lead to be given to the valve' has no meaning, as, though the metal lead is heavy, the lead of a valve (pronounced 'leed') is a distance, and space is not heavy. But further on we read, 'The lead is the distance the valve is ahead of its mid-position when the crank is on the dead-centre.' Not so; the lead is the distance the valve is open when the crank is on the dead-centre—it is, in fact, the '⅛ in. opening at the start' referred to in the last line but three. What authority can be cited as giving the lead (lineal) any other meaning?"—[The words "weight of" should not have appeared; in this connection they are without meaning. I do not know if they were in my MS., as I have no copy of it, but I think it unlikely. Your correspondent mixes lap and lead when he says that the ⅛ in. opening at start represents the lead, and as for the authority to be cited as giving lead (lineal), I give no authority, as my replies are based upon over thirty years' practical experience in my business. I fancy your correspondent thinks he knows me, but he is mistaken, for I always pronounce *lead* as *leed* in this connection.—F. C.]—["Amount" was written in F. C.'s MS., and there has been a printer's error.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Watch and Clock Tools and Materials.—L. F. (*Stafford*).—In No. 179 of WORK, p. 356, the names of two firms were given as supplying watchmakers' tools and materials. As some readers appear to have difficulty in finding them, their full addresses are now given: Messrs. Hunt & Son, 21, Ironmonger Street, St. Luke's, E.C.; Messrs. Grimshaw & Baxter, Goswell Road, E.C. Catalogues can, no doubt, be obtained from either for the cost of postage. Full addresses are not given in leading articles in WORK, but only in "Shop." Firms mentioned in leading articles should advertise their addresses in WORK.—G.

Patenting Invention.—WHITESMITH.—It was quite unnecessary to have copied the Patent Office circular; all that needed to have been done was to have sent a copy of the paper that had been lodged with the application. This so-called specification is neither more nor less than an advertising circular, and as much like what a specification should be as the moon is like a green cheese, and about as likely to create a property the law can support. It is a fair sample of the general or "popular" ideas of inventors in regard to specifications and the kind of thing people are rushing with to the Patent Office daily, with the idea that they can create and secure a property by so doing. We should advise WHITESMITH to refer to No. 44, Vol. I., of WORK, where, at p. 694, he will find some information on patent matters that will, if studied and realised, be found of great use to him. We think it must be evident to him by this time that, to obtain what he desires so that it shall be capable of being of any benefit to him, he should secure the assistance of a qualified and experienced person to carry out the matter. A thing which is of no use when obtained is not worth the trouble of obtaining, and we think no man of common sense would waste his time in getting it.—C. E.

Management of Electric Machinery.—ENGINEMAN.—You should get the following books: "The Dynamo Tender's Handbook," "How to Manage a Dynamo," "Electro-motors: How Made and Worked," and "Electric Light Installations." These four books will teach you all you require to know on the subject.—G. E. B.

Amateur Type.—A. E. A. (*Sharpness*).—The cause of the imperfect appearance of some of the letters in the specimen card sent is that the type is "off its feet"—that is, that the types are not all perfectly perpendicular—the result being that one part of a letter prints, and the other does not appear. You will certainly obtain a better impression by slightly damping the cards and allowing them to lie under pressure for a few hours before printing. They should not curl unless made too damp.—W.

Musical Glasses.—S. M. (*Leeds*).—See reply to Dan Brearly in No. 185, p. 461.—R. F.

Mandoline.—E. D. (*Wandsworth*).—See reply to R. W. B. in No. 189, p. 524.—R. F.

Watch Repairers' Certificates.—HOROLOGIST.—A printed paper, containing the particulars of these examinations, can be obtained from the Secretary, British Horological Institute, Northampton Square, London, on sending a stamped envelope. The examination consists of two parts: (1) A series of practical tests of good workmanship (running in a cylinder, putting a balance-staff, etc. etc.); (2) A set of questions on theoretical matters (depthing, action of cylinder, lever, and other escapements, etc.). Any practical repairer of watches, who has given a little careful attention to the theoretical side of his business, should have no difficulty in answering any of them. A study of Mr. Britten's "Handbook" will be helpful, as it covers the whole of the ground. It is impossible to give the actual questions, as they are varied at each examination.—F. J. G.

