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A WORKMAN'S TOOL CHEST.

BY FRED CROCKER.

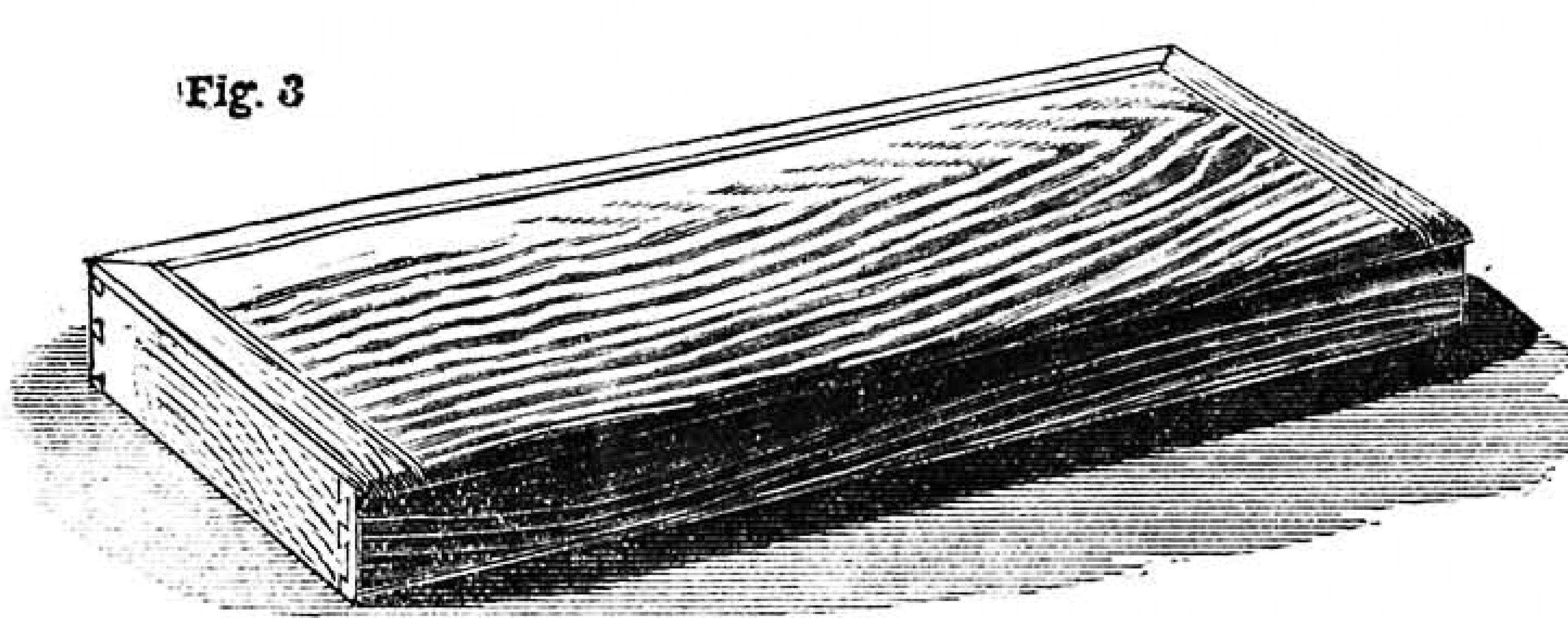
ADVANTAGES OF SLIDING TILLS—SIZE—MATERIALS—CONSTRUCTION.

IN making a "workman's tool chest," the object should be to economise space as much as possible, and to aim at lightness, combined with sufficient strength for the purpose required. The latter is necessary, especially for railway travelling, as they get rough handling by the Companies' servants, who—judging from the appearance of the tools after a journey—move the chest by tipping it end over end.

Advantages of Sliding Tills.—A reference to the drawings (Figs. 1, 2, 3) will show that sliding tills are given, which are preferable to the nest of drawers you sometimes find at the back of a tool chest. The former occupy less space, require less material and labour in making, and by sliding one over the other the whole length of each may be seen at a glance, and the tools easily found. Again, there is no danger of a tool such as a gauge binding against the bottom of the drawer above it; and there is also an advantage in packing: you simply tack a strip of wood in the slides at the ends of the tills to secure them, or use the space between as a clothes-box for working clothes.

Size.—The size, which may be gathered from Figs. 1 and 2, is smaller than that generally used by cabinet makers and joiners; but at the present time, when

Fig. 3



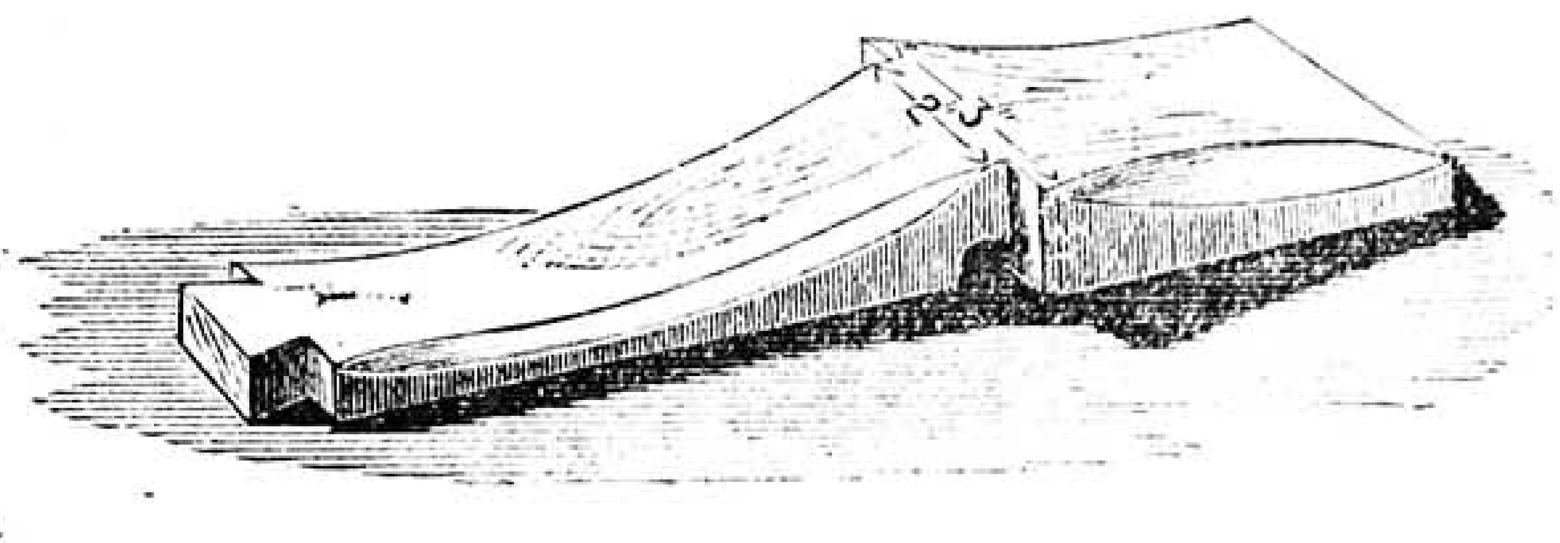


Fig. 4

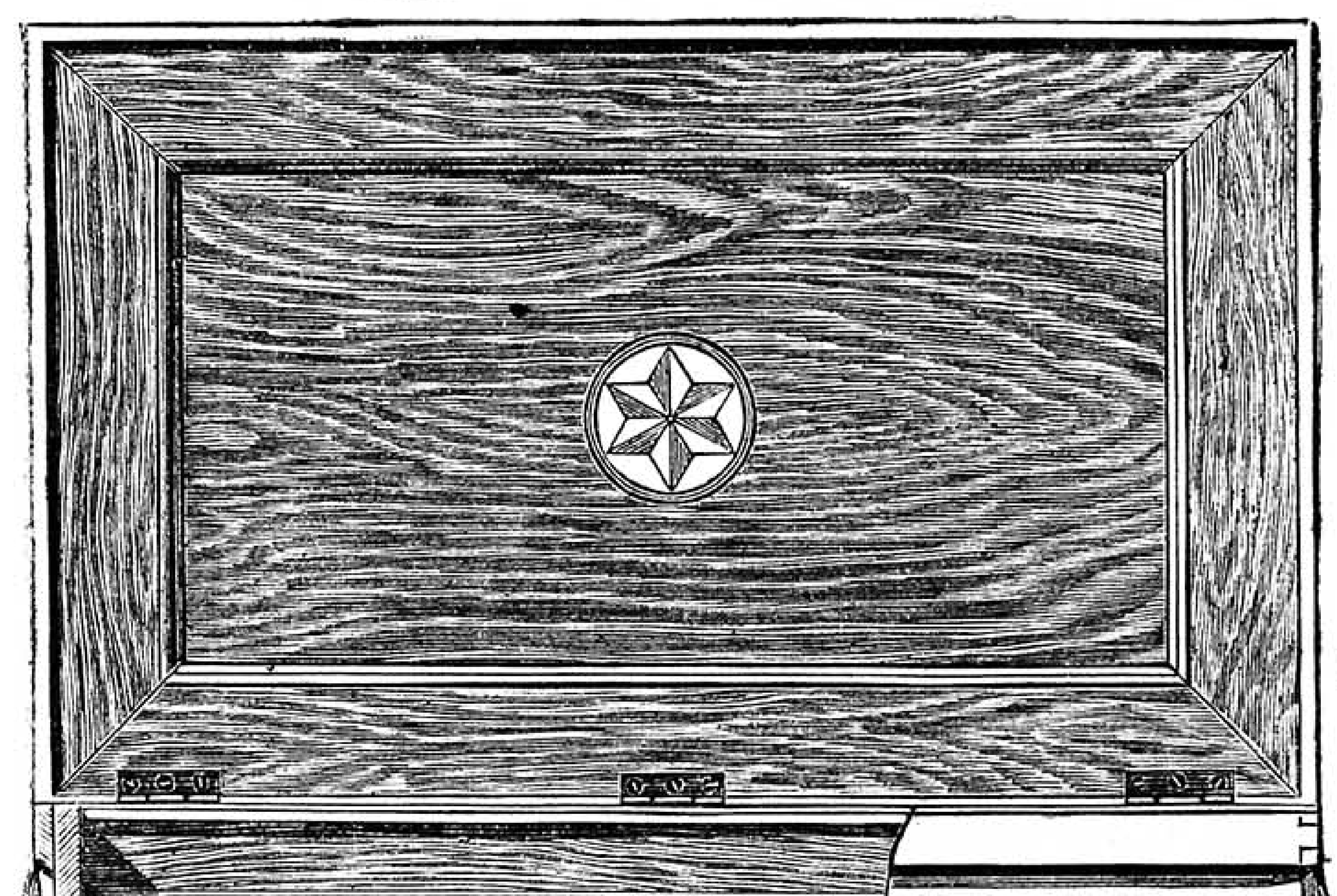


Fig. 1.

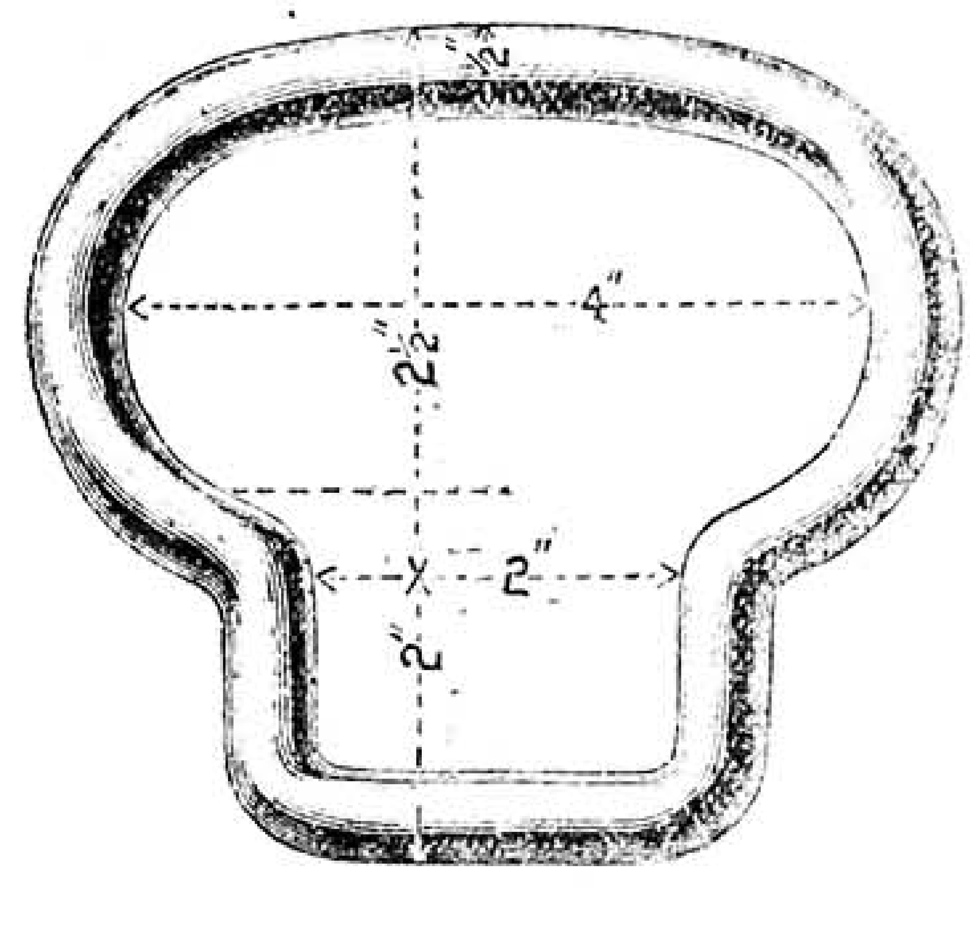


Fig. 5

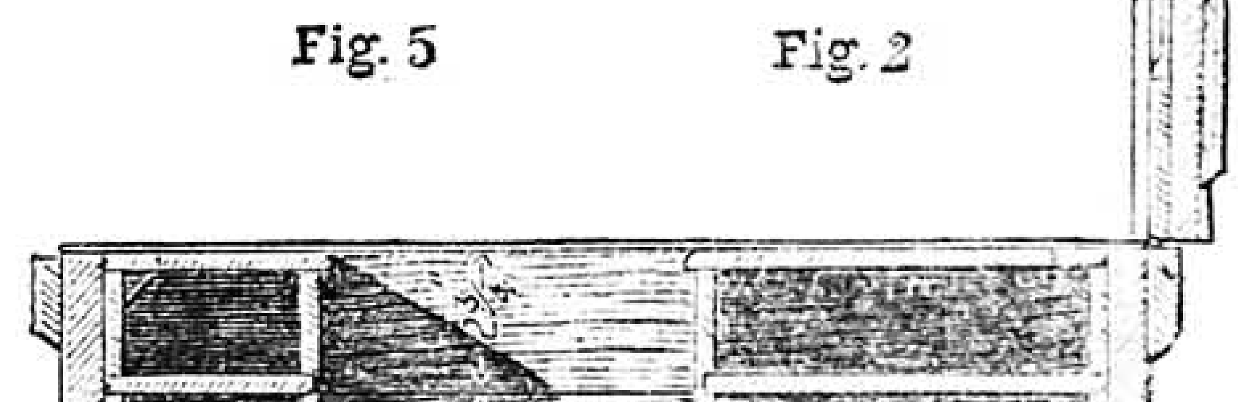


Fig. 2

Fig. 1.—Longitudinal Section and Part Front Elevation of Workman's Tool Chest. (Scale, 1¼ in. to 1 ft.) Fig. 2.—Cross Section. (Scale, 1¼ in. to 1 ft.) Fig. 3.—Top Till. Fig. 4.—Handle Bearer. Fig. 5.—Handle.

machinery is so much used, I should think it would be large enough for the average workman. This, however, may be modified to suit the particular trade or branch the maker may be engaged in.

Materials.—The sides and lid may be made of American pine, which should finish $\frac{7}{8}$ in. thick, and if not wide enough may be jointed; the bottom of $\frac{5}{8}$ in. match-boarding; the plinth, etc., of Baltic deal; and the inside may be fitted up with Honduras mahogany $\frac{1}{2}$ in. thick, which, for narrow boards, is fairly cheap, and is not so liable to twist as some of the more expensive qualities of fancy wood.

Construction.—First plane up and dovetail the carcase together, making the pins rather large; then screw the bottom on. Next the plinth may be screwed on sides and ends, and dovetailed at the corners—the pins being in opposition to those on the carcase, as shown in Fig. 1. Now the handles should be put on. These are made of $\frac{1}{2}$ in. round iron (Fig. 5), and are far better than the pieces of rope you sometimes see used for the purpose. The handle bearers (Fig. 4) may be of oak, and should be screwed from the inside. A dovetail is shown at the bottom, which may be cut into the plinth if the worker thinks there is an advantage in using it. The handles should be kept well up, so that the chest will not turn over if it should at any time be craned. Next, the till slides are put on inside the ends. These consist of a piece of veneer for the top, a piece of $\frac{3}{8}$ in. mahogany for the middle, and a piece of $\frac{5}{8}$ in. for the bottom. To the latter is screwed a piece $1\frac{1}{4}$ in. by $\frac{3}{4}$ in., having a $\frac{3}{8}$ in. rebate, to form a slide for the well board. Beneath this a block $7\frac{1}{2}$ in. wide is fitted in, to which the well sides are secured. Some strips of mahogany $\frac{3}{4}$ in. wide by $\frac{1}{4}$ in. thick, and equal in length to the sides and ends, are now required. These are glued on round the top of the sides and ends, and mitred at the corners. The lid will be the next thing to occupy our attention. It is not advisable to clamp it, as the pieces at the ends are often a source of weakness. The inside is veneered, and banded with a 3 in. margin of $\frac{3}{8}$ in. mahogany, mitred at the corners, forming a central sunk panel. The $\frac{5}{8}$ in. ogee mould may be stuck on the edge of the margin, or may be planted in. The centre may be ornamented with a monogram, or some other simple inlay, as shown in the sketch. The plinth ($\frac{1}{2}$ in. thick) is next screwed on, and round the top some 1 in. by $\frac{3}{32}$ in. hoop iron (see Fig. 2). This protects the lid, should the lid be used as a sawing trestle at any time. Between the hoop iron the space is filled in with $\frac{3}{8}$ in. board screwed on across the grain of the lid, and rounded at the edges. This protects and considerably strengthens it. Sometimes thick canvas is used instead of the $\frac{3}{8}$ in. board. The tills are dovetailed together, the top ones (Fig. 3) having a lid. The margin, $1\frac{1}{4}$ in. wide, may be secured with angle blocks glued inside. The divisions lengthways may be made to suit the requirements of the worker; for instance, the top till (back) may have an 8 in. division at each end for bits, the centre being reserved for gouges or carving tools. Small knobs are sometimes put on the front of the tills, but these are in the way of packing; if anything is used for the purpose, it should be small flush rings. The bottom space at the back will accommodate such planes as beads, rounds, hollows, etc., placed on end; while that at the front may have a rack for saws.

The lid is hinged with three $2\frac{1}{2}$ or 3 in. brass butt hinges, and a bead put on to line with the knuckles of the hinges, forming a sort of rule joint. This prevents the ingress of wet, dust, etc. A good lock should be provided, and two holes bored, so that the lid may be screwed down to prevent its being burst off. If the worker intends taking a trip to the Colonies, he may still further strengthen his tool chest by procuring a dozen pieces of thin iron, 6 in. long by $1\frac{1}{2}$ in. wide, bending these to form angle plates, and screwing them on the outside. The inside should be French polished; the outside may have two coats of lead colour and one of brunswick black.

Minor details of construction are omitted, as they have often been given before; but should any difficulty arise, or should any practical reader have an improvement to suggest, the columns of "Shop" are always open.

PRACTICAL PAPERS FOR SMITHS.

BY J. H.

ARRANGEMENTS SUITED TO VARIOUS TYPES OF SHOPS—STORAGE OF SMALL TOOLS IN RACKS—TOOL BENCH OR STAND—STAND FOR HEAVY APPLIANCES—MACHINES—VICES—DRILLING APPARATUS—SWAGE-BLOCK—STAND FOR SWAGE-BLOCK—HAMMERS—BOLT-FORGING MACHINE—SAWS—CRANE—STORAGE OF BARS AND RODS—STORAGE OF SCRAP—CONDITIONS AFFECTING THE FUTURE OF THE CRAFT.

IN this concluding paper I will treat, as I promised, of the arrangements of the smithy.

Arrangements suited to Various Types of Shops.—The arrangements of smithies, and their tools and appliances, differ as widely as do those of carpenters' shops or engineers' machine and fitting shops. From the country smithy of the roadside to the smithy of twenty or thirty fires is a long stage—a stage bridged by shops of all sizes and varied arrangements. In the small shops, machines and power-driving are *nil;* in the large ones, hand-work is reduced to a minimum. A few remarks relative to the arrangements of smithies of various sizes will, therefore, appropriately close this series.

My remarks will have reference to (1) small tools, (2) to machines and appliances, and (3) to storage of iron and scrap.

(1) *Storage of Small Tools in Racks.*—Small tools—as tongs, swages, fullers, flatters, punches, and such like—accumulate in large numbers, and litter the place unless proper means are taken to keep them in some order. There are two methods of storage—racks and stands. The most common method is that of racks, fixed against the wall by the side of the forge. These are simply stout parallel iron bars, supported between uprights, at a distance of from 6 in. to 8 in. from the wall, between which bars the shanks or handles of the tools, as the case may be, are dropped, their enlarged portions resting upon the top edges of the bars. The tool-racks against the wall are formed by driving two uprights into the ground at each end, and riveting the horizontal bars of iron to these. The uprights and the bars alike are of flat iron—measuring, say, 2 in. by $\frac{1}{2}$ in.—placed edgewise. There may be two or three series of these horizontal bars, at heights of about a foot apart, dependent on the sizes of the tools used.

