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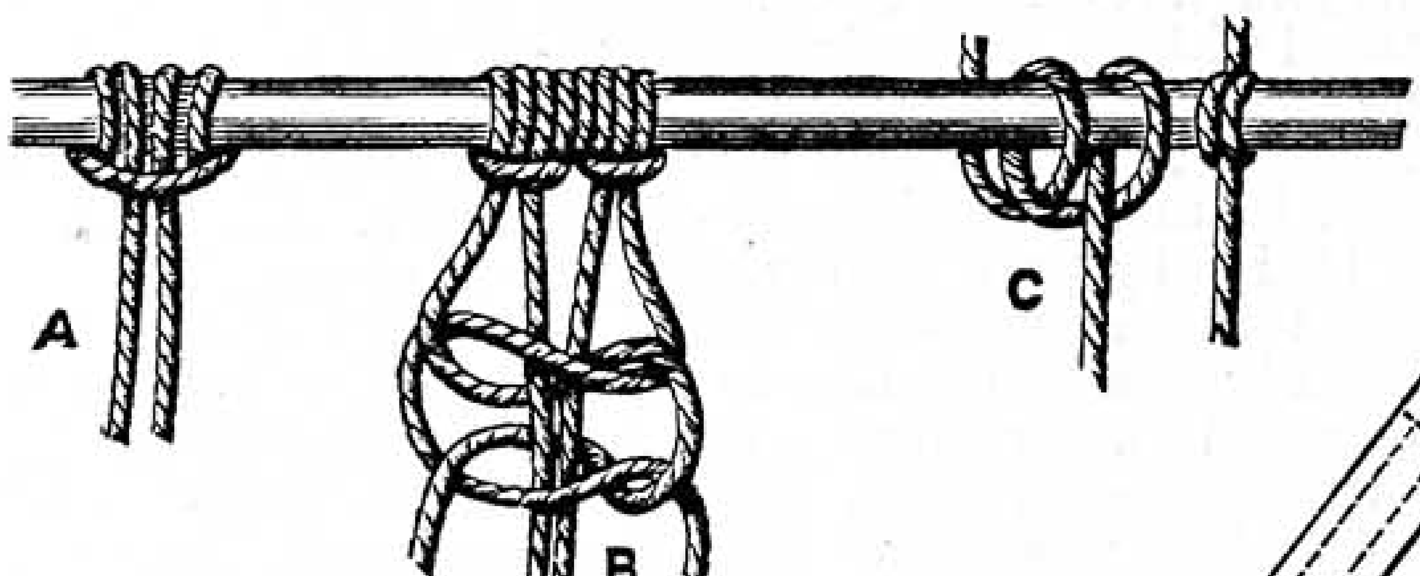

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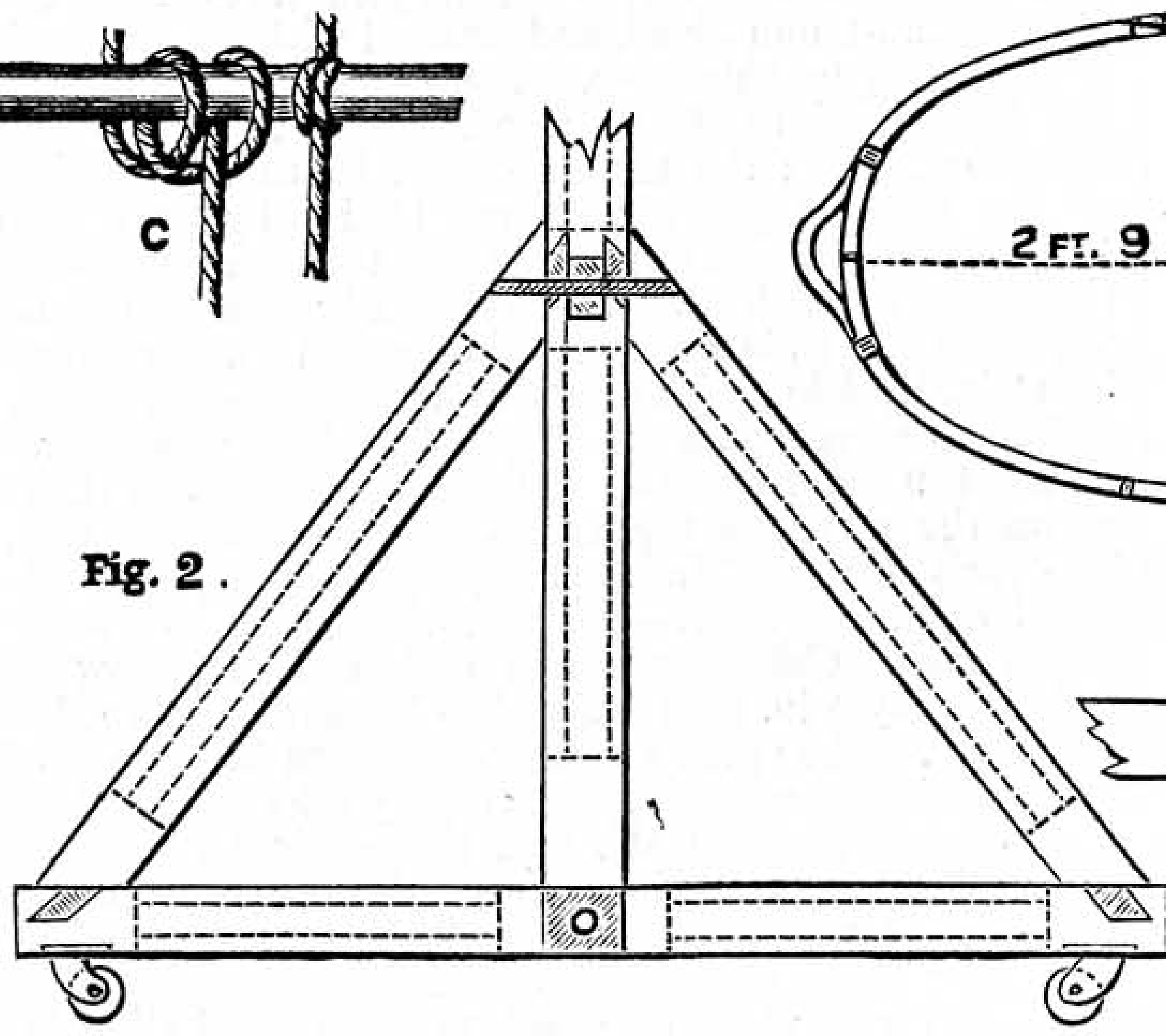