Gilt Picture Frames.—FRAME.—(1) Gilt frames are cleaned by washing very carefully with a sponge barely moistened with hot spirits of wine. The gilding must afterwards be left to dry naturally, and not wiped. (2) The eye alone, if practised, is quite sufficient to detect the difference between gilding with good gold leaf and with Dutch metal. (3) In Vol. III., p. 262, No. 121, is an article on Making Gilt Picture Frames. Directions and hints about picture frames of other kinds are so liberally scattered over the back numbers of WORK that it is not possible to give references to them.—M. M.

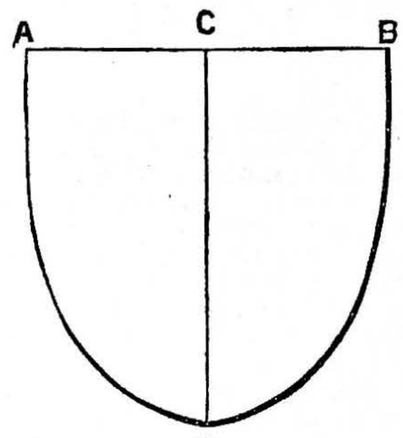
Making a Wood-turning Lathe.—W. S. (*Battersea*).—If you have made "the bench," I think your best plan would be to try to pick up the headstocks, crank, and wheel second-hand; this would really be cheaper than if you bought the materials and tools to make them new. You should have some practice on this one, and learn as much as you can with it; and then, by-and-bye, when you have learnt the requirements of a good lathe, you might try to make one. If I were to fill a whole column of "Shop" with directions for you, it would not really be sufficient. You cannot be told how to make a lathe in a few sentences.—F. A. M.

Air Pump.—J. J. J. (*Canonbury*).—A ¼ in. steam pipe should be sufficient for your purpose. A vertical boiler (tubular) 4 in. diameter and 10 in. high should do the work, but I should advise you to use a higher pressure—say, 60 lb.—and expand the steam by cutting off at ½ in. stroke.—F. C

Sign Writing.—W. C. M. (*Norwood*).—The numbers of WORK in which the articles on Sign Writing appeared (Nos. 1, 2, 4, 11, 13, 17, 19, 23, 30, 34, 44, 45, 47, 49, and 51) are out of print. You should advertise for them in our Sale and Exchange column.

Fire Escape Prize Competition.—A. T., JR. (*Birmingham*).—The responses to this were so numerous that the adjudicat on as to the prizes has been a long one. This will be made immediately.—ED.

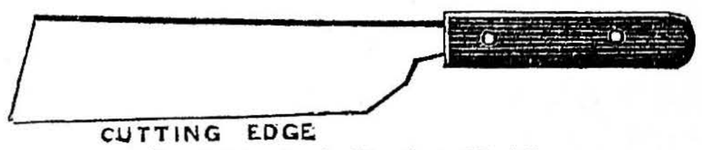
Curves of Ribs of Model Steamer.—A WORKING LAD.—The curves of the ribs of a model steamer may be obtained by drawing, either to the same size or to scale, an exact plan of the deck, and a similar one of the upper side of the keel. The positions of the ribs are then marked on both of the plans. From the former of these the distance between each opposite pair of ribs is obtained, and from the latter the height of each pair above the keel. Thus you will get the two dimensions of each pair of ribs. To get the curve of each pair, a line, A B (see the figure), is drawn on a sheet of paper equal in length to the width, and another, C D, at right angles to this and bisecting it, equal to the length. A curved line is then drawn from the points A and B to the point D, and this will be the shape of the curve of the particular pair of ribs in question. In each case the curves must be drawn by eye, and in the case of ribs in the fore-part of the vessel the bulge is at the lower end, the upper part being almost straight. As the boat is to be only 15 in. long, it will be best to draw the plans full size. The shape of a hull which will do equally well for sailing or steamboat is shown in No. 160 of WORK, Vol. IV., p. 58, Figs. 2 and 3. The straight part of the keel is made first, and the stern-post mortised on to it. The curved part of the keel at the stern is then cut out according to the plan, and fixed in its place. The ribs are cut out of pieces of board, and are secured in their places by tongues. A thin piece of board, cut to the right shape, must then be placed between each pair of ribs to keep them at the proper distance apart while the building is going on, which can easily be taken out when it is finished. Strips of wood, about ¼ in. thick and ⅛ in. wide, are nailed lengthways across the ribs, beginning at the keel, and working upwards, until the requisite height is reached. These strips may be made to overlap one another by being rebated, or may be made to fit simply against one another. The stern part must be carved, and fitted on to the top of the keel by a tongue-and-groove arrangement. When the building is finished, the whole must be covered by several coats of paint or varnish. As for books on the subject, there is one entitled "Model Yacht Building and Sailing," by E. Biddie, published by Messrs. Norie & Wilson. There are also several publications published by Stevens' Model Dockyard, 22, Aldgate, London. Before buying any book, you should examine it, and see that it contains the information which you require.—A CRAFTSMAN.