For the lightest tools, handled with withies, or with round rods, it is sufficient to employ short lengths of round rod riveted into flat bar. The flat bars are then secured to vertical uprights driven into the ground and leaning against the wall, and the rods stand out like spike nails. Upon these the light tools are hung by their handles.

The flat bars may measure 2 in. by $\frac{1}{2}$ in., and the rods be of $\frac{1}{2}$ in. iron, 5 in. or 6 in. long. These lighter racks should be placed above the racks of parallel bars just previously described.

A large quantity of tools can be easily stored in this fashion without occupying any of the floor-area of the shop, and are quite handy, since the smith has but to turn round from the anvil to pick out any tool required.

Tool Bench or Stand.—The other method is to have an oblong open bench or stand of wood, framed together with good rigid diagonals. The top is crossed with strips or rods, leaving open spaces, in which the shanks or the handles of the tools drop. Unless there is plenty of floor-room available, this is not so good as the rack, because the latter occupies scarcely any floor-space. But such a stand is very serviceable adjoining machines like the steam- or drop-hammer, or the Oliver. Without it, the tools would lie about round the machines in confusion.

Stand for Heavy Appliances.—For the heavier appliances used with the steam and other hammers, stands of a different kind are also made use of. Thus, two cast-iron standards of A form, with three or four pairs of internal flanges facing towards each other, carry stout deal planks between them, which are bolted to the flanges. Upon these deals the heavy spring-swages, die-blocks, cutting-off tools, hoop-tongs, etc., are laid side by side, the lighter on the top shelves, the heavier beneath, ready to hand, and without superposition of one tool on another.

(2) *Machines.*—The machines and larger appliances used in a smithy are very numerous in some shops, very sparse in others. In a country shop the vice, drill, and swage-block are frequently almost the only ones that merit notice; in large shops the steam or other hammer, the bolt-forging machine, the hot and cold iron saws, and the crane, are essential adjuncts. A few words on each of these must suffice.

Vices.—The ordinary tail or standing vice is, on the whole, as good as any. The high-class vices with parallel jaws and instantaneous grip arrangements used by fitters are scarcely suitable for the smithy, where the work is mostly of a rough character. If a regular bench is put up in the smithy, the tail-vice may be attached to it; or a small vice-bench, two or three feet in length only, may be attached to the wall beside the forge, and the vice fastened to that; or it may be self-contained, standing on a tripod anywhere in the shop, and so be movable.

Drilling Apparatus.—For drilling large holes, the ratchet-brace is the best tool to use. It can be fixed upon a bench in a permanent position, or it can be fixed where wanted on work in hand. A press-drill thrust down with a lever is also a common appliance in country shops. For a modern shop where drilling is done, a double-geared hand or power drill is the most efficient tool.

Swage-Block.—I have not yet alluded to the common swage-block, an appliance without which no smith's outfit is fairly complete. It is an almost universal tool. Its body is pierced with numerous holes—round, square, and oblong. Its edges are provided with indentations of curved and V'd forms, in various sizes. The block is used, when lying flat, as a bolster upon which holes are punched and drifted; and as a heading-tool, upon which shouldered work is finished. When laid upon one of its edges, the indentations upon the edges fulfil the function of bottom swages for circular, hexagonal, and rectangular work.

Stand for Swage-Block.—The stand upon which the block is mounted consists of two cast-iron frames—an upper and a lower. The upper one is provided with strips, enclosing the block. The two are united rigidly by means of four shouldered wrought-iron pillars, whose pins pass through holes cast in the frames, and which are riveted over at top and bottom.

Hammers.—In a country shop destitute of power, the old Oliver is a most useful tool. It is efficient, easily and cheaply rigged up by smith and carpenter, and though, of course, not so rapid in its action as a steam-hammer, is its best substitute, and is entirely under the control of the forgeman. If power is available, then the drop-hammer is an improvement on the Oliver, and one that is employed in many large firms. With steam-power, the steam-hammer is the most efficient; but it consumes a large quantity of steam, requires the attendance of a man to operate the valves, and is costly, and therefore only suitable to large shops. Its place is always about the centre of the shop, to afford all the room available for the turning about and manipulation of long forgings, rods, and bars. Still, when the shop is of sufficient size to pay for the introduction of a steam-driven hammer, its uses are very varied and manifold; and fresh classes of manufacture can be developed that could not have been undertaken without the hammer. In a myriad ways the hammer can be utilised, and the slow operations of the striker be expedited manifold.

Bolt-Forging Machine.—The bolt-forging machine is a power-driven machine, by which bolts and their heads are formed between dies having a rapid vertical movement imparted from a long cam-shaft. Where bolts are made in even moderate quantities, the bolt-machine soon pays for itself.

Saws.—An almost necessary adjunct to this machine is the power-driven hot and cold iron saws. The first is a comparatively thin saw, run dry at a high rate of speed, that cuts through red-hot rods and bars almost instantly. The second is a thicker saw, that cuts slowly, running in water the while. The first makes a rough cut; the second is quite smooth and clean.

Crane.—The best crane for the smithy is a wall-crane that leaves the whole of the space underneath the jib quite clear. The framing is triangular, comprising the horizontal jib, the diagonal tie-rods above the jib, and the vertical rod upon which the whole swings. The top and bottom pivots of the vertical member turn in castings bolted through the wall. The jib is formed of flat parallel bars, upon which a light carriage or jenny runs, and from which the chain depends. The chain may be an endless chain with a loose sheave-pulley and hook, suitable for light weights; or differential pulley-blocks may be suspended from a hook for lifting heavy loads. The length of the jib will be such that it will command the forge-fire, the anvil, and, if necessary, any other appliances.

(3) *Storage of Bars and Rods.*—The stock of iron and steel bars and rods of a smithy should be kept in a shed, or at one side or end of the shop, stacked against a wall, the bars standing upon the ground and leaning against the wall. They can then be picked out without having to remove some bars to get at others, as must be the case when they are laid horizontally. As far as room will permit, all bars of different dimensions should be kept distinct. Short horizontal rods should be driven into the wall, standing out a foot or more, to divide the space into bays for iron of different sections and sizes—something similar to the arrangements used for stacking timber on end.

Storage of Scrap.—Odds and ends of iron bar and rod, and pieces cut off forgings, accumulate rapidly in a smithy. They are all valuable in turn, because they frequently save the cutting of a long bar. The best way to store these is at one end of the shop, spread over the ground; or, if space is limited, upon a stand like that used for the die-blocks and spring-swages. The less they are piled up the better, because, if spread thinly, any pieces required are more quickly seen, and selected for use.

Conditions affecting the Future of the Craft.—Owing to the gradual introduction of labour-saving machines into smiths' shops—the steam-hammers, bolt-machines, forging-machines, saws, etc.—and the increasing practice of stamping or die-forging, the craft of the smith is being affected in the same way that other crafts are being influenced. The inevitable result is sure to follow. Some considerable amount of skill will be sacrificed to specialty and to mechanical routine, and all-round smiths will become more and more scarce. But it cannot be helped. We are, all of us, the offspring of our age, and are borne along by its tendencies. All the more reason, however, why every craftsman should endeavour to gain a broad culture, and keep in touch with all modern improvements and studies bearing on his craft, and thus supplement the inevitable narrowing influences of the modern division of labour, and atrophy of manual skill and of the art of craftsmanship brought about by machinery.

HOW TO CONVERT AN OLD HAND-BELL INTO AN ELECTRIC BELL.

BY G. E. BONNEY.

THE CLASS OF BELLS WHICH MAY BE CONVERTED—THE GONG—THE MAGNET CORE—THE ARMATURE—THE BOBBIN AND COIL—THE CONTACT SPRING—FITTING THE PARTS—BATTERY TO RING THE BELL.

INQUIRIES from correspondents respecting the internal fittings and mechanism of a Jensen electric bell have led me to think that there may be a few amateurs who are the happy possessors of old bell gongs which they may like to fit up as electric bells. The gongs referred to here, are those belonging to house-bells, worked with wires and cranks, or hand-bells of the church-bell pattern. These may be utilised as gongs for electric bells, and the fittings for the same may be enclosed inside the gongs, as in the bells introduced by Mr. Jensen. As there may be some readers of WORK who would thus like to try their hands at converting a gong of the old system into an electric bell of the new system, I herewith give a few simple directions and diagrams to show how it may be done.

The Gong.—First a few words respecting the gong—that is, the bell itself—as we find it in the lumber room. It may be dirty and dusty, and attached to a rusty spring. We can do very well without all these accessories, so will clear them away at once. We will not bother ourselves about a handle to the bell until it is nearly finished. The bell may be of any size, from 1½ in. across the mouth up to 6 in. I do not advise working on a larger or a smaller size than the above, as the smaller sizes will not afford much room to work in, and the larger sizes will take up too much battery power to work them. By this hint it will be understood that the fittings will have to be adapted to the size of the bell, and must be made proportionate throughout. I shall, therefore, not be able to give measurements of the various parts, as these must be found by measurements of the bells, but will give rules for obtaining these measurements, and also give the shapes of the various parts. The bell must be first cleaned, and the rusty spring taken off with an old rasp file; then a hole must be drilled exactly through the centre of the crown to receive the screwed shank of the magnet core and its insulating sleeve. The internal fittings of the bell will be held up by this shank, and it will also serve to convey the current to the magnet. It must therefore be strong, and must be insulated from the bell. A hole $\frac{3}{16}$ in. in diameter would be large enough to take the shank, but as this must be surrounded by an insulating sleeve of ebonite or boxwood, it will be advisable to take out enough to form a ⅜ in. hole. This done, the bell will be ready for its fittings.

The Magnet Core.—In electric bells, there are usually two magnet cores, to hold two bobbins filled with wire. In this bell we have little space at our command, so shall have to put up with only one core and one bobbin of wire. As part of the core will pass through a hole in the crown of the bell, and be held in position by a nut on the top, we must take measurements for length of core from fully ⅜ in. above the top of the gong down through the centre to within ½ in. of the bottom. This will give the length; now for the diameter. This should be ¼ in. for a 1½ in. to 2½ in. gong, ⅜ in. for a 3 in. up to 4 in. gong, and ½ in. for gongs above 4 in. up to 6 in. The material must be best soft iron. One end of this small bar must be turned down to form a shank, to pass through the hole made in the crown of the gong, and a screw-thread cut on its upper part (to fit the nuts, Figs. 8 and 9), as shown at Fig. 1. Just above the shoulder of this shank we shall want a thin collar or washer of ebonite or boxwood, to insulate the shoulder from the gong and to carry the contact spring, so must leave the shank long enough to take this, which must be thick enough to carry two short screws for holding up the contact spring. About ¼ in. below the shoulder, drill a small hole right through the core, to take a pin on which the gimbal or loose sleeve of the armature and hammer will hang. The lower part of the core should now be turned smoothly, and the upper pole-piece fitted to it. This pole-piece (shown at Fig. 2) is another piece of soft iron, from $\frac{3}{16}$ in. to ¼ in. in thickness, wide enough to allow a hole in one end to fit on the core, and long enough to allow the other end to project a little over the edge of the bobbin, as shown at Fig. 7.

A corresponding pole-piece will go on the end of the core, after the bobbin with its coil of wire has been fitted on the core, so should be got ready now. It must be understood that the very softest and best-annealed iron will be required in core and pole-pieces, to prevent the least trace of permanent magnetism being retained after the iron has been magnetised.

The Armature.—This also must be made out of soft, annealed iron, to the form shown at Fig. 3, then filed smooth and bright. The width of this piece should correspond nearly with the width of the pole-pieces, and its thickness may also be the same, whilst it must be long enough to reach from gimbal to lower pole-piece, as shown at Fig. 7. At the upper end, it must be bent as shown in the figure, and this bent part filed down thin enough to go easily into the jaws of the gimbal, or loose collar holding the armature and hammer, as shown at A (Fig. 2). This part is best made of thin brass, which need not have a greater thickness than $\frac{1}{8}$ in., bent around the core to fit it closely on two sides of the oval. Its form is shown at B (Fig. 2). Its jaws will clasp the upper bent part of the armature, and be secured thereto by two small rivets, passing through holes drilled through the jaws and armature. At the opposite side of the oval, drill a $\frac{3}{16}$ in. hole, to take the end of the hammer-shank, which may be fitted in and soldered, or tapped and screwed in, as may be deemed best by the workman. The hammer-shank may be of iron or hard brass wire, from $\frac{1}{8}$ in. to $\frac{3}{16}$ in. in diameter, and long enough, when bent to shape, to reach from the gimbal down to the lower edge of the bell. The hammer-head is simply a small brass ball or marble, with a small hole drilled and tapped to receive the screwed end of the hammer-shank. The gimbal, with its hammer and armature, may now be set aside until the core has been fitted with its bobbin of wire.

The Bobbin and Coil.—The bobbin or reel on which the coil of wire is to be wound may be made of ebonite or of boxwood, or of *papier-mâché*. It must fit tightly on the core, and its diameter should be about three times the diameter of the core, whilst its length must be governed by the space between the pole-pieces between which it will be snugly clipped. The flanges may be $\frac{1}{16}$ in. to $\frac{1}{8}$ in. in thickness, according to size of bobbin, but the body should be turned down so as to leave just a thin shell between the core and the wire, because a better magnetic effect is produced in the core when the wire is brought close to it. Fill the bobbin with silk-covered copper wire, and see that it is free from kinks, knots, and bare places. The wire should be wound on evenly, as a reel of cotton is wound. Leave out about 4 in. of the commencing end to connect up the coil with; finish off at the same end of the bobbin, and leave about 4 in. of free wire for connections. The sizes of wire should be No. 28 for the small bells, No. 26 for the medium size, and No. 24 for the larger size bells. The bobbin may be wound on the core, or first wound and then slipped on carefully, to prevent fracture of the flanges. The lower pole-piece must then be fitted on with the same care. If the amateur is not able to fit these pole-pieces tight, they may be secured to the core by a small set screw in each piece. The relative positions of these parts are clearly shown in Fig. 7.

The Contact Spring.—This may be cut out of thin spring steel, spring brass, or German silver—the latter being preferable—to the form shown at Fig. 4. The broad part must have two holes drilled in it, as shown, to take two small screws for fixing it to the insulating sleeve (Fig. 5). At the other end solder on a thickening lug of brass to hold the adjusting screw, and drill a hole through lug and spring to take this screw. The small contact screw, shown close by, is made of brass. A tiny hole should be drilled in the end of this screw, and plugged with a tightly-fitting scrap of platinum wire, or a piece of platinum foil may be soldered over the end of the screw. The insulating collar (Fig. 6) should be of ebonite or of boxwood. This will occupy the position shown at A D (Fig. 7), and must be made to fit this part. It will there serve the purpose of holding up the contact spring, and insulating it from the gong and from the core.

Fitting the Parts.—The various parts being all made, we may now fit them together. First, plug the hole in the crown of the gong with the insulating sleeve (Fig. 5). Next place the gimbal in its position on the core, and secure it there by a pin of hard brass passing through gimbal and core. See that the gimbal swings freely on the pin, and is poised aright. The weight of the hammer should keep that side down close to the bobbin when the core is upright. When the armature is pressed against the pole-pieces, it should fit fairly and squarely on them. Now place the insulating collar (Fig. 6), with the contact spring fixed to it, in its proper position in the crown of the bell, and fit the core in its place, just to see how the parts suit each other. Curve the hammer shaft so as to cause the hammer to strike the edge of the bell. Curve the contact spring until it keeps the armature in its right position, close to, but not touching, the pole-pieces. Note where the contact screw touches the armature, and mark the spot. Take these parts out again, and solder a scrap of platinum foil on the back of the armature, on the spot where the contact spring touches it, then place the fittings back in their places. This time we may connect up the coil, and make all secure. Lay bare about $\frac{1}{2}$ in. of each end of the wire; secure one end under the contact spring as shown at D, and the other cleaned end against a cleaned spot on the gong under the insulating collar, as shown at A (Fig. 7).

We may now see about a loop or handle for the bell. This is shown at Fig. 7 as part of the gong. A similar-shaped piece of brass or of copper may be soldered to our finished bell in the same position, or a piece of No. 8 brass or copper wire will serve the purpose for small bells. The handle will be hung on a bracket, and one of the line wires connected to the bracket, under one of its screws. The handle and the bracket will therefore form parts of the electric circuit; therefore, all points of contact must be clean. The other line wire will be connected to the binding screw on the bell, at the top of the magnet core. This wire should therefore be coiled in the form of a helix at the end, to ensure due flexibility.

Battery to Ring the Bell.—Two No. 2 Leclanché or Gassner, or E.S. dry cells will serve to ring the small bells, but three Gassner, or E.S. dry cells in series are recommended for the other sizes, as a battery of these cells furnishes a large volume of current for a long time without any attention.

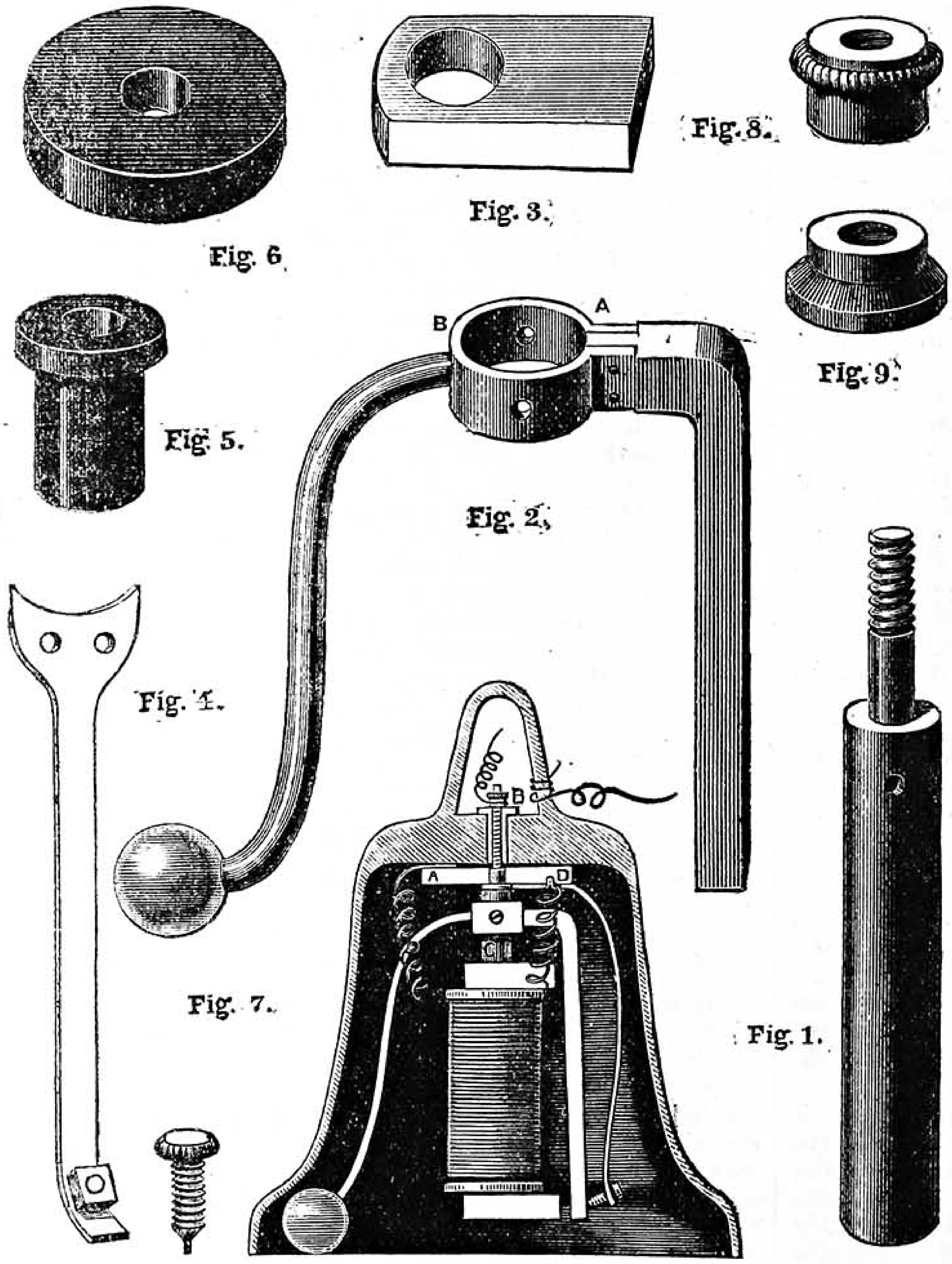


Fig. 1.—Core of Bell Magnet. Fig. 2.—Armature Hammer and Gimbal connected together. Fig. 3.—Pole-Piece of Armature. Fig. 4.—Contact Spring and Screw. Fig. 5.—Insulating Sleeve of Ebonite. Fig. 6.—Insulating Collar of Ebonite. Fig. 7.—Showing Internal Fittings and Connection. Fig. 8.—Upper Connecting Nut of Bell Magnet Core. Fig. 9.—Lower Holding Nut of ditto.

SCARF ORNAMENTS.

BY H. S. GOLDSMITH.

SCARF RINGS.