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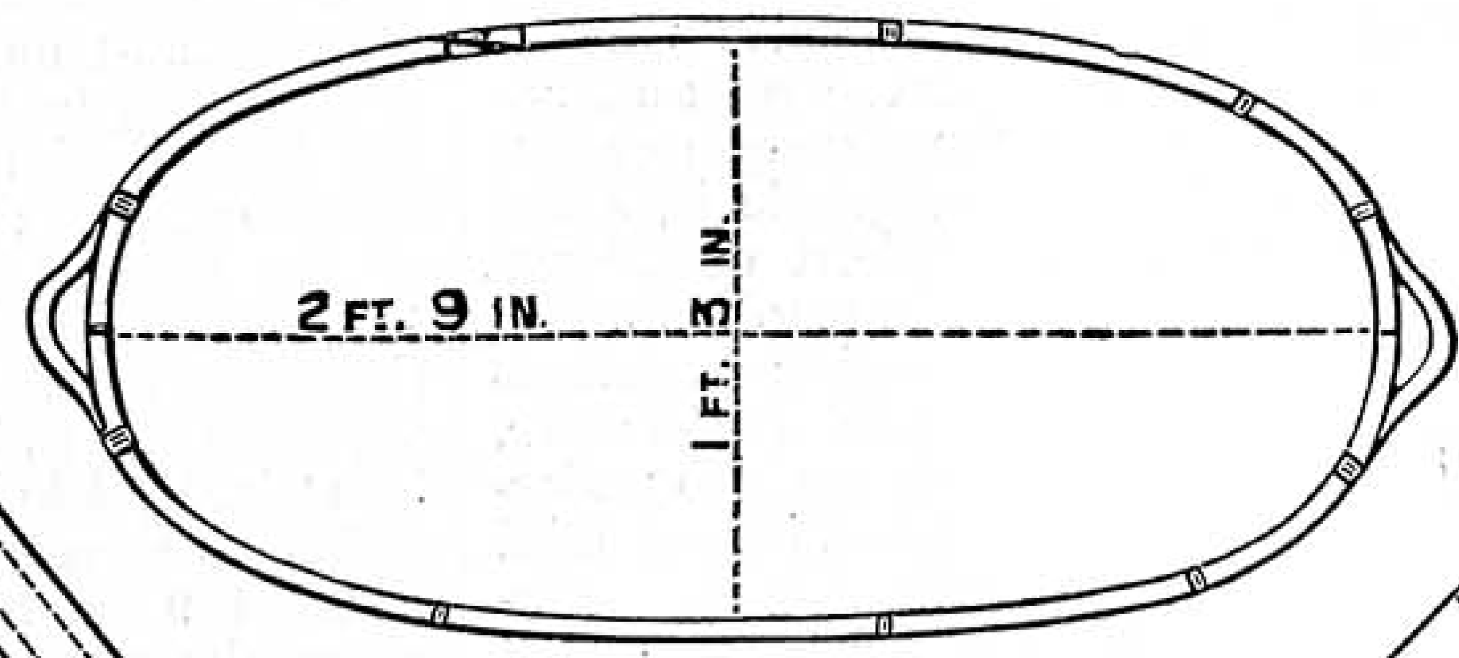

