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HOW TO DRAPE A BRASS OR IRON BEDSTEAD.

BY J. WHITFIELD HARLAND.

CANOPIES IN WOOD.

IN these modern days, when Tudor and four-post bedsteads are fast becoming obsolete, and bedsteads of metal are slowly but surely supplanting them, we have but one regret, and that is the sort of comfortless absence of the drapery which gives an air of coldness and, even in otherwise handsomely furnished rooms, a bare hospital-ward appearance. Nor is it in look only that the warm rich drapery is missing; in winter, be the room large or small, crafty draughts blow keen and cold upon the sleeper, leaving the memento of a stiff neck, whilst the invalid whom the breath of the east wind might throw into a relapse in the night-watches feels, and fancies he feels more keenly still, the draughts around his head. Of course, we must not in these days of sanitary science advocate sleeping as our forefathers slept, tented in with hangings all around them almost enough to stifle them; but it must not be forgotten that whilst we are up and taking exercise the throat and chest are ordinarily well covered up, and then on going to bed we throw off all this covering, and a thin night-shirt takes the place of them during the colder half of the twenty-four hours, in a room without a fire, and nine times out of ten draughty. The bed-linen, blankets, and counterpane no doubt during the early part of the night remain drawn close round the neck and shoulders, but during sleep the arms frequently are thrown out, and leave shoulders, chest, and throat exposed to the cold at a time when no exercise is being taken, whilst digestion is at rest, and therefore supplies no heat to the body; whereas if a moderate amount of drapery is arranged round the head of the bed to keep off all draughts, one would be far less liable to take cold in the chest and throat, and the air of comfort so essential in a bedroom is at once supplied.

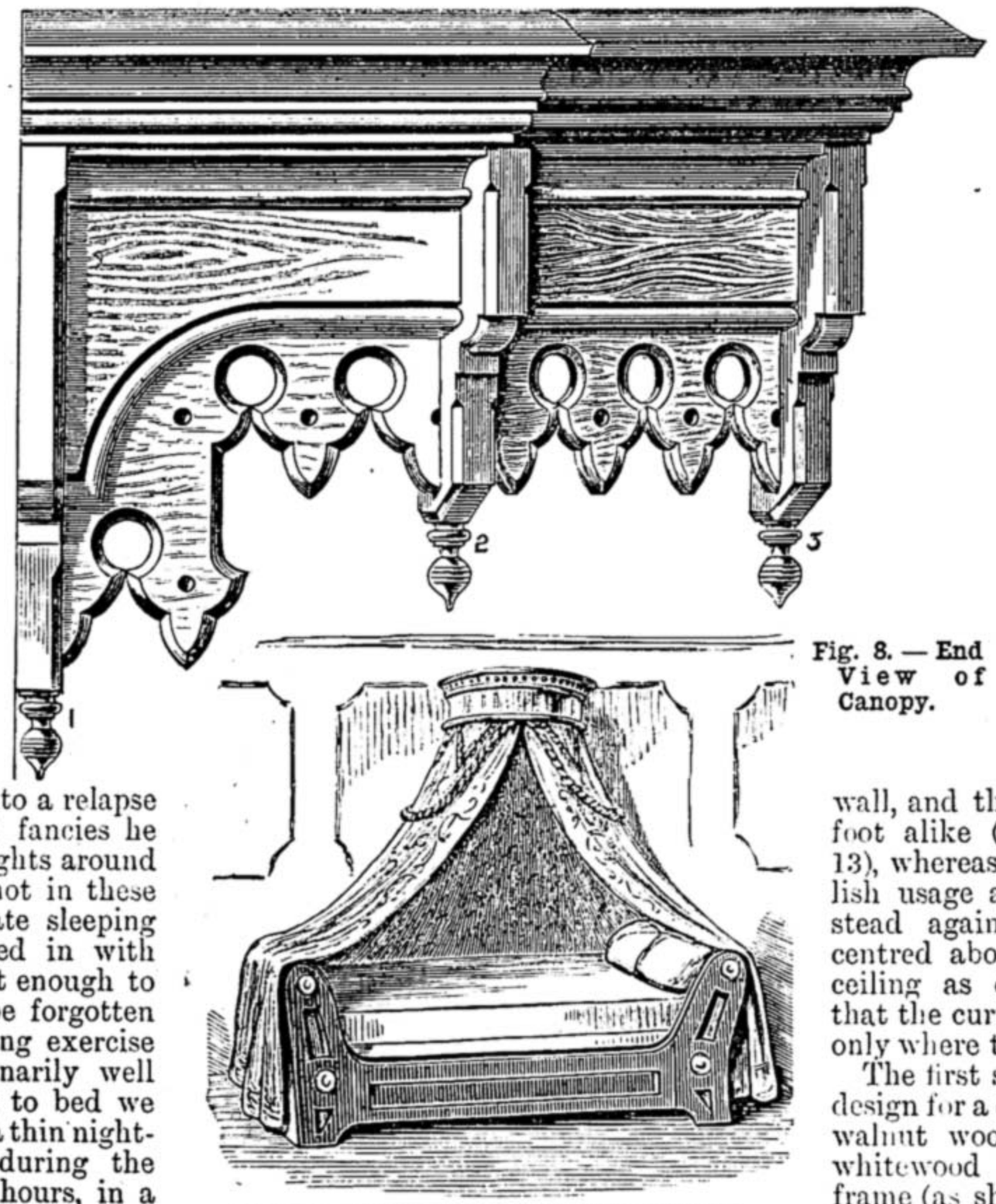

Fig. 8.—End View of Canopy.

Fig. 13.—Perspective View of French Bed.

In the earlier days of metal bedsteads, four-posters, Tudors, tent-bedsteads, and half-testers were made, but gradually fell into disuse—the crusade against insanitary conditions, as is too often the case, rushing into opposite extremes.

As a consequence of the foregoing reasoning, I hit upon the idea of adapting the French plan of draping bedsteads from a *couronne* (crown) or canopy, the difference being that the French place the bed sideways against the middle of a wall, with the canopy centred against the same wall, and the hangings fall over head and foot alike (see small sketch of bed, Fig. 13), whereas I propose to conform to English usage and place the head of the bedstead against the wall with the canopy centred above the head rail, as near the ceiling as convenient (see drawings), so that the curtains may fall exactly where and only where they are really wanted.

The first step in the construction of the design for a canopy in wood, be it mahogany, walnut wood, rosewood, or plain deal, or whitewood for enamelling, is to make a frame (as shown in Figs. 1, 2) of inch stuff, just 3 in. wide, halved at each joint (see dotted lines), glued and screwed together to form the skeleton framing upon which to fix the exterior portions. Next get out four pieces of the shape shown in Fig. 3, and two more for the ends against the wall of the form of Fig. 4. The frame may be of pine, or even deal, or American whitewood, but these dropping pieces should be of the same wood as the rest of the exterior of canopy. By the section (Fig. 6) you will see how the backs of these are to

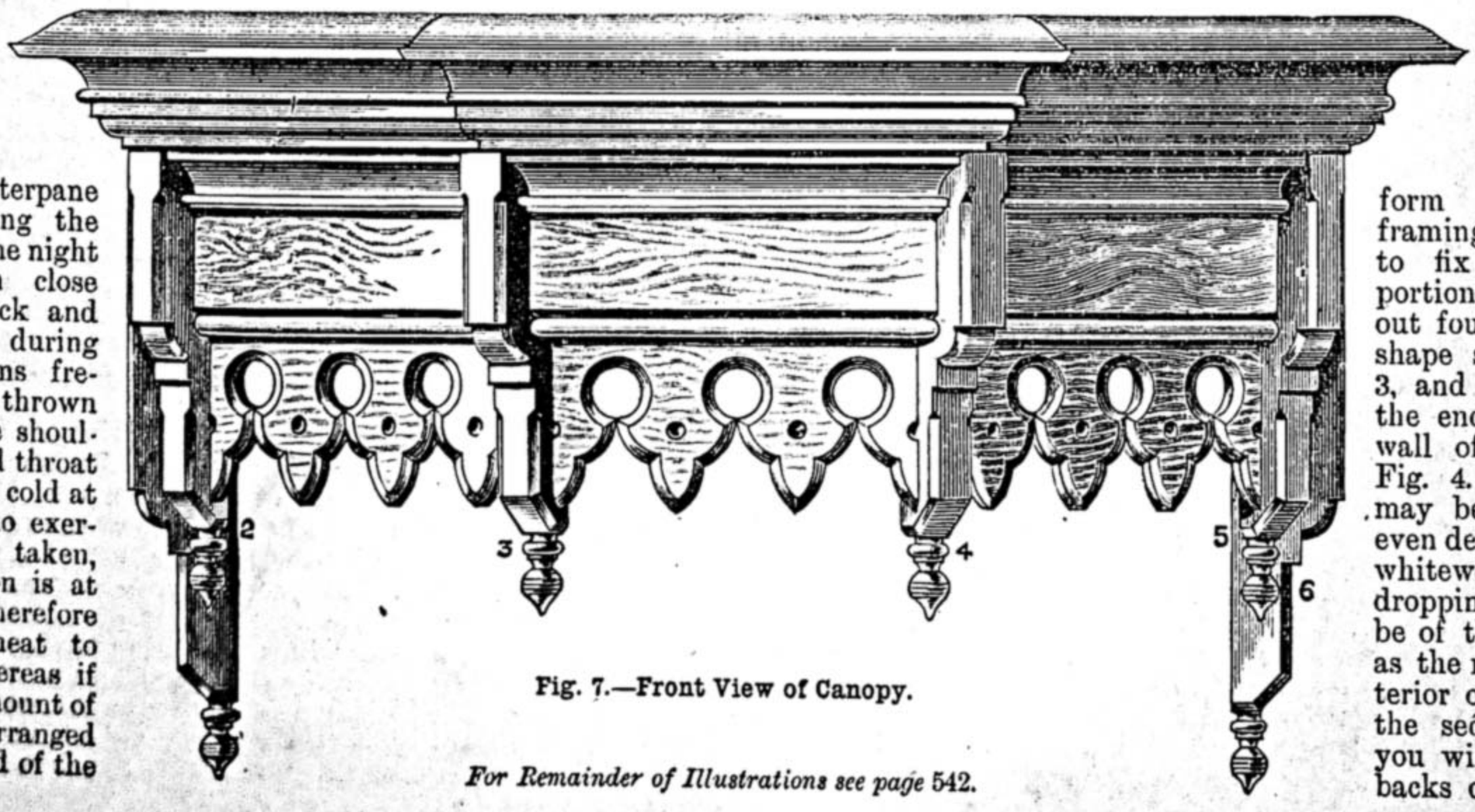

Fig. 7.—Front View of Canopy.

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be recessed to receive the various members A, B, C (Fig. 5), and the mouldings *a*, *b*, *c* (Fig. 6). What may be called the facia or architrave, A and B, should have the grain running horizontal, whilst C should consist of separate ¼ in. boards with the grain perpendicularly placed, a feature in my design upon which I lay some stress. The section also shows how the fixing can be done by screws from the back, which, with glue, ensures, even in damp places, that it will never give or get away from its berth. The dropping pieces 1, 2, 3, 4, 5, and 6 (see Figs. 7, 8), are to be chamfered and carved, and squared at top as shown. At this stage, let me advise both amateurs and workmen not to rely upon the bevel-square. I have too often seen an unnoticed movement of the blade throw everything out of truth, and entail all the work being re-mitred, with the result that the original frame requires planing smaller as each bay is shorter. As there are 360° in a complete circle, it follows that the angle of the mitre for an octagon, namely, P Q R, P R Q (Fig. 5), is ½(180°—45°) = ½ 135° = 67½°. This is the angle at which make a fixed bevel-square, and, let me add, a shooting-board and mitre-box. The time spent will prove time gained. To arrive geometrically at the exact angle, get a sheet of stiff paper and turn with the pencil compasses, with a radius of twelve iuches, a quadrant of a circle ; bisect this, and draw a line from the centre of the circle to the point of bisection, and another line from the point of bisection to the end of the diameter of the circle. The result will be that you have constructed an isosceles triangle—the apex having an angle of 45°, and the angles at the base each equal to 67½°, the required mitre ; then cut out this paper template, and make your mitre-box, shooting-board, and bevel-square exactly to the angle required. Even practised cabinet makers will tell you that it is more than twice as difficult to work to an octagon than it is to work to a square, but the greater the difficulty "the greater share of glory." Next make another sort of shooting-board, viz., one which, instead of having the bed square with the shooting-plane, must have a bed at the angle of 67½° to the plane; this is to enable you to plane on the shooting-board the ends of the pieces which go to form your bays,

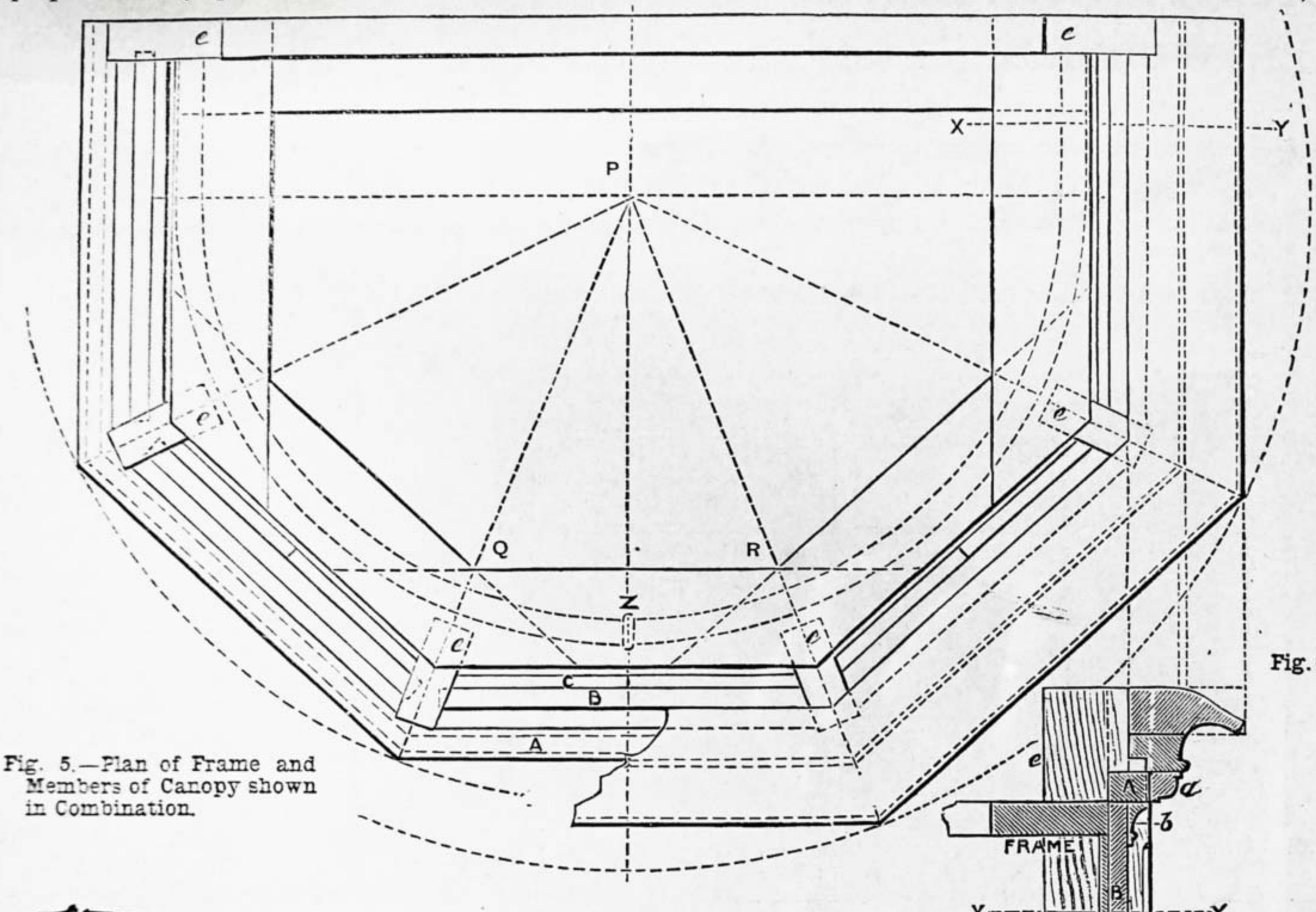


Fig. 5.—Plan of Frame and Members of Canopy shown in Combination.

Fig. 6.—Section of Frame and Canopy on X Y in Fig. 5.

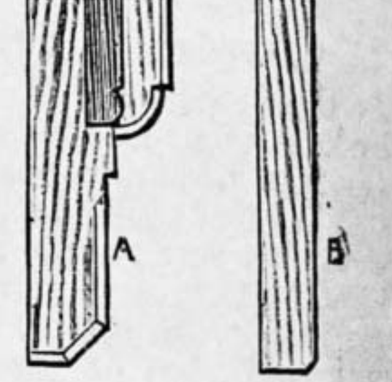


Fig. 4.—Side View (A) and Back View (B) of Nos. 1 and 6.

Fig. 9.—V-Tool for Curved Beading.

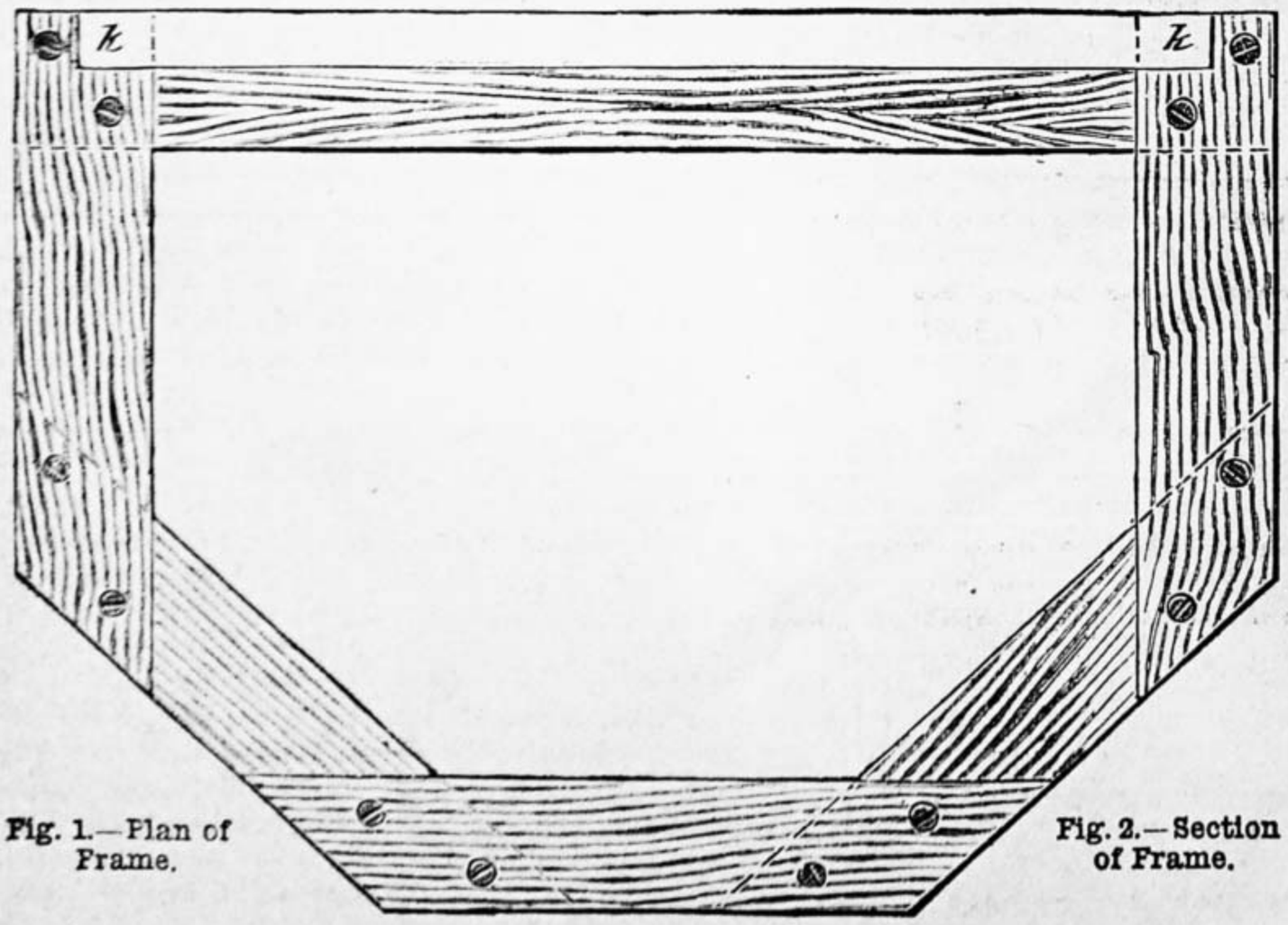


Fig. 1.—Plan of Frame.