SPACE being in very great demand in this paper, short introductory remarks are advisable. They will be very few in this case, being merely the statement that this is written to explain the mechanical details of scarf rings—not the artistic. Thus, the same lines will be followed in this case as in the previous papers in WORK on ear-rings and scarf pins.

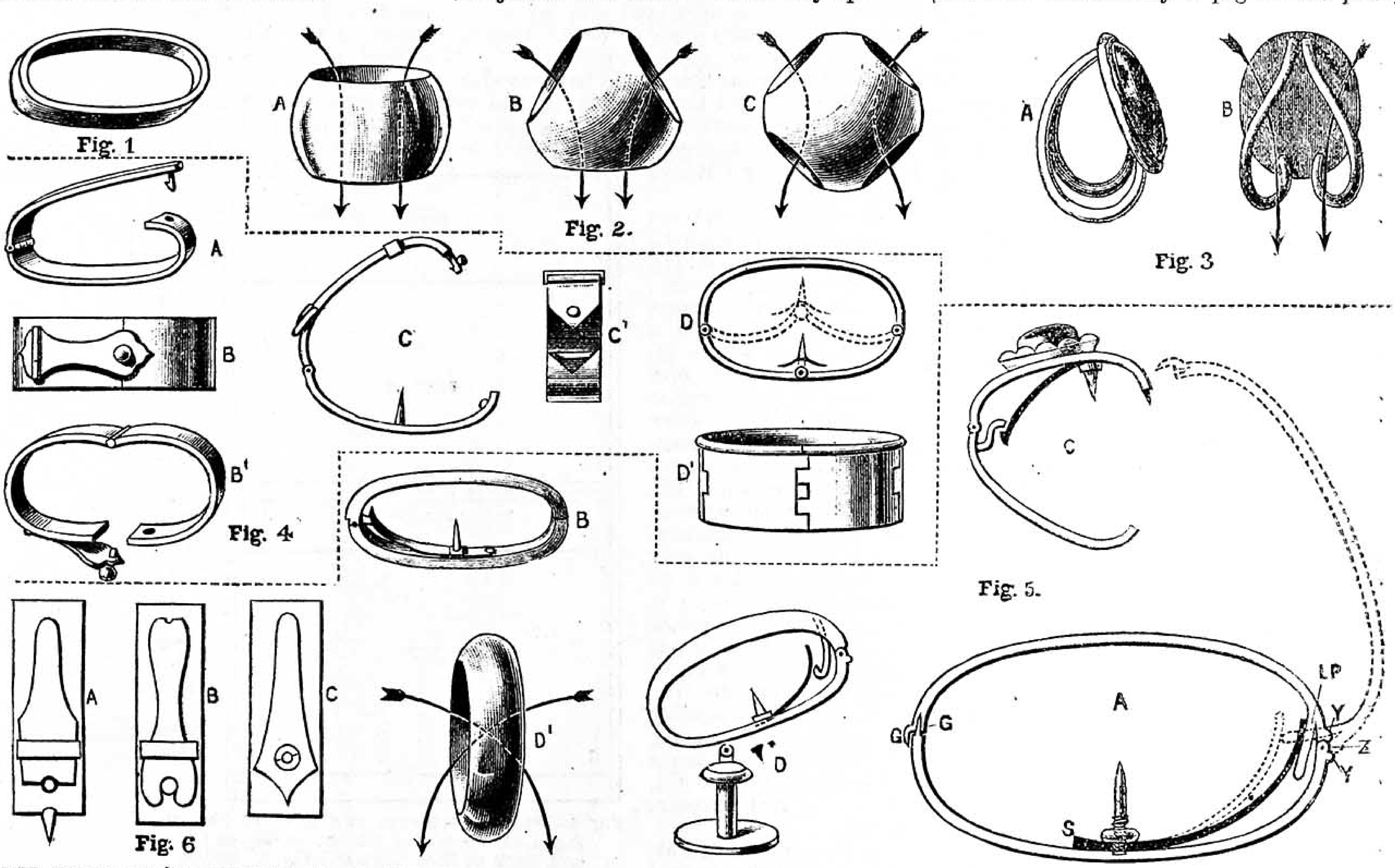
The simplest form of scarf slide or scarf ring is one that merely slides over the scarf, and is retained in its position by the two folds of the scarf, which, when passed through the same aperture, fit the ring or slide rather tight. Such a simple form of this ornament as these (which has nothing added to a plain oval or round mount to obtain security) can be put in the same class as finger rings, when they are used as scarf rings; and one feels rather inclined to believe that finger rings are the real originators of the article, notwithstanding the rather flat, oval form, now the most common shape in which this ornament is found.

that are generally made, and afterwards we can gradually note the complications as they are added. The simplest would be that shown in Fig. 1, which is an oval, plain gold band about 1 in. long and ½ in. wide, the depth being about ¼ in. to ⅜ in. These measurements are not to be taken altogether as standards, but as a fair average, they having been arrived at by comparison and measurement of several.

Three other very simple ones are shown in Fig. 2, A, B, C. They are all made from hollow, round beads, pierced by round holes in the various ways shown, the direction the scarf takes being indicated by the arrows. Of these, Fig 2, B, is the most usual, and can be just as well worn the other way up.

presently, there is a spike often added, which penetrates the scarf, to keep the scarf ring in its place; but with Fig. 3 there is no need of such a spike, because the wire mount is made to fit over the top part of the collar stud, and, generally, spikes cannot be used with any advantage unless there is a joint (as in Fig. 5, A, B, C, D) which allows the ring to reach its proper place on the scarf before it is closed, for it is by the action of closing the scarf ring that the spike is made to penetrate.

The first departure from the simple, rigid form is by making the band of two pieces and jointing them together, such as we see in Fig. 4, A, B, C, D. Three (Fig. 4, A, B, C) are held fastened by a peg on one piece,



RIGID FORMS OF SCARF RINGS. Fig. 1.—Plain Band Scarf Slide. Fig. 2.—A, B, C, Three Simple Forms made from hollow Beads, pierced in different directions, the Arrows showing the direction the Scarf takes. Fig. 3.—Skeleton Scarf Slide Mount—A, Side View; B, Back View. JOINTED FORMS OF SCARF RINGS. Fig. 4.—A, Simple Form, fastening by a Peg snapping into a Hole; B, Another way of using the same Fastening, Front View; B', Side View of same, partly open; C, Fastens by snapping over a Bar; C', End View of same, partly open; D, Three-jointed Form, Side View, showing in Dotted Lines the Position when fastened; D', Back View of same, showing Construction of the Joints. JOINTED FORMS OF SCARF RINGS WITH SPRINGS AND LEVER PIECES. Fig. 5.—A, Enlarged Diagram; the two Halves are jointed at Z, two Stop-pieces to regulate the Opening, Y Y; L P is the Lever Peg attached firmly to one half; S, the Spring which acts against L P, Dotted Lines showing the relative Position when open; G, G, Guiding Pieces at the Shutting Edges; B, Form with Sunk Joint, and different Forms of Lever and Spring; C, Form with another kind of Spring and Shape of Lever Peg; D, One that is intended to be worn vertically instead of horizontally, shown in the Side View for another kind of Lever Peg, and the way it is attached to the Collar Stud; D', Front View of same, the Arrows showing the way the Scarf passes. Fig. 6.—A, B, C, Three Patterns of Springs.

The finger rings most likely to be used for this purpose will be those with a very long oval head, composed of a border of stones surrounding a painting—*i.e.*, memorial rings, which, for the most part, were found to be rather uncomfortable things to wear on account of their size. Even now, it is not at all an uncommon thing to see a diamond ring or a signet ring worn on the scarf. However, it is not with these finger rings that we have to deal in this paper, but with the various forms of ornament especially designed for wear on the scarf—ornament where the scarf is retained in its place by being threaded through some ring-shape or other, instead of being skewered on, as is done with scarf pins.

Barring finger rings, we will, then, consider first the simplest forms of scarf slide

The next one (Fig. 3, A and B) is that wherein spaces or passages for the scarf are arranged by having a wire mount made and attached as shown in the sketches—one a side view and one a back view of the article. In this one the loops, in their upper part, are intended to fit over the front of the collar stud—hang on to it, as it were—and consequently to keep the ornament always well up to the top.

This skeleton pattern, as we may call it, seems the best to use when the front consists of a large oval stone—say, a cameo—for then the stone and its setting need only form the front; while, if a band like Fig. 1 is used for such a shaped stone, it will probably project on each side of the setting, and will not always look as if it belongs to the ornament, but more or less of a makeshift. As we shall see

snapping into a hole (Fig. 4, A and B), or over the bar on the other piece (Fig. 4, C). To either of these a spike, such as shown in Fig. 5, B, can be added.

The fourth (Fig. 4, D) has three hinges, and the position, when closed, is shown in dotted lines. The closed portion here is retained, because the front of the slide—which is somewhat of the shape of a bow—has the ends made to spring slightly inwards, and in that way it acts as a spring to force the inside plate and spike forward against the two parts of the scarf that are passed through it. The spike and plate is on a loose piece of joint, and forms the centre one of the five shown in Fig. 4, D'.

In three of these last, no reserve force is present to keep the ring closed, and once the scarf ring gets open, there is nothing—except, perhaps, a spike—to prevent the scarf ring falling and getting lost. Such conditions not being satisfactory, the type illustrated in Fig. 5 is preferred; but both Figs. 4 and 5 are combined in one article sometimes.

For security, as well as for convenience in adjusting, we find that the greater number of scarf rings are now made like Fig. 5, A, B, C, and D.

These all have springs, so fitted that their force shall be exerted to close the scarf ring, and keep it closed.

In spring scarf slides, the two necessary things to obtain—after we have got our joint well made, and with the guiding pieces (if any) on the shutting edges—are (1) the lever peg, soundly and firmly attached to one half, and so placed and shaped that the spring is able to exert sufficient force on it to keep the two parts closed up; (2) that the spring itself shall be of a suitable shape and strength, and so placed that it will act on the peg as it should do, and yet will allow of sufficient opening of the scarf ring to easily insert the scarf. In the diagrams there are shown different shapes that these lever pegs take, and there are also several forms of springs (Fig. 6). The different forms of both one and the other are not very material, for the work in each case is the same, and will be best explained by the enlarged diagram (Fig. 5, A).

The large ellipse represents a side view of a scarf ring, jointed at one end so as to allow an opening of rather less than a right angle. If the scarf slide has to open wider than those shown in the sketches, a longer spring will be required, otherwise it would slip under the lever peg, and would then very effectually prevent the closing of the ring until the joint pin was taken out and the spring readjusted.

One other advantage of this restricted opening is that pressure is always *on* the spring, so it does not require to be fastened in its place with a screw, but will remain perfectly steady and act perfectly well if it is passed under a bar and against a stop, as in Fig. 5, B, and Fig. 6, A and B.

To restrict the opening to the usual angle, we have to do one of three things: two to the joint—viz., either let it in deep, like Fig. 5, B, or else add pieces, or a piece, along the joint, like Fig. 5, A; or, if the spring is held in its place by a screw, it may be made like Fig. 5, C—that is, with a step-like end, to prevent the lever peg going beyond its proper position.

The shutting edges, although sometimes finished flush, like Fig. 5, B, more generally have a raised piece added, which has to do two things. One is to hide the shutting edges if they do not quite meet; the other is to act as a guide to the opposite half, and lead it into its place, right in line with, and close to, the other half.

Another piece is also used to lead the two parts into a correct position one with the other, and that is shown in Fig. 5, A and C—that is to say, a tapering piece, placed on one side so that it will lead the other by fitting into it.

The position of the spikes is often changed from the central position, as in Fig. 5, A, to a place nearer the shutting edges (Fig. 5, C), and one even sees it attached to the side, where more strength can be got than if it were soldered in the middle.

We generally have the spring and spike on the back part of the scarf ring, but there is no particular advantage in that, and on occasion it will be better to reverse the positions, as in Fig. 5, C, particularly if by so doing we can get a firmer base for our spring and spike as we can when an ornament is fixed on the front.

There have been scarf slides made and patented which were intended to retain a vertical position (as Fig. 5, D and D′), the scarf passing as indicated by the arrows. They have not been much used, and seemed to require a special collar stud and peg to steady them.

Although not worn in that vertical position, it is possible to wear most of those we now make in that way, if a change is desired.

The three forms of springs (Fig. 6, A, B, and C) are such as one generally uses. The two first are kept steady by means of transverse bars or bridges, and also by pressing against a stop-piece or bead. One is grooved to fit over the lever piece.

The third is one that would be screwed or held by a nut, and the thickness of gold to be used for all forms would be about size 7 to 10 Shakespeare gauge, and should be hammered to get it nice and tough.

In conclusion, let me say that these things have to be borne in mind: (1), strength of the hinge; (2) the firm attachment of the lever peg, and a good form of same; (3) the strength and firm position of the spring at one end, so as to allow the other end to always act steadily on the peg in the one direction. The length of the spring must be properly considered too, and as for the gold it is made of, let it be rather tough; polish it bright, and also polish that part of the lever peg against which it acts, in order to reduce the friction as much as possible—a polished surface being, of course, better than a coloured, or even a gilt, surface for such purposes as this.

If these things are attended to, there should be no doubt about obtaining a successful result when making a spring scarf slide. If any difficulty is found, there is "Shop" always open for inquiry.

HOW TO MAKE A CARRIAGE FOOT-WARMER.

BY J. L. D.

THOSE who drive to any extent in this bitterly cold weather will, without doubt, appreciate the comfort of a foot-warmer, and many who dabble more or less in amateur mechanics will be able, by following carefully my instructions, to make for themselves a foot-warmer quite equal, if not superior, to those which can be bought.

Some time ago I undertook the manufacture of one for myself, and succeeded fairly well, although tin-plate work is not at all my strong point. Ruminating afterwards on the various stages of my work, I thought out a plan which I imagined would produce a better finished article with less trouble.

To test my new idea I determined to make another foot-warmer for presentation to a friend, and in this I succeeded beyond my most sanguine expectations. The work was so easy that I do not see why any of the readers of WORK who can solder should be without this useful article.

I write, of course, as an amateur, and in this particular branch of manufacture, a poor one, but this ought not to deter my readers from following my example. It ought rather to encourage them to find that a novice succeeded so well.

The size of the foot-warmer will be governed, to a certain extent, by the size of the tin from which it is made.

I got three sheets of strong tin, which is sold under the name of boat tin, and measures 12½ in. by 17 in. The cost is 4d. a sheet. I also got half a pound of tinman's solder: cost 7d., which is, I believe, excessive.

After much calculation I cut the ends out of a piece of tin like Fig. 1, which is a rectangle 9 in. by 7 in. The line A A, dividing the opposite sides into parts 4½ in. and 2½ in. long respectively, makes the two sides from this piece of tin.

When they were separated I placed them together and saw that they were both exactly the same size. Then, with a marking gauge, I drew lines right round each end, as shown in Fig. 1. These lines are ¼ in. from the edges. The little square pieces at the corners I then cut out carefully with the shears. I next turned up the flanges along the marked lines by laying the tin on the planed surface of my lathe-bed, having the line over the edge of the bed, and the ¼ in. flange overhanging; then I struck the overhanging part with a sort of bat, made like Fig. 3, so as to turn down the entire flange at once. With two or three strokes I made the flange at right angles to the remainder. Then I went to the next edge, and so on all round. It required some little practice to strike the whole length of the tin at once with Fig. 3, and occasionally the point or handle would hit first, but this made very little difference, as the whole flange was easily turned in the end. Fig. 3 is of oak, about 10 in. long, 3 in. wide, and 1 in. thick.

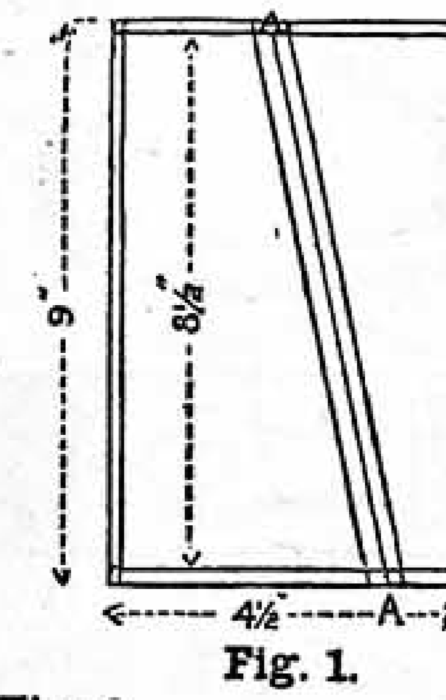


Fig. 1.

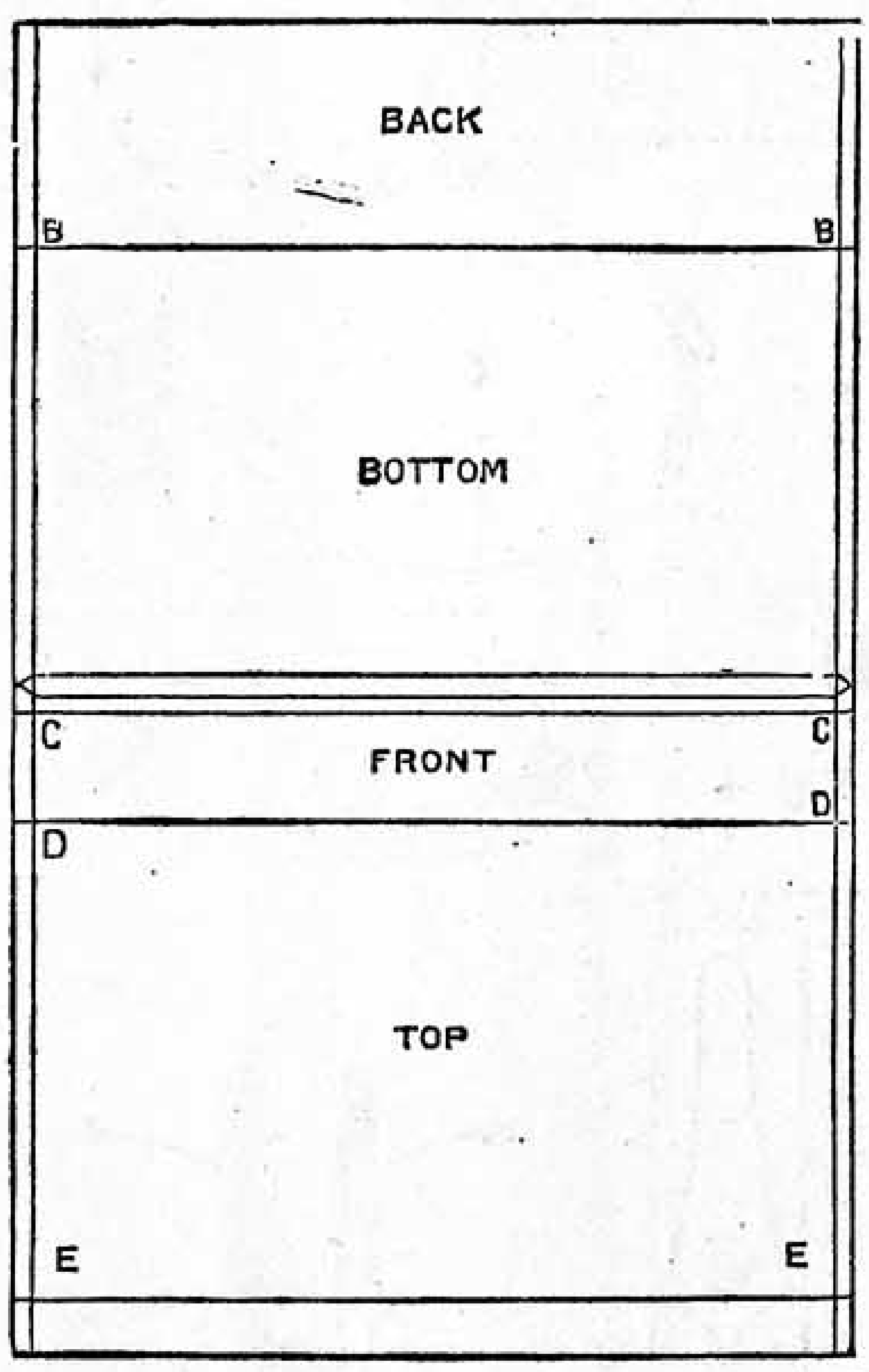


Fig. 2.

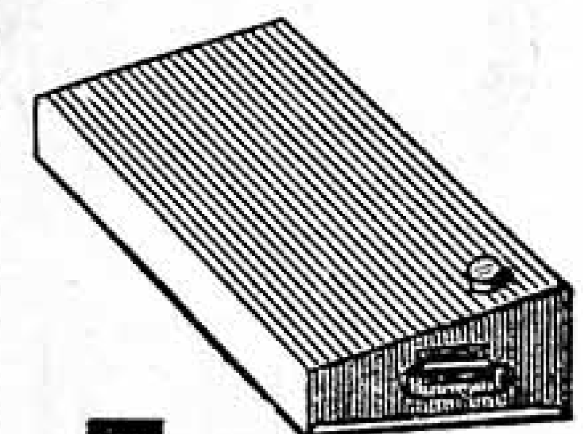


Fig. 4.

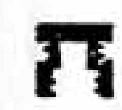


Fig. 5.

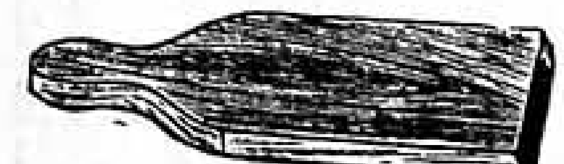


Fig. 3.