Ship's Rib Curve.

Colouring Metals.—M. W. (*Stepney*) and W. P. B. (*Birmingham*).—For colouring metals, if you will look up the following in your back numbers of WORK, you will find far more than can be given in "Shop": In Vol. II., No. 72, p. 324; No. 102, pp. 811 and 814; No. 91, p. 632. In Vol. III., No. 142, p. 602; No. 143, p. 622; No 144, p. 638.—J. B.

Paring Knife.—T. C. R. (*Blindley Heath*).—If I had your knife in my hands, I could much sooner sharpen it for you than I could tell you how to do it. The biggest trouble with you is your misapprehension of the cutting edge. I reproduce your sketch, and will show you where you are wrong (see Fig.). If you grind, and afterwards set, on the edge as shown, and push it from you with a kind of a sideway motion. you will, doubtless, get on all right. I must refer you to back numbers of WORK for the process of gilding edges. I am constantly writing details of this process. I have not always time to do so, and space is very limited in "Shop." I have no intention to be disagreeable, but querists should really look up back numbers before sending their queries. How simple it would be, for instance, for all bookbinding readers of WORK to acquaint their fellow-workmen of bookbinding matters appearing in WORK. This would save needless inquiries and replies.—G. C.



Bookbinder's Paring Knife.

Ticket Writing.—WALTHAMSTOW.—A series of papers will be given shortly.—ED.

Electric Bell.—W. H. (*Bristol*).—It is evident, from the feeble way your bell rings, you have not enough power. Put on another cell in series, and if that will not do, write again more fully. You need not put anything in the porous pot of a Leclanché—they are sold complete. Let it stand for a few hours after making up the cell before you use it.—J. B.

Vertical Pantograph Milling Machines.—C. C. (*Sheffield*).—Messrs. T. Cooke & Sons, machine tool makers, York, are the makers.—T. R. B.

Hooter.—OUT OF KNOW.—The reason your hooter does not give a clear note is probably because the edge of the bell is not directly over the annular outlet for the steam. It is also too far away; ½ in. instead of 1¾ in. would give a better result. The whole thing is badly designed.—F. C.

Model Boiler.—BEGINNER.—Assuming the seams to be not only hammered, but well brazed, your boiler should stand a working pressure of 50 lb. per square inch, if the ends are hemispherical and properly stayed flat ends. You do not state whether it is tubular or how it is fired, so I cannot say if it will supply enough steam for your engine. For the same reason I cannot give you size of safety-valve. Pressure-gauges and other fittings may be obtained from the "Model Dockyard," Fleet Street, London, E.C. You should write there for a price list.—F. C.

Engine for Existing Boiler.—R. M. D. T. (*Frome*).—A vertical inverted cylinder engine would be best. A larger engine at a slow speed will be the more economical. You might put in a cylinder, say, 4 in. diameter by 6 in. stroke, and cut off steam at one-third stroke. You should increase the pressure as you increase the load. Line your fire-door with fire-clay to prevent it becoming red hot. As to the castings, you should apply to some local founder in a small way of business, or write to the "Model Dockyard," Fleet Street, London, E.C.—F. C.

Preservation of Wood Flooring and Ironwork.—BUNKER.—Creosoting for timber is very effective if properly carried out—about 9 lb. creosote per cubic foot of timber. Rotting may also be prevented by immersing the timber in a solution of corrosive sublimate. For ironwork, the protective covering which has best stood the test of years is a paint made of peroxide of iron, coloured paints being put over it as required.—F. C.

Fittings for Model Steam Engines.—W. J. H. (*Market Harboro'*).—These fittings can be obtained from the "Model Dockyard," Fleet Street, London, E.C. Write there for a price list.—F. C.

Covering for Folding Screen.—WILLIAMS.—As you wish to avoid the ordinary scrap-picture covering, you may, if you can paint, cover with that kind of Lincrusta-Walton which artists use as a ground for painting on, or there is an American leather cloth sold on which painting may be done; both these are admirable if you can decorate them yourself. If not, you should apply to the Liberty Art Co., Regent Street, who will supply you with a variety of Japanese or other artistic covering materials.—S. W.