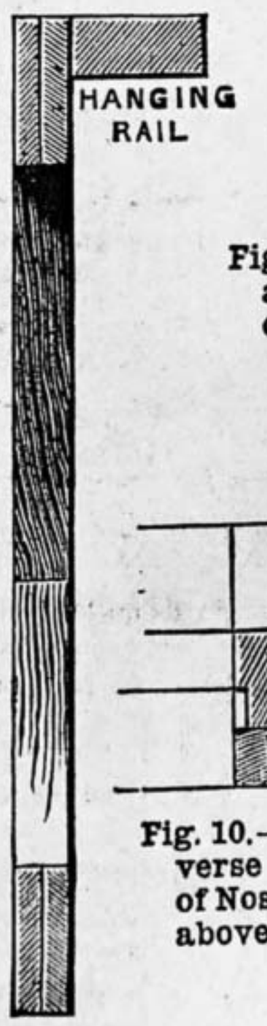


Fig. 2.—Section of Frame.

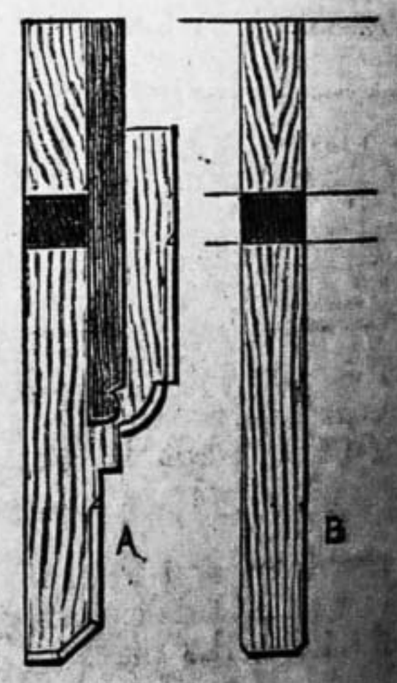


Fig. 3.—Side View (A) and Back View (B) of Nos. 2, 3, 4, and 5.

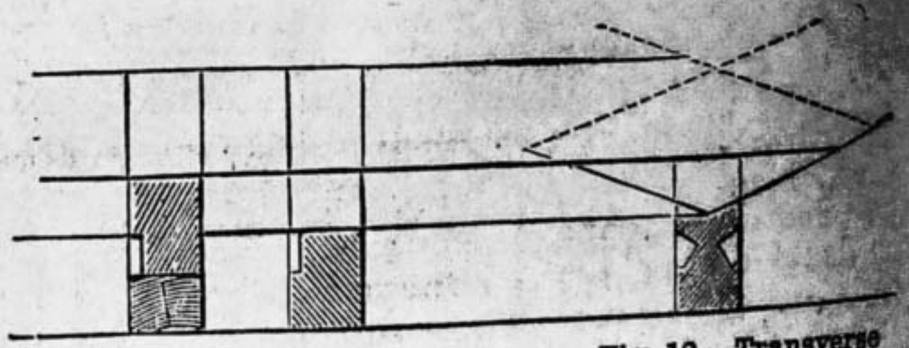


Fig. 10.—Transverse Section of Nos. 1 and 6 above Frame.

Fig. 11.—Transverse Section of Nos. 1 and 6 at Frame Level.

Fig. 12.—Transverse Section of Nos. 2, 3, 4, and 5 at Frame Level.

and the ends of your moulding so true as to avoid any misfits. Even when you have finished your canopy these tools will be available when you next require them, and will serve many a turn when you least expect it, so do not begrudge the time they take to make them carefully and well.

I have given three transverse sections (Figs. 10, 11, 12) at different heights to show how the ends of the members A, B, and C are housed into the dropping pieces dividing the bays; these will be the same in the two end pieces, Nos. 1 and 6, except that the architrave and mouldings will be housed *square* into them instead of at the angle of 67½°. In these two end bays the architrave, instead of being, as in the four other bays, 5 in. wide, must be cut as shown in Fig. 8, with a curve, and return from the 5 in. width to 9 in.; and the moulding which is planted on to the others must be carved on the edge following its curve, as shown, as it would be almost impossible to work it as a separate moulding: this carving will only require one special tool, viz., the V, or parting tool, as shown at Fig. 9, the rest being cut with a chisel, face outwards, gradually rounding off the ½ in. bead, the V tool being used only for the groove, leaning it over to form the shape.

The cornice should be made as shown in section (see Fig. 6) of two pieces, one of which, the under one, is used for the double purpose of thicknessing out the upper member of cornice, and also in its rebate, to receive the upper edge of the architrave thus concealing the joint. Measure and mark off, not from the exterior face, but from the plane of the *inside* face of the dropping pieces, otherwise errors will creep in and destroy the accuracy and symmetry of the work. Enlarge all drawings to full size (they are one-eighth full size)—*i.e.*, 1½ in. to the foot; *e e e e e e* is to be taken as the datum line from which to gauge all other planes, and unless you act on this you will be like one who sits upon two stools, and finally comes to grief between them. Note that in sticking the cornice mould the plane will not finish the deep hollow shown; this must afterwards be deepened with a gouge, but the richness of effect will amply compensate for the extra trouble. This moulding is to be found in its pristine beauty of form in many of our old cathedrals, when the then British workmen, under the influence of priestcraft, put their best work forward, and did for nothing that for which they would not move a finger for the capitalist employer of to-day. I should like to expatiate on the old majesty of craftsmanship, the glorious old system of German and English guilds, when the journeyman, after his severe apprenticeship, travelled in foreign countries. Hence the term "journeyman." Space denies my pursuing this subject further, however, at present.

Having cut the housings in the sides of the pieces Nos. 1, 2, 3, 4, 5, and 6, prepare them also as shown at *k*, *k*, to fit into the frame, taking care that they shall be quite square with it (see transverse section, Fig. 11), and also cut them away at the top to receive the back of the cornice (see plan, Fig. 5, and section, Fig. 6). Instead of planting the bead C underneath the facia B, it may be worked with a ½ in. bead-plane out of B, by getting out the stuff wider, if preferred. Having now tried your facias and the frame to see if they fit, glue the dropping pieces to the frame, and whilst the glue dries saw out the fringe-boards C, C, in plan and section, to the shape shown in Figs. 7 and 8, chamfering their edges as shown, and with a ¼ in. gouge cut half through the holes shown. These should be made of panel stuff, about ¼ in. thick, and if you make each bay out of two widths they need not be jointed together. As I said before, the grain runs up and down in these. The two bays at the sides next the wall differ from the other four (see Fig. 8), in being carried lower to carry out the idea of a bracket arching away from the wall. You may now fix on upper side of frame, next wall, a piece of deal or pine, square with it, *k*, *k*, Fig. 1, having two ¼ in. holes to hang it to wall, with brass-headed nails. This can be glued and screwed in place from the under side, as it carries not only the whole weight of the canopy, but that of the curtains as well. Presuming that the dropping pieces are now firmly glued to the frame, slide in from the top into their respective housings the facias B, B, B, etc., then cut to their proper lengths six pieces A, A, etc., leaving the ends long enough to fill the grooves, through which you slide down the facias B, B, etc. Glue these ends into their places, and fit the mouldings *a*, *a*, *a*, etc., and *b*, *b*, *b*, etc., nicely into their places, and glue them with nice thin glue, and drive a few needles in to strengthen them, taking care that the joint A *a* is flush, so as to permit of your next putting on the cornice, which is to be glued to the upper parts of the pieces 1, 2, 3, 4, 5, and 6, previously prepared to receive them, and screwed, if desired, from the backs of each of these to bring up the mitres close and strengthen the whole structure; commencing, of course, with the bays next the wall sides, working with the greatest accuracy in the mitreing and fitting. Next proceed to glue and screw to the back of your facias the fringe-boards C, C, C, bevelling off to angle 67½° those portions that are in contact with the dropping pieces 1, 2, 3, etc.; the upper ends should touch the under side of the frame and bed exactly on the backs of B, B, B, etc., to which nail or screw them, and glue as well. Now turn, or have turned, six drops to pattern, with a shank to enter holes bored in the ends of the dropping pieces (see Figs. 7 and 8), and the construction is complete. Now for the curtain rod. Procure a piece of ¼ in. gas-barrel, and bend it to a semicircle, as shown in dotted lines in plan (Fig. 5); bore with a centre-bit in dropping pieces 1 and 6 holes exactly the size of the exterior diameter of the gas-barrel, on the level shown in section, viz., exactly behind the ½ in. bead at the lower edge of the facias B, B, etc., so that the curtain, stitched to ¾ in. rings, may hang behind the fringe-boarding without showing any gaps. At Z screw into the frame a meat-hook, until the lower part of its hook shall be level with the barrel; now slip the centre of the barrel into the hollow of the hook, and so arrange that the two ends will just spring into the holes prepared to receive it, so as to hold fast enough to prevent them slipping out again, unless required, when some little force ought to be necessary to withdraw them. Drive into the wall brass-headed nails same distance apart as the holes you have bored previously in the hanging rail previously described, and you can then hang your canopy in its proper position, centrally over your bed-head, say 5 or 6 feet above the head-rail thereof.

Every 5 or 6 in. stitch firmly to your curtains, rings which will be strong enough to sustain the weight, and slipping them on the rod, *i.e.*, the ¼ in. barrel, will permit of your drawing them close together, the meat-hook alone intervening at the front. Now take two breadths of your curtain stuff if it is a yard wide, or three breadths if it is only ¾ wide, boxpleat the top to the width of the back of frame, and with tinned tacks fasten the top to it. This stuff will then hang in graceful folds between the bedstead head and the wall, closer at top and widening out to the width of the bedstead at the bottom. You will then find that by pushing the side curtains behind the back curtain you have a cosy retreat in which, when you retire for the night from the cares of the world, you will never suffer from draughts.

INDIARUBBER FELLOE-RIMS.

BY JOHN CHARLES KING.

ALTHOUGH vulcanised rubber has been in use in carriages in England and France many years, many manufacturers of parts of ironwork to standard patterns and sizes do not understand the main principles of its application to springs and scroll-irons. One of the chief uses, when applied to the pipe-eyes of springs and scroll-irons, is to cut off contact of iron and iron so as to prevent

Fig. 1.—Form assumed by Indiarubber Tyre at contact with Road.

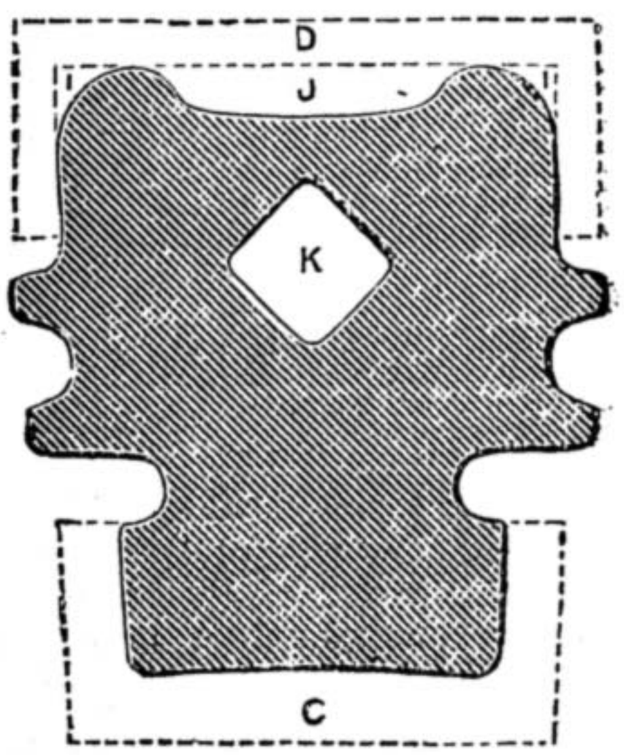


Fig. 2.—Section of Indiarubber Felloe-Rim—C, Flanged Rim holding Ends of Spokes; D, Flanged Tyre on Felloe-Rim; I, J, I, Spaces between Rubber and Tyre; K, Centre Hole running through Tyre.

jar and noise. At the late French International Exhibition, some of the best forged ironwork and springs had indiarubber applied in a way which ensured contact of rubbing surfaces of spring-eyes with scroll-irons, which allowed the jar to be communicated from the roadway to the carriage, to the annoyance of riders, who expected silence by the rubber bearings to springs to their carriages. The fault was pointed out and admitted by the expositors. Cheap warehouse ironwork is equally defective in England. Workers paid by the gross for inserting "rubbers" know nor care little whether right or wrong so long as they can take more money on Saturday.

The more rubber is applied to jointed surfaces or road bearings of a carriage, the lighter and easier it moves and springs, and more noiseless for a rider if the road be a rough one.

The rubber tyres on vehicles are a gain in silence, but on a smooth road cause the vehicle to move harder for the horse. The weight of the vehicle flattens the rubber tyre on the road, and presents a bulge of tyre in front of the advancing wheel as

at A, Fig. 1, which has to be crushed down to allow the wheel to roll forward. Now on a rough road this bulge would bed its cushioned surface into the projections of the road, thereby avoiding lifting the vehicle up over them, so that for such roads the gain is great; but as the streets and roads in our chief towns and cities are generally so smooth and level, there is a loss by the use of these tyres, and their cost and rapid wear by road friction form a serious expense to the repairs of a carriage.

To do away with the road-wear of rubber on wheels, a Mr. Ayres introduced rubber felloe-rims, of which Fig. 2 is a section. It is shut in between two steel rings: C is a flanged rim holding the ends of the spokes of wheel; D is a flanged tyre, which encompasses and protects the felloe-rim of rubber from contact with the road. It will be seen that this rim does not fit the rubber; there are spaces I, I, and J, and a central square hole K, the whole length of the rubber; these are the special means by which the utmost elasticity of the rubber is ensured, as these spaces allow the spreading and yielding of the rubber under pressure.

Here the rubber is put in its proper place on the wheel for lightness of draft and prolonged durability, and no repairs needed till worn out. They have been well tested on cabs and parcels carts. It does not argue much for the intelligence of hansom-cab builders, who make no difference in the weight of wood or ironwork, whether to be fitted with wheels with iron tyres or rubber ones, whereas with rubber tyres nearly every part of the cab might be lighter.

MODERN FORGING.

BY J. H.

Miscellaneous Examples.

Having now described in brief the elementary principles of the practice of forging, I shall take some examples of leading types of work. The subjects treated in this and two successive articles will embrace some of the common types of forgings made and used in the construction of machinery, engines, etc., such as various rods and levers, bolts, and cranks. After that will follow special chapters on some branches of smiths' work, as tool making, the working of steel, model work, country repairs, etc.

Rods and links with bosses, like Fig. 50, are used extensively in various forms and proportions, and are also differently made. At first sight, upsetting would appear to be the most obvious method of making such rods. It seems so simple to take a round or rectangular bar, as the case may be, of the same size as the intermediate portion A and to dump up the ends to make the bosses B. But upsetting tends to open or spread the grain and impair its continuity, and moreover, the operation would require several heats, and occupy a good deal of time: unless, indeed, the bosses were very small in proportion to the bar.

Three cases at least may exist:—(1) When the bosses are small relatively to their rods, and the rods are of no great length—a few inches only, as in some machinery links and levers. Then it is practicable, though not desirable, to form them wholly by upsetting. But, properly, they should be made either by partial upsetting and partial drawing down, or wholly by drawing down, according to what iron happens to be in stock. (2) When the bosses are relatively large and the eyes relatively small (Fig. 51) and the rods of several feet in length, as in the tie rods of roofs. Then they will be forged from the solid, distinct from their rods, and welded on. (3) When the eyes are large—Fig. 52—as in the truss and tie rods of bridges, jibs of travelling cranes, etc. Then the eyes are formed by turning round and welding the iron, and usually also by welding the eyes when made, to their rods.

In case (1), whether the bar be wholly upset, or partly upset at the ends, and partly drawn down in the intermediate portion, or wholly drawn down in the intermediate portion, from a piece of the full dimensions of the ends—in either case the lumps for the bosses B are at first left rough and irregular, and unshapely. Then, if they have been upset they should be well hammered at a welding heat to consolidate the metal. Always they will be finished after rough hammering by the aid of the hollow top and bottom tools or swages, operating on the curved edges (*a*, Fig. 50); by the flatter and sledge on the flat faces *b*, and by the fullering tool around the neck *c*. In repetition work the eyes would be finished in a pair of cast-iron dies, like Figs. 53, 54. Fig. 53 gives the finished curvature to the edges *a* in succession, and the fullered neck *c;* and Fig. 54 completes the flat faces *b;* and the eye *d* is punched, if punched at all (in a small boss like Fig. 51 it would be usually drilled), while the boss B lies in the die, the core falling down into the hole A, a trifle larger than the punch. The boss is beaten into the dies with the sledge, or preferably under the drop, or the steam hammer.

In Figs. 53 and 54 B is a wrought-iron bond shrunk on to prevent the cast iron from becoming burst by the concussion to which it is subject. These blocks are made of square as well as of circular form, but the latter is to be preferred, because of the greater ease experienced in fitting and shrinking on the bond.

Dies like this are often made in pairs, top and bottom being coupled with pins for use under the steam hammer. Should space allow, I will say something about die forging later on.

In case (2) the bosses are made from bar of their own dimensions, and a sufficient length is drawn down—say from three to six inches—to permit of making a scarfed, welded joint (Fig. 55), with the long plain body of the rod.

In case (3) the eye is turned round and welded, forming a short solid shank, which is then scarfed and fullered for welding, like Fig. 56. Or it is turned round to form what is termed a tongued joint (Fig. 57)—that is, a joint in which a wedge-like end is fitted into a corresponding cleft, and so welded. This is supposed to be stronger than the plain scarf, and is often used on iron of heavy section.

Fig. 58 shows a tongue joint made in solid bars. Note that the ends are upset as in an ordinary scarf joint. It is made as follows:—

First upset both ends; then for the tongue (A, Fig. 58), set in a fullering tool on opposite sides of the upset portion (Fig. 59, *a*). From thence the end will be tapered down by hammering until it has the appearance of Fig. 58, A. For the recess B, nick the other upset end inwards with a chisel, and open out sufficiently with a wedge. This will spread the end more, as well as open it out; and this spreading out is an advantage, because it gives plenty of metal for welding and swaging down to finished dimensions. The tongue joint is then made in the usual way by raising both ends to the welding heat, and when assured that the faces are clean and free from dirt and scale, hammering them together, first with the hammer, and then finishing them with the top and bottom swages. The first blows should be given endwise, to ensure union at the termination of the tongue. These may be given while the work is in the fire, provided the fire is clean, and the joint cleansed by throwing sand into the fire over the work. When the joint is being hammered circumferentially, the angular swages (Fig. 60) may be used to better advantage than by merely laying the work upon the anvil. The angles support the sides of the work, and the operation is performed more quickly—a vital matter in welding operations. The top swage may be used as well, or the sledge only. Or the steam hammer may be brought into requisition.

Levers of the general form shown in Fig. 61, but variously proportioned, are very common. The methods of their manufacture will be modified by circumstances. They may be drawn wholly from the solid, or partly drawn and partly welded—seldom, however, upset.

A lever of the proportions shown in Fig. 61 would in general be formed wholly by drawing down.

A rectangular bar, having a sectional area about equal to that of the central boss A, would be selected. First, a fuller would be driven in on opposite sides, as at *a*, *a*, *a*, *a*, Fig. 62. Then the bar would be drawn down roughly from the fuller nicks to the ends, until the ends were reduced to an area *a*, suitable for the smaller boss B in Fig. 61. Again the fuller would be driven in at *b*, *b*, and then the intermediate portion B would be reduced by fullering or by hammering until the required thickness of the web (C in Fig. 61) was nearly reached. The blows would be made to alternate on sides and faces alternately, drawing the sides to the tapered form seen in the plan view, as well as the webs to thickness. There is no attempt at finish just yet, for the centres of the bosses are probably not correct, and it will very likely happen that some further drawing down, or even a trifle of upsetting, will be required before the boss lumps will be sufficiently near to correct centres, to permit of their holding up to the required dimensions. Rough measurement will be taken from time to time with the rule, or with some form of gauge. At this stage the lever will be something like Fig. 63, with square lumps at centre and ends of the webbed portion. Now, to hammer these bosses at once into a circular form would mean a lot of labour and several heats, so the corners are cut off with a hot set, as shown by the dotted lines. When a boss is small, four corners only are cut; when large, eight, or even more. The set is driven perpendicularly first, and then horizontal cuts are made to meet the perpendicular ones, until the boss is rudely chiselled to a circular form. The set is not driven right down to the web, but stops at the radius or hollow. Then the hammer, and afterwards the hollow swage, are used to give an approximately circular form to the bosses; and the hollows shown at *a*, *a*, in Fig. 61 are shaped with the hollow fuller (Fig. 64). Fairly shaped bosses can be thus made, but not perfectly true. In repetition work recourse is had to dies. For the end bosses the die would be like Fig. 54 in this respect: that the end bosses (B in Fig. 61) would be

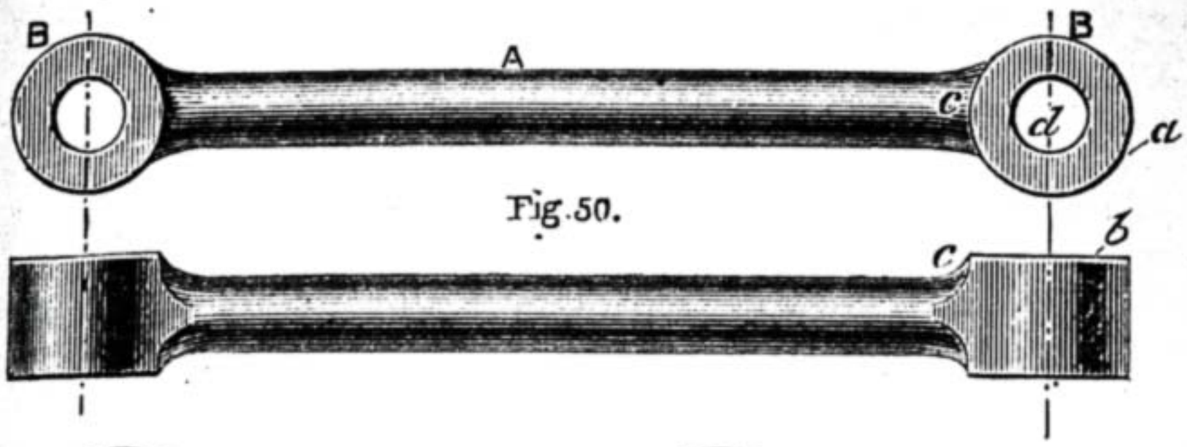


Fig. 50.