Fig. 1.—Piece of Tin with two Ends of Foot-Warmer marked out. Fig. 2.—Piece of Tin (24½ in. by 16½ in.) for Top, Front, Bottom, and Back of Foot-Warmer. Fig. 3.—Mallet for turning Flanges. Fig. 4.—Foot-Warmer complete. Fig. 5.—Section of Cap.

The second end was flanged opposite to the first, so that when they were put back to back the flanges turned out; they were, in fact, right and left, and it is important to remember this before commencing to flange the second.

Having completed the ends, I had to decide upon the proper length for the foot-warmer; 17 in., the length of the tin, I considered too long, and 12 in., the breadth thereof, I thought too narrow, so I fixed upon 15 in. as being the finished length. I therefore cut the two sheets $15\frac{1}{2}$ in. long, the extra $\frac{1}{2}$ in. being for turning in. I then joined the two sheets together, edge to edge, by turning down $\frac{1}{4}$ in. of the edge of one, turning up $\frac{1}{4}$ in. of the edge of the other, hooking them together, and hammering down flat. Before I turned them down, however, I cut the corners off, which served to make the joint thinner at the ends.

I then ran a little solder along the joint at both sides, making sure that it took well all the way. I had now a sheet of tin about $24\frac{1}{2}$ in. by $15\frac{1}{2}$ in., which I proceeded to trim so as to make the edges quite straight and parallel. I then drew lines across it to mark the positions for the bends: B B, 4 in. from the end; C C, $8\frac{1}{2}$ in. from B B; D D, 2 in. from C C; E E, about $8\frac{3}{4}$ in. from D D. In other words, from B B to the edge is the height of the back of the ends; from B B to C C is the breadth of the bottom, and so on all round.

Having these marked lightly with an awl, I turned up the edges of the sheet at right angles to the body, $\frac{1}{4}$ in. wide, and with a triangular file nicked the flanges where the cross lines came—*i.e.*, at the points B, B, C, C, D, D, E, E. I then turned the sheet square up at B B, again square up at C C, and again at E E. I then laid one of the ends in the position which it was finally to occupy, having its flanges turned out, against which the back, the bottom, and the front were lying.

I then ran solder all round the end inside, being careful, especially about the corners. The other end I then put in place and ran solder round it likewise. After this I turned down the flanges of the back, bottom, and front so as to overlap those of the ends. It was necessary now to bend down the top along the line D D, in Fig. 2. I cut a piece of oak the exact length, so as to fit inside the foot-warmer, and 2 in. wide. This I placed in front, resting on the bottom, and had no difficulty in bending the top down sharply over it, afterwards springing it up for the removal of the wood. The inch from E E to the edge overlapped the back and served as a joint. I found it easy to turn in the flange of the top over the ends and solder it from the outside, making all perfectly water-tight. While soldering the overlap at the back I held a piece of wood so as to keep the edge of the tin right down to his fellow, otherwise they had a tendency to part company. It will be seen that the ends are $\frac{1}{4}$ in. inside the edges of the sides of this foot-warmer—something like the bottom of a barrel—and this is the plan which made its construction so easy to me.

In my workshop I found a piece of brass pipe, about $\frac{3}{4}$ in. diameter, screwed into another piece. I bored a hole in the top of the foot-warmer the exact size of the larger piece of pipe, and soldered in about $\frac{1}{4}$ in. of the screwed part. I then cut off a piece of the other which screwed into it, and fitted a cap to that and secured it with solder. Thus I had a screw plug which allowed of the foot-warmer being filled, and kept the water safe when it was in. A handle of wire at the same end completed the work, which has for some time given the greatest satisfaction.

TWO ARMOURERS' HAMMERS.

BY CAROLUS REX.

To fully realise the dignity of handicraft, we must consider the methods of the painstaking and patient masters of the various mechanical arts in bygone ages, while such of their tools and appliances as have come down to us are also revelations of the honour and dignity with which such crafts were originally invested. Who, for instance, can imagine the wielders of such tools as the two hammers here portrayed to have been other than stately and eminently dignified masters of the most honourable and lucrative handicraft of their age? Truly, no mere smiths or workmen were they, but artists keenly alive to all that was graceful and beautiful in connection with their calling, as well as skilful workers in the metals over which they had the mastery. The tool roughly sketched in Fig. 1 would appear to have been a kind of planishing hammer, and is noticeable not only by reason of the extreme elegance of its ornamentation (which the writer has only succeeded in caricaturing in his very rough drawing), but also on account of the very peculiar shape of the handle, which, moreover, is covered with chamois-leather. No mere labourer or 'prentice hand could have used, effectively, this hammer. Its weight is about six pounds, and its face is a plane surface; hence, without great skill, every blow would bruise. The head is of chiselled steel, highly wrought and exquisitely finished, and there are few modern die-sinkers who could turn out as creditable a piece of work. The piggish-looking head shown in my sketch is, in the original, that of a conventional dolphin, and on the other side there is another head—that of a lion—in equally high relief. The scroll-work is also delicately undercut, and the execution throughout is evidently that of a master hand. The other hammer, portrayed in Fig. 2, is widely different in shape, material, and treatment. It is of bronze, gilt, and damascened with wire of various colours. The shaft of this tool is also a work of art, every portion, with the one exception of the steel ferrule next the head, being beautifully inlaid. The wood is of dark colour, something like cocoa wood, and the stars of the upper part are of gold wire. Towards the lower third of the handle is an ivory ferrule, shown plain in the sketch. The lowest section is of the same dark wood as the upper, and is elegantly inlaid with gold wire in the form of scroll-work. The head, in this case, is not square, but has the section of a flattened diamond figure (see Fig. 3). At the extreme end of the shaft there is a small ferrule of ebony. According to our modern ideas, such a handle would be the reverse of "handy," as, for the matter of that, would be the head also; but from the amount of time, labour, and skill expended upon head and shaft alike, these would appear to have been accepted patterns. It is easy to imagine one of the polished and polite, but brutal, Florentine nobles picking up such tools while lounging in the workshop of his armourer, and looking with reverence and admiration on them as evidences of the skill and dexterity of the craftsman. We can also imagine the smile of complacency which the face of the master would wear when complimented upon his efforts, as well as the scarcely veiled contempt which he surely felt for the wearers of his handiwork, whose only art or accomplishment was the ability to deal hard knocks. We might easily sermonise at great length over such magnificent tools, but must not take up more space. As the knowledge of the implements used by former craftsmen

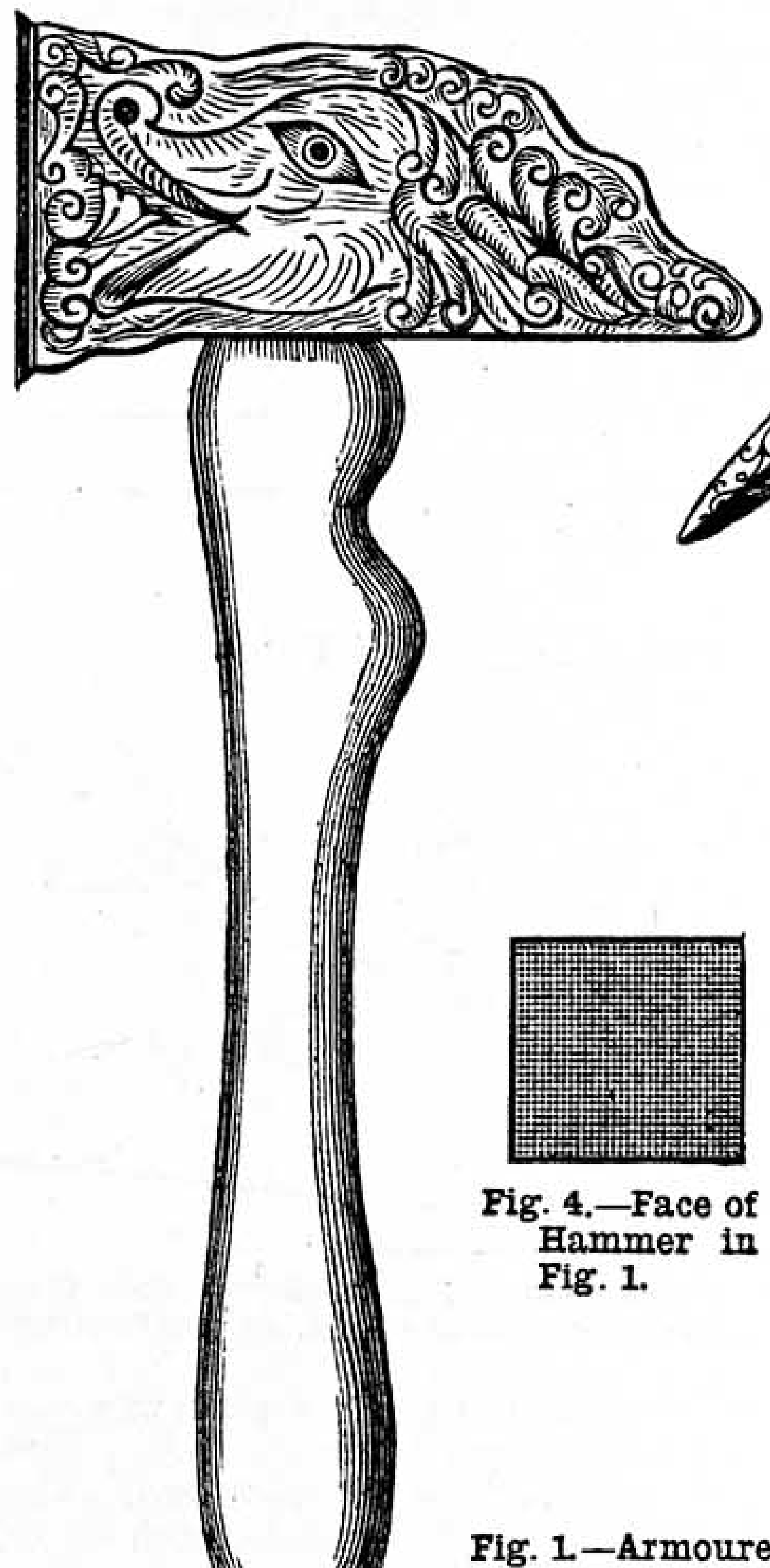


Fig. 1.—Armourer's Hammer. Italian, Sixteenth Century.

Fig. 4.—Face of Hammer in Fig. 1.

Fig. 3.—Face of Hammer in Fig. 2.

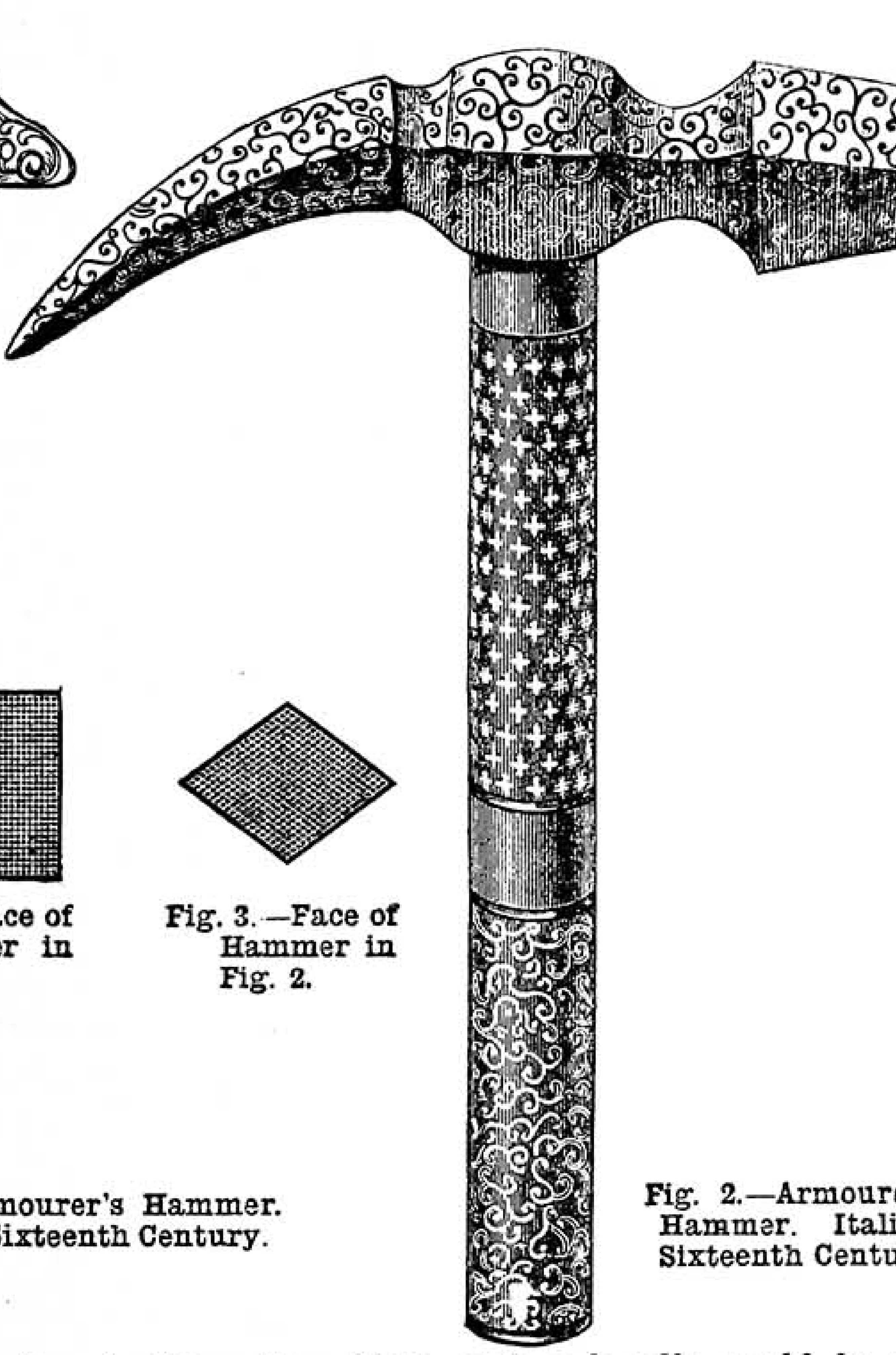


Fig. 2.—Armourer's Hammer. Italian, Sixteenth Century.

is of great use to those of the present day, the writer gives these two ancient tools for what they are worth.

SCREWING TACKLE.

BY DAMON.

Screw-Cutting—Screw-Plates.

Outside threads or screws can be cut either with screw-plates and dies, or in the lathe. The screw-plates and dies have several cutting edges, and form several threads—or rather several turns of the thread—at the same time. In the lathe a single pointed tool is generally used, though not always. Modern machinery, made specially for screw-making, is generally adapted to use a modification of the ordinary stocks and dies. Screw-plates and dies can be applied either by hand or power. I propose to take the screw-plate as used for screw-cutting by hand first, as it is the simplest, and pass on to the others later.

Screw-plates are generally used for making only the smallest sizes of screws, say, from $\frac{1}{8}$ in. downwards, although they are occasionally made as large as $\frac{1}{4}$ in. One form is shown in Fig. 1. It consists of a flat plate of the best tool steel, varying in thickness from one-half to the full diameter of the screw it is intended to cut. Of course, if several sizes of holes are made in the one plate, the thickness is made suitable for the largest. This plate is drilled with a series of holes corresponding to the sizes of screws it is intended to cut. The chief fault of screw-plates is that the position of the cutting edges with regard to each other is fixed—that is, they cannot be separated or brought closer together. To attempt to cut a full thread by forcing a plate having a standard size tapped hole in it over the rod to be screwed would require the exertion of so much power, apart from the difficulty of getting the plate to start, that the rod or pin would be twisted and perhaps broken. To avoid this, several holes of different diameters are used for the one size of screw. The first one, which is of course the largest, merely marks out the thread. The others are used in succession, each one cutting the thread a little deeper, until the last makes a full thread of the standard diameter. For the very smallest sizes of screws, two or three holes are used; for the larger ones, four, or even six. The holes belonging to one set are connected by lines, as shown in Fig. 1. These lines can be cut with a chisel before the plate is hardened.

Having settled the number of holes and their diameters, they are drilled in the plate, which has been previously planed or ground flat on both sides. The holes are generally opened out slightly on the starting side, to make the thread easier to start; though the last hole of a set, which is used more as a gauge than a cutter, is not. The holes are then tapped with a special tap, called a "master" tap. This tap, as I described in my last paper, has more grooves cut in it than an ordinary tap, giving more cutting faces; but, with this exception, it is made and hardened in the ordinary way. The next step is to provide these holes with cutting edges. There are several methods of producing the cutting edges. The most usual is shown in Fig. 1, and at A, Fig. 3. Two small holes are drilled, one on each side of the tapped hole, and close to it. The three holes are then connected by cutting through the metal between them, either with a saw or a small file. This gives four cutting faces, two of which operate when the plate is moved round in one direction, and two when the motion is reversed. This method gives good cutting edges and plenty of room for the cuttings. It is not liable to break in hardening, and is easily cleaned. Sometimes the small holes are omitted, but just the notches cut, as at B, Fig. 3; while occasionally, the holes for the same size of screw are joined together by the notches, as at C, Fig. 3. This latter method has this advantage: If the piece of wire being screwed happens to break off short in the plate, a small saw can be readily used to cut the bit in two. This loosens it, and it is easily removed. The cutting edges having been made, each set of holes is stamped with the size of screw they cut. The plate is then ready for hardening.

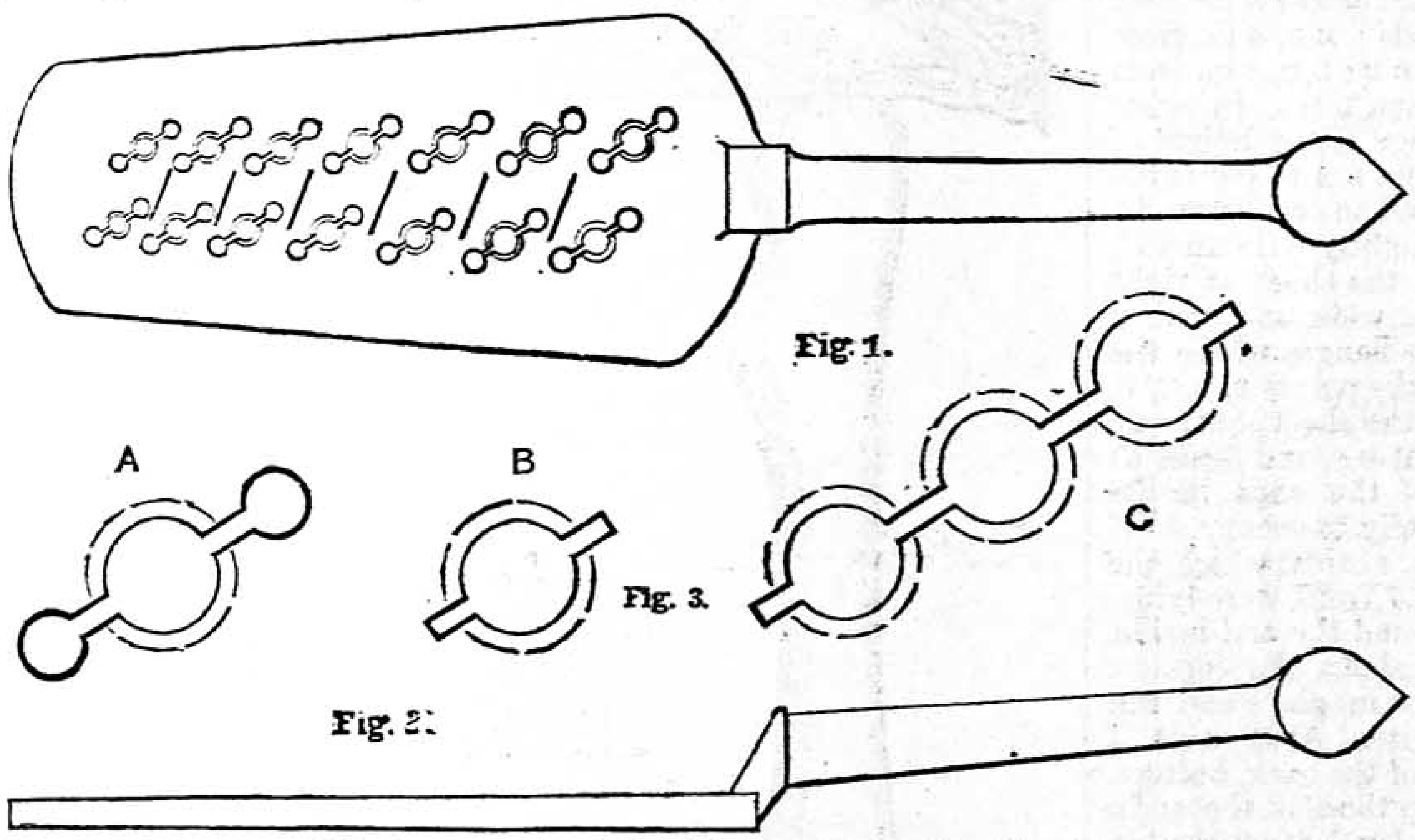


Fig. 1.—Shows Plan of Ordinary Screw-Plate. Fig. 2.—Shows Side Elevation of ditto. Fig. 3.—A, B, C, shows Three Methods of producing the Cutting Faces.