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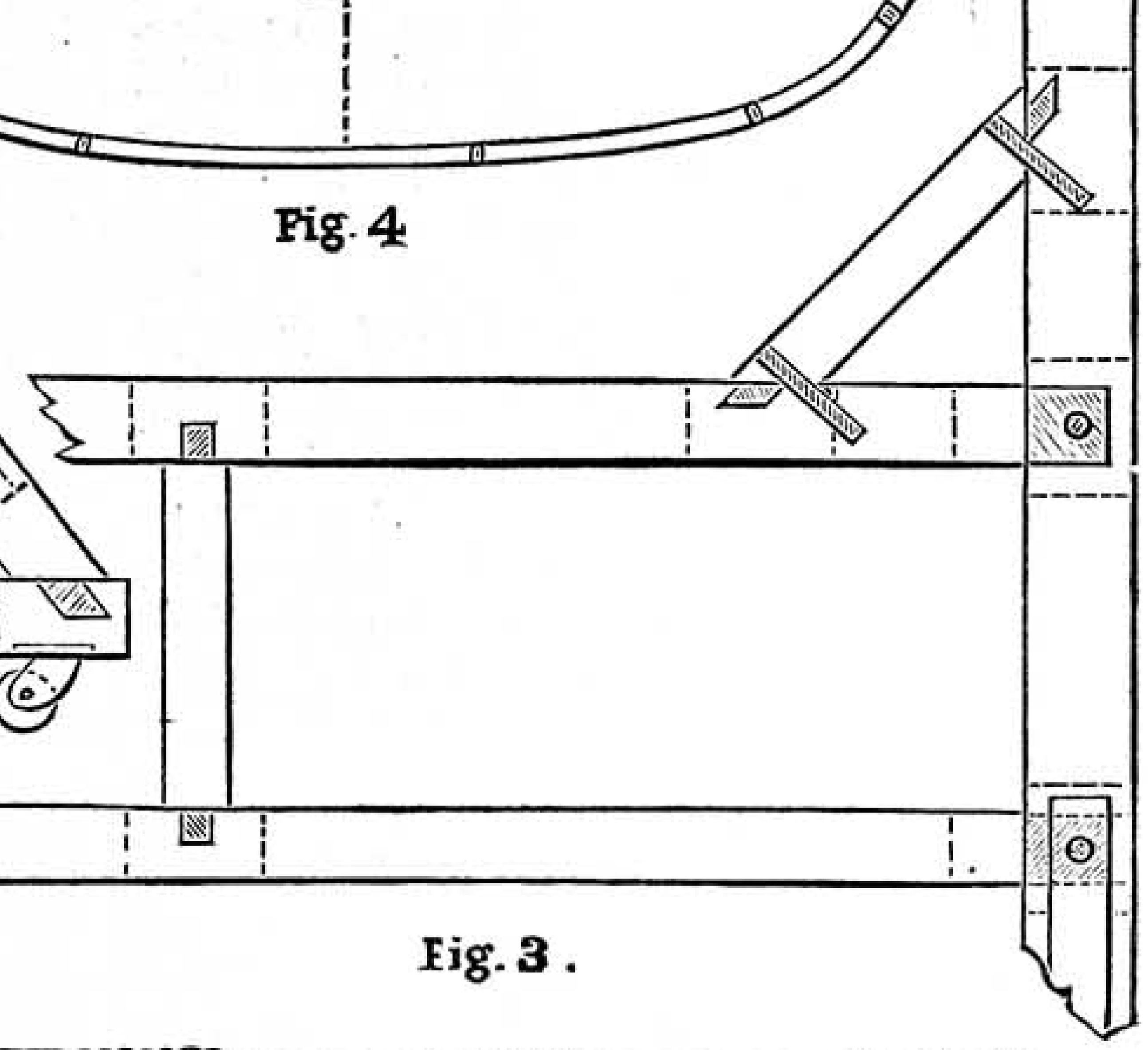

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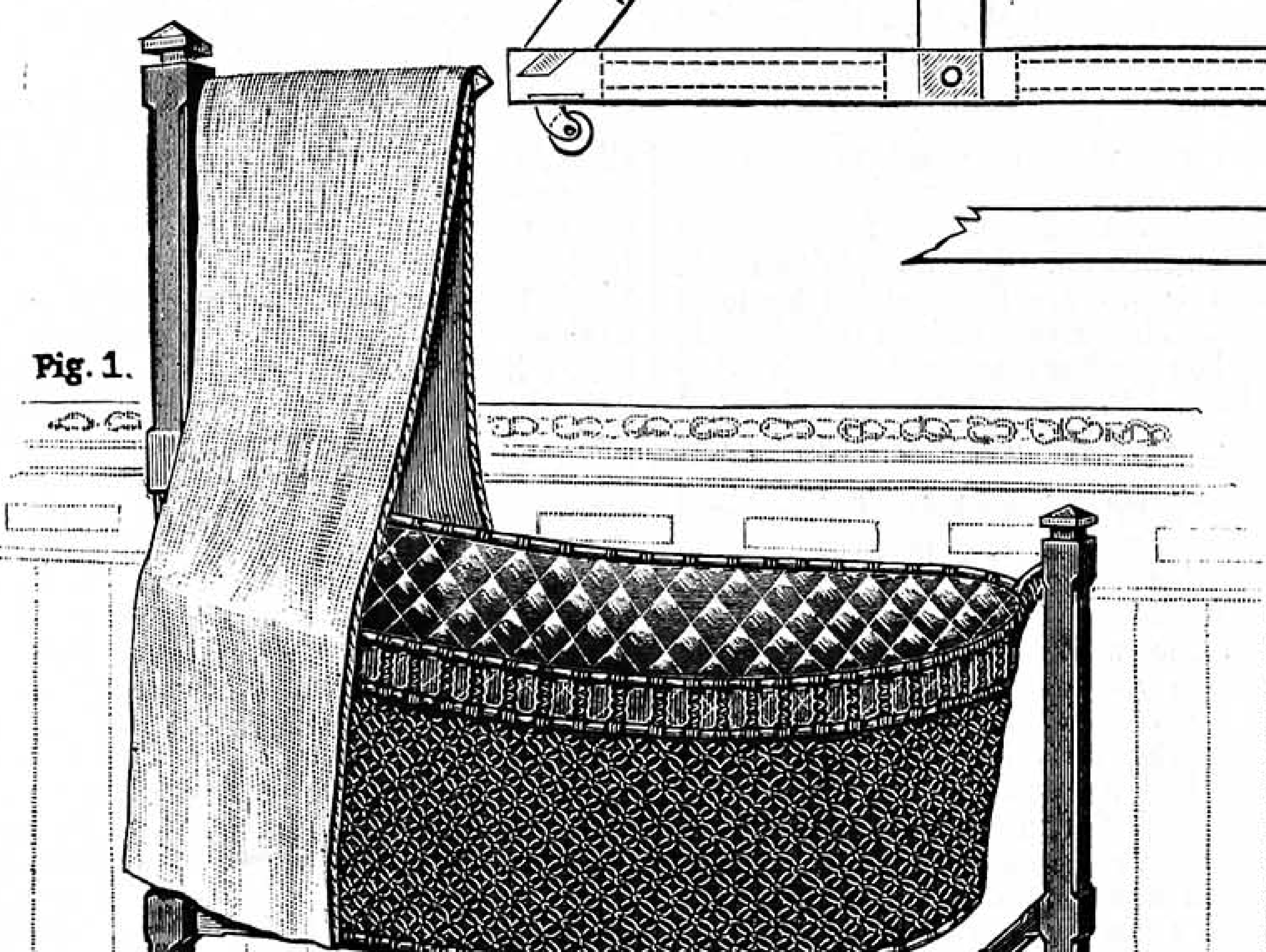