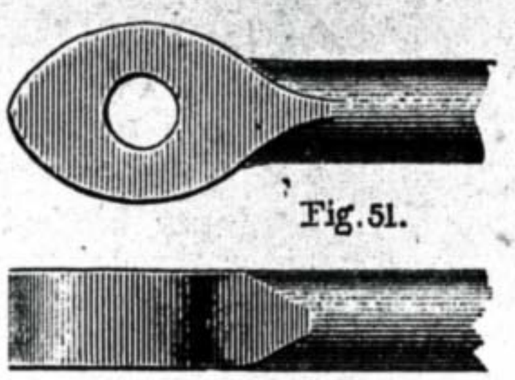


Fig. 51.

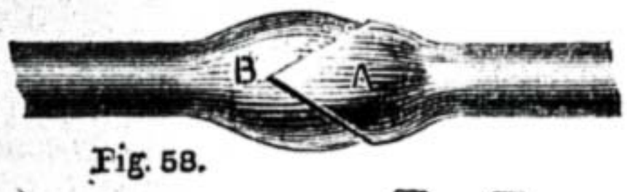


Fig. 58.

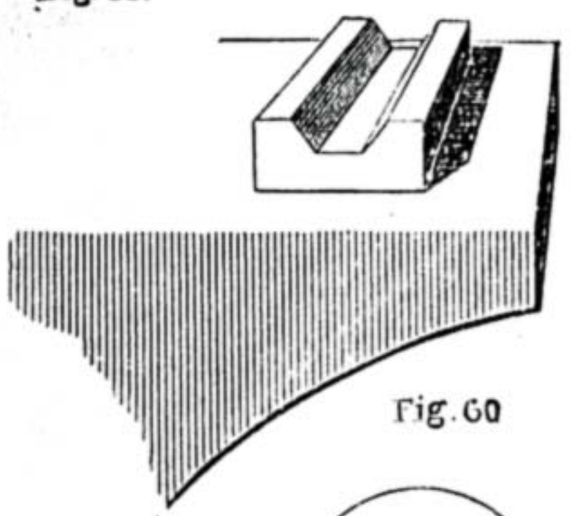
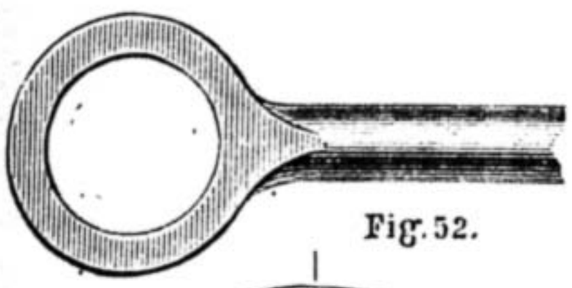


Fig. 60



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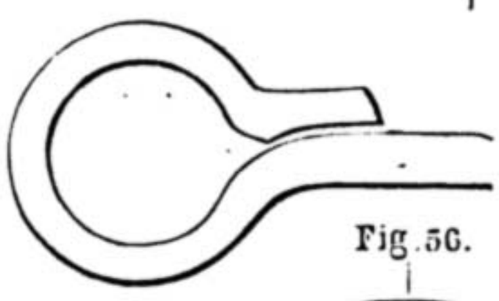
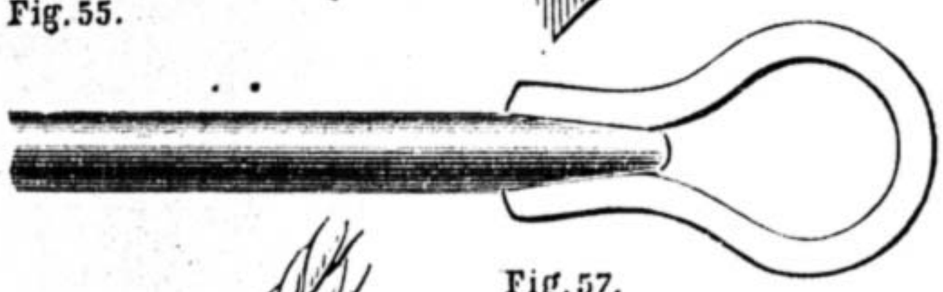


Fig. 56.

Fig. 55.



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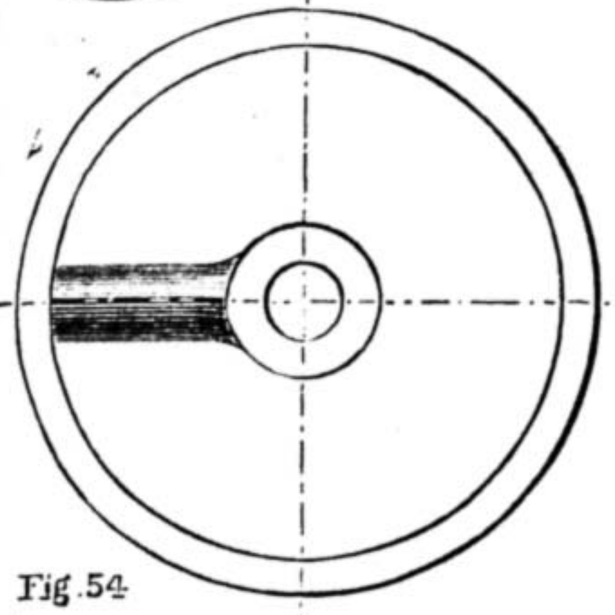


Fig. 54

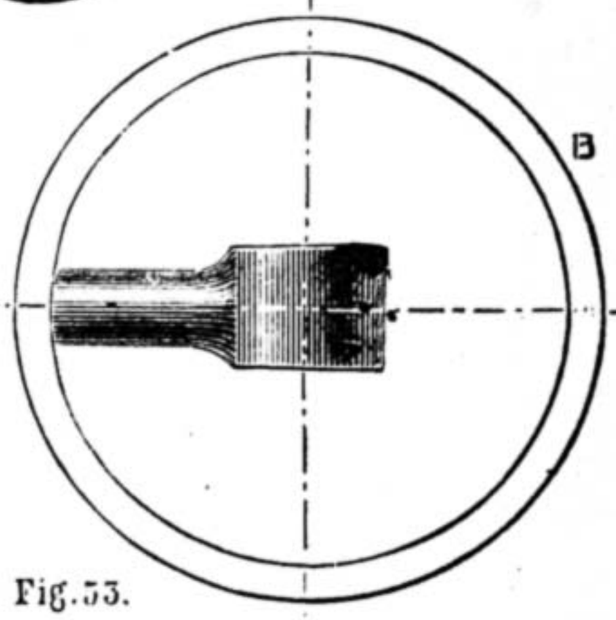
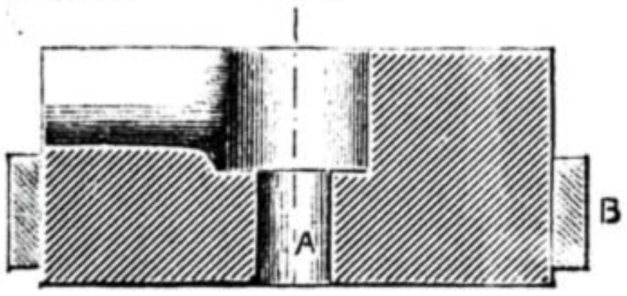
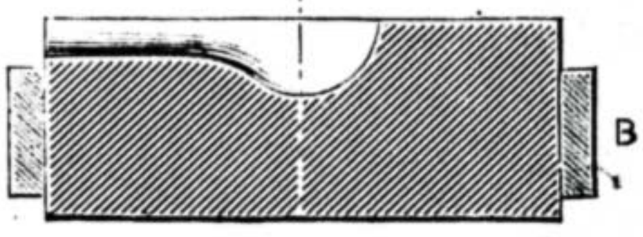


Fig. 53.

Fig. 64.





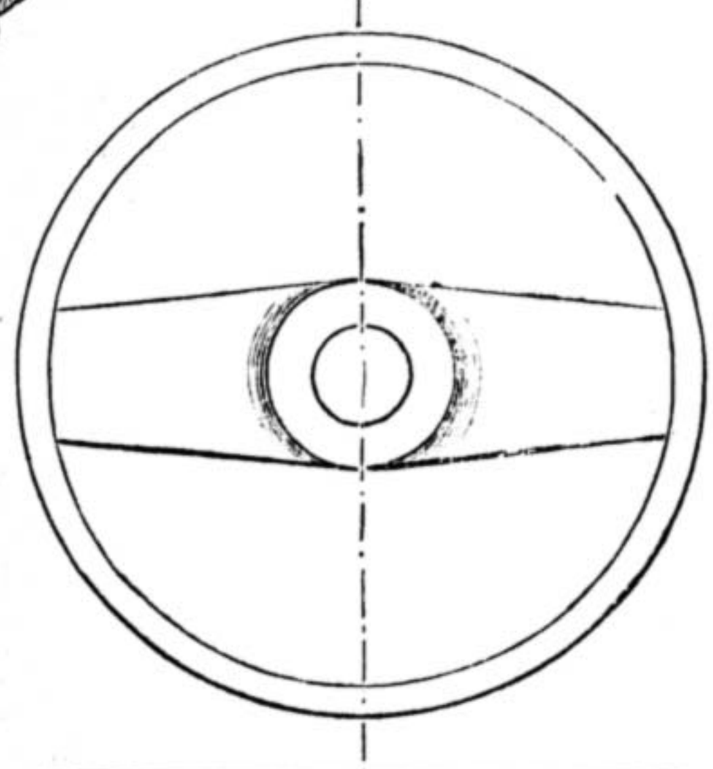


Fig. 59.

Fig. 61.

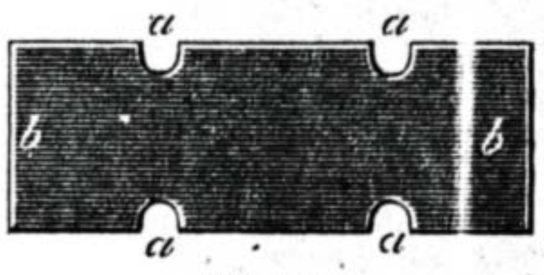


Fig. 66.

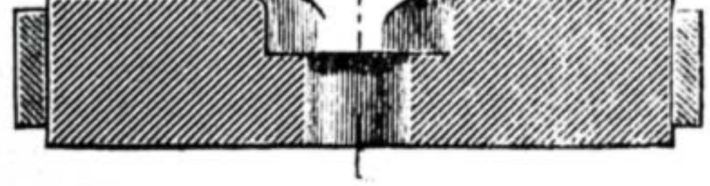
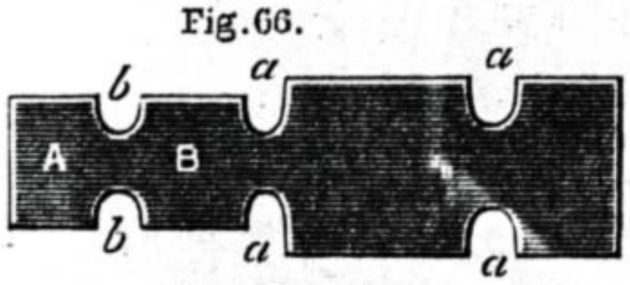


Fig. 65.



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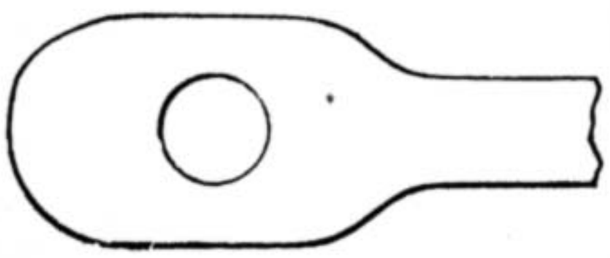


Fig. 70.

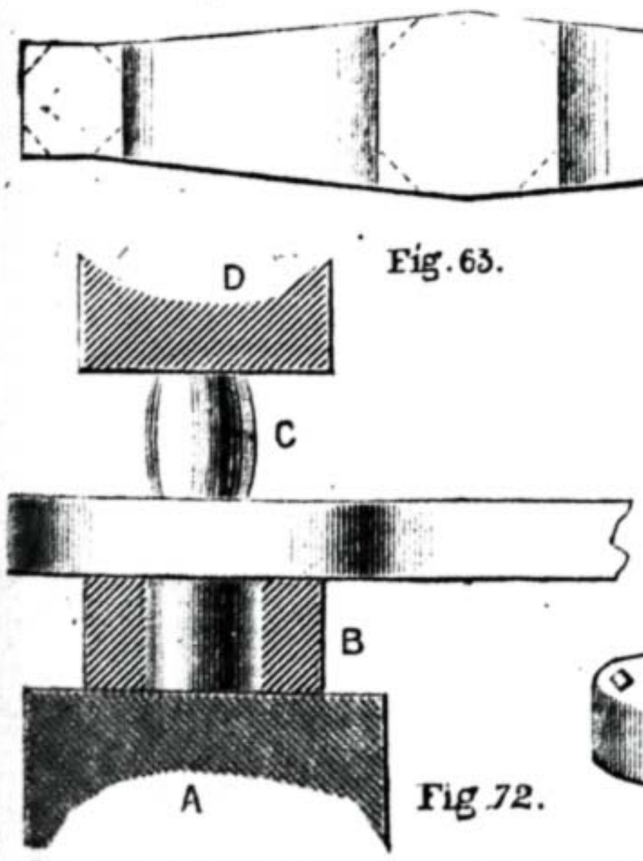


Fig. 63.

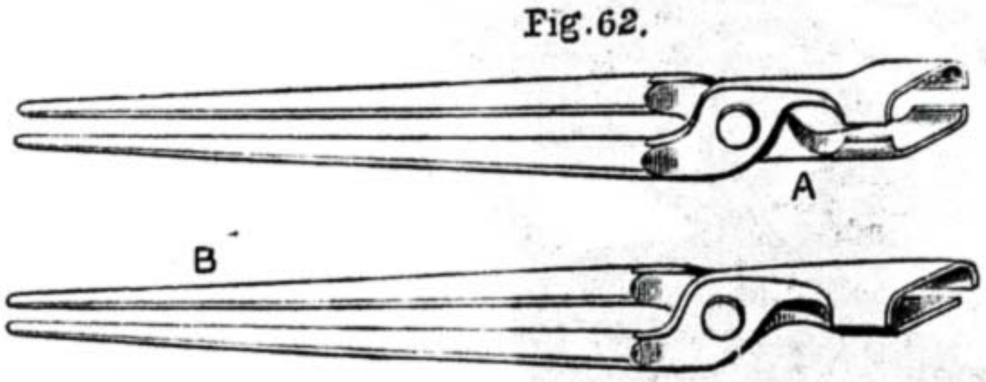


Fig. 69.

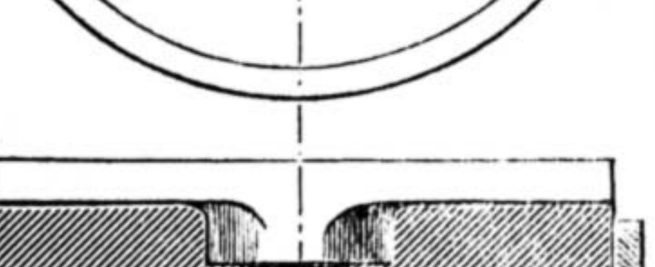


Fig. 71.

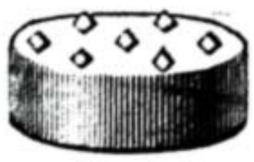


Fig. 68.

Fig. 67.

Fig. 72.

Fig. 50.—Rod or Link. Fig. 51.—Small Tie-Rod End. Fig. 52.—Large Truss or Tie-Rod End. Figs. 53, 54.—Die Blocks. Fig. 55.—Boss End scarfed for Welding. Fig. 56.—Eye turned round for Welding. Figs. 57, 58.—Tongued Joint. Fig. 59.—Fullered End for Tapering. Fig. 60.—Angular Swage in Anvil. Fig. 61.—Double ended Lever. Fig. 62.—Fullered Lump. Fig. 63.—Lever roughly forged. Fig. 64.—Hollow Fullering Tool. Fig. 65.—Die Block. Fig. 66.—Fullered Lump. Fig. 67.—Bosses and Rod scarfed for Welding. Fig. 68.—Boss Lump prepared for dabbing on. Fig. 69.—Tongs for flat Bars. Fig. 70.—Tie-Rod End. Fig. 71.—Rough Forging for ditto. Fig. 72.—Punching Hole in Tie-Rod End.

hammered into a recess in the middle of the die, and the web would rest in a recess reaching from the centre to the outside. For the centre boss the die is shaped like Fig. 65. Bosses finished thus are so true that they can be left without subsequent turning, polishing on the emery wheel giving sufficient finish.

If the lever were of considerable length, say anything over a foot, it would be easier to take separate pieces of bar iron for the web, and separate pieces for the bosses, and weld them together. Thus a lump would be taken (Fig. 66) for the central boss, and set in with the fuller at *a*, *a*, and drawn down at each end *b*, *b*, leaving the extremer ends rather thicker than the intermediate portion (Fig. 67, A), in order to form scarfed joints for welding. The end bosses (Fig. 67, B) would be similarly prepared, and all welded to the webs (Fig. 67, C), also upset and scarfed. The shaping and finishing of the bosses are most conveniently effected previous to the welding up.

Yet another way is to weld or "dab" the bosses on the web. The boss pieces would be cut off a round rod of suitable diameter, and while red-hot, hatched up with a corner of the chisel (Fig. 68), the chisel being held diagonally and struck with a hammer. These hatchings are for the purpose of assisting the union of the welded surfaces. The flat bars and the bosses, being then raised to a welding heat, are made to adhere by a few hammer blows. The thinner the web the more intimate and secure the weld.

When forging articles of this kind, it will be necessary to test the parallelism and the rectangular form, and the winding of the various parts. Forgings are apt to develop inaccuracy quickly while the metal is yielding, and so the smith employs the eye in the early stages of the work, and squares, and calipers, and straight-edges as it becomes cooler.

For holding flat bars and levers of this type, tongs shaped like Fig. 69 are employed. In A the jaws are alike, and come into direct opposition. In B a flat jaw falls within the sides of the other. These are made in various widths and proportions, the range of a single pair being rather limited.

Large tie-rod ends (Fig. 70) are always welded to their rods. A rectangular lump is drawn down (Fig. 71) at end A to an area a trifle larger than that of the rod, and scarfed for welding. The rounding corners B are shaped by first cutting the angles off with the hot set, and then by rounding off with the hollow tool.

In these rods the eyes, being large, are usually punched, even if, as is frequently the case, they are rymered out afterwards. Such large holes are punched with difficulty under the sledge, but are easily done under the steam hammer. Fig. 72 shows the arrangement employed: A is the anvil of the steam hammer, and upon this the bolster B rests. The diameter of the bolster must be sufficient to give proper bearing and support to the eye, and its hole must be a trifle larger ($\frac{1}{8}$ in. or $\frac{1}{4}$ in.), but not much larger than that of the punch C. Two or three blows of the hammer or tup D will send the punch through. The latter is slightly bellied in order to squeeze the metal, and also to clear itself in the hole easily.

After the rounding of the edges and the punching of the hole, the flatter will be brought into requisition before the bar is quite cool, to smooth over the edges that have been slightly upset during these processes.

ON THE DIVISION OF MUSICAL STRINGS FOR BANJOS, ETC.

BY B. A. BAXTER.