Stamping out Metal Disc.—J. C. L. D. (*Derry*).—You do not clearly state your requirement. If it is only for a rough purpose, and assuming that the metal is malleable, they could be punched out by an ordinary punching machine at a small enough cost. Your best plan is to communicate with the Britannia Tool Company, Colchester, enclosing sketch of disc and the material of which it is made, also its thickness, and the weight you require it to be; on which they will forward price of new or second-hand machine to suit your purpose. Correspondents should be more explicit in stating their requirements, which they should do fully, and, if necessary, enclose a sketch, however rough, giving proper dimensions, so that reliable information may be given.—T. R. B.

Thermopiles.—A. F. (*Bow*).—Thermopiles can be obtained from any dealer in electrical sundries—such as the Electric Stores, 51, Cannon Street, E.C. Their value, in relation to the cost of fuel employed in heating them, may be put down as one-third that of a gas-engine driving a dynamo. That is to say, it will cost three times as much for fuel to work a thermopile as it would cost in gas to work a gas-engine and dynamo generating the same quantity of electricity.—G. E. B.

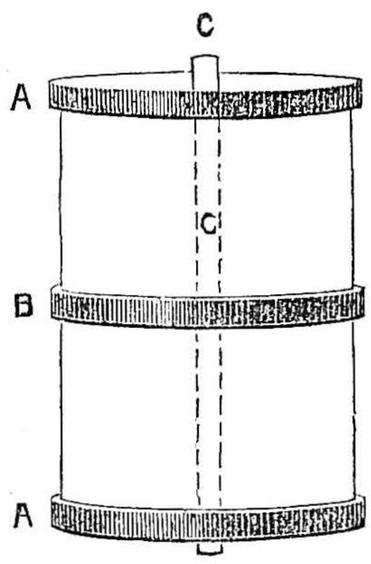
Cement for Carbon.—H. S. (*South Hackney*).—Even if we could hit on a cement capable of conducting the electric current equally as well as carbon, it would never pay to cement broken battery carbons, as the cost for labour would exceed the value of the plates. It is, therefore, impracticable. The zinc plates are easily coated with mercury. Get them clean by washing in dilute sulphuric acid, then pour mercury over them in a shallow dish containing some of the sulphuric acid solution, and brush them with a bunch of fine copper or fine brass wire until the mercury spreads all over the surface. The E.S. dry battery is one of the best for a small coil, if you only wish to use it for a few minutes at a time occasionally. I do not know of a book on the art of swimming. Consult *Chums*.—G. E. B.

Dry Battery.—J. B. (*Accrington*).—The Hellesen, Gassner, E.C.C., and E.S. dry cells are all good forms. The Hellesen and E.S. are powerful and compact cells. I have not had enough experience with these to decide on the best, but find both very good for such light work as bell-ringing, telephones, and small night lights.—G. E. B.

Coil gone Wrong.—T. S. (*Bolton*).—Assuming that the sketch of your coil is a correct one, I do not see how you could expect any evidence of current from the terminals of the secondary wire, as you have no magnet to work the break-hammer. If you do not arrange the contact-breaker to be worked by the magnetised core of the coil, as shown by me in No. 164, p. 118, you must have a separate magnet to work the hammer. If you had made the coil as I directed, you would have got a smart shock from it. Of course you get a shock when the current from another coil is sent through your coil, as the break of the other is working all right. Read the articles on Induction Coils that have appeared in WORK, and make your coil as directed in them, then you will not go far wrong. My book on the subject is published by Whittaker & Co., and the price is 3s.—G. E. B.

Boiler.—W. E. E. (*Manchester*).—Your letter is not a specimen of courteous letter writing. With regard to your remarks on my paragraph, which you call an article, on p. 369, No. 180, paragraph 3, I thank you for your suggestion.—T. R. B.

Garden Roller.—H. H. (*Bootle*).—I am glad to know that you have been successful in making a garden roller from the instructions in WORK, and no doubt other workers will be encouraged to make the attempt, and also materially assisted, probably, by your ingenious use of empty cheese boxes in lieu of sheet iron for the mould of the concrete roller. Your sketch, appended, will explain itself to those of our readers who perused the articles, "Simple Accessories for the Garden (see No. 175, p. 292).—C. M. N.