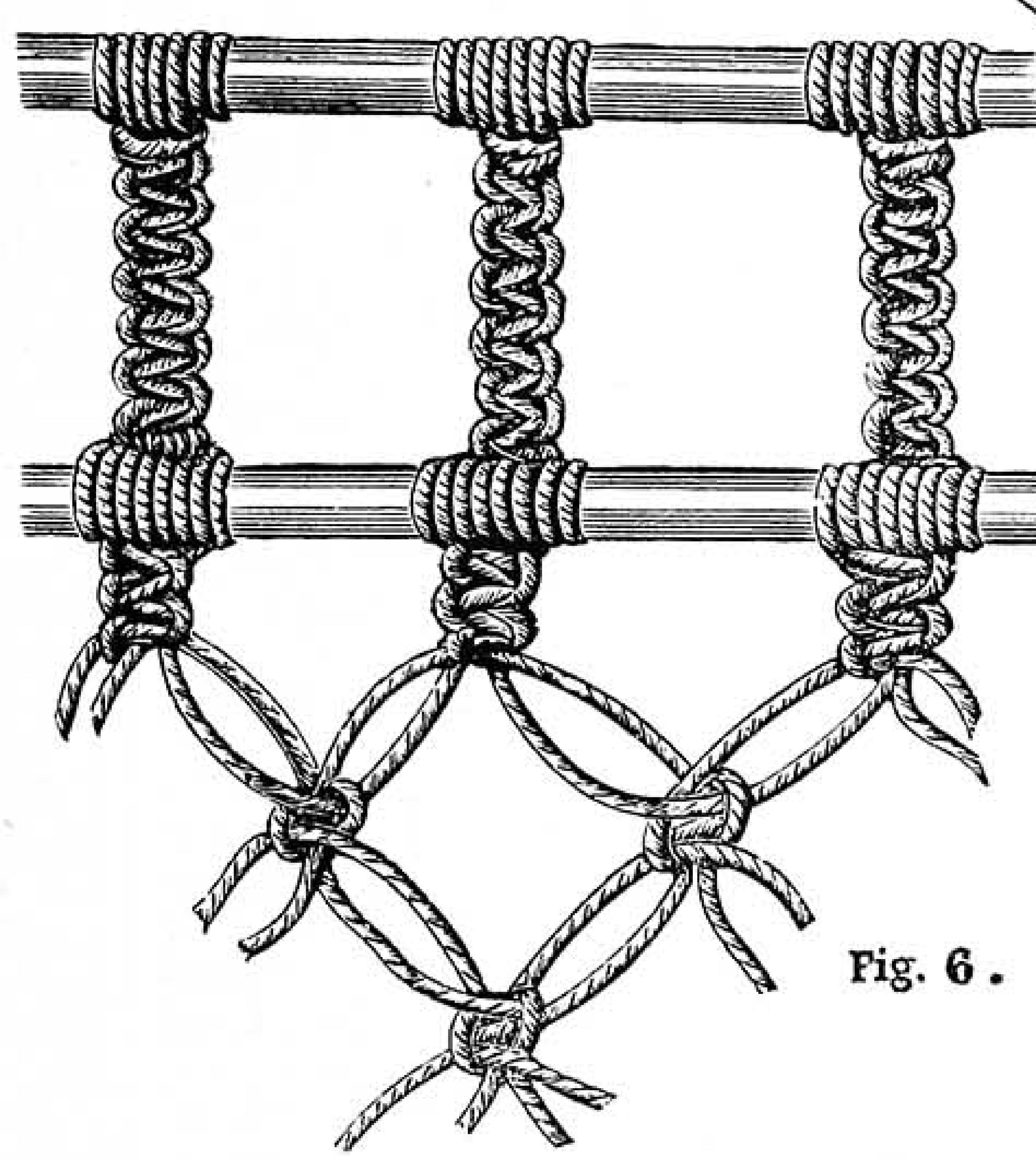

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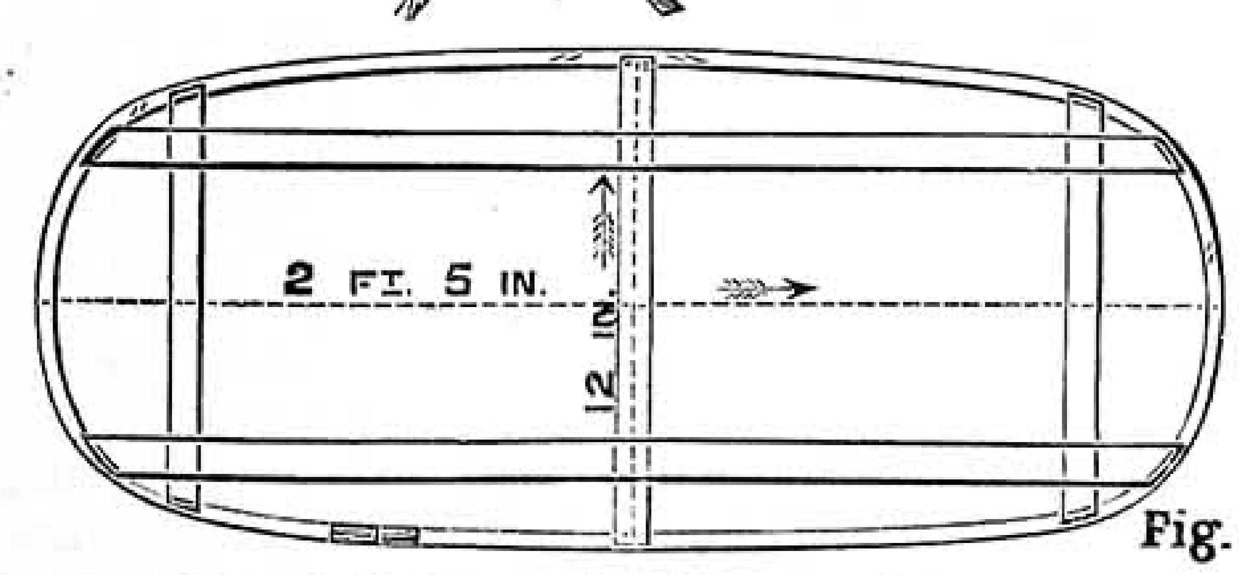


Fig. 7.

Fig. 1.—Perspective View of Swing-Bassinette. Fig. 2.—Showing insertion of Uprights and Spurs, and Method of securing Spurs and Connecting-Bars with Pin. Fig. 3.—Section of Connecting-Bars. Fig. 4.—Shape for Canes of Cot. Fig. 5.—Laying on Cords (A); a Solomon's Knot (B); a Macramè Knot-Stitch (C). Fig. 6.—Solomon's Knotted Bars and Network below Second Cane. Fig. 7.—Bars fastened to Cane to form Bottom of Cot.

HOW TO MAKE A SWING-BASSINETTE.

BY CHARLES E. DODSLEY.

ADVANTAGES OF SWING-BASSINETTE—PRINCIPAL POINTS IN FRAMEWORK—PIECES AND THEIR DIMENSIONS—STYLE OF OUTLINE—JOINTS—MORTISES—TENONS—PUTTING FRAME TOGETHER—CASTORS—HOOKS—CANES FOR FRAMEWORK OF COT—MATERIAL FOR COT—ITS COLOUR—MACRAMÈ CORD FOR NETTING—SOLOMON'S KNOTS AND KNOTTED BAR—ATTACHMENT OF CORDS TO CANES—FORMATION OF BOTTOM OF BASSINETTE.

FOR the benefit of those who read this paper having present or prospective requirement for an article of domestic furniture such as is herein described, I will, before directing how a swing-bassinette may be made, give what I consider the great advantages it possesses over the old-style cradle. One dictionary meaning of cradle is, a bed which may be rocked. A short experience of the same unpleasant rolling motion would develop in many the nauseating sensations attendant upon an attack of *mal-de-mer*, yet the poor helpless babe is made to undergo daily experiences of this kind—a mild form of churning. How different the soothing movement of a hammock! Who that has enjoyed it can forget the pleasant swaying to and fro beneath the leafy branches, the sunlight glinting between the leaves, and the faintest south wind stirring them to a whisper, lulling gently into a happy state of *dolce far niente?*

Such advantages as the following will be evident on glancing at the illustration (Fig. 1). The cot is raised to a convenient height above the floor, thus keeping the little occupant out of draughts; and if other children are about they cannot get to baby without leave, and so many a cry may be saved, consequent upon excessive loving. There is no chance of tumbling over it. It is much more handy for the mother, requiring no stooping to attend to baby during the day, and stands conveniently at the bedside at night. It is supported on castors, and so may be easily moved wherever desired. Lastly, our swing-bassinette is superior to a metal one, being strong, but light, warmer, and much less in cost. It may be elaborately finished, according as the worker's taste may dictate and pocket allow. You will notice two distinct kinds of work are entailed in the making: the supporting frame, in wood, and the bassinette, or cot, of knotted macramè thread upon a cane foundation, lined and padded, forming as comfortably easy a snuggery for the "cannie wee bairnie" as the fondest parent could desire.