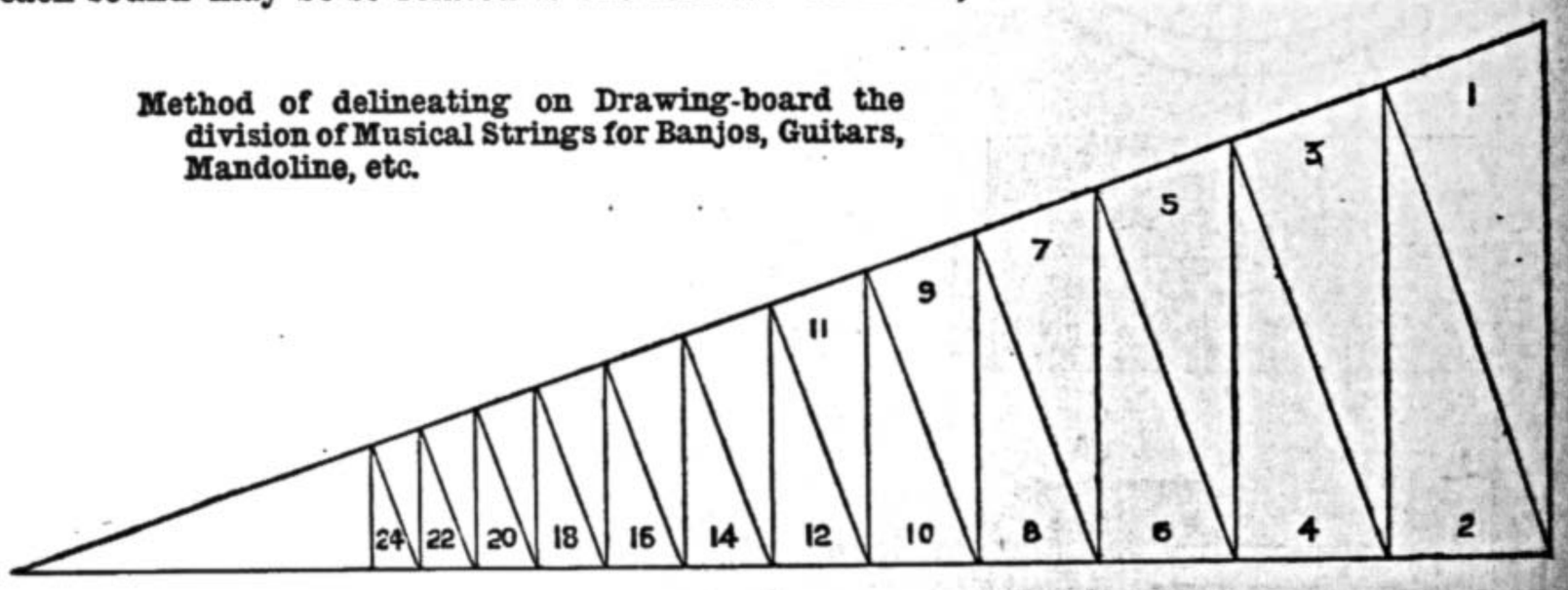
ONE of our kindest contributors sent us recently, through the medium of "Shop," directions how to make a mandoline (WORK, Vol. II., p. 229). In the course of the article he explained how to set out the varying distance for the frets. I have long been acquainted with various devices for determining these distances, as applied to organ-pipe scales, etc., but I was not prepared for so simple a mode of obtaining the desired result. As J. G.-W. did not claim absolute exactness for his method, I expected that the error in his plan was serious; and when one of our correspondents began to criticise the method given, in a rather elementary manner, I resolved to test the matter for myself. I did not, however, follow out the instructions to the letter, but in the spirit.

It may be well to mention here the fact that a musical string, weight and tension being the same, requires to be halved to produce the octave, and that the divisions needed to produce the seven natural tones, and the semitones which occur between, are twelve in number. Now, in order that each sound may be so related to the rest as to give similar results in *any* key, the scheme given by F. H. (*Streatham*), in page 355, will not serve; it will only do for one key, and for every change of key fresh errors will be introduced. What is wanted is a system whereby every key is as good as possible and as good as all the rest. Mr. J. Gleeson-White has done this, and although he makes no claim to perfect exactness, I find the imperfection is not greater than the accidental errors that are likely to occur in the application of a perfect system. But, speaking practically, the spacing out with compasses of $\frac{1}{18}$ and $\frac{1}{18}$ of each remainder is really a formidable undertaking, and ought not to be recommended unless there is no other way to ensure the same result.

If, however, the mandoline maker would make himself a pair of proportional compasses, having its legs in the proportion Mr. Gleeson-White suggests, he would soon find out if his plan is perfect, and how far it is from accuracy if it should not be quite true. Suppose, therefore, a pair of pieces of iron, say nineteen inches long, and pointed at each end: if these are so placed that the points are in contact, and a hole bored one inch from the end of each, and a rivet inserted through both (while the points are in contact), then it follows that if the points of the longer ends are separated to any distance, the points of the shorter ends are also separated in proportion to the length of each limb of the compass, and a trial can easily be made of the compasses as follows: Take any distance with the long arms of the compass, reduce the distance by the amount of space between the points of the shorter pair, take the remainder with the long pair, reduce again by the distance of the short pair, and so on until twelve distances have been determined; this should just halve the original line, and, if the process does not halve the line, then one or other can be filed shorter and another trial made; thus, if twelve spaces do not together occupy as much as half the original line, then the long limbs must be shortened; but if the twelve divisions overstep the half, then the short limbs must be reduced. If, however, this is deemed too troublesome—and it might be if only one finger-board had to be divided, though the use of such a pair of compasses is not confined to any length of string—still another plan may be adopted. On a drawing-board describe a right-angled triangle, having one side 17 in. and the other 18, the right angle being contained by the 17 in. and the shorter side, which will be about $9\frac{3}{4}$ in., full. Then take a set square and draw right angles, first to one side, then from the point of intersection to the other, as shown by the illustration; and, as before, twelve spaces will indicate if the plan is perfect. The drawing indicates how *very slightly* Mr. Gleeson-White's plan deviates from absolutely perfect equal-temperament division; and when it is remembered that the straight-edge or the set-square, or both, may have been imperfect, or that the operator may have been at fault in getting the intersections, I think that the readers of WORK will see that it is an excellent plan that F. H. seeks to improve upon, and that the plan he would substitute is not so good as Mr. Gleeson-White's.

Of course we must all come under the criticism of our readers, and as I thought Mr. White might not care to reply, I send this, as it contains a suggestion which may be useful to any makers of fretted stringed instruments.

Method of delineating on Drawing-board the division of Musical Strings for Banjos, Guitars, Mandoline, etc.



MEANS, MODES, AND METHODS.

A GRIP VICE.

ANY reader of WORK who may be in want of an occasional instantaneous grip vice on a small scale, may contrive one easily by fixing in his bench vice a sliding-screw cramp. By sliding-screw cramp I mean one of Hammer's cramps (I fancy that, like many dodgy things, they are of American origin), in which the screw may be loosened by a half-turn to the left, and drawn out or pushed in to its full extent, and tightened by a turn or so to the right. A 5 in. cramp will take in work from the thickness of tissue paper up to $4\frac{3}{4}$ in. full, without any loss of time in turning the screw.

Of course, as the jaws of the cramp are

not very broad, the device is not so well suited for large articles as it is for small jobs. For those who have no other instantaneous grip vice it will no doubt be of use. I have jotted it down as a useful hint for them. H. J. L. J. M.

Lathe Improvements.

My lathe, which is one of the smaller kind manufactured by the Britannia Co., has been, and is, one of my most useful tools; but at one stage of my work with it, now some years ago, I was much hindered by the great amount of time consumed in removing the slide-rest and in fixing it in its place when required, and also in removing the hand-rest and tail-stock when not in use. To obviate this waste of time I filed out so much of the iron between the two flat bars that form the bed of the lathe as would enable the slide-rest and tail-stock and other movable parts to be put in their places simply by loosening the nuts by which they are kept in position. I rounded all the edges of the nuts, and reduced them a little in thickness, so that I might not have to file away more of the lathe than was absolutely necessary.

No doubt some dismal croakers will say that I weakened my lathe by so doing, but I will say that the weakness exists in theory rather than in practice.

Another improvement I made was to raise the lathe from the floor by placing a piece of stout quartering under each of its legs. This was done with a double object: firstly, to bring the lathe bed up to a more convenient level for working, as the height of the lathe table, 33 in., was too low for me to work at long with comfort; secondly, by raising the treadle from the floor, to prevent my toes and those of my pupils from some occasional reminders—distinctly unpleasant reminders—that the treadle was there.

Lately, I substituted boxes about 2 ft. by 6 in. by 6 in. for the quartering. These boxes raise the lathe to a still more convenient height, and, being left open at the front end, form a convenient place for the hand-rest and tail-stock when not in use. H. J. L. J. M.

"Rubbing off" Brass Plates.

"Rubbing off" is the process of fretting down the superfluous wax after the waxing of the engraved letters. It is rather a laborious job, especially when the plate is large and the letters numerous.

Those who have to experience this process, will find it greatly to their advantage to mix with their fretting medium a little *common soda*. It acts as a solvent on the wax, greatly facilitating the removal of that which is not required. It should be used very carefully at first, until a proper acquaintance of its properties are determined.

After you have worn the wax rather thin the soda should be dispensed with, and the plate effectually finished with pumice-stone and water only. This will remove every trace of soda, and impart a proper surface to the wax. Probably if you neglect this, the after processes for completing the plate—the polishing especially—will render the wax below the level of the brass; because the upper part of it being made soft with the soda, will be unable to withstand the friction, and, consequently, will be worn down a little.

Neither should any water saturated with soda, or the soda itself, be permitted to remain inert on the plate for any length of time. If you have to leave the plate before it is finished, thoroughly swill it with water, rubbing the wax with the palm of the hand to remove any soda which may be incorporated with its surface. R. G. N.

Ebonising White Wood.

Ordinary white wood can be given the appearance of black walnut by first thoroughly drying the wood, and then, when warmed, coat it two or three times with a strong aqueous solution of extract of walnut peel. When nearly dried, the wood thus treated is washed over with a solution made of one part (by weight) of bichromate of potash in five parts of boiling water. After drying thoroughly, rub and polish.

J. H.

Stretching Canvas, etc.

To stretch a cloth material upon a frame—*e.g.*, the canvas for an oil painting—so that there may be no puckers, and the whole shall be evenly strained, seems a simple matter, but often proves a difficulty to the amateur, who, in nine cases out of ten, will first tack one side and then the side opposite, with the invariable result that the corners will not come right, or that there will be an excess of material at some point in the work, especially in the case of a large frame, such as the leaf of a screen, etc.

To obviate all difficulty and ensure a good job, begin to tack the material at any point—say, a corner—and, keeping the covering moderately tight and evenly stretched, go round the frame, etc., until you arrive at the point from which you started.

Opifex.

FITTING AN ELLIPTIC CHUCK.

BY JAMES LUKIN.

Fine Filing and Finishing—Tapping, etc.

After the several parts are fitted as described (see page 429), the fine filing and finish may be taken in hand. The holes in the guide bars are to be filed somewhat elliptic, with the long diameter across the bar to allow them to be tightened up if the slide move too easily from wear, and also during the present fitting of the slide; and it will therefore be advisable to drill, tap, and insert screws in the thickness of the plate, the heads of which must be in contact with the bars so as to set them forward. As the bars do not overhang the plate the heads must be recessed to enable them to act, such recess being made by means of a pin-drill, or cheese-headed countersink, after the holes are drilled and before they are tapped. Four screws will be needed, two to each bar. A bit of oilstone pounded in a mortar until sufficiently powdered, if oilstone powder cannot be got, will now have to be mixed to a paste with a little oil and smeared on the edges of the bars and V groove of the slide, and the two worked together until the fit of the parts is perfect and the motion smooth. It is then to be wiped off, and the action repeated with oil alone.

All parts requiring it may now be gone over with a finer file, and ultimately with a smooth one, but let it be distinctly understood that elaborate finish of exposed surfaces is not nearly so important as a true fitting of the moving parts.

The nose of the chuck will require some slight correction, which cannot be effected until after the ring has been fitted, therefore, it will now be necessary to take this part in hand. Two views are given of the ring and plate to which it is attached in Fig. 8, which is copied from one in the writer's possession. The plate A is $\frac{3}{8}$ in. thick, the lugs C, C, are $\frac{1}{2}$ in., and $\frac{3}{4}$ in. including the turned part. The ring D is $\frac{1}{8}$ in. thick at the edge, but more solid further down. It is filed away, however, after being turned, as shown by the dotted lines in the profile, so as to produce an opening wider than itself in the main plate. I do not consider this a good pattern, because it has not sufficient bearing against the face of the poppit, when by means of the adjusting screws B, B, it is set over on the side. There is no reason to have so large a central opening, as the only motion the ring has is about an inch or two horizontally. It is better, therefore, to have a broad, flat surface like Fig. 9, with a central oblong opening to allow it to free the mandrel. In all positions it will then take an ample bearing against the face of the poppit, which is there dotted in, the mandrel being marked M. The top of this plate is filed true with that of the mandrel, and has one inch or so marked in tenths, to read against a line on the poppit. This is denoted by the word "scale" on the drawing.

Mount the casting upon a wooden chuck by its ring, with the lugs towards the poppit, or mandrel headstock, and trim up the outside of the ring and face of the back plate, using a slow speed, and, of course, a slide-rest. True up also the front edge of the ring; next grasp it by the outside of the ring in a self-centring chuck, and bore out the inside and face the back as far as the lugs will permit. If no such chuck is at hand, make a wooden one, and bore to fit the ring already turned. With a flat file finish the bevelling of the back where the tool was interfered with by the lugs.

To mark and drill these lugs for the diametrical screws, stand the piece upon its ring, face downwards, upon a true surface (the lathe bed may be pressed into service for such work), and, setting the marker of a scribing block as near as possible to the height of the centre of the boss only, scratch a line across it at both ends. This will mark both lugs alike. The centre may now be readily judged by the eye, and a punch dot made in the centre of the scribed lines. Deepen these marks and mount between the lathe centres to shape the turned part of the lugs, which will also then become a guide for rounding off their edges neatly. With a $\frac{3}{8}$ in. drill—or a $\frac{5}{16}$ in. if a $\frac{3}{8}$ in. screw is to be used—drill at these marked centres, placing the drill point in one while the back poppit centre is in the other hole, and a true line will be ensured. These holes may now be tapped, and a pair of screws fitted. Use three taps to secure accuracy. The entering one will go far enough into the hole to ensure parallelism, for it is at the commencement, if anywhere, that the tapping will be other than true. After the first tap has passed clean through correctly, the intermediate will readily follow it, and the plug will bring up a full thread. For such work in taps, I confess to a prejudice against the Whitworth standard as giving too coarse a thread; but it is not very easy now to obtain taps of a given pitch as well made as the standard ones. For the size of ring we are dealing with, each screw may be three inches long, and should be of steel, with brass milled heads screwed on and riveted. They must be turned and nicely coned at the ends, but need not be so sharply pointed as to necessitate the obliteration of their drilled centres. If

preferred they may have heads or thumb-rings forged in the solid, flattened, and filed up to shape. This will depend, probably, upon the castings supplied by the firm to whom the order is given, and is of no special importance, one being as easy to fit as the other; and while some will use the lathe wherever possible, others prefer a little work with a file. It is essential that both screws point to the centre of the ring, and that the alignment with each other is perfect. A slight correction of the outer surface of the ring has to be made, but for this it must be first of all secured in its place upon the headstock; the latter must therefore be marked and drilled to receive it. Place a centre point in its hole in the mandrel, or mount a centre chuck in the nose as for turning a bar of iron: see that it runs true. Then set the needle of a scribing block to the height of centre, and scratch a line with the needle on the face of the poppit on each side of the mandrel as far as the edge (or, at any rate, mark it close to the edge), keeping the base of the scribing block upon the lathe bed as a surface plate. Then, by the help of a set square carry this line round each side of the headstock, and it will, of course, be at the exact height of the lathe centres. On this line the hole has to be drilled for the points of the screws which are already fitted to the ring. Hold the ring in place against the face of the headstock, and carefully setting up the screws, each upon its own bore, until they will just support the ring, the position of their points upon the line can readily be seen and a mark made close to each, which mark, when the ring is again removed, can be transferred to the lines. Another method is, after marking the lines, to set a gauge or a pair of spring dividers to the distance of the screw points from the back of the ring plate, and to measure the same distance on each of the scribed lines from the face of the headstock. Then with a sharp punch prick a hole to secure the point of the drill. As very much depends upon this drilling operation, it should be carried out with great care, and as soon as the holes are just deep enough to receive the points of the screws, the ring is to be put in its place and examined to see if its base rests against the face of the poppit, and to see how nearly the ring itself is concentric with the mandrel. To test this, screw on a drill chuck, carrying, instead of a drill, a bit of wire about four inches long, and bend it so as just to clear the outside of the ring as it rotates with the chuck. You will very quickly see whether you can set the ring so that the wire gauge shall touch it exactly as it revolves; it will probably do so, but if the ring appears, when thus tested, to be too high or too low, an attempt must be made to correct it in the process of deepening the holes in the headstock. These holes should tend slightly forwards towards the face of the headstock, so that the screws may have a tendency to draw the back plate of the ring firmly against the face of the headstock. They need not exceed a quarter of an inch in depth, and should be nicely coned to fit the screw points. Proceed carefully and with deliberation, trying the ring frequently in its place, testing and retesting its centrality, and a successful result will be attained. For final correction of the ring a cutter must be contrived that can be adjusted to finish the outside surface, and the old plan of Bergeron's will be as easily carried out as any other. At any rate, it will illustrate the sort of apparatus needed for this work.

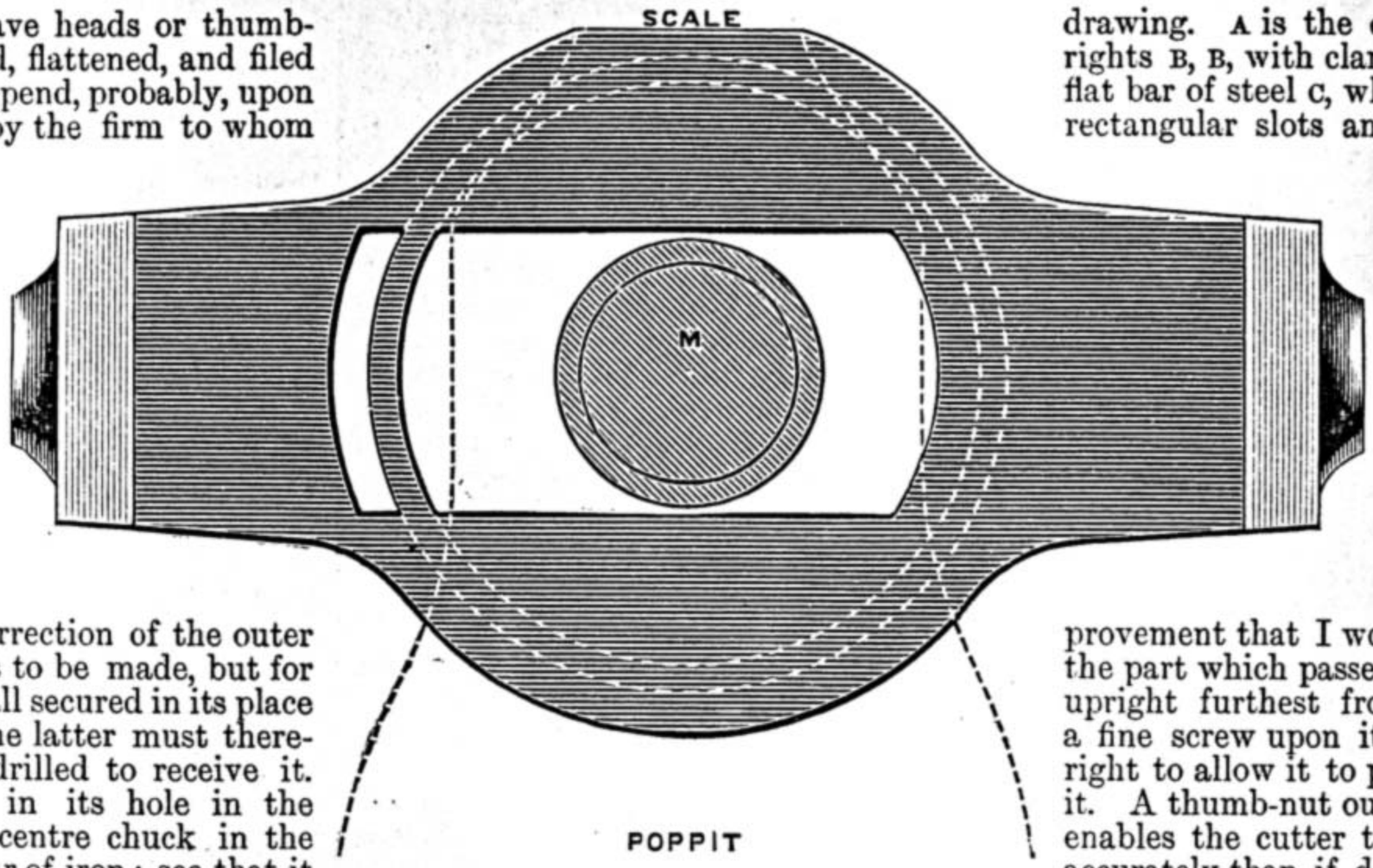


Fig. 9.—Alternative Arrangement for Plate and Ring.