In hardening, there is nothing special, except that care must be taken to heat the plate evenly, and avoid burning the cutting edges. Temper slowly to the usual "dark straw" colour.

Screw-plates have occasionally been made for $\frac{1}{2}$ in., and even larger, screws. In these sizes three or four notches are sometimes cut, giving six and eight cutting faces respectively; only half of them, however, acting at the same time, the particular faces cutting depending on the direction in which the plate is turned. For all sizes above $\frac{1}{8}$ in., however, I personally prefer the stock and dies.

The iron intended to be screwed by a plate is generally held in a vice. The point is filed a little taper to enable the plate to start more easily. After the point has been filed up, the plate is applied, the largest hole of the set being used first. Downward pressure, varying with the size of the screw, is necessary to start the thread, after which the plate moves forward by its own action. Starting the thread is the great difficulty. The plate must be kept square with the rod being screwed, or what is known as a "drunken" thread will be made. A little practice will soon give the necessary skill. Of course, the more the point of the iron rod is tapered, the easier it is to start the thread; but, then, all this tapered portion may have to be cut off after the thread is finished, which is a waste both of material and time. Besides, in short screws there is not length enough to allow much tapering, so that it is better to learn to do with as little as possible. Oil is used as a lubricant with iron and steel, but is not required for brass. The plate is worked both forward and backward, and should not be forced on too fast, or the rod will be twisted. A thread can be cut with a plate right up to a shoulder or to the head of a screw. After being used, the holes in the plate should be cleaned, or the next time it is used the cuttings may bind, and break the thread in the plate.

If the rod on which it is desired to cut a thread is steel, and is hard, or has hard places in it, it should be softened before the plate is applied, or the cutting edges will soon be worn out or broken. If the rod or pin to be threaded has been turned in the lathe, it is generally left in the chuck, the point slightly tapered and the plate pressed against it, the lathe meanwhile being pulled round by hand. The screw-plate is sometimes used as a gauge to size when a number of screws have to be cut the same diameter. The screws are cut as nearly alike as possible, and the plate is then passed over them to ensure their similarity. In small machines—such as sewing-machines and automatic tools, which are turned out in duplicate in large numbers—all the separate parts are made interchangeable, so that repairs are more easily executed. All the screws have therefore to be alike, and a screw-plate is a ready means of insuring this.

It must be noticed, by the way, in drilling the holes in a plate, that they must not be drilled the same diameter as the screw they are intended to cut, but what is known as the "tapping size" of that screw—that is, the diameter at the bottom of the thread.

A FOLDING OR CAMPING-OUT TABLE.

BY A. CABE.

Herewith is illustrated a new form of folding or portable table, of which I, as a practical cabinet maker, have recently made a number. It is admirably adapted for camping out or for summer garden use, and indoors is an excellent breakfast table for, say, a couple of diners; or in the drawing-room, where, made of wood to harmonise with the other furniture, it is a very useful occasional or side table.

I made the first one as a small breakfast table, to stow away when not in use, being limited for room. The arrangement and construction of the folding framework is quite an original idea, and it is given for the benefit of any readers of WORK who may choose to make it, or have it made for them.

The table in question, which I am at this minute using to write this paper, is made entirely of mahogany. It may be made of other woods, such as oak, American black walnut, or yellow pine. The table stands 29 in. high, and the top is 30 in. long by 24 in. broad. The top is made in three pieces hinged together, the central piece being 4 in. broad and the two hinged leaves being each 10 in. broad, the whole being $\frac{3}{4}$ in. thick. The chief peculiarity, however, consists in the hinged framework.

In the annexed drawings and diagrams, Fig. 1 is the table open for use; Fig. 2 the table folded, when the space it takes up is 8 in. broad, and the frame part is the same length as the central frame. The leg is $1\frac{1}{4}$ in. square, tapering from the middle of its length to $\frac{3}{4}$ in. square where it touches the ground. The two rails and the hingeing stile are all $\frac{3}{4}$ in. thick, upper rail 2 in., lower rail and hingeing stile $1\frac{1}{4}$ in. broad. The hingeing stile projects downwards, and is rounded off the same as the uprights in central frame. These four frames are made in two pairs, or if the $\frac{3}{4}$ in. rails are let into the centre of the $1\frac{1}{4}$ in. legs, instead of flush on one side, then the four frames are all alike. None of the mortises are mortised through, being only 1 in. deep, and cut with a $\frac{5}{16}$ in. mortise chisel (see Fig. 4, A and B). This is a rule that holds good in all cabinet work, as distinguished from joiners' work. The joiner makes all his mortises through, and wedges them on the outside. All the frames of this table are dressed square on the edges; this, of course, is the simplest support the top should fold out to a right angle; it will be enough for them to be at the angle of about 40°, as in Fig. 7. At this angle I insert, in the top on the under-side, small stop-pins $\frac{3}{8}$ in. thick, and projecting downward $\frac{1}{4}$ in. The four frames stop against these pins in the position as shown in Fig. 1.

On the ground of economy, iron hinges might be substituted for the brass ones, being only about a third of the price. The whole table is French polished, but the frames may be only varnished, and the top polished, if required to be finished cheap.

The table, as may be seen, is a very simple one for the amateur cabinet maker to construct, and anyone going in for it will have a table useful, handy, and really original in design. It is far superior to many so-called occasional tables, partly by reason of the facility with which it is reduced in size, or extended when reduced, and partly on

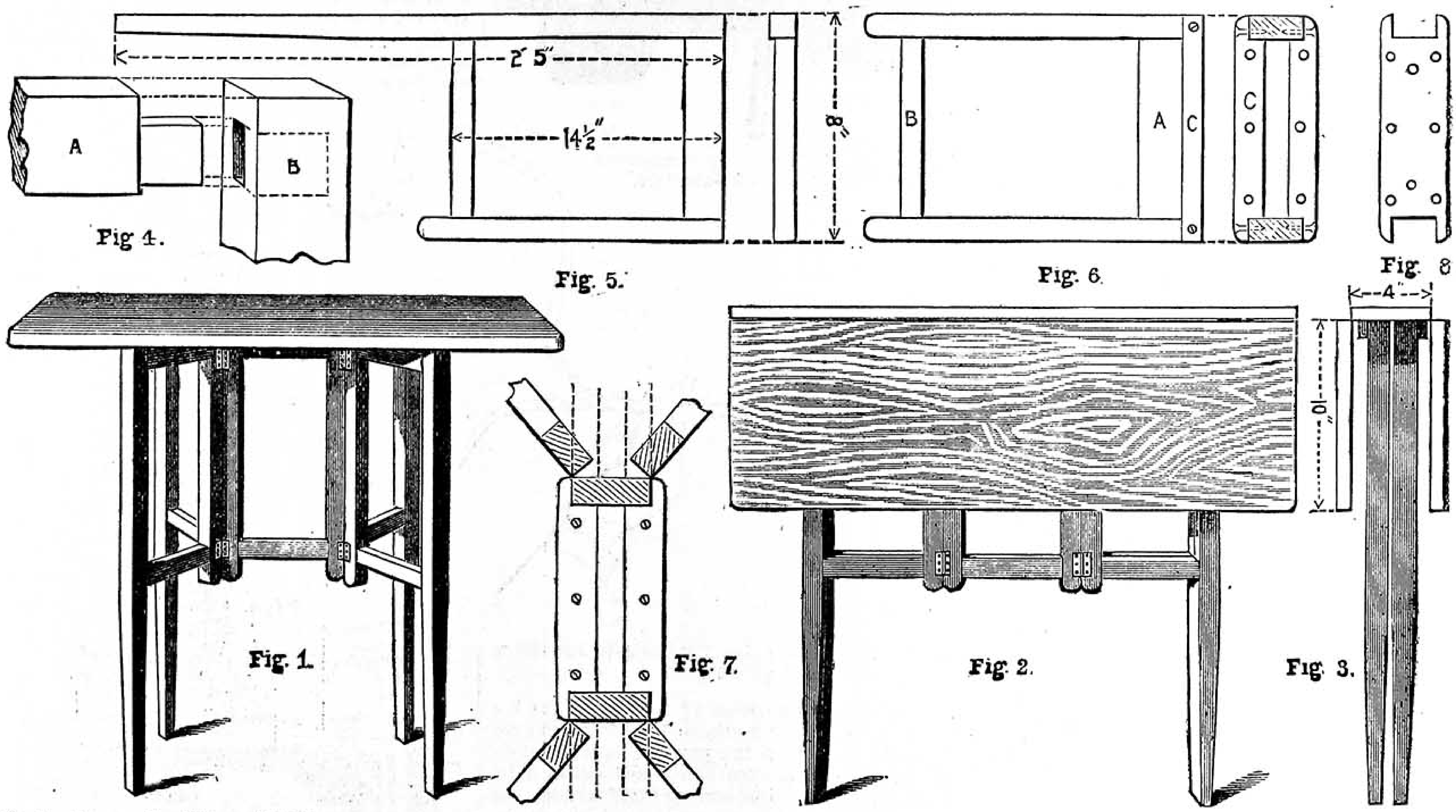


Fig. 1.—Perspective View of Table open. Fig. 2.—Table folded. Fig. 3.—End View folded. Fig. 4.—The Mortise and Tenon. Fig. 5.—The Leg Frame. Fig. 6.—The Central Frame. Fig. 7.—Method of hingeing Legs and clamping Frame to Table. Fig. 8.—Piece to fit over Frame.

only $5\frac{1}{2}$ in. (see Fig. 3, which is the end view when folded flat). The diagrams, Figs. 4, 5, 6, and 7, show the structural parts before being put together as a whole. First of all, Fig. 6, the central frame, to which the four legs are hinged, is made. The two uprights are 2 in. by $1\frac{1}{4}$ in.; the upper rail, A, is 2 in. broad by $\frac{3}{4}$ in. thick, and the bottom rail, B, $1\frac{1}{4}$ in. by $\frac{3}{4}$ in. The breadth of this frame is 8 in., and the height over rails $14\frac{1}{2}$ in. The lower ends project downwards $1\frac{1}{2}$ in., and are rounded as shown. On the top of this frame a piece, C, is fitted, 8 in. long and $3\frac{1}{2}$ in. broad, and 1 in. thick. It is cut in at the ends, as shown in Fig. 8, to fit neatly between the uprights of the frame, and is glued and screwed down to the top of rail, A. Four screws are also put through the ends into the uprights (see C, Fig. 6). This top piece is to fix to the under-side of the central portion of the top, and the frame serves the purpose of a table pillar when so fixed (though it does not reach the ground), whereon to fix the four framed legs. One of these frames (Fig. 5) is shown. It also is form. The rails might be stop-chamfered or cut away according to fancy, or perhaps to match some other furniture. The legs might be turned instead of square, or they might be square-chamfered. The frames being square-framed up, and nicely cleaned off and glass-papered, what remains is to hinge them to the central frame. For this I use $2\frac{1}{2}$ in. brass hinges, four pairs for the leg frames and two pairs for the hinged top. When hinged together they should be perfectly level on the top edges, both with each other and with the central plate, C (Fig. 6). I have shown the top hinged, a plain square joint being the simplest method. A much neater method, however, is what is called the Pembroke quadrant joint; in it the hinges are quite invisible, but it requires a pair of planes specially made for the purpose, besides careful fitting and working up. The hinges of the top should be sunk fully the thickness of the hinge plates, so that the leaves when folded down will show a close joint at the inner junction.

It is not necessary that the frames to

account of the many purposes it may be made to serve.

SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

MITRES AND SCRIBES.

THE word "mitre," which appears to be borrowed from an ecclesiastical ornament, is used by wood-workers to express a joint which bisects an angle, giving to each piece of the material joined *equal* angles. The great majority of mitred joints require the united pieces to make a right angle, or 90°. The mitre angle, therefore, unless otherwise described, is always understood to be 45°. Picture-frames present a good illustration of mitres. As a rectangular figure must have its opposite sides parallel, it must also, of necessity, have its opposite sides equal. If these conditions are to be secured, the eight surfaces, which form by contact the four uniting joints, must be equal in angle to each other. Taking our illustration from a picture-frame, a little consideration will show that a joint, to be satisfactory, must be at right angles to the plane of the frame in one direction, and must bisect a right angle in the other direction. Now, for mitres of the ordinary type—that is, of 45° —an appliance is, or should be, made by every worker. It would greatly help to secure a correct understanding of special requirements if the worker endeavoured to contrive any appliance to assist him. In the case of ordinary mitres, this is so well known that scarcely anyone makes the mitred joints of picture-frames and other right-angled work without the use of the mitre shooting-board.

For the rare cases in which other than right angles are required, it would not pay for the trouble to make a special block, but a very simple expedient presents itself. Suppose a triangular panel—such as that often used for enclosing the space below stairs—is to be moulded, the moulding itself may be made to assist, being parallel and fairly straight. A pencil-line can be made at the distance from the frame that the width of the moulding indicates. These lines will intersect, and a line drawn from the intersection to the angle of the frame and panel will show the mitred joint. The moulding may be cut to this line, and will then intersect properly.

In moulding door-panels, etc., it is best to cut each piece to fit equally tight, for the ends of a mitred piece of moulding are so easily bruised, and, of course, thereby shortened, that slight differences are easily overlooked in such a case. To make the best of it, put the tightly fitting pieces in last, bending slightly, so that the ends are adjusted first, and the middle pressed down afterwards. This expedient cannot be resorted to in the case of short lengths of stout moulding. Scribing mouldings is a useful method in internal angles, often used in sashes. It consists in tracing the line, which would be made in mitring, on *one* of the intersecting mouldings, and not on both. All the wood that would be covered by the moulding must be then cut away with chisels and gouges, exactly up to the traced line. This, if done properly, is equal to a mitre in appearance, and gives a slight opportunity of adjustment, which the mitre does not.

The judgment of the operator must decide which piece is to be scribed, and which left square. Scribing is often resorted to when various moulded members of different pattern are brought together, in which case a template is of great assistance.

OUR GUIDE TO GOOD THINGS.

**** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

116.—Aublet, Harry & Co.'s Improved Instantaneous Band-Saw Vice.

The length and peculiar formation of the band saw, which, after the manner of an endless cord, is an endless strip of serrated metal, renders it somewhat difficult to hold in a fixed position during the operation of sharpening and setting. It has been reserved for Messrs. Aublet, Harry and Co., who are as yet best known by reason of the excellent quality of the French band saws that they supply, to introduce a vice of sufficient length and sufficient power of grip to hold with firmness a tolerably long piece of a band saw in its jaws while the saw itself is being sharpened and set. The vice itself, when fixed in position to take the saw-blade, is shown in Fig. 1. The jaws and, indeed, the vice itself, are 13½ in. long. The pressure of the jaws which grip and hold the vice is greatest when the handle is in the position shown. When the handle is raised, the pressure is diminished, and the saw-blade is easily removed; but when the handle is depressed, the jaws of the vice are driven into the closest possible contact with the saw, and the saw-blade is held immovable in their grip. This

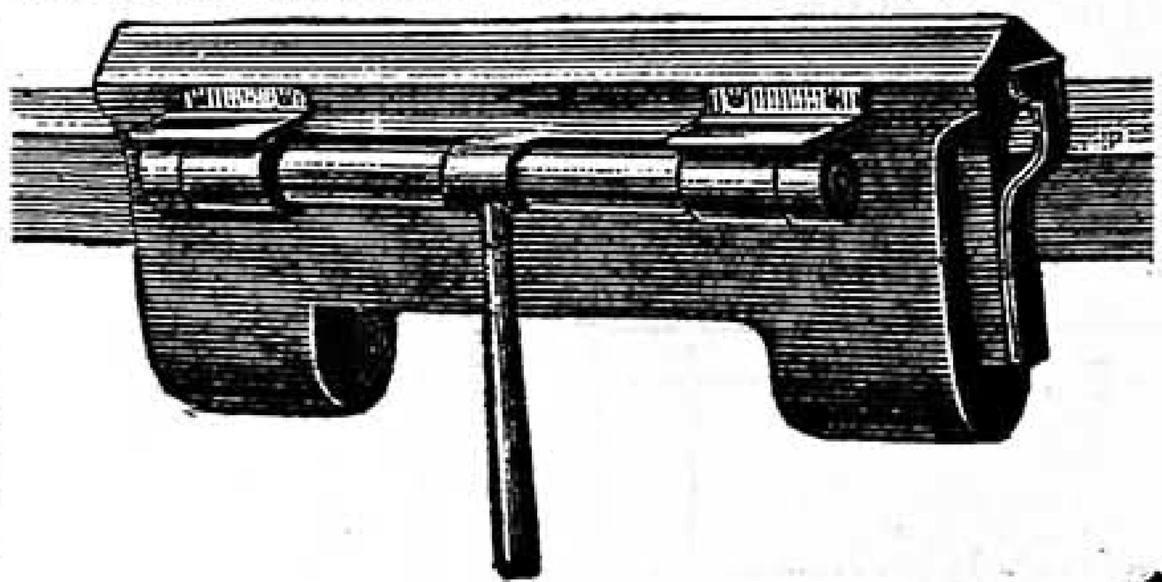


Fig. 1.—Aublet, Harry & Co.'s Improved Instantaneous Band-Saw Vice.

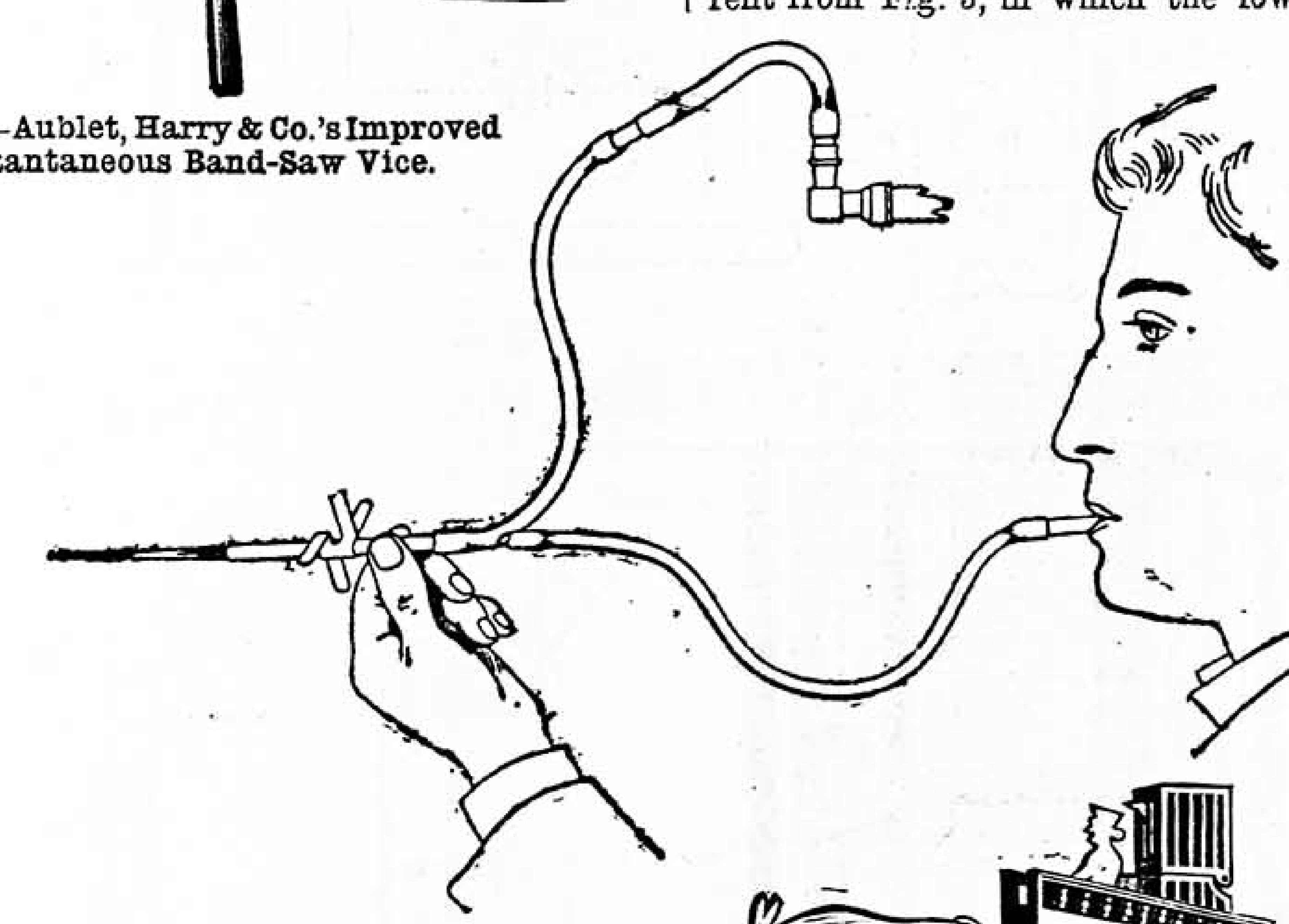


Fig. 2.—Moor's Blowpipe, for Dentists, Jewellers, Opticians, etc.

is produced by the action of the ends of the bar to which the handle is attached, after the manner of a cam, and when the pressure is withdrawn the jaw in front is apparently fixed outward by the expansion of coiled springs fitted within. At each end of the vice are guides which can be adjusted to suit any width of band saw. The price of the vice is 25s. They should be found in every workshop in which band saws are used.

117.—Moor's Blowpipe, for Dentists, Jewellers, Opticians, etc.