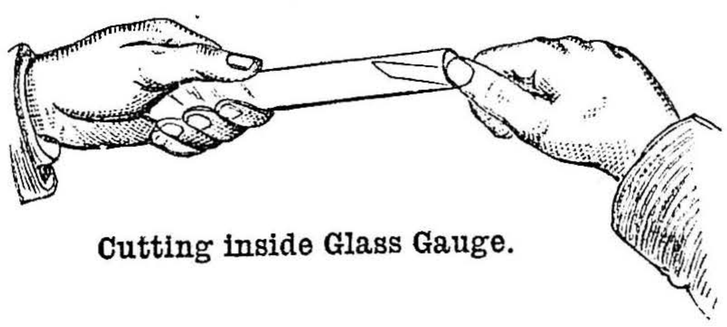
Cylinder ready for Casting — A, Bands on Cheese Box; B, Band made by knocking Top off Lid; C, Axle.

Water Resistance.—WIREMAN.—Get a gauge glass tube. Cement the lower end into a brass foot socket, perfectly watertight. Screw this down to a wooden stand or base, and connect the flange of the socket to a binding screw by a length of copper wire. Fit a rod of brass in a cork stopper to go in the top of the glass tube, and let this rod slide stiffly in the stopper. The rod must be long enough to reach the bottom of the tube, and should have a screw on top for connecting the rod with one of the line wires. Fill the glass tube with water, and slide the rod up or down, as required, to get the desired resistance. This is one of the most simple forms of a water rheostat.—G. E. B.

Shellac in Water.—S. A. L. (*Great Yarmouth*).—The addition of a little common washing soda will generally suffice for common work. For the better class, try 2 oz. gum arabic, 1 oz. borax to 1 lb. shellac, in ½ gallon of water. Bring slowly to boiling point in an iron pot; stir up occasionally till all gums are dissolved. May be used hot or cold.—LIFEBOAT.

Squaring Round Corks.—F. G. (*Liverpool*).—I am not acquainted with any such machine, but see no difficulty in the way of constructing one. Your object is, of course, to reduce all your old corks to one uniform size. First, you will need a brass bed for the cork, its width that of the required square. Half its length would be concave, to hold the round cork; the other half flat, for the second cutting. Second, a clip, the counterpart of the bed, to fit down on the cork and to hold it tightly, by means of a lever or otherwise. Third, parallel knives, set to the width of the bed, having a handle at their upper ends, and their lower ends being hinged to a metal arm, the further extremity of which would work on a pin; the object being to give that kind of cut which is gained in the old-fashioned chaff-cutting box.—S. W.

Cutting Water-gauge Glasses.—W. H. M. (*Cradley Heath*).—To cut these to fit, use a hard steel point on the *inside*, as shown in the illustration. With a little practice, it can be made to scratch a perfect circle, when the piece can be easily broken off. Should a large piece have to be taken off, you might start a small crack at the end,


Cutting inside Glass Gauge.

and then, with a red-hot wire, make it follow it, and so break off a small piece at a time; but, remember, the secret for success is to cut the inside and not the outside, as you have been doing. I do not know of a machine to perform the work, and do not think you will need one when you have tried the proper way.—W. E. D., JR.

Accumulators.—D. C. (*Blackburn*) and H. S. B. (*No Address*).—If you will either purchase or look up in your back numbers VOL. II., No. 101, p. 790, of WORK, you will there find far more information than can be given in the limited space in "Shop." The paper is by Mr. G. E. Bonney. If you have your back numbers, you will also find, by consulting the indices of past volumes, many hints on accumulators in "Shop;" and, should you require more information, I think you could not do better than get Sir D. Salomons' book on "The Management of Accumulators," price 5s., published by Whittaker & Co.—J. B.

Winter Window Plants.—C. H. (*Newcastle*).—If the window is enclosed it will be an easy matter to heat it as you suggest. A tin saucepan, with the lid soldered down, will serve for a boiler. The pipe should start from the top of the boiler, be continued round the window, and re-enter the boiler near the bottom. Half-inch iron barrel will be best for the purpose; lead pipe may be used, but the heat will not radiate so freely. An air pipe must be carried from the highest point of hot-water pipe, above the level of the boiler, and a pipe (syphoned) fitted to boiler for filling it; ¾ in. will be large enough for these.—T. W.

Asbestos.—TIRO.—(1) It is impervious to heat, cold, or water. (2) Bell's Asbestos Co., Ltd., 118, Southwark Street, London, S.E.—T. W.