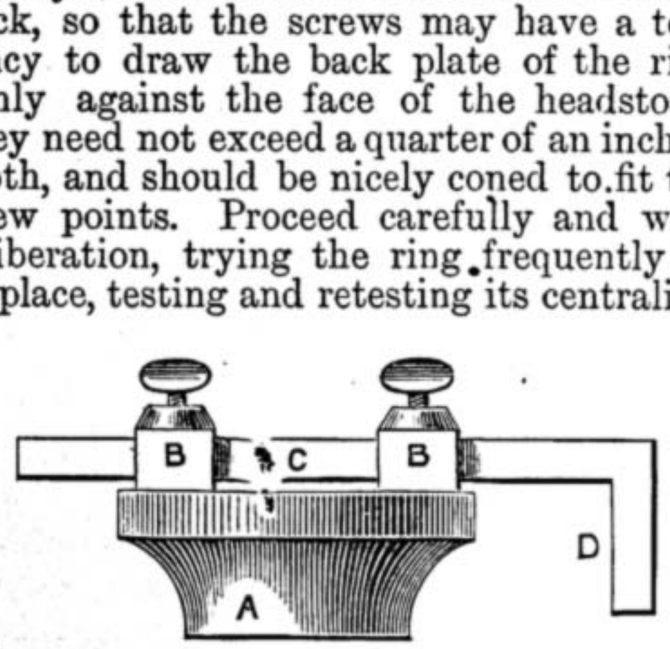


Fig. 10.—Cutter for final Correction of Ring.

Fig. 9 is a reduced copy of Bergeron's drawing. A is the chuck carrying two uprights B, B, with clamping screws to hold a flat bar of steel C, which passes through the rectangular slots and is sharpened on the inside edge, D, of the bent arm. This is the part which cuts the outside of the ring as the chuck is slowly revolved with the mandrel, and the clamping screws allow it to be set in closer as the operation goes on. It is easy to see that this simple apparatus is capable of elaboration, but the only improvement that I would suggest is to round the part which passes through the left-hand upright furthest from the cutter, and cut a fine screw upon it, and to drill that upright to allow it to pass just easily through it. A thumb-nut outside the upright then enables the cutter to be set in much more accurately than if done by hand as in the first case. In another design the main bar is fixed, and the cutter made to slide upon it, but although it is easy to elaborate a tool of this kind, the simpler it is the better it will work; and when it is needed to make, perhaps, only one chuck in a lifetime, any contrivance that will serve, even of wood, with the cutter wedged in, may be made use of. With such an appliance the ring can be made absolutely concentric with the mandrel, and then a mark is to be made upon the poppit head to coincide with the zero of a few divisions which are to be engraved upon the top of the ring plate, which is filed for that purpose flat and true with the top of the headstock. When the two marks, therefore, are at any time made to coincide, the ring will be in its normal concentric position, and will not affect the slide of the chuck. One inch of the flattened part of the ring is generally divided into tenths, so that the ring may be set out of centre accurately to a given degree. These tenths ought to be numbered, and may be subdivided by shorter lines or dots.

When the ring has been thus fixed, the chuck must be screwed upon the mandrel to enable the palettes to be adjusted, and a final touch to be given to the chuck screw. The palettes, or pallets, must be advanced to touch the ring with light pressure, and kept up by the screws already described; and when it is found by gently revolving the chuck that they go round smoothly, and that the slide does not move, a steady hole is to be drilled through both plates, and reamed out slightly conical, and a steel pin is to be fitted so as to keep the slide in position and remove all strain from the parts. The nose of the chuck is then to be trued, and a few touches of the chasing tool should render the screw perfectly true also. The chuck is now finished, unless it requires to be further touched up with a planisher, and here and there with a fine file where the turning tool is unable to reach it. In our next the movable nose piece will be described.

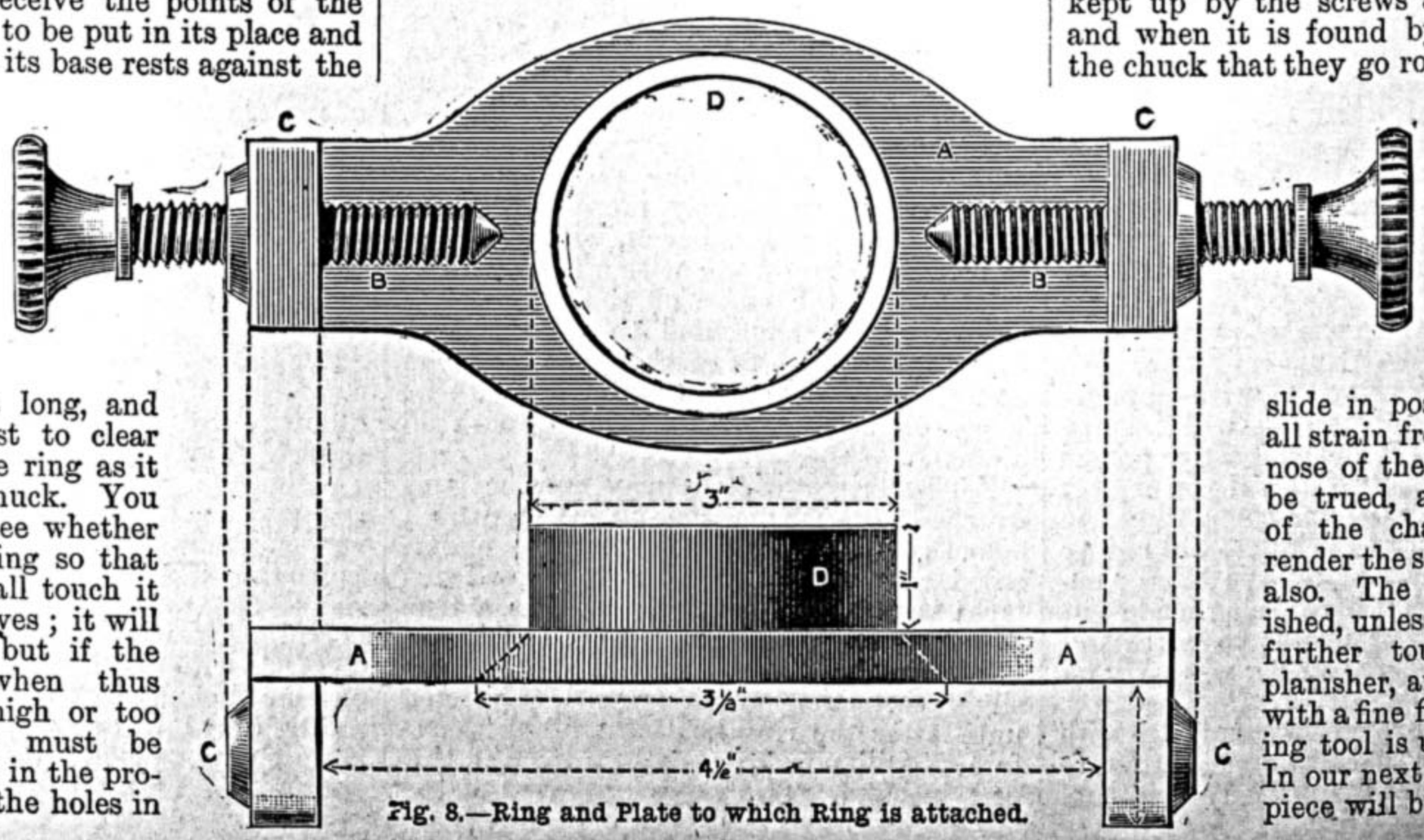


Fig. 8.—Ring and Plate to which Ring is attached.

OILSTONES: HOW TO CHOOSE AND MOUNT THEM.

BY FREDERICK CROCKER.

THE oilstone is one of the most important tools in a wood-worker's outfit; and these few notes are written by a practical worker as a slight guide to anyone who has to select one, and wishes to keep it in working order. There are a good many varieties in the market, but I will confine my remarks to two or three of the commoner kinds.

The Turkey stone is of a dark-bluish colour, with white spots and a whitish grain. This cuts quickly, and will put a good edge on a tool, but wears away irregularly, therefore requires frequent rubbing down, and is liable to break across the centre. A fair-sized one costs about six shillings.

The Ouachita, or "Washita," stone is of a yellowish-grey colour, cuts quickly, soon wears hollow, but more evenly than the Turkey, and is much cheaper, being about half the price. It does not leave so keen an edge as the other kind.

The Charnley Forest oilstone is of a greenish slate colour, with small brown or red spots. These, however, are not always to be found.

The greener and lighter in colour the stone is, the better; the dark varieties are liable to hardness. A good-sized one will cost about three shillings, and should last a lifetime.

The objection to this kind of stone is that it takes longer to sharpen a tool with it than with the other kinds; but I think the extra labour involved is fully repaid by the fine keen edge; and my opinion is that there is no stone in the market to beat it.

In selecting a stone, some test them by rubbing with the thumb-nail, but this cannot be a good guide, as there is always a rough surface left by the stonecutter in dressing. For the same reason, you cannot tell by sharpening a tool on it for the first time how a stone will turn out. A good plan is to wet it, and see that the grain runs as near as possible parallel with the length. Uneven grain or uneven colour will probably lead to uneven wear, and this means frequent rubbing down.

After buying an oilstone, the first thing to do is to make a case for it to protect it from the dust and grit, always to be found in a workshop, from sand-papering, and other causes. This may be done as follows: Procure two pieces of wood (I prefer mahogany) 1 in. wider and 1½ in. longer than the stone; we will say the stone is 1¼ in. thick, then the bottom piece should be 1¼ in. and the top 1 in. thick; but this latter will depend upon the style of ornamenting the case. Some make them as plain as possible, as Fig. 2; others chamfer the lid (Fig. 3); others, again, mould, bead, and ornament them as much as possible (Figs. 1 and 4). I have seen them with the lid carved; it all depends upon the taste or skill of the worker.

Having procured the wood, place the bottom of the stone upon the piece intended for the bottom of the case, mark round with a lead pencil, and mortise out ¾ in. deep. If you have a brace and a large centre-bit, you may bore a good deal of the waste timber out, and a router will be found useful to gauge the depth. Fit the stone in loosely, so as to allow room for the cement which is used to fix it to the wood.

Perhaps a few words about the cement to be used for this purpose will not be out of place. Some use thick white lead. This is not a good material for the purpose, because the stone sucks the oil out of it, and becomes loose; waste oil gets in, is also sucked up by the stone, and has a tendency to make it hard. I have used the following with success. Melt some glue, and mix dry red lead with it till it forms a stiff paste. Spread this over the bottom and inside of the case, press the stone into it, and allow to set. This, it must be remembered, should be used as hot as possible.

The other piece of wood is mortised, and fitted over the top of the stone in a similar manner, but, of course, is not cemented on. The two are then put together, cleaned up level with each other, finished, and should be either varnished or French polished. The bottom should be hollowed out between the ends, as shown in the sketches, to give a good bearing on the bench, and two small steel points driven in at one end, and allowed to stand out about $\frac{1}{16}$th of an inch, to prevent the case slipping.

Fig. 1 is a section through the stone and case; S is the stone, L the lid, B the bottom.

In Fig. 2 the lid is hinged, and provided with a hook and eye. When made in this manner the cover is not so liable to be left off or lost.

After using the stone, the oil should be wiped off, as it has a tendency to make it hard, and the cover put on. Boiling is said to be a remedy when a tone becomes hard, and I have known them to be boiled for days; but it does not make much difference.

When an oilstone becomes hollow or uneven from wear, it requires rubbing down. Perhaps the easiest way of doing this is to tack a sheet of emery-cloth on a piece of level board, and rub the stone on it till level. Some fine sand sprinkled on the board will answer the same purpose. Another way is to get a plate of iron or piece of old plate glass, sprinkle sand and water on the surface, and rub the stone on it, adding more sand and water as may be required. This is a very good method, as it leaves a smooth, even surface. Some level them by holding on the side of a grindstone while it is revolving, others with an old file, others sand-paper till level; but the first-mentioned methods are best.

Oil slips are used for sharpening spokeshaves, hollows, bead-planes, etc., and are generally made to the form shown (Fig. 5). They vary in price from 3d. to 1s., according to quality and size. If a special shape is required, it may be obtained by rubbing as described above. The same remarks as to quality apply to them as to oilstones.

The prices are taken from Mr. Routledge's Price List, of Bull Street, Birmingham.

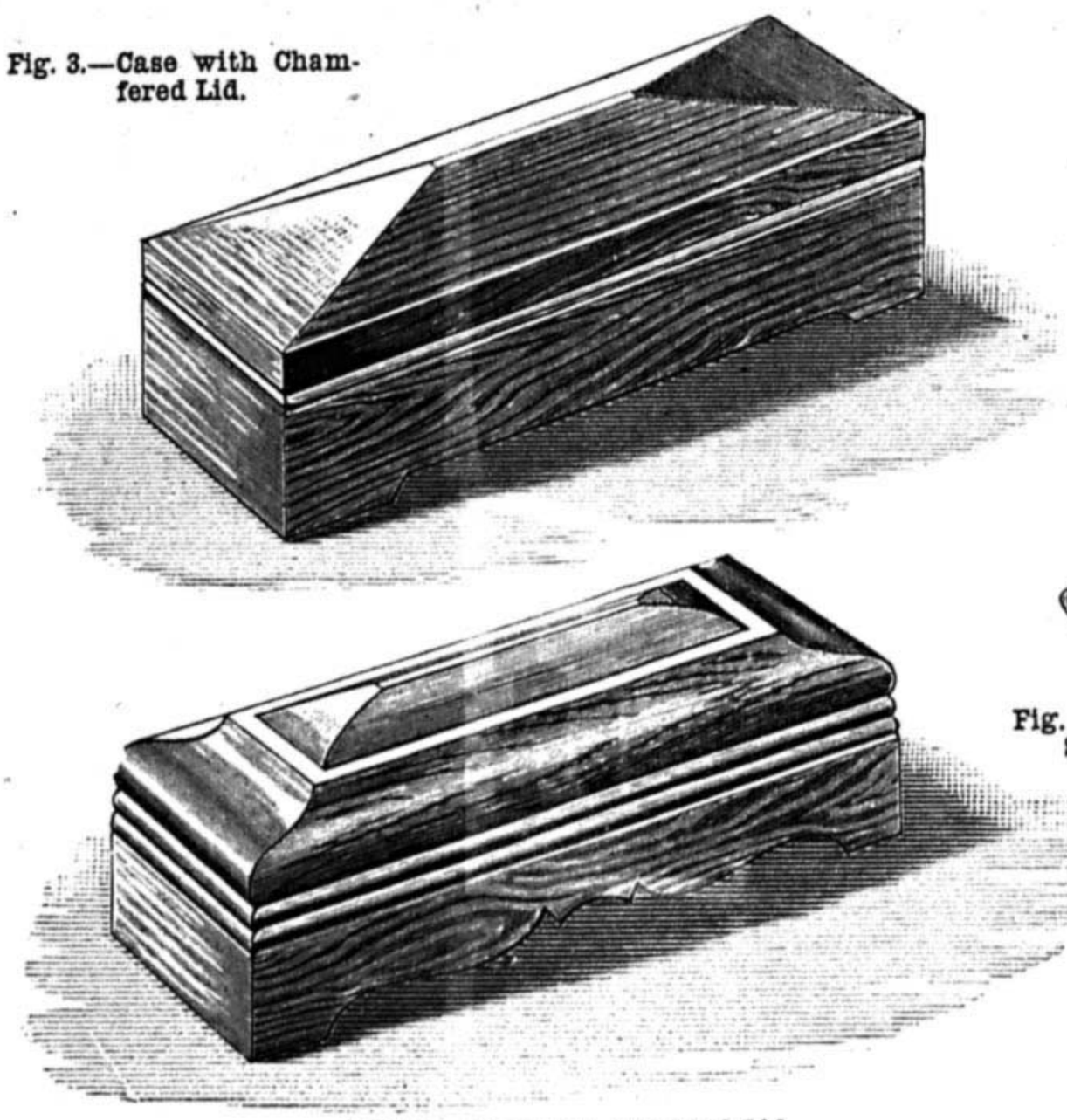


Fig. 3.—Case with Chamfered Lid.

Fig. 4.—Case with Moulded Lid.

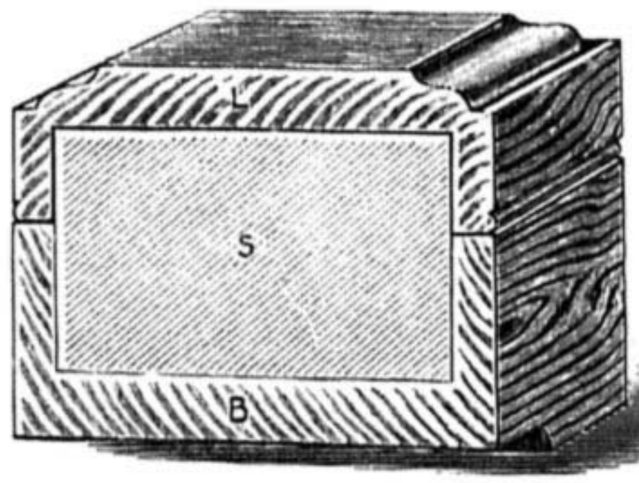


Fig. 1.—Section of Box and Stone.

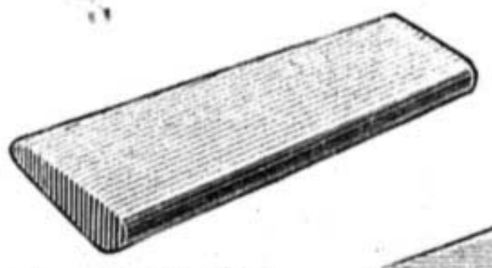


Fig. 5.—Oil Slip for Spokeshave.

Fig. 2.—Plain Case or Box for Oilstone.

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 any one 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.*

87.—WYATT'S PATENT PERFECTED CHROMATIC DOUBLE SLIDE TRUMPET.

THE old double slide trumpet may be regarded as an instrument that reigned in its day by its inherent power and modulation of tone, but keyed instruments supplanted it for some purposes of execution and seem to have left the slide trumpet to take a place of limited range in bands and orchestras. Mr. Wyatt, 123, Portman Buildings, Marylebone, London, N.W., the inventor and patentee of the modified instrument which he has called the Perfected Chromatic Double Slide Trumpet, has, by his genius and a series of experimental efforts extending over nine years, made it transcend in power and modulating effects the keyed instruments that were superseding it, by using a double slide for the old single slide, so that its power is extended to E flat in the base, and from this note every semitone upward can be played with a graduated evenness, which needs to be heard to convince a listener of its wonderful flow of tonic power, obedient to the lightest or most rapid touches. The shift notes are only half the distance of those on the ordinary slide trumpet, and this tends to make manipulation easy. The open notes are the same as those of the old slide trumpet, so that in this respect there is no difficulty for any player to use it. When "crooked" in C, amateurs can play piano or organ music with it, without any transposition of notes. When "crooked" in E flat, the trumpet parts for a military band can be played, which was unattainable by the old slide trumpet. Thus, in the hands of a trumpet player or cornet player, it will be a masterly instrument for rendering notes, and admirably adapted to accompany the organ or piano, as well as for a full orchestra. In completing this instrument, of which an illustration is given in Fig. 1, the inventor has improved the three principal crooks, C, D flat, and D, by his plan of construction. A contributor to WORK has told me that he had the advantage of hearing Mr. Wyatt's instrument played by Mr. W. J. Cubis, formerly Trumpet Major, 2nd Life Guards, and that its combination of power and sweetness of tone was very striking in difficult pieces of music. Mr. Cubis, speaking of the instrument in a letter to Mr. Wyatt, says:—"I have this day given your double slide chromatic trumpet a good trial, and find it everything that can be required in a perfect instrument. Well in tune and of splendid tone, the facility which the double slide gives for the production of all the notes on the chromatic scale fully carries out everything you claim for it in your prospectus, and must stamp it as the coming instrument of the age." The illustration shows in what way the double slide supersedes the single slide of the old instrument. It represents the trumpet crooked in C as a non-transposing instrument. It is fitted with six crooks, namely, C, D flat, D, E flat, E, and F, and also with bent bit, tuning bits, slide cleaner, and silver-plated mouthpiece, all highly finished in the best style. At present it can only be obtained from the inventor and patentee. The price of the trumpet complete, in lock-up case, is £15, or silver-plated, best plate, £18. The instrument will be exhibited by Mr. Wyatt at the forthcoming "Work" Exhibition at the Polytechnic Institute, Regent Street, from Dec. 29, 1890, to Jan. 10, 1891.