A short time since I had the pleasure of noticing an excellent retort stand, which had been invented and introduced for use in the chemical laboratory by Mr. C. G. Moor. He has now placed operative and analytical chemists, dentists, jewellers, opticians, and others under new obligations to him by the introduction of his new blowpipe, as above, which is admirably adapted for the work of brazing and hard soldering, and equally well adapted for ordinary soft soldering, as practised in the metal trades. The blowpipe itself, as Mr. Moor himself explains, "is simple in construction, substantially made, and does not easily get out of order." Its construction will be understood from Fig. 2. The frame can be easily regulated in size, and is of great intensity. A supply of gas is obtained from any gas burner by means of the upper tube, the end of which is composed of tubing of larger diameter than the other tubes, that it may be the more readily slipped over the burner. The lower tube is fitted at the end with a glass mouthpiece, through which the operator blows to increase the intensity of the flame. The lower tube is led into the upper tube near the end of the latter, and the gas and mingled air then passes through a metal tube, to which are attached metal arms in a cruciform arrangement which slides along the tube. These apparently form a support for the metal end of the blowpipe when laid down after using it. The extreme flexibility of the blowpipe, and the ease with which the flame can be directed and applied to all parts of the work, render it a most desirable appliance in the trades named above. The flame gives heat sufficient to melt silver or copper, and even platinum wire when used with hydrogen. The size of the flame can be regulated when in use by compressing the gas tube between the fingers and the palm of the hand. The price of the instrument complete, post free, is only 2s. 9d.

118.—Automatic Savings Bank in Fretwork.

Messrs. I. & J. Soar have recently produced some capital designs in fretwork which can be made up into automatic models, which will, no doubt, afford considerable pleasure to those who are fond of this kind of work, both in the making of the toy and in exhibiting its action after it is completed. The value of the model will be apparent from Fig. 3, in which the lower part is a

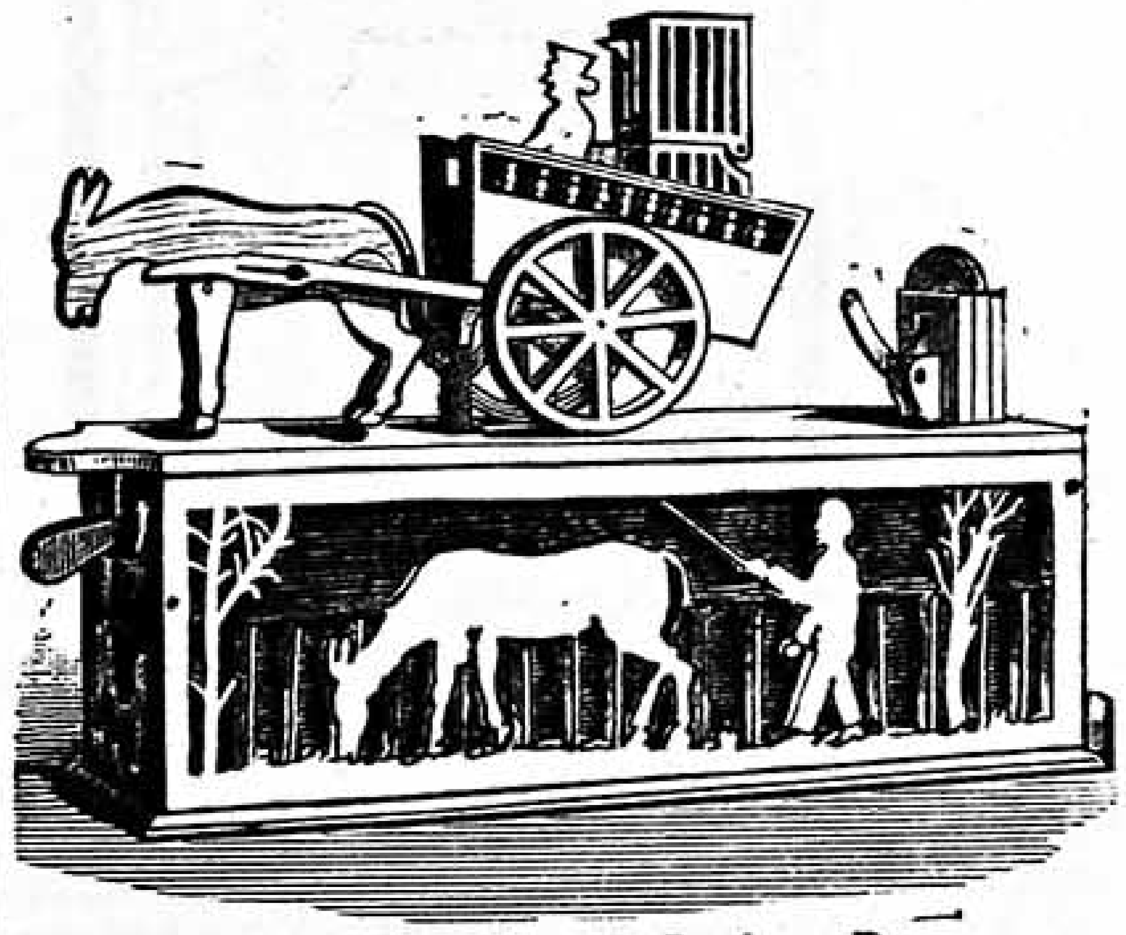


Fig. 3.—Automatic Savings Box.

box formed of fret-cut sides and ends and a catch in front and a door behind, which can be opened at the will of the owner. The fret-cut parts of box should be lined with plush. The legs of the donkey on top of the box are first put in position, and a penny is placed in the slot shown at end of top to the right. The catch is pressed upwards to the top of the box, and then a series of events happens in the following order: The donkey's hind legs, being released, fly upwards, the cart is tilted back, and the figure in the cart and the crate behind him are thrown backwards, the crate hits the projecting catch in front of the slot, and this, in its turn, facilitates the descent of the penny through the slot into the box. The inventors have other designs in hand which will be ready shortly. The sum charged for each sheet of designs necessary to make the model is 2s. The designs are clearly and boldly drawn, and will present no difficulty in cutting, even to indifferent fretworkers.

The Editor.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

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

I.—LETTERS FROM CORRESPONDENTS.

Varnish.—A WOODWORKER writes to F. P. (*Newport, Mon.*) (see pp. 699 and 702, Vol. III.):—"In the directions given for making varnish with methylated spirit, shellac, and benzoin, you say the fluid is to stand in an open vessel for a few days, then strain for use. Would not some of the spirit be lost? and as alcohol has an affinity for water, would not the spirit attract watery vapour from the air? and as few people know much about the subject, would you kindly explain the advantages of such exposure in an open vessel? I believe I have come across similar advice in making varnishes with turps, but that is so different to methylated spirit that it by no means follows that what is good for one solvent is proper for the other. I ask not for the sake of criticism, but solely to gain information."

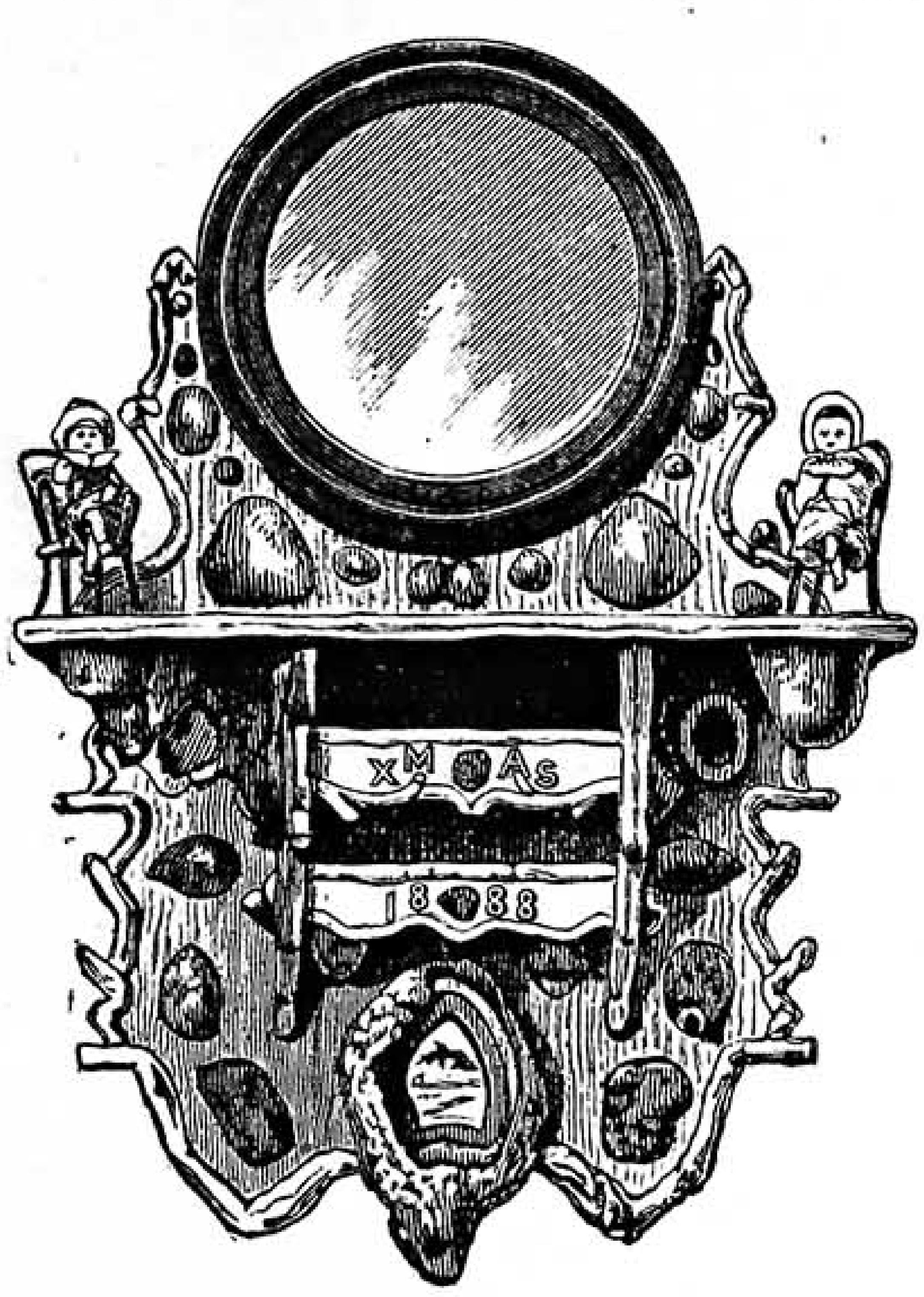
Wire-Work — Errata. — J. S. (*London, E.C.*) writes:—"In the inscription under my first series of sketches on p. 692, No. 148, Vol. III., where an allusion is made to Fig. 150, the word 'handle' should be replaced by 'ladle.' And in the same number, in p. 702, the word 'lever' in line 9 of my reply to R. J. (*Burdett Road, E*) should read 'sever.'"

Testing the Accuracy of Framework.—J. S. (*London, E.C.*) writes:—"I should like to add a trifle of justifiable stimulus to this 'storm in a tea-cup.' I have not differed in the slightest degree with J. C. K.'s methods. All I did was to protest against his assertion that the simple method was misguiding. I will leave it to the judgment of the readers whether I do not come forth from this scrape untainted, untarnished—well, that's enough. In referring to the last sentence written by J. C. K. on p. 683, where he says, 'If the opposite sides of a picture-frame are equal, and the angles square, no other test is wanted for accuracy,' I will ask if I did not claim that my method was a means to this end. It was to test the squareness of the angles for which I sent the few notes."

Testing Accuracy of Framework.—G. P. (*Elgin*) writes:—"I note a further communication by J. C. K. (*London, W.*), *re* the above subject, in WORK, No. 147, p. 683. He there states that 'if the square frame is winding, the diagonals being alike for length would prove the frame was not square at two angles.' That may be so; but what would be the use of, for instance, a picture-frame that was winding? How would the glass lie in the rebate? No, it would not do at all; and no man in his senses would put such work out of his hands. Euclid was referred to to prove my statements; to make an assertion is one thing, to prove the truth of it is another. It is certainly true that the laws of Euclid would prove that the same length diagonals might indicate a trapezoid; but the opposite sides of a trapezoid are not equal, and as the test, about the accuracy of which we differ, is for the squareness of picture-frames, carcases of dressers, etc., which must have their opposite sides equal, I cannot see why the properties of trapezoids have been pushed into the discussion at all. From the last sentence of his communication, I am led to believe that J. C. K. has read my former letter hastily, and has gone away with an erroneous idea of its contents. In that sentence he states a truism: I endeavoured in my note to show that if the opposite sides of a figure be equal, and the diagonals be also equal, then the angles of the figure are bound to be right angles."

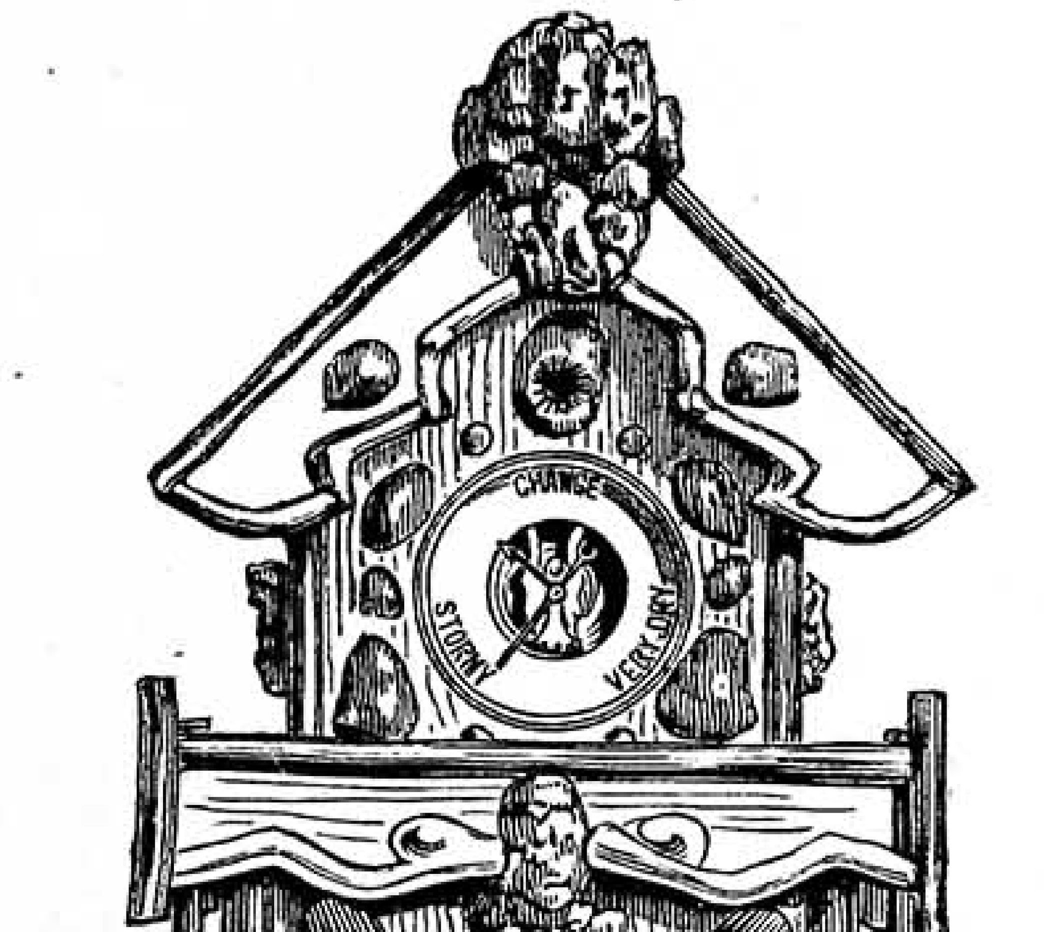
Macramé Board. — C. E. M. (*Birkenhead*) writes:—"Will you allow me to correct a misunderstanding in reference to a description of my macramé board, which you published on p. 420, Vol. III.? The writer of the article which appears in No. 147 on 'An Easily-made Macramé Board' mistakes the object of the attachment which I described. He supposes it to be an appliance for holding the vertical strings taut while ornamental knots (such as the Solomon's knot) are being worked on to them. If PASQUIN will turn to my letter again, he will see that that was not the idea at all. It is 'for gripping *the lace* when a long piece is being worked'—*i.e.*, when a piece of work is being made longer than the board, and has to be moved along; to obviate hooking it on to the pegs or screws, and thus dragging the lace, I place it under the spring as described. My board has no arrangement to meet the other difficulty; I have, therefore, overcome it with practice, and always hold the strings tightly between the third and fourth fingers and palm of my left hand."

Rustic Work.—P. H. (*Allendale Town*) writes:—"The readers of WORK may be glad of the accompanying designs for a rustic bracket and clock case, made entirely of rustic knots cut from trees and ivy branches, split or sawn up the middle. The case is



Rustic Bracket Design.

fitted with drum clock and barometer. The bracket has a spinning-wheel rim to form a mirror, and looks much nobler than it does in the drawing. It is easily made."—[We are always glad to give insertion in "Shop" to little novelties of this sort,



Rustic Clock Case Design.

and your example might well be followed by others of the thousands of WORK readers. There must be many who have home-made novelties of this order which they could photograph, and send for the benefit of brother chips and workers.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

WORK—How to Serve.—SCHOOLMASTER.—We are glad to get your assurance that you subscribe regularly to WORK, and to hear of your anxiety to help the publication. As you cannot write articles nor draw, what you had better do will be to take two copies instead of one, and push the duplicate off to a friend or relative. If every subscriber did this, WORK would have a truly phenomenal circulation.—ED.

Quarter Horse-Power Engine.—A. W. C. (*Kilburn*).—In Nos. 106, 110, 121, 125, 131, 136, 141, and 145 of WORK will be found articles on this subject.

Phonograph.—WIN.—Consult the indexes to WORK, Vols. I. and II.

One-eighth Horse-Power Hot-Air Engine.—WIN.—This subject is more fitted for an article than a "Shop" reply. You must kindly wait.

Water-Colour Painting.—BLUE EARTH.—A good book on this subject is "Painting in Water Colours," by R. P. Leitch, published by Cassell and Co., London, E.C.

Nose Instrument.—J. J. (*The Park*).—We do not undertake to give information about shaping noses in WORK. If your nasal organ does not commend itself to you, and you really cannot reconcile yourself to it, then write to some medical paper, or consult the London Directory for addresses of makers of appliances such as you describe.

Wheelbarrow, etc.—PROMETHEUS.—The wheelbarrow article appeared in No. 68 of WORK. Do you refer to "Lighting Arrangements in Temporary Decoration," in WORK, No. 142, by hand light making?

Incubator Fittings.—J. W. (*Loughborough*).—For reply to your query, see previous replies in "Shop," or consult the advertisement pages.—LEGHORN.

Incubator.—G. S. W. (*Dewsbury*).—You need be under no apprehension that opening the lid will interfere with the regulator. Of course, the rod, R R, will be disengaged from the adjusting screw, S, of damper, but by opening the lid you will naturally reduce the temperature very quickly. The ether vapour will then again liquefy, the mercury will rise in the short limb of tube, and, consequently, fall in the long limb, carrying with it the plunger and rod, so that by the time the lid is closed all will be clear. If, on opening and closing the lid quickly, the weighted end of damper lever is depressed, the rod will resume its normal position, when the lever can be lowered on to it, the screw, S, engaging with the top of rod as before. A joiner making a dovetailed box would make box and lid all in one, and separate by sawing, as I described. If you do not think you could manage to cut it truly, make it in two by all means. Either way, the hinges would have to be fixed to the lid proper, as you term it. It is, however, not nearly so difficult a job as you imagine. For glass tube and thermometer, see previous replies and advertisement. See that the hole in lid through which rod passes is sufficiently taper to allow it to clear on closing the lid.—LEGHORN.

Ebonising Carved Pinewood. — H. C. F. (*Hungerford*).—The way in which I have been accustomed to ebonise pine, whether carved or otherwise, has been to brush the wood twice over with a hot and strong decoction of logwood, and afterwards with a solution of iron (made by putting small scraps of iron in a bottle with vinegar), also applied hot; when dry, to go lightly over with fine sand-paper, and to polish with beeswax and turps. But there are other ways of ebonising; and in the back numbers of WORK you will find the matter frequently discussed. Some use a solution of copperas (sulphate of iron) instead of that above mentioned. Some mix the ingredients before applying, and add a little lamp-black or indigo to make the stain more intense. The least trouble is to buy an ebony stain, of which there are plenty in the market. As to the mountings for plush frames, you can doubtless get them from the dealers who supply photographers' sundries. You might try Harger Bros., Settle, Yorkshire, who advertise in WORK, and who could supply you with the brass back legs.—M. M.

Collodion Jelly.—JELLY had better dissolve the jelly in a mixture of equal parts of pure alcohol and ether. If he adds about as much as before the drying took place, and shakes it occasionally, it will soon be restored to its original consistence. The jelly may be broken up in the bottle to facilitate the solution.—D.

American Organ Building.—TREWERK.—We have made inquiries, and cannot learn of any work on the making of American organs.—G.—[A series of papers are in hand, specially written for WORK.—ED.]

Incubator.—J. F. W. B. (*Leicester*).—(1) The incubator described in No. 143 cannot be purchased complete from any firm, it being my own design, and particulars not having been previously published. If you will send me your address, I will write to you privately. (2) Fittings cannot as yet be obtained from any one firm. Some I bought, and some I made; but if there appears a demand for sets of fittings, I will try and arrange with someone to supply complete sets or portions as required.—LEGHORN.