The two principal points requiring thought in designing the framework are (1) that it shall with ease bear all the strain of leverage upon the posts, and so obviate all fear of collapse; (2) that it cannot be easily overturned. As the whole weight of the cot and occupant depends from the top of one post, and at an equal height from the other, there is considerable inward pressure of the posts. This inward leverage is modified by means of the short spurs, the weight being thrown more into the centre of connecting-bars, relieving the joints from over-strain, and so danger of collapse is avoided. The possibility of being overturned is secured against by the length of the foot-rests or steps, and position of spurs.

Now, to work. I do not think anything will look better for the wooden frame than oak, either polished or plain. Pieces of the following dimensions will be required:—

Head-post—4 ft. 5 in. by 1½ in. by 1½ in.
Foot-post—3 ft. by 1½ in. by 1½ in.
Two connecting-bars—each 3 ft. 2½ in. by 1 in. by 1 in.
Three rails—each 6 in. by 1 in. by 1 in.
Four spurs—each 1 ft. 2½ in. by 1 in. by 1 in.
Two spurs—each 6½ in. by 1 in. by 1 in.
Two foot-rests—each 1 ft. 7½ in. by 1½ in. by 1 in.
Curtain-rail—1 ft. 1 in. by 1 in. by 1 in.

It will be seen that the style of outline is square and octagonal. This, however, may be varied at the will and ability of the worker, the posts, etc., being turned or carved to any design; but I think the method of fitting and jointing I have adopted is as reliable as any way. All the joints are mortise-and-tenon glued, and secured with a pin about $\frac{3}{16}$ in. thickness. The tenons are cut the full width of the wood, except the spurs and rails; the tenons at the bottom of the upright posts measure 1½ in. by 1 in. by ⅝ in., a mortise being cut through the centre of each step to correspond; the tenons at the ends of connecting-bars, 1 in. by 1¼ in. by ⅝ in., with mortises in the uprights to correspond, the lower bar being inserted 9 in. from the bottom of posts, above the step, the top one 5 in. above it. The rails are fixed into connecting-bars at equal distances apart—*i.e.*, 8¼ in. space between each. Cut the tenon at each end of rails ½ in. by ½ in. by ¼ in., and so leave rails 5 in. long. The spurs are fixed as shown in Fig. 2, being permanently secured by a long pin passing through the top, the upright connecting-bar, and the spur at the other side. The tenons of the spurs will be cut at an angle; if the uprights be fixed into the step, and the piece of wood to form the spur placed in position at the side, the angles at which the tenons are to be cut will be easily marked off. Fig. 3 explains itself. The short spurs are fixed at an angle of 45 degrees. The curtain-rail is 1 ft. in length, and may be round or octagonal, a knob being left at the end to prevent the curtain slipping over. This rail will only require to be glued in.

All the separate pieces being finished and ready for uniting, we may put the wooden frame together. I have simply given measurements and working outline, leaving details to the worker; for I guess no one would make a commencement who mistrusted his own ability to complete it. First, glue the rails into connecting-bars, clamp firmly into position, and set aside. Place the step flat, and the upright with spurs on either side above it, all being ready glued; with a mallet drive together, and secure with a pin through the steps. Allow time for the glue to set, and then unite the posts with connecting-bars and short spurs. Fix on the castors last; these should be small, and placed at the ends of the steps, so that the weight rests well between them. The hook in the foot-post is 2¾ in. from the top, that in the head-post being an inch higher. On the top bar, above the middle rail, fasten a narrow thong of leather or a macramè band, to act as a stop strap, leaving 5½ in. on either side, with dress-hooks at the ends. This is to prevent the cot swinging, unless desired.