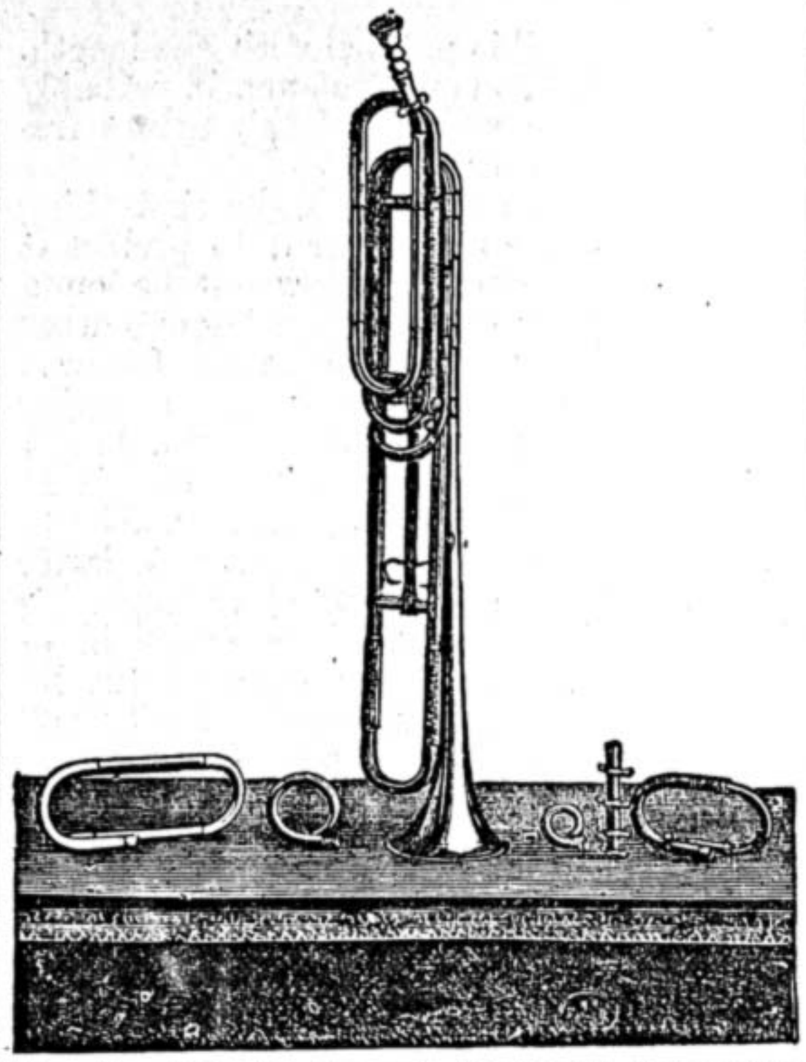


Fig. 1.—Wyatt's Patent Perfected Chromatic Double Slide Trumpet.

88.—LEWIS'S IMPROVED AUTOMATIC PLATE-ROCKER, PATENT ADJUSTABLE STAND-HOLDER, AND KALLITYPE PAPER.

Messrs. John Lewis & Co., 99 & 100, Gladstone Road, Sparkbrook, Birmingham, have submitted for inspection and trial three of their specialities, namely, the Patent Improved Automatic Plate-rocker, the Patent Adjustable Stand-holder, and "Kallitype" Paper and Printing Process. The paper may be had in a full sheet, 26 in. by 20 in., three of which are supplied for 2s. 6d. post free,

Fig. 2.—Patent Adjustable Stand-holder.

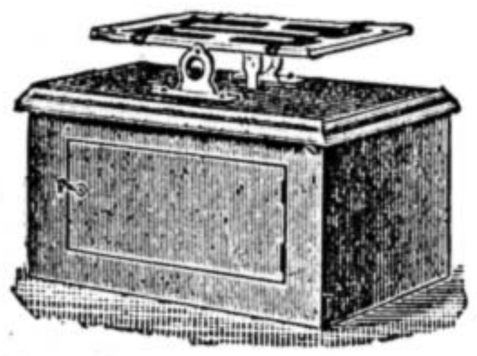


Fig. 3.—Patent Improved Automatic Plate-rocker.

or cut in various sizes to suit the various requirements of photographers, and sizes of cameras. It may be procured direct from the manufacturers, Messrs. Lewis and Co., who will forward price lists to any applicant, or from any photo depôt. The photographer who tested the paper and process at my desire says:—"I have tried the Lewis Kallitype process as per directions and find very good results can be had with it, but I did not find the paper so sensitive as stated. Great care has to be exercised in the process to avoid abrading the surface, which is most easily injured whilst wet. The process seems an easy one, and suitable especially for thin clear negatives." The nature of the Patent Adjustable Stand-holder may be gathered from Fig. 2, although it is far smaller than I like, because excessive smallness in a cut is detrimental to clearness. However, I suppose almost everyone knows what a tripod camera stand is, and will understand me when I say that in the adjustable stand-holder there are three holdfasts which are gripped, one to each leg, by screw clamps with milled heads. From these proceed cords, which pass through a central plate, and, being weighted at the far end, tend to keep the stand steady and prevent slipping. It can be adjusted in a moment, and being flexible and only a few ounces in weight, folds up with stand. Its price is 4s. The Improved Automatic Plate-rocker is designed to keep the negatives in motion during development, intensification, reduction, etc. The rocker, as may be seen from Fig. 3, is placed on a stand, within which is a clockwork movement, which keeps the rocker in motion, and when wound up, may be set going or stopped at pleasure by pulling out or putting in a stop inserted for this purpose in one end of the stand. It is silent in action. It is claimed for it that by its use under-exposed negatives may be fully developed without fogging, and that intensification and reduction of negatives may be safely accomplished by its aid by taking time over the process and using moderately weak solutions. It is certainly a time-saver, because the photographer can place his negative on the rocker and turn his attention meanwhile to other work; and it is cleanly, because those who adopt it will avoid the stains inevitably caused by holding the tray in the hands during development. The price for whole plates and under is 17s. 6d.; for 15 in. by 12 in., and under, 25s.

89.—WARBEY'S IMPROVED FIRE EXTINGUISHING APPARATUS.

Messrs. P. and J. Warbey have invented and patented a new system and means of extinguishing fires, to which they have given the name of "Warbey's Improved Fire Extinguishing Apparatus." Judging from the engraving of the apparatus supplied in Fig. 4, it consists of a system of hydrants and perforated pipes laid in or attached to the ceiling of every floor of a building, having in addition the ordinary fire hydrant with hose and nozzle attached, as shown on the third floor of the building represented in the engraving. The principle of the invention is this:—A supply pipe from the main is connected with a multiple hydrant placed in the basement, although it should be said that it is by no means necessary that the multiple hydrant should be actually within the building, and by means of separate branches connected with the hydrant and the main pipe, water is conveyed to each and every floor of the building by pipes, as shown in the illustration. Each division of the multiple hydrant is fitted with a valve, and the main pipe also is similarly fitted, and these valves are opened and closed by a spanner or key attached to the hydrant, so that an emission of water can be caused on any floor where it may be requisite by turning the valve in the division leading to the floor in question, or the whole building can be flooded by turning on all the valves. Nor is the utility of the apparatus confined to the interior of the building, for it is said by the patentees

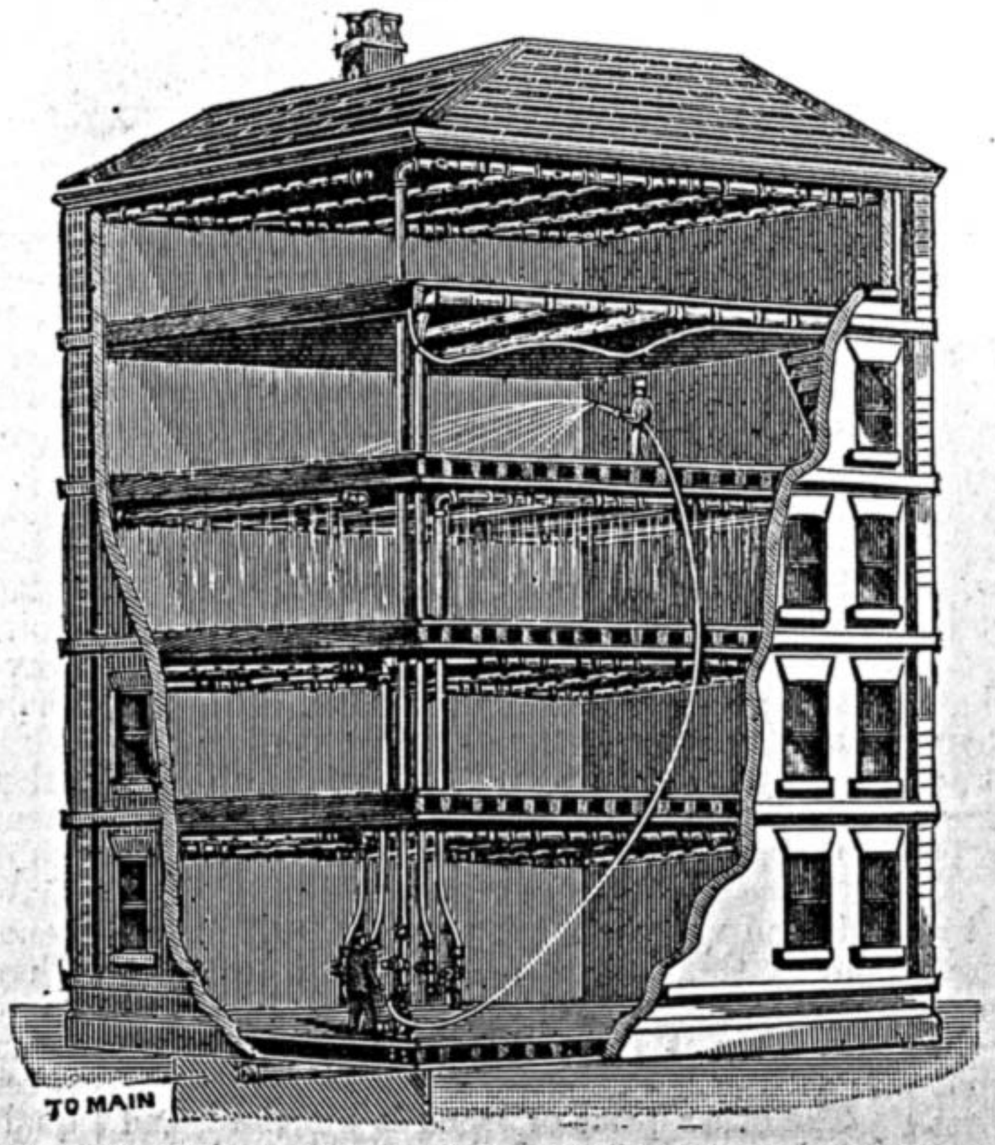


Fig. 4.—Warbey's Improved Fire Extinguishing Apparatus.

that it can be applied for washing down the outside if it be desirable, and for protecting any property from fire in its immediate vicinity, but this, of course, is accomplished by means of the ordinary fire hydrant with its independent hose and nozzle. The invention seems a useful one, and no harm could possibly arise from its adoption unless the valves in main pipe and multiple hydrant got out of order, which is not likely. Whether or not the attachments to the ceilings of a building in the form of perforated pipes are unsightly can only be judged from seeing them in position, but the inventors say that they are by no means an eyesore.

THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

*** *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. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

"WORK" EXHIBITION.—NOTICE.

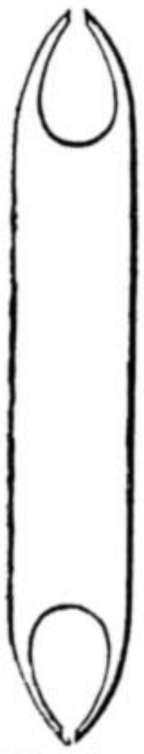
In answer to numerous correspondents, the Secretary has made inquiries as to the Hire of Packing Cases for the term of one month by intending Exhibitors in the London district, and announces with pleasure that Messrs. DREW and CADMAN, High Holborn, W.C., are prepared to lend on hire, cases of various sizes, on moderate terms for that period; on application by letter, or personally, they will give every information.

JNO. W. HARLAND, Secy.

I.—LETTERS FROM CORRESPONDENTS.

A Photographing Expedient.—J. B. (*Westminster*) writes:—"Having a little idea as regards a photograph changing bag, I explain it, as it may be of some use to my fellow photographers. It is by taking the coat off, laying it on the ground, and thrusting the arms through the sleeves, and kneeling on the collar of the coat. Any amount of work may be done in this way if care be taken not to raise the coat too high. My idea is of little use for London work, but will be found an advantage to tourist and cyclist."

Netting Needle.—J. H. B. (*Pendleton*) writes:—"Having seen an article in WORK, No. 79, on netting, I enclose a sketch of a needle which I like much better than the one you show, which has a very weak point in the peg round which the string is put. I have done netting by the yard, hammocks, tennis nets, etc., and always used this sort."



Netting Needle.

Wood-carving Patterns.—AMATEUR CARVER writes to W. J. H. (*Redhill*) (see No. 83, page 504):—"I am copying some very fine old English carved panelling, which I obtained *on hire* from Mr. Jarvis of Church Road, Hove, Brighton, and have no doubt W. J. H. could be accommodated in the same way. I find it excellent practice as an amateur, and have gained much information from the study of it."

Perpetual Motion.—W. S. writes:—"I wish to ask a question about 'perpetual motion' in 'Shop'—if there is anyone that makes it, and how it is made; a sketch would kindly oblige." [No human being can make, or in other words cause, perpetual motion. Only He that is omnipotent can do this, and omnipotence belongs to God alone. It is made or called into action by the feat of God's Word alone. The only thing approaching to a sketch of perpetual motion that I can suggest is the heaven above us, studded with heavenly bodies that have been performing from the beginning, and are performing, and will perform their circuits and functions with unerring exactness until it be the Almighty's will and pleasure that they shall cease. —ED.]

Erratum.—R. F. (*Norwich*) writes:—"A slight error occurs in my reply to SCOT on page 440, No. 79. Your comp. makes me say 'harmonies' instead of 'harmonics,' in line 9. The difference, although of only one letter, is really so great that it quite alters the sense of the whole."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Cement for attaching Metal to Marble.—A. M. (*Willenhall*).—Your query as to a suitable cement for fixing a piece of German silver to a marble timepiece is a wide one, and would take over a column to answer fully, but I will do the best I can for you. If I were going to fix the metal plate myself, I should solder two short pieces of copper wire—rather stout in gauge, like that used by bellhangers—on to the under side of the plate, one at each end, about half an inch from the edge. Next I should drill holes in the marble into which the wires might fit, rather loosely if anything, countersinking the holes just as if screws were to go into them, so that the plate with its soldered wires might fit quite close on to the marble. Then I should fill the holes with resin, or the shellac cement sold sometimes as panel wax, or the cement referred to below; heat the wires as hot as possible without melting the solder, and press them firmly into the holes. The heat of the wires will easily melt the resin or cement, as copper retains its heat for some time, and the plate will be firmly fixed. Another method that could be adopted if the plate is large is as follows:—Drill in the plate as many holes as you think necessary, and drill holes in the marble exactly to correspond; plug the latter with chips of wood dipped in liquid glue or other good liquid cement, and then with round-headed brass screws, silvered or otherwise whitened, screw the plate into its place. This plan I should recommend if your inscription plate is lacquered, because there is no heating of the plate required. If the plate is to be let into the marble, cement would do, as the plate would be less liable to sudden knocks or blows, and there are many that would answer your purpose such as jewellers' cement, Armenian cement, often sold in china shops under other fancy names, and many what I may call chemical cements. These I should not advise A. M. to make, as they require some considerable nicety and some chemical knowledge. I have just tried cementing a piece of German silver (roughened with a graver) to plate glass with the cement described by me in WORK, Vol. II., page 354, and it seems to answer very well, though detachable with a hard blow.—H. J. L. J. M.

Smoke Consumer.—A. T. G. (*Bowes Park*).—The Acts of Parliament referring to smoke consumption may be obtained through any law stationer. They merely amount to a statement that under certain circumstances no smoke is allowed to be discharged into the atmosphere except for a few seconds after stoking the furnaces, and it is not likely that they will assist you in your design. Your attention requires to be directed to the scientific and practical requirements of the case, in order to avoid or overcome the difficulties which have rendered useless the majority of the hundreds of appliances that have been patented in this connection. From a theoretical point of view, the matter is very simple. To avoid emission of smoke, there must be perfect combustion of the fuel before leaving the chimney. To obtain perfect combustion of fuel, there must be a sufficient supply of air to furnish the requisite quantity of oxygen, and the temperature of furnace and combustion chamber must not be lower than the temperature of combustion of the products generated in the furnace. This latter requirement has proved a great practical difficulty, and the methods that have been devised to overcome it are almost innumerable. In most furnaces combustion occurs in two stages—primary and secondary; the first consists in the ignition of the solid fuel fed into the furnace, and the second comprises the combustion of products evolved by the primary combustion and of carbonaceous particles carried along by them. Assuming that sufficient air is supplied with the fuel for complete combustion, this will not—when an open draught is used—occur near the front of the furnace, because the cold fuel will lower the temperature below that necessary for the consumption of the gases evolved, and, in fact, the evolution of these gases will locally lower the temperature of the furnace. What then is required for the consumption of smoke is so to arrange the back part of the furnace, or a chamber in connection with it, as to have there always a sufficient supply of air at a temperature sufficiently high to ensure the combustion of all the products passing from the fire grate. I should advise you, before expending much time on this matter, to read up what has been patented in this direction in connection with furnaces and steam boilers, in the specifications in the library of the Patent Office in Southampton Buildings, Chancery Lane. As to the proceedings of the Committee for Testing Smoke Preventing Appliances, you may obtain particulars from Mr. Fred. Scott, Secretary, 44, John Dalton Street, Manchester.—F. C.

Relacquering Brass, Nickel-plating, and Polishing Celluloid.—J. C. J. (*Hepworth*).—Cleaning and lacquering brasswork has already been treated in WORK, Nos. 55 and 58, Vol. II., pages 35 and 82. Nickel-plating steel goods can scarcely be properly treated in a reply. Use a fair-sized depositing vessel of slate or wood, lined with pure lead, put together with burned joints. The upper edge of this vat must be furnished with a wooden ledging made in the form of a step, to which is attached a rectangle of brass tubing or stout copper rod, a binding screw being soldered to one corner of this for the purpose of connecting it with the zinc of the battery. A similar rectangle is likewise fitted to the lower step of the ledge, and this also is provided with a binding screw which connects it with the carbon of the battery. A series of brass rods, about ⅜ in. or ½ in. diameter, and each of about the length of the tank's width, are laid across the outer rectangle, and from these the work to be plated is suspended, similar but shorter rods being placed across the inner rectangle for the purpose of supporting the anodes; all these conductive fittings being kept scrupulously clean by frequently rubbing them with emery cloth. For a small bulk of solution, and work not exceeding a square foot of surface, three quart bunsens will be found sufficient, but for larger work they should be double this size. The anode, which is a roughly-cast plate of nickel, is hung in the solution in the vat from the anode rods by means of S-hooks; its function being to supply the solution with fresh metal as it is deposited upon the work. These anode plates can be had in all sizes at about 3s. 6d. per pound; a ⅜ in. plate 10 in. by 4 in. would weigh about 2 lbs. As nickel is a bad conductor of the current, it will be necessary to have the anode considerably larger than the work to be plated. The plating solution for the vat is made from the double sulphate of nickel and ammonia (usually sold as nickel salts). Dissolve the salt in distilled water or clean rain-water in the proportion of 2 lbs. of salt to every 3 gallons of water, the solution being filtered through a piece of fine linen or calico into the vat. As you desire to re-nickel old work, it will be necessary to first strip off all the old plating by immersing the work in the following stripping solution:—Sulphuric acid 4 lbs., nitric acid 1 lb., water 1 pint. Add the sulphuric acid to the water (do not reverse this), and when quite cool, pour in the nitric acid and then stir the mixture with a glass rod. The articles to be stripped must be dipped in the solution by means of a piece of bent wire, and the appearance carefully noted, as some articles, by reason of the extremely thin coating of nickel, are stripped almost immediately. As soon as the plating is dissolved off, the work should be rinsed well in cold water, after which it is dipped in boiling water and allowed to dry spontaneously. The articles must now be well scoured with very fine sand, applied by means of a stiff brush—this will leave a good surface upon steel goods; and immediately after the work has been scoured it should be put into the vat, in order to get a coating of nickel on the surface as quickly as possible before the air has had time to affect the metal. The work may now be hung from the cathode rod by means of stout copper hooks bent in the form of an S. The full battery power should be employed until the metal has been uniformly deposited over the entire surface, when one cell may be taken off in order that the deposit may be worked at a lower tension. In judging of the thickness of the deposit, it is a good plan to note the time taken to cover the surface of the work with a coating of nickel, and then to allow two or three times as long, according to requirements. On removing the work from the vat, rinse well in cold water and then polish with either tripoli, whiting, or rouge. The operation of scouring serves the double purpose of cleaning the work and at the same time providing it with an almost imperceptibly rough surface, to which the plating will adhere. It is a most important matter to place all steel work into the plating-vat immediately after cleaning, as a very slight exposure in the air will be sufficient to cover the surface with a thin film of oxide, thus preventing the proper adhesion of the metal. With regard to the polishing of the celluloid pianoforte-keys, you should rub them with very fine glass-paper and then with powdered pumice-stone applied on a wet rag, afterwards finishing off with washed whiting or tripoli applied by means of a soft linen or woollen rag dipped in soap-suds. Or, if preferred, you may polish them by means of finely powdered pumice-stone, Russian tallow, and elbow grease.—C. A. P.

Bookcase.—J. T. D. (*Nottingham*).—You should purchase the Index to Vol. I. of WORK from your bookseller, price one penny. From that you will be able to ascertain all that has appeared in that volume of WORK upon bookcases. All back numbers of WORK can be had of Cassell & Co., Limited, Ludgate Hill, London, E.C.