Quasi-Square Turning.—DICK 2.—Yes, this may be done, as you suppose, by cutting in a large turned cylinder several long deep slots of square section. The pieces to be turned would be planed square, so as to fit the slots in which they would be secured. In turning the several pieces of work, the cylinder edges between them will also be turned, so that when each piece has been unfixed and turned quarter-round, the moulding on the cylinder will form a guide for the tool. The three first sides can be turned so that the edge of the work will have the support of the side of the groove; but to prevent breaking down the last edge, a slip of wood must be carefully fitted in. Perhaps, by great care and with some kinds of hard woods, this precaution might not be required. Is it a *model* hot-air engine that burnt out in a fortnight? What a shame!—F. A. M.

Boring.—J. W. (*Glasgow*).—Centre the wood at each end, and mark centre lines on the four sides; then fix it in a horizontal position by cramps or similar means. It will be, perhaps, advisable to have a centre line on the supports as well, so that in case the wood has to be turned end for end, it can be fixed in the same position. Then fix two bearings of hard wood for the shank of the auger to revolve in: these must be exactly central with the centre lines on the wood, one being fixed about 1 ft. from the end of the wood to be bored, and the other 1 ft. from the handle of the auger. This handle should be a good length, so as to give a good purchase in boring. The shank of the auger must be sound and truly central with the boring end. The boring can now be done by revolving the auger in the bearings; and as the handle comes up to the outside bearing, provision must be made for shifting it inwards. The auger should be withdrawn after boring 4 in., and the hole well cleaned out. The utmost care must be taken to see that it is kept in line with those marked on the outside. Should it be found going to one side, the wood should be turned, and the boring commenced from the opposite end. I have seen a tree 20 ft. long bored in this manner for a pump. It would be better to keep the wood larger than 2 in. till it is bored, for fear of getting out of truth. This method may be used for a small number, but if a large number are to be done it will be better to have a machine, as this will be a very slow and tedious process. If you require a machine, you might get one from Messrs. John McDowall and Sons, Johnstone, near Glasgow, as they are makers of wood-working machinery.—M.

Metal for Photo, etc., Frames.—C. E. L. (*Andover*).—Gilding metal similar to your sample may be obtained from Messrs. Smallwood & Co., Small Heath, Birmingham, or from the Berndorf Metal Works, Birmingham, who make a speciality of "Oreid" gold-coloured sheets and wires, and who will, on application for quantities, send you the current prices of the different gauges and widths. Another metal for photo mounts is called Britannia metal, and may be treated as found in an article entitled "A Novel and Artistic Photo Mount" (a piece of fancy work for engravers), pp. 141 and 142, Vol. III., of WORK. Price of metal is about 1s. 6d. per lb. There are also in the market numerous fancy and artistic designs in rolled sheet metal, and which are largely used for the purposes named above. The cheapest way of going to work for producing the ornamental material is to have a steel plate engraved with the required design, buying the sheet metal wholesale, cutting the same into sheets, and afterwards sending them to be re-rolled at a sheet metal (cold) rolling-mill. In conclusion, I may observe that nearly all metals fluctuate according to the market, so that a price-list of old date must be viewed with caution.—N. M.

Boot and Shoe Repairing.—J. R. (*No Address*).—The numbers of the papers since the paper on Blind Stabbing appeared are 126, 130, and 137 of WORK.

Locomotive.—C. W. L. (*Newcastle-on-Tyne*).—The furnace is too small for charcoal; you should have a spirit-lamp. The fact is, many of these toy locos. are frauds. I fear you can do nothing with it.—J.

Bent Ironwork.—J. C. (*Liverpool*).—I am preparing a series of papers on the subject for the approaching new volume of WORK, in which the various operations will be illustrated, and a number of designs given.—J. [Watch for No. 157.—ED.]

Pattern-Making.—F. W. (*Bradford*).—A journal devoted exclusively to pattern-making would not receive sufficient support to pay expenses. But the subject will be treated in WORK. You may get "Pattern-Making," by myself, published by Crosby Lockwood & Co., Stationers' Hall Court, E.C.—J.

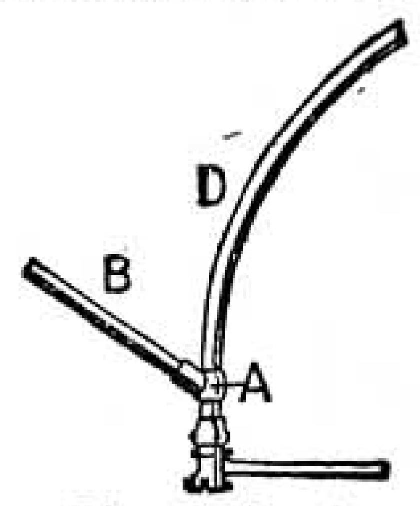
City and Guilds of London Examinations.—H. B. (*St. Peter's Park*).—"Elements of Machine Design" (Professor Unioni), "The Strength of Materials" (Professor Anderson), "Principles of Mechanics" (Professor Goodeve), "Steam and Steam Engines" (Jamieson), "The Steam Engine" (Cotterill), "Strains in Structures" (Professor Adams), "The Steam Engine" (Holmes), "Elements of Mechanism" (Goodeve), "Practical Mechanics" (Perry), and many others, may be studied.—J.

Fret-Sawing Attachment for 2½ in. Lathe.—SEAFARER.—I have been sketching one out for you, but it looks very cumbersome of wood on such a small lathe. You can make it look better by having castings made from your own patterns, but then it is not worth while to make patterns for only one machine. Altogether, I think you would do very much better to have a separate machine. There would be a good deal of work in yours, with vertical stroke and presser foot, and it is not worth while to do it all on such a little lathe. Get a No. 8 machine from the Britannia Co., then you can use the lathe to turn the little pillars and pinnacles for your fretwork brackets.—F. A. M.

A Canvas Canoe.—G. G. (*Llandudno*).—The following treat of canoe and boat building:—"Practical Boat Building for Amateurs" (Gill); "Yacht Designing, Yacht and Boat Sailing," by Kemp. The weight of the canoe, I should think, is about 50 lbs. I should not recommend making it shorter: that would make the lines too bluff and more difficult to paddle.—J. B. F.

Home-made Novelties.—HOBBYIST.—We shall be very pleased to see sketches or photographs of such articles from you or any other reader of WORK, and if they are worth putting before our readers, you will be paid the usual scale rate. You should address the Editor of WORK.—ED.

Bicycle Castings.—AN OLD SUBSCRIBER.—With reference to the castings for safety I have but one set remaining—namely, steering barrel, seat bracket, and bottom bracket. The bottom bracket is somewhat different from that shown and described in the articles, the only difference being that the tube, B, joins on to the curved tube, D, a little above the bottom bracket, as in the accompanying sketch, the lug, A, being easily procurable of any of the dealers in parts. I could not get more castings done under four weeks, but if the one set is of any use to your correspondent I will be glad to send them to him. A safety with 28 in. wheels need not have the wheel centres any nearer than given in the articles. There is a rage just now for a long wheel base—*i.e.*, greater distance between the wheels. A 1⅛ in. solid tire of very best rubber is superior to a cushion tire, unless the latter is also of very best rubber, and the hole not over ¼ in. The bearings in the bottom bracket are Bown's knuckle-joint, and there is no necessity whatever for covering the shaft between the bearings.—A. S. P.



Bicycle Part.

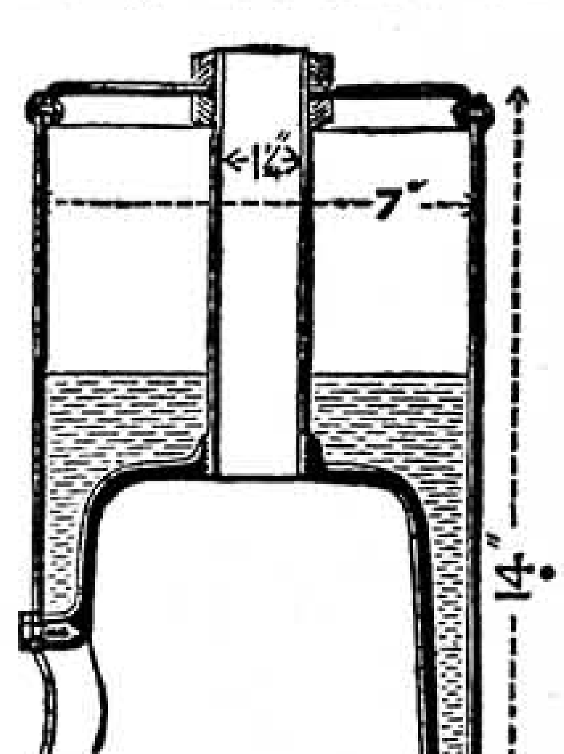
Materials for Electric Alarum Clock.—ANXIOUS ONE (*Rainton*).—If you will kindly turn to page 538, Vol. III., or, if you have the loose numbers, to No. 136 of WORK, you will find in the third column of "Shop," a reply to EXPECTANT, who asked where he could get materials for making coils. Any one of the firms mentioned in that reply will supply you with the bell, battery, switch, wire, and everything required to fit up the electric time alarum described by me in No. 32 of WORK. The whole will cost about 10s. 6d. at the lowest estimate, unless you make several of the parts yourself.—G. E. B.

Tools.—AMATEUR POOR MAN.—You complain of a tool-maker advertising in WORK, but you have placed neither name nor address on your letter. If the letters you have written to the tool-maker in question were equally faulty, we do not wonder at your getting no replies. Look into the matter from this point of view.

Brazing.—J. C. J. (*Gloucester*), A NEW ONE, and others.—For information on brazing, see Nos. 36, 42, 48, 50, 65, 76, and 92 of WORK.

Vellum Drum-Heads.—F. B. (*Clapham*).—For drum-heads in large quantities, you may apply to Messrs. Elzas & Sohnen, Barkeloo, Holland.—G.

Boiler for Model Engine.—A. H. (*No Address*).—How will this form suit you? It should be sufficient for your cylinder of 1¼ in. diameter and 2½ in. stroke. Shell of 7 in. diameter, Elmore copper tube ⅛ in. thick; top plate same thickness, flanged, riveted, and sweated to shell with soft solder; fire-box of cast brass, $\frac{3}{16}$ in. thick. This avoids the difficulty of making the ring round the furnace door. It is an easy pattern to make; the casting will be turned in a lathe round the bottom, so as to drive tightly into the shell, and the mouth of the furnace also turned; joints made with red lead or soft solder, but if made with lead, boiler can be taken apart to examine. Chimney tube screwed into fire-box with red lead and joint at the top of boiler made with two nuts and red lead. If more steam is wanted, some "Field" tubes could be screwed into top of furnace, or some cross tubes might be put in. Working pressure 60 lbs.—F. A. M.



Boiler for Model Engine.

Electro-Deposition of Iron.—H. C. (*Surbiton*).—Unless you have had considerable experience in the electro-deposition of other metals, I should not advise you to attempt the electro-deposition of iron for an electrotype. Electrotypes are sometimes *faced* with a thin film of electro-deposited iron; perhaps this is what you mean. If so, you will not require a film $\frac{1}{16}$ in. thick. I do not suppose you could get a deposit of workable iron so thick as this, even if you were experienced in its deposition. A solution employed in steel-facing electrotypes—that is, depositing a facing of iron on them—is made as follows:—Dissolve carbonate of ammonium in filtered rain water, at the rate of 1½ lbs. to each gallon of solution required. Suspend in this two plates of best charcoal iron, and pass a strong electric current from one to the other until a good deposit of iron is obtained on a test-plate of copper occasionally suspended in the solution to test it. When a good deposit of iron is obtained on the copper plate the copper electrotype may be substituted. This must be previously well cleaned with the usual potash solution, then rinsed in water, then dipped in a weak acid pickle for a few moments, well washed in water, and transferred at once to the iron solution. The anode surface of best charcoal iron must be seven times larger than the electrotype to be faced. A current of large volume at a pressure of 6 volts will be required. At the end of five minutes take out the electrotype, brush it with fine whiting and water, and re-immerse it. Repeat this every five minutes until a sufficient thickness of iron has been secured. Wash very carefully in boiling water, then rinse in cold water, brush dry, rub in benzine, then oil, and brush the surface with a soft brush. This is to prevent rust. This is only a brief outline of the process.—G. E. B.

How to Soften Hard Boots.—E. C. (*Folkestone*).—You say you "have tried all sorts of things, and they have failed." This does not give me much scope to give you any information, for if you have tried all, you must have tried the one I am going to tell you of; but still, as it is not always what is used, but the way it is used, I will tell you how. I have used it many times, and always without failure, and I think (any way, I hope) it will give you the same satisfaction. Let your boots be dry, and then give the hard parts a good drop of quite warm—but not hot—water. This, if done before the fire, will soak well in, and when you think it has gone right through, give them a good coat of neatsfoot oil, and keep them before the fire at a respectable distance, and as the water dries out the oil soaks in. As this action takes place, keep pressing the leather in different places to work it and make it mellow, and also, as this goes on, rub in one coat of oil as soon as the other has soaked in. Should this fail, let them lie by a day or two, and then repeat the above, first with the water and then the oil.—W. G.

Boot and Shoe Repairing and Making.—NOVICE.—In making riveted, pegged, or machine-sewn work, there is always between ¼ in. and ½ in. more stuff left on all round the bottom of the tops, or, in other words, the tops are cut longer and wider. This, because in this class of work the rivets, etc., are nearer to the centre of the sole than the sewing is in hand work, as the welt is sewn in nearer the edge, and any upper leather that is above the seam has to be cut off close to the welt. The leather is not (as you ask) subjected to any special treatment to soften it as a rule, though, if the leather is very stubborn, it can be made softer by damping it with water. All leather will form wrinkles and pipes in lasting, more especially at the toe, and here most at the extreme edge of the leather; therefore it is easier to last the first-mentioned work than it is to last hand-sewn (where there is only just enough to hold with the pincers). While lasting in the toe, only put a tingle in here and there, say, one in the centre, then the two draft tacks (one each side), and then (more particularly those you have the most trouble with—viz., "leather-lined") last up the lining first, only just knocking the tingles through the inner sole, so that they may be drawn out when you last the upper; and in doing this see that you last it smooth previous to proceeding with the upper. Then place a tingle between the centre and draft tacks. This will make or leave a pucker each side of it; these you try to tap or hammer out before putting in any more tacks. Every time you put in a tack, it should be through the top of one of these pipes or puckers, and when the toe has enough tacks in it, hammer it all round well, starting from the edge, and working to the centre of the sole, till you get to the edge of the leather. You will not get all the pipes out by this means, so you can cut a V piece out of each, and then top it down again, or the tops of them may be skived off; but, in either case, only cut to within about ¼ in. or ⅜ in. of the edge of the last, so that the rivets, pegs, or stitches have firm and solid leather to go through. By the above means light leathers can be lasted without the use of the knife at all. Perhaps the tops you used were small.—W. G.

Kit of Tools.—INTENDING CARPENTER.—For a kit of carpentry tools such as schoolboys could use, you cannot do better than buy of Melhuish, Fetter Lane, London, Hobday, Chatham, or one of the other tool makers who advertise in our columns.—W.

WORK Exhibition.—IVY.—There will be **no** WORK Exhibition this year, but due notice will be given in WORK of any similar exhibitions throughout the country. Secretaries should inform us.

Mechanical Dentistry.—AMOS.—In reply to your query as to how packing is done, there are two ways of doing this: the one is by taking your case off the model very carefully and sinking in the plaster—that is to say, you have your flask ready, and having mixed some plaster of Paris as before, pour into the bottom half level with the edge. Your case, we suppose, has been taken off the model and placed in cold water to prevent any alteration. You then take your case and sink in plaster, palate side downwards, deep enough for plaster to be half-way up the teeth; then allow to set, after which you must render non-adhesive the whole surface with liquid; then place the middle of flask on; mix some more plaster, about the consistency of cream, and fill up to the top, shaking well down while filling; then place its top portion on and put the whole under press and screw well down, and allow to stand, say, one hour, when you will be able to take your flask and place it in hot water sufficiently long enough to soften the wax on model; then you can take it apart. This you must be very careful about, as there is great danger in breaking away some portions of your counterpart: then pour boiling water over the whole to remove any portions of wax, as your flask must be quite clean. You then take your rubber, of which there are various colours, and cut it in slips, and place them on a hot-water plate, also to be had at a dental depôt, until they become soft. Having previously made your flask warm, which is of great assistance in packing, you then pack the rubber first well round the teeth, and then on the palate sufficient to take the place of the wax previously taken away. Then shake a little French chalk over the surface to prevent the two parts adhering; then put your flask together and place in press and screw well down; then unscrew press and open flask to see if you have sufficient: if not, add a little more, as your flask must be quite as close as with the wax. You then clamp it with an iron ring very tightly and transfer it to the vulcaniser, in which is placed about half a pint of water. The flask is then put inside and the cover screwed down quite tight, the gas lighted underneath, your thermometer placed in position and watched until it registers 315° Fahr., and kept at that for seventy-five minutes. Then turn your gas off, and allow to cool down sufficiently for you to be able to take it out, when, with a few sharp taps with a mallet, you will be able to divide your flask, and take out your case, and after washing all plaster off you finish your work with scrapers and files and finally polish, and your case is ready for the patient, for, as I before said, if the impression and model are correct so must your case be when finished. I will, later on, give a description of the process of making gold plates, and hope that the preceding letter may be of some service to parents who contemplate giving their sons an opportunity of being taught the profession, as for good workmen there is a great demand and good salaries paid; but the great secret is to place them in a good house, where they will have an opportunity of seeing the various cases made, which is necessary if the work is to be thoroughly understood.—Denta.

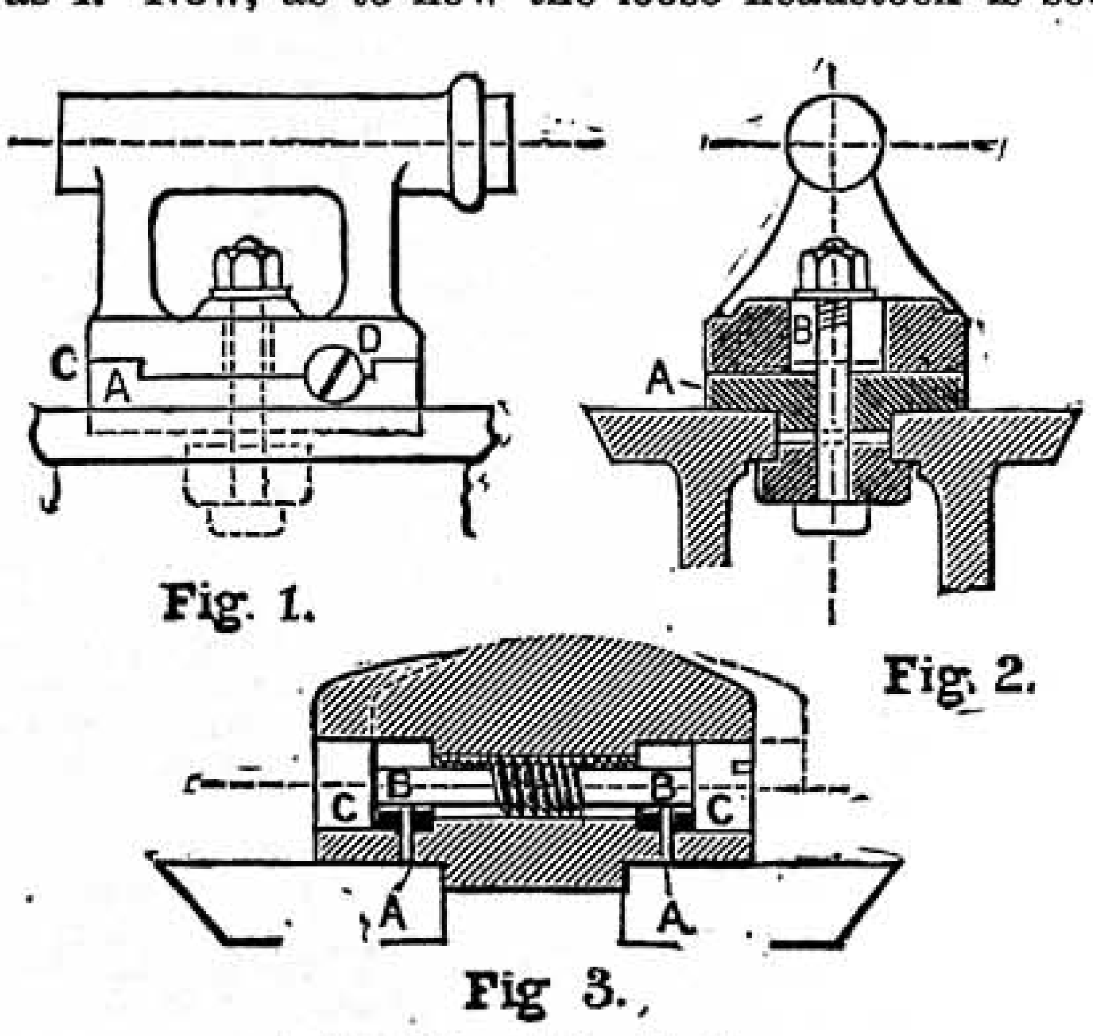
Model Engines and Motors.—W. W. (*Cross Hills*).—If you had told us what you wished to work with the motor, I should have been better able to advise you. You will experience most trouble and expense with an electro-motor of 2 man-power, driven by current generated in a battery. You can get such a motor from Mr. Bottone, at a cost of about 50s., exclusive of battery. Electro-motors are only admissible in situations where some inconvenience would be experienced in the use of a model steam engine, a gas engine, or similar motor. Model steam engines are made by Mr. R. A. Lee, High Holborn, London, E.C. The castings for the ½ horse-power horizontal engine described by F. A. M., in Work, are sold by Mr. H. Milnes, Ingleby Works, Bradford. Probably Mr. Milnes will make the engine for you, as you cannot make it yourself. Have you noticed the advertisement of the Robinson hot-air engine in Work? Perhaps this will suit your requirements. Small water-motors are made by W. H. Bailey & Co., Albion Works, Salford. Consult advertisements in Work. —G. E. B.