Bent Iron Work.—M. P. (*Glasgow*).—Whiteley, the Universal Provider, Westbourne Grove, London, W., sells the iron for this work.

Boot and Shoe Making and Repairing.—LEATHER.—You ask if it is possible for a person of average skill to make any kind of boot or shoe at a profit. My answer is, Yes; but, at the same time, I would ask you to be very careful how you commence, as, of course, you will have to master a tremendous lot to compete with other manufacturers that have been in the market a long time, and have learnt how to cater for the public. You ask if you could dispose of them to boot salesmen. Well, that can be done (if you are not a good salesman yourself) by paying some traveller, who has a commission in a different kind of stuff to yours, a little to sell them or take orders from samples for you. A few of the difficult things to overcome would be how and where to buy, and how to judge your leathers; getting a proper set of lasts, and suitable to the work you are going to make; some idea as to what material is necessary, and also what fitting—that is, girth measurements, large or small—for the locality they are for; getting the proper plant, and producing every pair as uniform as possible. I hope you will not think I am one who would try to discourage anyone else at whatever they attempt, for that is not by any means why I write the above; but, you see, as you only tell me you have read my articles (of which, by the way, I thank you for your kind approval), I do not know if you can cut, close, or make: only that you say you are a novice. You need not, I think, trouble much about profit; as you want to make good use of spare time, your wages for the work done would form that for a time, and then economy and quantity of work would soon bring profit. There are a good many leather sellers, etc., advertise in the *Boot and Shoe Trades Journal*, 10 and 12, St. Bride's Avenue, Fleet Street; and the *Shoe and Leather Record*, 30, Finsbury Pavement, London, E.C.; 2d. each, weekly. My advice would be that you should start repairing (and making, if you can) for your friends, or, if you can work very well, try to get work from the tradesmen you deal of yourself, and get them to recommend you. I say this because any man with a little skill can soon rise without much outlay. Only do the work as punctually and well, and use as good leather as you can for what you are going to charge, and, I think, if you are in a neighbourhood where there is any muster of inhabitants, you will not be long with much spare time on your hands.—W. G.

Sharpening Knives, etc.—AMATEUR.—Former questions already answered. Singer's machine is an up-to-date tool, and the best in the market for general purposes.—W. G.

Naphtha for Fake.—W. P. C. (*No Address*).—It is mineral naphtha that is used for making fake. Paraffin is sometimes used, though I like the former best. You say buff balls; you should use heel balls, with about half a white glazing ball to two of hard black heel balls. The material you saw in the bottom of a light boot must have been common black felt, something like that used for roofing, etc. After it is worn it does crack, but it is not right. A hand-sewn boot wants to be flexible. When stiffness is wanted, stouter leather should be used; besides, an inner sole will sooner form its shape to the sole of the foot in wear when a nice soft felt is under it.—W. G.

Is Goat's Flesh Venison?—C. H. B. (*Blackpool*).—The term "venison" is the ordinary speech applied only to the flesh of adult animals of the deer kind. In a broader sense it has been, and may be, properly applied to the flesh of any animal taken in hunting, since it is derived, through the French *venaison*, from the Latin *venor*, to hunt. In neither sense can it be applied to the flesh of the tame goat.—M. M.

Cleaning Kid Gloves.—S. P. (*Hulme*).—Stretch the glove on one of the wooden hands sold for the purpose at glove shops, and sponge it two or three times with benzole, using clean benzole each time. Keep your work away from the fire.—S. W.

Motor Address.—R. A. D. (*South Kensington*).—The address cannot be given in "Shop," but if you send a stamped addressed envelope to the Editor, it will be sent. We cannot, from practical experience, say to which we would give the preference. If you refer to No. 112, Vol. III., of WORK, you will there find a full description of one. We should recommend you to see both at work; you will then be able to judge for yourself which is most suitable: or, failing this, give particulars of what you want them to drive to each maker, and have a guarantee from them that the machine will do the work. You will require a water pressure of not less than 50 lb. per square inch; if more, so much the better.—M.

Paper Pulp Moulds.—W. H. S. (*Southampton*).—An article on the subject he mentions, including a few diagrams, is in progress, and will be submitted to WORK as soon as completed.—G. P.