So far, all has been plain work. The cot will be to many a new departure, but when finished it will fully repay for the time and patience spent over it. First will be wanted three canes, each 7½ ft. or 8 ft. long, which may be had from dealers in basket or wicker-ware. Bend these into shape, as shown in Fig. 4, two of them being equal in size—length 2 ft. 9 in., breadth 15 in.—and the other one of a smaller circumference, being 2 ft. 5 in. by 12 in. broad. To join the canes, taper off the ends so that they fit closely together, unite with marine glue, and rivet with two or three small wire nails, boring a hole first to prevent the cane splitting; then bind with thin twine. For the handles, two pieces of cane, each 8 in. long, will be needed. Taper off the ends and fix on to the top cane, uniting and securing the same way as above. As the elaboration of design in the woodwork is left to the worker's taste, so the choice of colour and material for the cot must be. Fawn-coloured cord, with lining of peacock-blue sateen, padded and quilted with pink sateen on the inside, and curtain to match, has an exceedingly pretty effect, and has been much admired: this by the way. Two balls of macramè cord will be required. Cut off into lengths of 10 ft. each. There will be few who are altogether unacquainted with macramè work, but for any who may not know how to set about it, I will do my best to initiate, and, with reference to the illustrations, I think any difficulty will soon disappear. Take the top cane and one of the 10 ft. cords; pass the ends under the cane inwards, draw over the top, and pass through the loop formed; under, over, through the loop again, as Fig. 5, A, and draw tight on to the cane. We have now two threads to work with. Place a second cord in the same manner, and draw close up to the first one. Leave a space ¾ in., and place two more cords, and so on all the way round. All the cords being placed in pairs at equal distances, a Solomon's knotted bar, of six double Solomon's knots, is to be made, four threads going to form one bar. I find the easiest way of working these knots throughout is to loop the two middle cords into a button-hole of the vest, and so leave both hands free to pass the outer cords from side to side. Fig. 5, B, shows a Solomon's knot before it is drawn tight. In Fig. 6 is shown a finished Solomon's knot and netting below second cane. Five minutes' practice will teach how this is done, whereas detailed directions would probably fail to make it any clearer. Having finished the round of Solomon's knotted bars, fasten on to the second cane by the macramè knot-stitch (Fig. 5, C). Remember, in doing this, that the first knot must always be drawn tight before the second is made, two knots with each cord forming one stitch. When the second cane is fixed, make two Solomon's knots beneath each of the above bars, and then proceed with the network. Fig. 6 will readily illustrate this. Take the two left cords of one knot and the two right cords of the next, and with them make two Solomon's knots, but drawing the first loosely in each instance; four fresh cords are taken each time. Work round and round in this manner until the depth of netting reaches 9 in. or 10 in.; then four or five more rows, gradually narrowing, by drawing the first knot higher up in each round. Fasten the cords on to the bottom cane in the same way as the one above—*i.e.*, with macramè knot-stitch. Cut all the cords to one uniform length of 5 in. or 6 in.; tie each pair together, forming half the number of loops. Now, from a piece of light strong wood ¼ in. thick, cut three bars 12 in. by ¾ in., and two bars 2 ft. 5 in. by ¾ in. Groove the ends for the cane to fit into, and fix as shown in Fig. 7, by lacing a length of cord through the loops previously formed, from side to side and from end to end, and draw up as tight as possible before fastening off. A piece of stout ticking must be fastened underneath, and two eyelets to receive the hooks at ends of stop-strap.

Our part of the work towards supplying a swing-bassinette for baby is now completed. What remains to be done—draping, etc.—will be more deftly and nattily done by the willing hands of those whose pleasure it is to make babyhood a comfortable and happy time.

CONSTRUCTIVE STRENGTH IN METAL WORK.

BY J. WHITFIELD HARLAND.

OBTAINING STRENGTH FROM PUTTING SEPARATE PIECES OF METAL TOGETHER TO FORM FRAMING—INVISIBLE FORCES IN ACTIVITY—ATTRIBUTES OF FORCES—VELOCITY—WEIGHT—TO DESCRIBE A PARALLELOGRAM OF TWO FORCES AND TO FIND THE DIAGONAL OR MEAN—THE IMAGINATIVE FACULTY—LIGHTNING CONDUCTOR—LATTICE GIRDER—ARCHED LATTICE GIRDER OF NEW CONSTRUCTION—BARS DECREASING IN STRENGTH PROPORTIONATELY TO LENGTH—IDEAL ARCH—CONDUCTORS—STRUTS—SECONDARY FRAMING—BOLTING THROUGH OUTER AND MIDDLE WEB-PLATES.

I HAVE endeavoured in two former papers to indicate the main points in achieving strength of construction in metal, and have spoken of the different strains and opposing forces, showing how their directions might be so deviated as to clash and expend themselves in neutralising one another, instead of acting in concert to destroy the construction itself. Fanciful, perhaps, I may have been in seeking to impress an image on the minds of WORK readers of the action of unseen forces in active operation, but this conception, if fanciful, is, in the main, absolutely true, and serves the purpose of stimulating the reasoning powers in the effort to foresee the results of the various expedients one must employ to overcome, by stratagem, as it were, the material obstacles that opposing Nature throws up against man. It is in this connection that I must emphasise the well-known principle of the diagonal of the forces, which we reduce to paper by making two lines square with one another, or at such an angle as represents the direction of each force, of such proportion to one another as shall express the value and activity of any two forces acting at the same time and in different directions. In arriving at this proportion it is evident there must be a unit of comparison, there must be a common denominator. One cannot compare chalk and cheese. All forces have two attributes: (1) velocity or speed, *i.e.*, feet travelled per second, and this involves what we term momentum (which is, after all, a mean between *inertia* and *propulsion*); and (2) weight. Hence, given the speed a certain weight travels per second in one direction, and given also the speed the ascertained weight travels per second in some other direction, and supposing the direction of each to be also ascertained and expressed accurately on paper by two lines drawn indefinitely long, one is now able to decide, by comparison, by simply multiplying the weight by the velocity in each case, to establish a unit of comparison between any two forces; the product of the one multiplication giving the one length of line, the same process giving accurately the length of the other. We have now only to complete the parallelogram by dropping perpendiculars, and draw a diagonal, which *must* be the mean of the two forces. To ascertain still further the complication of more forces than two, we can simplify the operation by the same process of elimination, obtaining the diagonal of any two, and then using the diagonals so obtained as data, and finding their joint diagonal, or mean co-efficient, which is the same thing.