Sycamore Wood.—BANGOR can buy sycamore wood any size at Messrs. Snewin Bros., Back Hill, Hatton Garden, E.C.—A. J. H.

Filling Compo for Brass Plates.—W. M.—(*Southampton*).—You do not appear to have succeeded with sealing-wax. Grind up with black (or coloured) wax sufficient gold-size to make the mixture run freely, fill in the letters, and allow the filling to thoroughly set, and clean off with spirits of wine. A pinch or two of Prussian blue will give a brilliancy to the black.—N. M.

Silver Chasing.—ARGENT.—Mr. A. Foster, Rockingham Street, Sheffield, and Mr. T. Dennil, Eyre Street, Sheffield; write to either, and ask them to procure and chase for you three or four (or more) Britannia metal teapot bodies with patterns suitable for sterling silver. If they will not comply with your request, write me through the Editor, and I will try to get them for you.—N. M.

Bassinette.—A. M. (*New Brighton*) and others are informed that a paper on this subject is already in the Editor's hands.

Leclanché Battery for Electric Lights.—G. A. B. (*Sunningdale*).—D. O. W. (*Ipswich*) has kindly replied to your letter, and I give herewith an extract from his remarks, together with some further comments of my own on the subject. The lamp will give light "sufficient to distinguish the various articles of furniture, and look for a match-box to light the gas, but not to read by. I only use it for a few seconds when I wake, as I very often do during the night, to see what the time is, or in case of illness, to see about the room for a short time. I believe it to be a 2½ c.p. lamp, and it cost me 3s. 6d. The sealed cells in a cool place will go for twelve months with the little use proposed." From our friend's description of his lamp and battery I find that his lamp is a 6-volt 2½ c.p. Woodhouse and Rawson incandescent lamp, and his battery is a 25 cell Leclanché arranged in five rows of five cells in series. He has 40 feet of No. 22 double line wire, silk covered, to convey current from battery to lamp. The Leclanché battery soon polarises when used on such heavy work as electric lighting, hence it can only be used for a few minutes at a time, and at intervals of several hours. When a large battery of cells is made up in parallel sets, as, for instance, in the battery employed by our friend, where twenty-five cells are arranged in five rows with five cells in a row, a larger negative and positive surface is exposed to the action of the current, the internal resistance of the battery is lessened, and the cells do not so soon polarise. But the same result is better attained by using large cells with flat plates of carbon and zinc, instead of small blocks of carbon and small zinc rods.—G. E. B.

Nickel-plating.—M. R. (*Huddersfield*).—A nickel-plating plant must consist of the following articles:—(1) Enough solution of the double sulphate of nickel and ammonia to cover and surround the articles to be nickelled. (2) A vessel large enough to hold the nickel solution. (3) Anodes or plates of cast nickel to hang in the solution. (4) Rods of brass to support the anodes and the articles and conduct the current. (5) Hooks of brass or of stout copper wires to support the articles and anodes. (6) Stout copper wires to convey the electric current from the machine or battery to the vats. (7) A battery or a dynamo electric machine. (8) Several acid-proof stoneware vessels to hold pickling acids. (9) An iron tank to hold hot potash solution. (10) A polishing lathe and set of circular brushes, mops, buffs, dollies, etc. (11) Polishing materials, such as tripoli, crocus, pumice, Sheffield lime, etc. (12) A scouring trough and brushes. There are many other useful appliances. The size and number of all these will depend on the magnitude of your intended business. You will find Watt's "Electro-Deposition," price 9s. 6d., the best book on the subject. Shall be pleased to advise you at any time.—G. E. B.

Fine Mainspring.—W. W. (*Carnforth*).—You must surely be mistaken when you speak of getting eight and a half turns out of the mainspring of the watch job to which you refer. They must be half turns which you have been counting. If, however, they really be full turns, the spring must be, out of all proportion, too weak for the watch. Five and a half turns are considered a liberal allowance, and out of this one turn may be "set up," if you know what that means. I cannot understand why your watch does not go for thirty hours if there are as many turns in the barrel as you mention. Your watch will possess a "stop work" unless it has been removed by some careless jobber. Perhaps the fault is in the stop work. The springs to which you refer are evidently very common ones. The best thing you can do under similar circumstances is to send the barrel and bit of old mainspring to the tool shop and allow them to fit the spring. The best place in the North of England, and the nearest to your place of residence is the firm of C. Rowson & Son, 44, Sir Thomas Buildings, Liverpool. This firm will do all you require. The time you mention for getting done the repairs stated is quite out of the question. The people to whom you sent the work must be dilatory beyond measure. The firm mentioned above, and, indeed, all business-like people in the trade, whether in London or the provinces, would execute such jobs as those you mention in two or three days. To return to your question about fitting mainsprings, it is my duty to tell you that the old spring is not always a guide for the strength of the new one. It is the commonest thing in the world for unskilled workmen to fit a wrong spring into a watch. Then the spring breaks, and the next workman, unless he is experienced, fits a new spring of similar strength as the old one, and hence perpetuates the mistake. A good guide for the fitting of a mainspring is that the barrel should not be more than two-thirds full. It should then make, say, five and a half turns in winding. Of course, in common watches which have been badly handled and require plenty of driving, it may be necessary to have a spring so powerful that it makes only a little more than four turns in winding. It needs experience and judgment to find out exactly what is required. The finest mainsprings I have ever obtained in this country were purchased from Muller Brothers, 58, Dean Street, Soho, London (watch material dealers). But Rowson & Son will be handier for you and will suit all your requirements; they will also promptly deal with your jobbing work. The best thing for cleaning watch movements is benzine, or benzoline. Buy a little glass jar with a glass top, and fill it with, say, half an inch or an inch deep with benzine. Take your watch to pieces and drop it bit by bit into the benzine, and leave it there for a few minutes, or longer if you like. Then take the pieces out one by one and brush them carefully with a clean brush. After having brushed the wheels as clean as possible, take a pointed peg and go through the leaves of the pinions, as the dust and dirt always accumulate there, and brushing will not always remove them. I am glad to hear that the articles in WORK "have been a great help" to you, and I am sure it is a pleasure at all times for myself and other writers to help one who is so anxious to learn as yourself.—HERR SPRING.

Butter of Antimony.—W. W. (*Chelsea*).—Butter of antimony is the liquid form of antimony trichloride ($SbCl_3$), and should be obtainable of, or through, any druggist at about 2d. per oz. If unable to obtain from your regular druggist, you could certainly be supplied by any dealer in chemical reagents, such as Townson & Mercer, 89, Bishopsgate Street Within, E.C., or Becker, 34, Maiden Lane, Covent Garden, W.C. The chemical in question is largely used for staining gun barrels, as an ingredient in French polish revivers, and, to a less extent, in medical practice as a caustic. It is an ingredient in several proprietary corn cures, and it is said that a few drops dissolved in a wine-glass of water, and the liquid applied with a feather, is incomparable as a remedy for unbroken chilblains.—P. W. S.

Mincing Machine and Varnishing Tins.—W. T. B. (*Somerset*).—What sort of tins do you want to paint and varnish? Any kind of paint, from the common paint sold in tins at 3½d. per lb., up to Aspinall's special bath enamel at 1s. 3d., will adhere to tin equally well, and the same remark applies to varnish either clear or black. For machines for such purposes as you require write to Messrs. Kent and Co., Holborn, or to John Thent, Baldwin Iron Works, Bolton, who will send you full particulars and prices.—R. A.

Paquelin Lamp.—J. A. C. (*Canewden*).—The paquelin lamp is sold by Crowden & Garrod, Falcon Works, Southwark Street, London, S.E.; a card of instructions as to filling, lighting, etc., is sent out with each; the price is 12s.—R. A.

Circular Saws.—H. G. (*Little Bolton*) will be glad if any correspondent will furnish the title and name of publisher of the best book on the practical working and management of the circular saw.

Chimney Shaft.—FOREMAN BRICKLAYER.—The thickness of the walls depends in a great measure on the purpose for which the chimney is required; thus, a chimney in which a great amount of heat is to be brought will naturally require thicker and stronger walls than one in which the heat is not so great. In the case named, if it is for an ordinary boiler furnace, make the base three bricks thick, the first quarter of the shaft two and a half bricks, the second quarter two bricks, the third quarter one and a half bricks, and the fourth quarter one brick in thickness. Line the inside for half the height with fire-brick, half a brick in thickness, binding it every four courses. You will see a drawing and description of a furnace chimney in the articles on "Bricklayers' Work," now appearing in WORK. If there is any particular case in which you require information, if you send me particulars through the Editor I will give you any information I can. There is a work on chimney building published by Messrs. Spon, Charing Cross, called "Chimney Construction," by Messrs. R. and F. Bancroft, price 6s. 6d., but I have not seen it.—M.

Soldering.—H. M. (*Manchester*).—An Index to Vol. I. can be had for 1d., and you will then be able to see what articles have appeared on "Soldering." The papers on "Sheet Metal Work," appearing in Vol. II., would be useful to you.

Waterproof Red Ink.—BARTLETT does not say whether he requires this for paper, canvas, calico, or walls, etc. I presume, however, that the former is the most likely. I do not know what the usual ingredients are, but it occurs to me that a solution that I have found most useful for outdoor scene painting, instead of size, is likely to be of service. Take a sufficient quantity of borax, and dissolve in warm water all that the water will take up. This is technically termed a "saturated solution" of borax. Then break very small "white shellac" into an earthenware jar, and pour on it—warm—the borax solution, letting it stand on a warm hob or oven top, not too hot, stirring it awhile; if all the shellac dissolves, add more until it ceases to melt. Let it stand to cool, and bottle it close from the air. This solution, the only *aqueous* solution of shellac, has the property of drying quickly and being afterwards insoluble in water, and should be more widely known. It may be used for gumming paper together, and damp will not affect the gumming. I have used it for mounting photographs, as it never mildews, and, let down with a little milk, for fixing crayon drawings, sizing paper, and for scene-painting, outdoor pictures, and illumination transparencies. If BARTLETT chooses to make the trial, it only costs a few pence; and I think if he mixes up his ground vermilion (dry colour) with this vehicle, he will find it will stand the weather either on paper, calico, or canvas. It must be used quickly, or it dries, and you cannot soften it again.—J. W. H.

Electric Machine.—W. A. (*Hulme*).—Your "electric machine" is a shocking coil. You should have no difficulty in making another with the very slight difference of having a sliding brass tube over the core instead of winding the wire direct upon the core. It involves the employment of a little more labour and a little more material, that is all. The connections are the same for both. First make up the bundle of iron wires to form the core, bind into a perfectly round bundle with string, and soak in melted paraffin wax. When cool, unwind the string and fit the bundle into the thin brass tube which will go over it. Allow the back end of the core to project about 1 in., and *fix* this into one of the reel ends of the coil. Now make a paper or an ebonite tube to slide over the brass tube, and let this form the body of the coil, bobbin, or reel, on which the primary is to be wound. The core is fixed at one end. Over the other end slides the brass tube in the ebonite or paper tube on which the primary is wound. If you do not now understand, please write again and state your difficulty.—G. E. B.

Platinum Points.—E. G. (*Dalston*).—If you mean the little points of platinum used in tipping the contact screws of electric bells, these are merely little bits of platinum wire inserted in small holes drilled in the ends of the screws. Drill the hole with a very fine drill, then get a piece of platinum wire a little larger than the hole, file the tip of the wire carefully to go tightly in the hole, nick the wire where it should be broken off when in the hole, drive it in tight, break off the surplus, and neatly hammer the end into the form of a rivet head. If you cannot get a piece of platinum wire large enough to suit the hole you have drilled in the screw tip, solder this up, heat the end of the platinum and sweat it into the solder, then break off the surplus and file off the rough burr on the point instead of hammering it smooth. Platinum wire is very costly. You will probably have to pay after the rate of from 40s. to 50s. an ounce, and will get but a very small piece for 6d. Any jeweller will get it for you, or you may buy it of a dealer in electrical goods. Should any reader experience a difficulty in getting such little things as these, and will write to me, enclosing stamped addressed envelope, I will try to help him.—G. E. B.

Book on Electrical Experiments.—AMATEUR ELECTRICIAN.—In all elementary text books on magnetism and electricity will be found directions for performing electrical experiments; but I do not know of a book devoted specially to the wants of amateurs. The field of electrical science is very large, and contains material in abundance for electrical experiments. This you will find if you get an illustrated catalogue of electrical sundries from such houses as Messrs. Price & Talbot, 26, Ludgate Hill, E.C.; and Messrs. King, Mendham and Co., Western Electrical Works, Bristol. When applying for one of those catalogues, enclose four penny stamps for postage. I shall be pleased to assist you with instructions for performing any experiment you may select, and also advise you where to get apparatus and materials at a low cost, if you will write to me and state your requirements.—G. E. B.

Castings of Model Dynamo.—X. Y. Z. (*Rugby*).—The castings of a small model dynamo of the Siemens pattern, to light up two 6-volt 2½ c.p. lamps, will cost 10s., and may be had of Mr. Bottone, Wallington, Surrey. Castings of small dynamos can also be obtained of Mr. H. Jones, 14, High Street, Lambeth, S.E. The small dynamo above mentioned will do useful work if driven at the rate of 3,000 revolutions per minute. This speed might be obtained from your model steam engine, if well made and finished, and supplied with steam at sufficient pressure. Respecting the boiler for the engine and a safety valve for the boiler, I can say nothing until I know the dimensions and form of your boiler and the material of which it is made. Send me full particulars of your boiler and I will then try to help you.—G. E. B.

Connections of Coil.—R. J. N. (*Fulham*).—From the sketch and description of your coil, I suppose it to be a combined shocking and induction coil. That is, it is furnished with a very long thin secondary coil for giving sparks, and a shorter secondary for giving shocks. The four-way switch throws in the spark coil with the condenser, at the same time as it throws out the shorter coil. The two loose wires form the terminals of the spark coil, and were once connected to two insulated handles or points which could be made to approach each other gradually until brought within striking distance of the spark. The ends of the primary go to the contact breaker and the binding screws or pillars. Connect these pillars with a pint bichromate cell. If you do not understand this, or if your coil will not work, send me your name and address, and I will try to arrange with you to see it, and put it in order.—G. E. B.

Electric Bell Failure.—READER.—If you make the parts of your bell as advised by me in Nos. 12 and 18, Vol. I. of WORK, pages 179 and 279, you will not fail to make a bell that will ring. On referring to the table showing the proportionate parts of magnets, on page 180, Vol. I., you will see that your magnet is wrongly proportioned, and is wound with the wrong size of wire. Had you given me the size of the gong of your bell, I would have told you the proportionate sizes of the other parts. The bobbins on a magnet 3 in. by ½ in. should have a diameter of 1¼ in., and these must be *filled* with No. 22 wire. Your chief cause of failure, however, lies in not knowing how to adjust the contact screw. When the armature simply vibrates to and fro at a distance of ¼ in. from the core, the adjustment is right. When you screw it up closer so as to allow only ¼ in. play, there is no break of current, and therefore the armature sticks to the

magnet. To make the armature work more briskly with ⅛ in. play between it and the core, either add more battery power in the shape of two or three cells instead of one, or add more wire to that already on the cores. If you wish to practically test your work as you go along, use the same battery you intend employing to ring the bell when finished. It will not serve your purpose to use a bichromate battery in testing the strength and capabilities of an electro-magnet intended to be worked with current from the Gassner battery, as the E.M.F. of the bichromate is much higher than that of the Gassner, and its internal resistance is also much lower. You do not tell me how many cells you used in testing the magnet, nor how many you thought of using to work the bell, so I cannot advise you further now, but shall be pleased to do so at any other time if you need advice. I would advise you to get the numbers of WORK mentioned above, and read the articles on "Burglar Alarums," before writing to me again.—G. E. B.

Mirror Painting.—F. C. (*Londonderry*).—The mirror or glass must be *perfectly* cleaned, either with soda and water or weak acid and water, so that its surface may be, as it is termed, chemically clean, care being taken, of course, that the back of the window be not injured in the cleaning process. The colours used are the ordinary oil colours, and the painting is done precisely in the same way as painting on canvas is done, with this difference, that it is not possible to trace the design on to the glass with any greasy tracing paper, like the carbonised or carbonic paper sold for tracing designs on to metal surfaces. It is far better to trust to the eye and paint from a carefully drawn sketch or model. The most important thing in mirror painting is the medium, or the vehicle, which assists the colours in adhering to the surface of the glass. There may be many such mediums, and no doubt excellent ones, but the best I know, without wishing to puff anybody's wares, is that sold by Lechertier, Barbe & Co., under the name of "Sosi-crystallograph," which is undoubtedly an excellent medium for the purpose. Besides this, if any reader of WORK tries mirror painting with this medium and fails, or is dissatisfied with his work, he has the satisfaction of knowing that the medium mentioned above will not be wasted, but will serve admirably as a medium for painting on metal, wood, or china—in the latter case, firing with a very good glaze. It is not at all prejudicial—in fact, the opposite—to the transparency of the colours used; it dries well and quickly, and the glass when finished may be cleaned like an unpainted mirror. One of the secrets of success in mirror painting is the extraction of any superfluous oil with which the colours used may have been ground up, by squeezing them from their tubes first on to blotting-paper instead of on to an ordinary palette; this has the effect of removing without difficulty any excess of oil, and the colours after standing awhile can be mixed in the usual way on a palette.—H. J. L. J. M.

Riddles.—DANDY ROLLER.—You ask what is the B.W.G. of the wires used. The book entitled "The English Wire Gauge" tells us that great variance exists among the gauges at present in use; the numbers adjacent to the knotches in one gauge differing greatly to many of those on the same sized knotches in other gauges. And several of these different gauges are known in different districts under the name of B.W.G.'s (Birmingham wire gauges). Therefore you will understand that if I tell you what gauge the wire is that is used in the shop whence I gain my information, the chances are that in your district wire of the same thickness would be known by another number. The author of the above-mentioned book gives over two dozen different gauges, each varying in some particulars from the remainder, and speaks of mistakes arising from this state of things. In my forthcoming papers on wirework, I shall adopt a certain gauge, according to which I shall number the imaginary wires in my sketches, and of which I shall give a drawing in order that no mistakes may arise.—J. S.

Re-covering Bagatelle Table.—W. A. F. (*Woolwich*).—Get all the old cloth off and clean the bed from all grit or dirt; also clean the cup holes and fit in the cups before putting the cloth on. Then lay cloth on, and if it is an open table—not folding—glue the cloth across at the end. Let it dry, and then tack the cloth on, stretching it as much as possible; and when the cloth is on, take a penknife and cut the cup holes across, so that the cloth will drive down when putting in the cups. Mind the cups are put down just level with the cloth. But if the board is one that folds up, it would be as well to glue the cloth on all over, and put cups in in the same manner as the open table. After this is done, put the cushion in with small brads without heads: drive them through the cloth of cush.—G. E.

Watch and Clock Cleaning.—F. S. (*Hoxton, N.*).—You cannot do better than advertise in our cheap "Sale and Exchange" column.

Practical Book on Preserves.—W. T. B. (*Somerset*).—I know of no separate work on this subject, but many recipes for preserving are given in Cassell's "Dictionary of Cookery," price 7s. 6d.—K.

Turkey Stone.—R. R. (*Belfast*).—You doubtless need this for sharpening tools. It seems impossible that you cannot get this in such a town as Belfast. If no tool maker there really has the real article, send to Moseley, 323, High Holborn, London, or to Buck, Tottenham Court Road, London, for prices.