Paint.—JACKSBY.—To mix about 2 lb. stone-colour oil paint you will require 1½ lb. of genuine white-lead—say, 5d.—one pennyworth patent driers or liquid driers, and half a pint of mixed linseed oil and turpentine, 3d.=9d. These are the rough quantities for white paint, and to make stone-colour tints you will require a little of *ochre* and *umber* pigments, ground in oil. Assuming the oilman makes you a pennyworth of each—he will not occasionally—this makes your paint cost, roughly, a shilling, and the total quantity will be some 2½ lb. The oilman will mix the paint for you at 6d. per lb., so that there is no saving with so small a quantity. If, however, you prefer to be your own mixer, break up the lead (purchased ground in oil) and driers into a stiff paste with a little oil. When thoroughly beaten up, thin down to the required consistency with your oil, add your pigments to desired tint, and strain, if for interior work, through a piece of fine muslin or old stocking.—F. P.

Mirrors.—J. B. (*Calderbank, N.B.*).—Apply to Newton, plate glass dealer, beveller, and silverer, New Inn Yard, Shoreditch, London, E. C.—B. A. B.

Box-making Machine.—T. M. (*Cwmbach*).—Messrs. Rhodes & Sons, Wakefield, make machines for stamping up all kinds of small boxes; and no doubt, if you state definitely what kind of box you require, and, if possible, enclose them a sample, they would be able to give you some information as to cost, etc.—R. A.

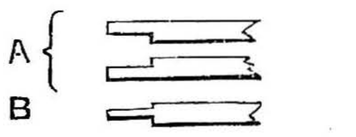
Soldering.—FIDDLER.—You need experience no difficulty in soldering brass screws to zinc plates; I suppose you mean plates of thick zinc, such as engraved name-plates, etc. Proceed as follows:—Scrape the places on the zinc plate where you want to solder the screws; next tin the end of the screw or bolt, or whatever it is that you wish to solder; use killed spirits of salts for this. Now tin the zinc plates on the parts cleaned, using strong spirits, and while both plate and screw are hot, solder them together. You must put a body of metal round, or there will be very little strength in the job. The secret of success is to get the plate well hot; then, if you have properly cleaned and tinned the parts, nothing can prevent them adhering. Used killed spirits for the soldering, and for soldering zinc to galvanised iron, use strong or raw spirits.—R. A.

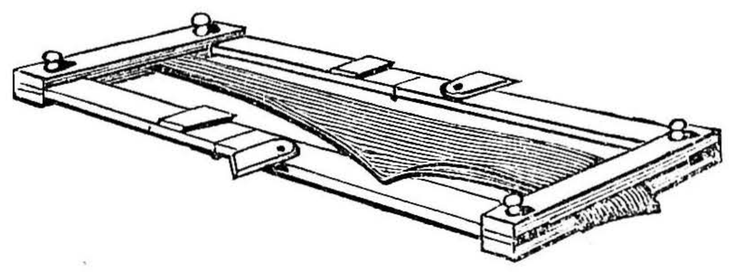
III.—QUESTIONS SUBMITTED TO READERS.

[Questions in this Section are held over to be answered at an early date.—ED. WORK.]

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Trousers Stretcher.—B. A. B. (*Hampstead*) writes to J. C. K. (*London, N.W.*):—"I accept your reproof, but, while I plead guilty, wish to say a word of excuse. A trousers stretcher in wood is





Trousers Stretcher—A, End Rails; B, Long Rails.

not absurd, for I could, with a little aid from a wood turner, and with the exception of a pair of hinges and some screws—which, of course, must be of metal—make one of beech. I have 'no right to assume KORIC is not a woodworker,' True; but would it not be better if querists gave fuller information as to their wants and capabilities, and even of their preferences? Those who answer questions often have to 'assume' some things which they have no right to. 'I cannot advise him to try to make one in metal.' This I must adhere to; I could not describe how to do the job. But my critic says, 'Why could not anyone who can upset, screw, and drill iron do one of the easiest jobs in blacksmithing?' Why, indeed? I, for one, would be glad to be taught how to do these things; and if my critic will 'assume' that KORIC also wants the same information, I hope he will supply it. However, I will assume that KORIC is a woodworker; if so, he can easily follow my instructions. Obtain two pieces of beech about 42 in. long, 2 in. wide, and 1 in. thick; four pieces about 14 in. long, and the same width and thickness. A pair of strong iron butts and suitable screws will be wanted. Then, by cutting the short rails in about ¼ in. on each side of the long rails, and by obtaining four turned wood thumb-screws, a frame somewhat like an artist's stretcher can be made, having the short ends of double thickness. If the screws pass freely through the two thicknesses and are tapped into the third, the whole thing may be made portable. When fitted, the long rails are to be cut across and hinged, and a pair of strong hooks and eyes, or a pair of dining-table fasteners, will keep the hinged rails straight. If, while the frame is *almost* straight, the trousers are fixed with the thumb-screws, and then the rails are pressed straight and fastened, the trousers will be stretched."