Camera.—Busy Bee.—The "Facile" camera, made by Fallowfield, Charing Cross Road, W.C., would suit you. All *very cheap* cameras are necessarily slightly made, and soon get out of repair, so, in the end, a more expensive one is really the cheapest, especially if it has to stand the continual vibration of a bicycle. We have had no experience with the instrument mentioned; it would be, probably, as good as might be expected for the money. Griffiths' guinea camera, or one made by Tylar, Birmingham, are both very good for the money; but you must not expect too much. You cannot do better than use Ilford plates for the negatives. Special plates are made for lantern slides. Thomas, or Mawson and Swan supply very good ones, as do many other makers. The formula for the developing solution is printed on each packet of plates. Hydrokinone developer is very suitable for this work. With any plates the following formulas will be found to answer: (A) Hydrokinone, 15 grains; meta-bisulphite of potash, 20 grains; water, 1 ounce. (B) Carbonate of potash, 180 grains; water, 20 ounces. For use, add 2 drachms of A to 5 ounces of B. Plates can be developed in this solution one after another until the developer is exhausted. A little of Judson's green dye diluted, and applied with a camel's-hair pencil, will answer very well; the other coloured dyes can be applied in the same manner. Consult the advertisements in Work.—D.

Small Galvanic Battery.—J. M. (*Glasgow*).—A small galvanic battery may be constructed of copper and zinc sheet cut into strips 1½ in. by 1½ in., and immersed in weak vinegar contained in egg-cups for cells. Solder the copper and zinc strips together in pairs (except one of each kind, to form the poles of the battery at each end), and place one of each pair alternately in each egg-cup. The current from this battery will be weak, and will not be constant. If the zinc strips are amalgamated—that is, coated with mercury—and the copper strips are coated with platinum, and dilute sulphuric acid is substituted for vinegar, the strength and constancy of the battery will be increased. All batteries described in Work are galvanic batteries, and a large number of these have been described in back numbers. Kindly refer to your indexes under the heading "Battery," and look in "Shop" for the information you require. If you had told me what you wanted the battery for, I could have given you a better reply.—G. E. B.

Band Saw.—Anxious.—You ask if there is such a thing as a home-made band saw. You also want a description of it. I am of opinion that a band saw cannot be made at home, but I will give you a brief description of how one is made. In the first instance, the steel is rolled hot to an 18 in. gauge: it is next rolled cold to the gauge required for the saw. It is generally rolled out in lengths from 60 ft. to 100 ft. After the cold rolling has been done the steel is pared down by means of a paring machine, which is of an ingenious design, to the exact width required. After paring, the process of hardening and tempering the steel follows. This is done by passing the steel through an oven-like furnace, the speed at which this is done being regulated in accordance with the heat of the oven. The steel is afterwards passed through a fish-oil bath. After the hardening and tempering are completed, the teeth are cut in by means of a self-acting toothing machine. This machine does its work with great regularity and at a high rate of speed, cutting from 400 to 500 teeth per minute. The glazing of the saw is the next process. This is accomplished by passing the saw between two glazing wheels, emery-powder being fed on the wheels as the saw passes between them. When glazed, they are then brazed, set, sharpened, and finally tested. A good band saw should stand a strain of not less than 180 lbs. for every $\frac{1}{16}$ of its width. After reading the above, Anxious will be able to judge for himself whether a band saw may be made at home or not.—A. R.

Setting over Loose Headstock for Taper Turning.—A. J. C. (*Carlisle*).—I have not one of the Britannia Co.'s 6 in. headstocks, and cannot, therefore, give you the dimensions of it without writing to them for it, and that you may as well do as I. Now, as to how the loose headstock is set



Headstock for Lathe.

over for taper turning, the sketches will show how it can be done. Fig. 1 is a side view, and Fig. 2 a section through the headstock, which, you see, stands on a kind of shoe, A A, which fits between the shears in the usual way; to enable the headstock proper to slide across the bed on this shoe, the bolt-hole is elongated, as seen at B. The front, C (Fig. 1), is filed up bright, and there is an index line and scale engraved there to show central point, and also how far the headstock is thrown out to front or back. This movement is made, after slacking the holding-down bolt, by applying a screwdriver to the head of screw, D. Fig. 3 shows a way of fitting this screw. It has two heads, and is secured from moving endways on the shoe by a collar turned to fit at B B, and then cut in two, and each half secured by the pins, A, A; the hole for the screw is made first of the size B B, then enlarged with a pin-drill at each end to the size C C, then tapped for the screw-thread, which thread is then removed from the shoe, or lower half. Thus, by turning the screw the headstock may be moved upon the shoe, and then it may be clamped in any position by the holding-down bolt. A steady pin should be fitted through the sole of headstock and shoe, so as to enable the workman to return it to centre with more certainty than by means of the scale alone.—F. A. M.

Marine Glass.—Bute has the tubes of an old telescope nearly complete that opens out about 20 in., the body tube being about 2 in. diameter, and wants to know what lenses are required, probable cost, and what to ask for. Lenses: object-glass, probably about 15 in. focus, and, say, 1½ in. diameter; without precise measurements of the tubes as to length, exact details cannot be given. The position of the erector must be found in the tube, then the focus of the object-glass must fall within the focus of the erector. Erector, two lenses: field, 1 in. diameter and 3 in. focus; second lens, $\frac{7}{10}$ in. diameter and 3½ in. focus; separated 4 in. apart. Eye-piece, two lenses: field lens, 1¼ in. diameter, 3 in. focus; eye lens, 2 in. focus, ⅝ in. diameter. These measurements are simply approximate. The cost of the object-glass will depend on quality; if an achromatic, about 5s. or 6s.; if non-achromatic, about 2s.; the other lenses about 1s. each. "What to ask for." Well, ask for what you want. If you write to a practical optician, such as Lancaster, of Birmingham, or anyone else who is pleased to accommodate amateurs, and simply say what you want, you will be supplied with the proper thing. What you need is a set of lenses for an erecting telescope, with the approximate measurement given. One thing be careful to ask—viz., how far the lenses in the erector must be separated, also the lenses of eye-piece, as the distance will depend on the exact focal length of the lenses. "How to chase a screw. I have a lathe." It is almost impossible to tell anyone how to do this. Is there no brass-fitter or mechanic in your neighbourhood? If so, ask him to show you; five minutes' seeing would teach you more than hours of reading. You will need a pair of chasers, inside and outside, which can be bought at any good tool shop. When the work is fixed in the lathe, turn rather slowly and steadily; place the chaser lightly to the work, and carry it forward at such a speed that with one revolution of the work the tool has progressed one thread. If moved forward too fast, the result will be that two or more threads will be chased on the work instead of one. It is exceedingly simple to watch one doing it, but to be able to do it is the result only of practice. As soon as the pitch is struck, then follow it up until the thread is cut sufficiently deep. If I were to write a page on the matter, I could not help you more. Practise on a piece of tubing, turning down the thread each time you fail.—O. B.

Patent.—J. W. M. (*Burslem*).—I believe it is generally understood that a patentee can allow his patent to lapse by ceasing to keep up his payments. The patent is granted for the fourteen years not absolutely, but conditionally, on the payment of the renewal fees.—C. C. C.

Cycle Depôt.—T. P. B. (*Bradford*).—It is somewhat difficult to give T. P. B. useful guidance in this matter. If he confines himself solely to repairs, it is little use keeping a stock of stampings unless he keeps a stock of all the different sorts and designs: and they are very numerous. When a repairer gets in a machine with a broken stamping, he may have a ton of stampings in stock, and not one of the pattern required. The rule is to send for a stamping or part by making a drawing of it, or finding a similar one in one of the catalogues. The only stampings that can be kept with safety are a few pair of rear-fork ends for cross frames, a few cross-frame centre brackets, handle-bar T-pieces, clutch legs for steering-posts and seat-pillars, to fit 1 in. and 1⅛ in. tubes, a few spoons for brakes, with forked ends for brake-rods, a few brake-pieces, and lugs for attaching to handle-bar; 6 in. and 7 in. crank stampings may be kept, also finished axle and pedal pins. A small stock of weldless steel tubes should be kept, from 1¼ in. down to ⅜ in., falling by ⅛ in., some straight and curved forks, mud-guards and stays, L-pins for saddles, etc. A stock of spokes, both for safeties, ordinaries, and tricycles, is necessary, of a gauge from 10 to 15; also butted spokes, as many machines have the latter, the butt being No. 8, and the shank about 11 or 12. Cement for putting on tires is bought in hard lumps. Solution for splicing is quite a different thing, and is sold in bottles in a liquid state at most of the cycle shops. Enamel for touching up repairs is also got in bottles. Club black hard drying is very good, as it dries in ten minutes. An agent requires to keep a good show of finished parts and fittings, such as hubs, bottom-brackets, cranks, pedals, chains, saddles, bells, foot-rests, spanners, oil-cans, pouches, etc. etc. Taps and single-hole plates of the Abingdon make, which I have found to be very good, can be had: Nos. 11, 12, 13, from St. George's Cycle Co., and from several advertisers in Work. T. P. B. should write to a few of the largest makers, sending his trade card, signifying his intention, when he will receive their catalogues and price-lists. The following firms will send illustrated lists of every possible part or fitting that goes to the make-up of the best cycles: Wm. Bown, Summer Lane, Birmingham; Hudson and Edwards, Sheepcote Street, Birmingham; Thos. Smith & Co., Saltley, Birmingham; St. George's Cycle Co., Upper Street, Islington, London; Brown Bros., Great Eastern Street, London; and the advertisers in Work. I shall be glad to forward any further information to T. P. B., if he desires it.—A. S. P.

Work Volume.—F. C. F. (*King's Cross*).—If you have applied to the publishers, as you say, and have failed to get the volume of Work, then you should look out at the second-hand book-shops for a copy, or advertise your requirements in Work. Some subscriber may care to sell his Volume I.; but your anxiety to possess a copy proves that the book has some increasing value.—Ed.

Altering Dimensions of Dynamo.—O. G. (*Holloway*).—The alteration proposed by you could not secure the desired end. If, as you propose, you could take a Siemens dynamo having an armature 4 in. × 1¾ in., and field-magnets 4 in. × 3 in., and stretch them six times longer—namely, armature 24 in. × 1¾ in., and field-magnets 24 in. × 18 in.—you would not obtain any advantage whatever by the change. On the contrary, the internal resistance of the machine would be increased, and its output decreased in proportion. To increase the voltage of the current from a machine, you must wind more *turns* of wire on the armature, or run the armature at a higher speed. To get a larger output in ampères, a machine of larger proportions in every way must be built. In the series of articles referred to there are details of larger machines. Get the castings, and construct a machine according to the instructions given there; but do not presume to alter the dimensions until you know more about the principles of dynamo construction than is shown in your letter. Your ideas respecting a dynamo to drive a motor and the motor to drive a dynamo, and an accumulator to drive a motor to drive a dynamo, are much like those of spending a penny to buy a penny to buy a pennyworth.—G. E. B.

III.—Questions Submitted to Readers.

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

Model Boiler.—P. E. J. (*Gt. Bridge*) writes:—"Will any reader kindly inform me how to fix a model horizontal boiler in brick-work (boiler is 22 in. long and 12 in. in diameter, made of $\frac{3}{8}$ in. plates)? If possible, kindly illustrate it by a longitudinal sectional drawing, showing the best way for fixing the flue, so that there will be a good draught for fire."

Monogram.—W. S. A. (*Kentish Town*) will thank any fellow-reader to favour him with a design for monogram for fret-saw work.

Coffin Plates.—H. E. L. (*Stockton*) writes:—"Could any correspondent kindly favour me with instructions how to letter coffin-plates (black ones only)? If so, I would esteem it a great favour."

Telegraph Instrument. — TELEGRAPHIST writes:—"Can any reader kindly inform me how I could construct a small single-needle telegraph instrument, and also the battery to work it?"

Baize and Monogram.—LOVER OF "WORK" writes:—"Will some reader kindly give me instructions for relaying my bagatelle board with green baize; also give me a monogram for fretwork with the initials J. W. B.?"

Organ Bellows.—C. W. T. (*Leytonstone*) writes:—"Will some kind reader of WORK inform me through 'Shop' the way in which the bellows suck the wind from the reeds of an American organ? I know the way the bellows are made."

Steam Power.—G. H. P. (*Norwich*) writes:—"Would any kind reader of WORK inform me through 'Shop' the price of a one horse-power (actual power) steam engine and boiler, and say if it is capable of driving a drilling machine and a small grindstone?"

Electric Motor. — C. H. (*Clerkenwell, E.C.*) writes:—"I should like to ask if any reader of 'Shop' would be kind enough to give me advice as to how to make a small electric motor? I am possessed of a fair amount of electrical knowledge, and wanted, if possible, to work it by battery power, and then the motor, in turn, to drive a small dynamo to light a small incandescent lamp."

Carriage Building.—R. S. (*Shelton*) writes:—"Will any kind reader oblige a beginner in carriage building with the dimensions for body-maker's tool chest, how to fit up interior, and what wood should be used for same? Also the probable cost of one ready made?"

Mill Bills.—W. H. J. (*Brentwood*) writes:—"Will any reader of WORK please state the process of tempering bills used by millers for dressing millstones?"

Blackboard Composition. — J. S. (*Amlwch*) writes, requesting the full address of Messrs. J. M. P. & Co. (*Nottingham*), makers of blackboard composition.

Bagatelle Board.—TASMON writes:—"I should be very much obliged for such information as would enable me to make a cheap bagatelle board about 7 ft. 6 in. long, giving kind of wood, cost of balls, and where they can be obtained."

Gas Engines.—YANKEE writes:—"Can any of your correspondents say if a gas engine has been applied as the propelling power in an ocean steamer? If not, would it not fill the bill, and be a great economy of boiler and bunker space? The gas to drive it could either be made from gasoline or from water."

Engineering Drawings.—BLUE EARTH writes:—"I should be very much obliged to any reader who can inform me where I can get coloured drawings, both engineering and architectural, illustrating the principles of cast shadows, etc."

Bell.—W. J. R. M. (*Sale*) writes:—"Will any kind reader give me a drawing of a dinner bell to hang on a bracket against a wall, so that it will swing to and fro by pulling a cord; and where to get a casting for an 8 in. bell, or a pattern for same, of the Old Church style?"

"Great Eastern" Model.—MODEL S. L. writes:—"I am about to build a model of the late *Great Eastern* steamship. If any reader can give me her dimensions, I shall be obliged—that is, her length from stem to stern, beam, depth from deck to keel, position of paddles, number and position of masts and funnels, and any other particulars that will be of use for making a good model, such as deck-fittings, etc."

Monogram for Metal Working.—WIN will thank any reader for a design for a H. E. B. monogram, to be cut out of metal.

IV.—Questions Answered by Correspondents.

Tailoring.—THE JOHN WILLIAMSON CO., LD. (*London, W.C.*) write to APPRENTICE (see p. 654, No. 145), calling attention to their books on cutting, etc.

Double Flageolet.—C. B. S. (*Leeds*) writes to S. (*Bristol*) (see p. 702, No. 148):—"I have a first-class one, which I would sell for fifteen shillings. It has silver keys and ivory mountings."—[C. B. S. should advertise in our "Sale and Exchange" column.]

Double Flageolet. — B. A. B. (*Hampstead*) writes to S. (*Bristol*) (see p. 702, No. 148):—"This instrument, known as Bainbridge's Patent, was known in London some fifty years ago, and though quite obsolete as a musical instrument, may often be seen at second-hand or curiosity shops. Its tone is pleasant but feeble, and its musical value is trifling. The difficulty of playing it is greater than the effect produced."

Oil Stone.—M. (*Bishop Auckland*) writes to A. E. M. (*Cheshire*) (see p. 718, No. 149):—"You might try rubbing the face of the stone down on a level flag, with sharp sand and water, and finishing off with fine emery-powder. If this does not cure it, the only remedy will be to get a new stone. If you have to get a new stone, get a joiner to select one for you."

Carpentry Kit.—J. B. (*New Cross*) writes, in reply to C. H. J. (*West Bowling*) (see p. 718, No. 149):—"You want a list of tools for an amateur to begin doing 'household furniture' and 'cabinet making.' May I tell you that an amateur beginning has a lot to go through before he arrives at either of the two subjects he mentions. I do not think I can do better than hand on the advice given me by an old chip when I was a lad. He told me to get a rule, a square (most important), a saw with teeth for general work, a medium-sized box plane, about 1 in. chisel, one or two gimlets and bradawls, a hammer, and a screwdriver. Then learn to use these well, but on something more simple than 'household furniture,' etc., to begin with. If you are quite a beginner, perhaps it may surprise you to know it is no easy matter to saw down a bit of 1 in. deal, say, 6 ft. long, making a good square cut, and right up to line from end to end, without practice. After you can use the above well, add to your list as you want them. The simple fact of wanting a new tool shows, in a small degree, that you know something of its use; and a tool, bought when required, is never money thrown away. Do not buy a lot of tools all at once—get them as you want them, and feel your way."

Mangle Rollers.—M. (*Bishop Auckland*) writes, in reply to LEARNER (see p. 654, No. 145):—"Holes are bored in the ends of the rollers, and the spindles—which have previously been turned—are driven in, and the roller is fixed in the lathe by the centres left in the spindles. You will require a long rest with two sockets and the ordinary wood-turning tools. You can turn them in a 5 in. centre lathe if you have sufficient power to drive it."

Photography *versus* Painting.—G. P. (*Elgin*) writes, in reply to A. B. (*Glasgow*) (see p. 686, No. 147):—"Oil paintings ought to be photographed on orthochromatic plates. A rapid rectilinear lens with a small stop should be used, and a suitable yellow screen fixed in front of it. The pictures should be fixed vertically, and the camera and dark back must be accurately levelled, so that the planes of the object and sensitive plate will be parallel. Care must be taken that the pictures are placed so that there are no injurious reflections from their glazed surfaces."

Photography *versus* Painting.—M. (*Bishop Auckland*) writes, in reply to A. B. (*Glasgow*) (see p. 686, No. 147):—"You will find instructions for copying oil paintings in 'Photographic Pastimes,' price 1s., published by Iliffe & Son."

Indiarubber Hand.—EDDIFRA writes, in answer to INDIARUBBER (see p. 702, No. 148):—"To receive correct information with regard to false hands, I called to see Mr. W. Marsden, the manager of Mr. Chas. Mackintosh & Co., Ltd., indiarubber manufacturers, High Street, Stockton-on-Tees. He told me they undertook to make all kinds of surgical appliances to order if they could not suit in stock; also, there is not much difficulty in making the fingers hollow—perhaps it would come in in fastening them to the hand. If you will write to them, and give them as much information as possible, or send them a model, they will be pleased to send cost. They have also branch establishments, and will give you the address of nearest branch, so you could personally visit them."

Asbestos Cloth.—EDDIFRA writes, in answer to JENWILL (see p. 702, No. 148):—"King & Co., Bristol, sell a cloth which they say is made of pure asbestos; also asbestos yarn spun from pure fibre. Send six stamps for catalogue."

V.—Letters Received.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—OBLONG; W. W. (*Glasgow*); RICHMOND; R. J. H. (*Dublin*); T. H. F. (*Cornwall*); A. R. (*Scorrier*); R. T. (*Frome*); W. W. (*Balham*); NIGEL; A. B. (*Blackburn*); A. G. L. (*Stratford*); J. M. (*Dawley*); H. D. C. (*Bishopston*); A. F. (*Halifax*); J. G. (*London, W.C.*); WILLM; J. A. W. (*Waterford*); C. W. (*Openshaw*); SHOPMAN; T. W. (*Glasgow*); E. A. P. (*Cork*); F. E. B. (*Sidbury*); P. S. (*London, E.C.*); G. R. (*Rushden*); J. B. (*Nelson*); J. M. B. (*Brixton*); E. J. P. (*Harrow Road*); W. T. K. (*Darwen*); T. H. (*Burnley*); HOLBORN; AMATEUR; F. T. (*Dover*); A. T. (*Sacriston*); G. M. (*London*); W. H. (*Padiham*); M. M. (*Edinburgh*); G. E. C. L. (*Ipswich*); E. T. (*Bolton*); G. W. (*Bournemouth*); J. L. S. (*Paisley*); P. R. B. (*Hitchin*); L. H. (*Everton*); BAPTISTA; W. H. C. (*Homerton*); J. L. (*Upper Holloway*); W. I. (*New Malden*); C. H. (*Ipswich*); CAWD HUD; J. B. (*Outlane*); B. H. R. (*Cardiff*); P. A. B. (*Manchester*); R. F. (*Kirkintilloch*); F. P. S. (*Hemel Hempstead*); SENTINEL; G. F. J. (*Bristol*); AMATEUR; TINKER; A. E. W. (*Purshore*); A. W. (*Latham*); J. H. R. (*Sheffield*); G. H. (*Rickmansworth*); C. K. (*Lockwood*); R. O. (*Rotherhithe*).

WORK

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