Quarter Horse-power Engine.—FOUR AMATEURS.—By laws I assume you mean the ordinary eccentrics of common engines. We will take first the case of an engine running in one direction only—that is, without reversing gear. Say the fly-wheel is to turn in the direction of the arrow A in the diagram, Fig. 1. Then the relative position of the crank pin B, and of the centre *c*, of the eccentric C, will be as shown, when the valve D is set with the edge nearest the crank pin open to a very small amount *a*, which is called the opening to *lead*. In a ¼ horse-power engine this lead opening *a* would not be more than a full $\frac{1}{32}$ in., or bare $\frac{1}{64}$ in. In addition to the lead, the lap of the valve must be determined before you can fix the distance *b* by which the centre *c* of the sheave C is set in advance of the centre of the crank shaft E. The lap in your case may be from ⅛ in. to $\frac{1}{32}$ in., and its amount is determined by the fractional part of the piston's travel at which you want to cut off steam. Perhaps I had better explain these two matters of lap and lead in case they may not be clear to some of our amateur friends. Note particularly the relative positions of the piston F and valve D, Fig. 1. Here the valve is open to lead *a*, and the piston F has just reached the same end of the cylinder and is returning in the direction of the arrow. But as the valve had already opened before the piston reached the end of the cylinder, this means that some steam

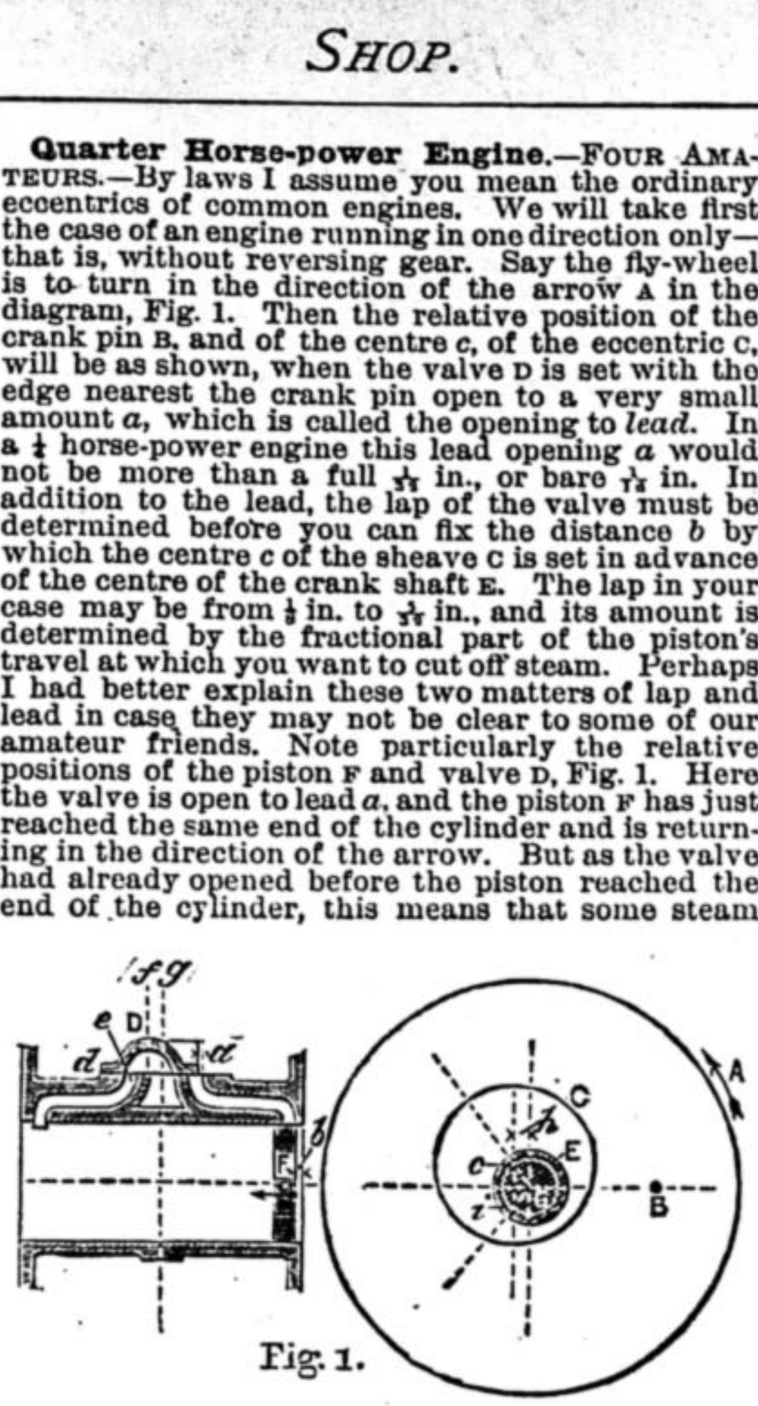


Fig. 1.

Fig. 2. Fig. 3.

Quarter Horse-power Engine. Fig. 1.—Diagram of relation of Eccentric and Valve. Fig. 2.—Templet for setting Eccentric. Fig. 3.—Double Eccentric for reversing.

was admitted to the clearance space *b*, as the piston was nearly terminating its motion towards that end. This small quantity of steam admitted by the lead of the valve acts, therefore, as a buffer or cushion in bringing the piston to rest and preventing shock. Looking now at the other end of the valve, it is seen that its edge *d* has *overlapped* the edge of the port *e* so far that the port must have been closed to the admission of steam some considerable time before the piston could have reached the end *b* of the cylinder. In a model engine it should cut off at about ¾ the stroke, or less if the boiler pressure is high. By this early cut off the expansive action of the steam is taken advantage of, and the action is easier than it would be if steam were admitted right up to the end of the piston stroke. The amount of *lap* is estimated as the distance by which the valve covers the edges of the ports when in its middle position—that is, when the centre *f* of the valve coincides with the centre *g* of the ports. Now adding the lap, as just explained, to the lead *a* in Fig. 1, we get the distance *h* for the advance of the centre *c* of the eccentric sheave in front of the centre of the crank shaft E. That distance is measured on the circle G, which represents the eccentric circle whose diameter is equal to twice the *throw* of the sheave C, equal to twice the lap added to twice the width of a steam port, provided the valve opens the entire port to steam. So that now you have all the elements of your gear, namely, the diameter of the eccentric circle G, equal to the total travel of the valve D, the distance of advance *h*, equal to the lap plus the lead measured on the eccentric circle; and the distance *h* set off plus 90° in advance of the crank pin B, with the valve just open to lead in the near side. Different people adopt different metods of setting the sheaves. About the simplest plan is to use a templet something like Fig. 2. Then having set the valve open to lead *a*, as in Fig. 1, with the crank pin B in exact dead centres and the templet plumb, the line A will indicate the angular position of the sheave. Before pinching or trying the sheave on, the engine is brought into the exactly opposite position and the position of the parts tested, and any discrepancy in the two positions altered by moving the sheave or altering the rods. If your engine is wanted to run in the opposite direction to that indicated by the arrows A in Fig. 1, then the centre of the sheave must be placed at *i*. If you are going to fit it with reversing gear, then there must be two sheaves, either separate or cast together (Fig. 3), whose centres will be at A and B. Then, according as the reversing link is raised or lowered, will one or the other sheave be rendered operative.—J.

Exhausting Tins.—W. T. B. (*Somerset*).—I do not know of any machine supplied for this purpose. The exclusion of air from provision tins when containing liquid is effected by raising the contents to the boiling point, and soldering the case up while it is filled up with steam, which prevents the entrance of air while the closing operation is performed.—F. C.

Replies to Questions.—S. R. (*Newry*).—You should have repeated your questions. When you and other correspondents find answers to questions delayed, it would be well to repeat the question, and thus afford a clue as to what you are referring to.

Canvas Canoe.—H. D. W. (*Manchester*).—You want to know whether the ribs can be built up. This can certainly be done, but they ought to be made a little wider and screwed together. Then take care to give them sufficient lap; but I strongly recommend the method shown in the article—that is, steaming, which is very easily done.—J. B. F.

Graining.—HULTA.—A most comprehensive and reliable work upon the art of imitating woods is now being published from Manchester by the Decorative Art Journals Co., Limited, 15, St. Ann Street. This is illustrated from samples grained by the best living British grainers, and reproduced in colour in a very masterly manner. Its price is two guineas, but facilities have been offered to apprentices, etc., to acquire the work at an easier rate. Compared with such a costly work, my own papers on the subject in WORK are but elementary; after mastering the latter you could then with advantage procure the Manchester book. The same source might help you *re* real panels; but you would not want them with the book. My own woods were veneered by a professional friend.—LONDON DECORATOR.

Calcarium.—H. J. M. (*Pembroke Dock*).—This product is a water paint or distemper—a preparation of lime. "Shop" is scarcely the place for a discussion of the relative merits of calcarium or alabastine. The proprietors of the former are A. T. Morse & Co., Stratford, London, E.; their nearest branch to you is at Perry Road, St. Michael's, Bristol. Calcarium is now made in forty-eight tints, and is supported by a string of testimonials. According to the proprietors, it is "non-poisonous, odourless, washable, does not rub off, durable, cheap, and easily used and made ready for use." Alabastine, as it is now termed, is a product prepared from gypsum, that has long been used in America, but only lately made here. Its virtues have already been explained in WORK. As a substitute for size and whiting colour it is a valuable acquisition to the country at large, whilst as a material for relief decoration its capabilities are enormous.—F. P.

Painting.—COUNTRYMAN.—As the window faces north, and therefore gets but little sunshine, I should advise—were it my own client and job—a warm treatment. The next question is what cost will they run to. If from £10 to £15 they could have a Japanese dado—dark terra-cotta and old gold—with wooden rail above same; total height from skirting, about 30 in., but that would depend upon the design and how it cut up. The filling might then be flatted and the cornice also—three coats and flatted, as per lessons in WORK, Vol. I., the colour being a soft salmon, or light terra-cotta in tone with the dado. A dado is a more serviceable and advantageous treatment for a dining-room, and, if of Jap. leather, would partly furnish the room, and could be varnished if desired. In any case, it would last a great number of years. The *reveals* of recesses must not have the dado carried across them: they and the arches should be painted and left plain, or stencilled with suitable design of darker shade. For a room the height you mention, brass picture rods, or iron ditto painted to match, should be fixed under cornice, but no frieze. The cornice can be of darker shades of terra-cotta, with other parts in soft aerial blue and dull greeny buff tints. These colours, if mixed and arranged with knowledge and taste, will make a nice harmonious combination. The ceiling could be either tinted a warm cream or very light salmon, or papered with a ceiling design in these tints if the "latest style" is desired. The woodwork had better be terra-cotta shades, light panels, as filling; darker stiles; panel mouldings still darker; the chamfers or bead gilded, and all varnished, save the gold. If a little gold can be used in the cornice on prominent beads and between the contrasting tints, the effect will amply repay cost. As the lighting is north, this kind of colour scheme is the right one, and it does not require an artist to make it successful. I could give you a dozen other treatments, but they would require a good colourist and decorator to personally control them.—LONDON DECORATOR.

Paint.—F. M. (*London*).—Paint for garden woodwork is best made with boiled linseed oil, driers, and the pigment according to colour. For white, take the best white lead (in paste form), add about one-twelfth part weight or bulk of paste or liquid

driers, then mix to working consistency with three parts boiled oil to one part turpentine. This will do for first or second coating equally well. For pea-green tint, the white paint with a little green pigment, purchased, if able, in paste form also. For stone colour, add a little of each, or both, according to tint desired, of yellow ochre and burnt umber, ready ground in oil.—F. P.

Gold Leaf.—J. L. (*Old Trafford*). — Since gold leaf is used in a dozen different classes of work, and generally for decorative purposes, I have no idea what particular phase of the process you refer to. The outlay of 1d. for No. 51, Vol. I. of WORK, will be a good investment for you, as a useful *résumé* of the tools, process, etc., is given therein.—F. P.

Paint Manufacturers.—G. M., JNR. (*Aberdeenshire*).—I append a few very reliable makers who could probably ship to you at low transit rates:—Storry, Smithson & Co., Bankside, Sculscoates, Hull; Heywood, Clark & Co., Caledonian Works, Vauxhall Road, Liverpool; The Yorkshire Varnish Co., Limited, Ripon. Remember *price governs quality* in all cases, and that no small quantities can be more advantageously purchased than from firms near home.—F. P.

Mattress and Polish.—J. K. (*Bethnal Green*). —The springs of the mattress can be fastened down with staples to the box bottom, or fixed in any way that may be most convenient to yourself. Tie them on top in the usual way. If you are not acquainted with this get some friendly upholsterer to show you. The best stuffing material is curled hair. Any number of dealers supply it in the neighbourhood of Bethnal Green, Curtain Road, Old Street, etc. To get the colour you want for your overmantel, go over the work with weak walnut stain, and use a red polish over it. The red polish may be made by putting a little Bismarck brown in ordinary French polish. By this method you get a good rich mahogany colour, which is far superior to the horrible bright red which is so often seen on common imitation mahogany furniture. Instead of filling, or as filling, use size. Do not oil. Polish otherwise as you have done before on your overmantel.—D. D.

Stitches in Upholstery.—J. H. B. (*Pendleton*). —The "mysterious pieces of string" you found in the seat you were re-upholstering were, no doubt, what is called the "tack stitching." They are necessary in order to keep the hair or other stuffing well up to the edge of the seat. The string is passed under the tacks and up through the stuffing in a slanting direction. It catches some of the stuffing, and so—in conjunction with other rows of stitches—pulls and retains it well in the corners. It is a pity you did not more closely examine the stitching when ripping the seat, as you would then have had a better notion of how to do the work than could be conveyed by mere written description. Your treatment of the old hair was decidedly wrong. It should not have been washed unless you were able to remake. The virtue of hair as stuffing material consists in its being springy. This springiness is imparted to it by twisting it into rope, which, after it has been properly prepared, is loosened. Water will effectually remove the curl which is given to it by being twisted into rope, and leave the hair as dead and useless as tow would be for stuffing. Remaking hair is not suitable work for amateurs, and when you have any more send it to some good upholsterers, who will get what is necessary done for you by the people who supply them with curled hair. The charge will be a very small one; but, unless the quantity is large, you will find it better to buy new hair, and get the value of the old allowed for. If you merely wish to get rid of dust and dirt, you can do so to a certain extent by loosening the old hair thoroughly; but whatever you do, do not wash nor wet the hair. You can now do nothing to restore the seat from its sunken and flabby condition except by re-upholstering it and using fresh stuffing material.—D. D.

Rusty Tools.—N. L. (*Huddersfield*). — Never keep steel or iron tools near steam pipes. Nothing short of a bath could more effectually rust them. Give them all plenty of sand-paper to thoroughly clean them, then keep them well oiled and, above all, thoroughly dry.

Change of Trade.—A COUNTRY INQUIRER.—You tell me very well what you want, but I cannot help thinking that there is another side to the question. If you apply for employment anywhere, the first questions put to you will be, What can you do? To what work have you been accustomed? Surely you ought to give some idea of what you can do best. As to managing a planing machine, that is very good if you have a good amount of that peculiar faculty for seeing faults, and still more important, seeing the remedy. Do you possess any ability in metal-working or machine-tool sharpening? for to *manage* a planing machine demands a knowledge of sharpening cutters to a great nicety, and setting the same (if several) so that the same duty is done by all. If you only mean to *wait upon* a planing machine I would say "Don't," as *Punch* said in answer to quite another question. In my ignorance of country life I had thought it most excellent for the workman. I had pictured the young carpenter repairing almost every wooden article used in the country. I had imagined he would be employed in making new fittings, when required, not only on the farm, but for the dairy and the homestead. Were I to be in your place I should see to it that I could repair or make a wheelbarrow or a village cart. I should make kitchen tables, try my hand at doors and sashes, and try boxes, tool-chests, etc., for my own use, if not good enough to charge full prices for, and try to avail myself of every opportunity that offered itself. It is manifest that it is not possible to tell you what you ought to get in Glasgow for your services, the value of which may be either great or small; but my advice is to eschew all unknown people who ask for improvers, especially those who have some patent or other speciality: they usually keep the young hand to one thing to their profit, but to his loss. Go in for variety, never mind the work being a *little* beyond you; but if you always do your best you will not be blamed if sometimes you fail.—B. A. B.

Cement for Cistern.—AQUA.—You had better take out your glass, clean up the work, and reglaze the aquarium, using a cement as follows:—To 1 lb. of putty add ½ lb. red lead, work it together with sufficient gold size to form a soft mass—it should leave a clean hand without sticking. Smear the edge of each piece of glass with gold size where the cement will have to touch; to ensure contact press the glass well home, and do not use more cement than necessary, and only just enough inside the corners to make a neat joint; when dry and hard, give two coats inside of copal varnish. If your frame and glass are strong enough this will be all right.—C. M. W.

Annealing Zinc, etc.—A. W. R. (*London, W.C.*) —There is no way that will render zinc permanently soft, and at the same time enable it to retain its other qualities. Zinc works best at about the temperature of boiling water; any great heat renders it rotten, as you have found by experience. You have used too stout a gauge of zinc for your crosses; No. 12 is what is used mostly for roofing purposes; I use No. 10 for nearly all crosses and wreaths. If over 20 in. long, use No. 11, which is strong enough for anything. For your fencing masks, if you want to use binding wire, why trouble to tin it when you can easily get it already tinned very cheaply? Try Harrison's, in one of the streets leading out of Drury Lane, close by you, or Henry Pinder, Drury Lane, where you can get anything in the metal or wire line. I think it will be best to solder after binding. Resin is the flux for lead if you want to dip it in that metal, but it must be got bright and clean before dipping by means of pickling and scouring. The gluing of the woodwork seems a very simple matter. You have failed through using bad glue, or not getting it hot enough. Try Le Page's liquid glue. Glue the pieces, place them in position, and lay a weight on them for twenty-four hours, and they will stand any reasonable strain.—R. A.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Coloured Patterns on Canvas. — To PO writes:—"Will readers please say how I can stain or otherwise fix permanently coloured patterns on canvas, suitable for hammock, chairs, etc., and in lengths, say, of three-quarters to a yard and a half? Of course they are wanted to stand wear well, and, preferably, put on with stencil patterns, or some such mechanical process, for lack of skill in free-hand drawing or painting. Particulars as to colours, medium—in fact, the whole process—would greatly oblige. Only a few at a time required, and in as economical a way as may be."

Working Fan-Mounter. — A. HANDICRAFTSWOMAN writes:—"I shall be greatly obliged if any reader could give me the address of a working fan-mounter."

Razor Setting.—J. C. (*Plymouth*) asks for the best directions for setting razors. [There is a cutting air about this query, but, withal, it would be an aid to J. C. and thousands of fellow workmen "to be up to" a keen edge that would hurl destruction at hirsuteness.]

Whalebone.—H. C. (*Maidstone*) will be obliged to any reader who will inform him where to obtain whalebone such as is used to make collapsible landing rings, as sold in the fishing-tackle shops.

Bursting Water Pipes.—GLASGOW writes:—"Being a sufferer from water pipes bursting during the night, owing to the great increase of pressure from the main supply, would some of your readers kindly inform me if they know of any regulator that can be attached to the pipes so as to prevent this great strain?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Glass Calculator.—J. F. M. (*Codsall*) writes in reply to G. M. (*Clapham*) (see page 457, Vol. II.) that he has a glass calculator for sale. [J. F. M. should advertise full particulars in our cheap "Sale and Exchange" column.]

Cork-cutting Machine.—ONE IN THE TRADE writes to AB UNO DISCE OMNES (see page 504 of WORK): "You can get a machine to cut cork into strips of any length from Mr. J. Lowman, cork cutter, Albany Road, Camberwell."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—MAC; F. MCA. (*Barrow*); R. R. Y. (*Canada*); XMAS; F. F. L. (*Leytonstone*); B. S. (*Edinburgh*); A. W. D. (*Perth*); OVERHEAD; PHYSIC; BATHONIAN; ANXIOUS LEARNER; J. S. R. (*Kettering*); T. G. P.; A SUBSCRIBER; DUSTY; OLD TIPTONIAN; OPTICUS; M. D. C. (*Liverpool*); A. J. S. (*Birmingham*); BERNHARD; H. D. H. (*Waltham*); T. H. N. (*Cockermouth*); AN OLD SUBSCRIBER; E. D. G. (*Ely, Cardiff*); W. B. (*York*); A. F. (*Sheffield*); D. T. (*Chatham*); J. M. (*Bacup*); C. E. H. (*Tottenham*); HANDY MAN; POLISH; F. M. R. (*London, E.C.*); J. B. (*Louth*); H. M. B. (*Wakefield*); GILT; JACK OF ALL TRADES; F. H. W. (*Wolverhampton*); B. F. (*Birkenhead*); M. A. (*London, W.*); BRAZIER; QUERIST; IMPROVER.

Trade Note.

A DISPLAY of seamless copper tubes and cylinders of all sizes up to 18 in. in diameter were lately on view at 56, Queen Victoria Street, E.C. The tubes are made by Elmore's Patent Copper Depositing Co., Limited, of London and Leeds. At present the Company's plant laid down is capable of turning out five tons per week, and this is being increased to a fifteen tons capacity. The specimens on view range from threads which have been passed cold through dies of $\frac{1}{1000}$ in. in diameter, drawn down from spirally-cut sections to this dimension, up to pipes 18 in. in diameter and 14 ft. long. Of the thread, 40 miles in length go to the pound, and it looks like a bunch of hair; while the pipes shown are a ¼ in. thick, though the thickness may be increased to any desired extent. When it is understood that these results are achieved direct from Chili bars, without any annealing whatever, and therefore without any detriment accruing from this operation, some idea will be formed of the purity. Specimens have been exhibited that had been treated very severely, yet no harm had been done to the metal. It was as homogeneous as before it was touched. The invention accomplishes all this by eliminating the foreign matter always found with copper in its usual form. Amongst the branches of trade the process will be likely to affect, we find mentioned — besides steam pipes — torpedo discharge cylinders, high-pressure air reservoirs, calico-printing rollers, weldless pans, and high conductivity copper wire. The Elmore tubes are deposited at the rate of ¼ in. in thickness per week of 144 hours, or 6 lbs. per square foot of surface. The process by which they are produced differs only in one respect from that hitherto followed in the electro-plating of rollers for calico-printing machines. The surface of the copper is continuously burnished by an agate the whole time, and as rapidly as the particles of copper are formed they are rubbed and matted into those beneath and beside them, thus forming a fibrous plate of perfectly uniform structure and great strength. So closely are the particles interlaced that the specific gravity is increased until a plate ¼ in. thick weighs 6 lbs. to the square foot. The material has a tensile strength of 25 tons per square inch, with an extension of 20 per cent. in breaking, and has therefore about double the strength of ordinary copper tubes.

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