Cycle Tire.—M. (*Bishop Auckland*) writes to CYCLIST (see No. 189, p. 526):—"You will find instructions for fixing tires on p. 521, Vol. III., of WORK."

Hot-water Apparatus for Warming Rooms.—M. (*Bishop Auckland*) writes to W. T. (*Southsea*) (see No. 189, p. 526):—"Try Mr. J. Attwood, engineer, Stourbridge."

Oxygen.—H. B. S. (*Liverpool*) writes to OXYGEN (see No. 192, p. 574):—"OXYGEN wishes to know the uses to which the gas having the same name as himself is put. There are several uses for the gas. First, it is used for giving light, as in the oxy-hydrogen, or limelight; for giving heat, as in the oxyhydrogen blowpipe for autogenous soldering or brazing, etc. It has lately been used for ageing or improving spirits, for which there is a patent out; it is argued that the improvement of spirits is due to the removal of the fusel oil by oxygen, aided by time: and as this is now done quickly by blowing oxygen through the spirits, a treatment of ten days has as much effect as keeping three years. Oxygen is also used in bleaching paper pulp, and, to a certain extent, in the purification of coal gas in a few works. These are all the industrial applications I know of."

Barometer.—F. W. L. (*Wolstanton*) writes, in reply to W. T. T. (*Houghton-le-Spring*) (see No. 189, p. 526):—"With reference to the question as to the construction of a cheap barometer, your correspondent, W. T. T., may make a sensitive and reliable barometer for a few pence if he will get 10 in. of ¼ in. glass tube, and fix one end of it so as to be quite air-tight into an empty ink-bottle (such as are sold at 1d.), pour in a few teaspoonfuls of water, and then put the open end of the tube into another ink-bottle filled with water. The liquid should stand about half-way up the tube, and will be found to rise and fall as the air pressure varies. A scale should be fixed behind to show the variation. A little glycerine in the water will prevent freezing."

Hollow Grinding.—C. K. (267, *Old Street, Shoreditch*) writes, in answer to A. E. B. (*Ashford*):—"I am a hollow razor grinder, and have been established in London over thirty years."

Leather Reviver.—A. C. B. (*Wilmslow*) writes, in reply to J. B. (*Dublin*) (see No. 190, p. 542):—"Replying to your inquiry, I have used a preparation called leathiden for the purpose you mention, and found it more than answered my expectations."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—CARDINAL; C. M. (*Pimlico*); C. M. (*Birmingham*); M. A. N. (*Castleisland*); COTTAGE; J. B. B. (*Liverpool*); W. V. T. (*Newington Green*); R. F. (*Hunwick*); A. W. (*Cambridge Heath*); J. B. W. (*No Address*); A. G. (*Sheffield*); G. P. (*Ealing*); ANXIOUS ENQUIRER; H. R. (*London*); W. B. (*Winson Green*); A. L. & SON (*London*); T. W. B. (*Old Charlton*); H. BROS. (*Settle*); A. W. E. (*Peckham*); F. P. (*Birmingham*); N. F. H. (*Dartmouth*); W. C. (*Coventry*); FRAMES; T. A. B. H. (*Newcastle-on-Tyne*); J. H. N. (*Chester*); PROGRESS A.; J. W. (*Darwen*); 12-BORE; W. C. (*Sheffield*); W. D. (*Highbury*); F. S. (*Withington*); CONSTANT READER; J. MCJ. (*Glasgow*); J. B. (*Ashton-under-Lyne*); CHEMICUS; A. T. (*Manchester*); W. A. J. (*Battle*); N. H. (*London, N.W.*); R. D. T. (*Marylebone*); K. B. D. (*Lyne*); A. E. H. (*Newton Heath*); WORKER; W. J. B. (*Londonderry*); CHOPSTICK.

PRINTED AND PUBLISHED BY CASSELL & COMPANY, LIMITED, LA BELLE SAUVAGE, LONDON, E.C.