It goes without saying that construction involves thought. As the Scripture saith, "Who by taking thought can add one cubit to his stature?" He cannot; but he has had the power conferred upon him—if he will study the all-wise laws which God has given for the government of the universe, not merely of what we call the earth, but, so far as we can see in our finite sphere of knowledge, of millions of other worlds visible only by our permitted knowledge of science—of manipulating such all-wise laws by his intelligence, and making them subservient to the good ends he has in view. Man cannot create, but he can construct; and whilst he may be defined by Carlyle as a "tool-using" animal, and by Sir H. Lyon-Playfair (in his opening speech at the late WORK Exhibition) as a "fire-using animal," and with all due deference to these high authorities, I prefer to define him as the *only imaginative animal* extant, and it is only by the exercise of this imaginative power that man has ever elevated himself and his kind. Therefore, it is by cultivation of the imaginative faculty alone that mankind can be educated to higher things; for neglected imagination, untrained, or badly trained, leads to the worst crimes; whilst on the other hand, the more thoroughly it is developed, the more it is brought under the control of reason and mathematics, and thus is compelled to act in strict obedience to the will and the conscience. The higher this high faculty becomes the more it will benefit mankind. All invention, all progress, all design—in short, all the influence that man can exercise over others for good or evil—depends wholly and solely upon the way his imagination has been trained. The genius of Shakespeare depended on this faculty; the whole system of jurisprudence, law tempered by equity, depends on the power of imagination, the power of putting one's self in the position of someone else; the power of knowing beforehand what is almost certain to occur in certain circumstances (and the worst of it is, that not in one single isolated case does our national system of education provide one lesson for the culture of imaginative faculties) is the function of imagination.

This digression is in defence of my mode of impressing on the minds of WORK readers the absolute necessity of forming an ideal in the mind of the hidden action of hidden forces which, to use a cant phrase, is "so much more easily imagined than described." Even such every-day phrases as "Fancy that, now!" "What do *you* think?" etc., show there is truth in this contention, for there must be a germ of it in the mind to cause such phrases to obtain currency.

Therefore, good WORK readers, please imagine that in the body of the metal in which you wish to work there are forces fighting against one another, or fighting against you, and that you must find out how to convert their efforts to nullify yours by taking advantage of the known conditions of their weight and their velocity and their natural direction, by pitting the one against the other, so that they may waste their initiative in overcoming, for you, other inimical forces without destroying the strength of your constructive scheme or plan.

To make this clearer still: you know, either by your own or by others' experience, that the electric fluid always seeks the shortest way to its opposite pole. In putting up a lightning conductor you provide the shortest cut to the earth, and thus render its passage harmless. In this case you simply have to contend with one force at one time. If you had two forces to contend with at the same time, the diagonal of the two forces, or three forces or more, ascertained as above indicated, would give you the direction in which the accumulative forces would elect to move; and if you provided in your scheme of construction a piece of metal lying longitudinally in that direction, as a path or channel wherein they might be jointly and severally conducted away, you deprive them of all power to injure your construction, just as the lightning conductor provides for a safe conveyance of the fluid to its other pole, instead of letting it run riot in its course to the destruction and ruin of your building which you thus protect. I say a piece of metal lying longitudinally advisedly, because, partly on account of the compressive resistance being greater than the cohesive resistance, and partly on account of the lengthway of metal being of greater dimension than any other, and therefore stronger, it is better fitted to form a way or channel between two points, without being itself injured, just as a road or street, having no obstructions and being hedged in, forms the best possible channel of progression.

The logical outcome of this theory is what is termed the lattice girder (see Fig. 1), in which what would, in a solid girder, be the two flanges, are two separate members connected together, not by a solid web as in the case cited, but by bars of metal which are riveted together and to the webs of the upper and lower members. Now to construct such a lattice girder properly, the bars which take the place of the solid web should possess the same resistance to strains of all sorts as the web would. If these bars were to be placed perpendicularly there would result an accumulation of force liable to displace them from the perpendicular, and the points of junction with the upper or lower webs would become so many fulcrums of leverage which the varied forces would immediately utilise. But, by ranging the bars in the line of the diagonal of the forces, they would be subject to no preponderance of any one force, and could carry off without effort or injury the whole of the combined forces longitudinally, conducting them to a safe outlet where they would become spent and harmless. Thus constructed, the framing constituting the girder can be made very much stronger than if it were made of the solid plate even of the same thickness as the bars, and this is not only a saving of material, but of a vast amount of weight to be carried, extra, which would increase instead of diminishing the strains of all kinds that would attack it.

I have, hitherto, spoken only of bars in the direction of the diagonal of the forces, viz.: *c*, *c*, *c*, *c*, *d*, *d*, *d*, *d*, in Fig. 1, but these are only the principal supports and the conductors of the forces, and would be incapable of resisting the remainder of the forces, as they could not, from their being at an angle to both top and bottom flanges, keep these two members invariably at one distance apart. We must, therefore, provide cross-braces, fixed to the centre of each diagonal bar or conductor, and to the webs also at each extremity of the bars (see *d*, *d*, *d*, *d*, Fig. 1), which braces or struts would prevent either end of the conductor from moving on a pivot at its junction with the girders, and thus maintain the rigidity of the framing. In Fig. 1 it will be seen that the diagonal of the forces is shown to vary the further it gets from the centre of the girder it is part of. I ought to say that in the diagram it is only guessed at, the actual diagonal of the forces governing it not having been actually arrived at, as we do not presuppose any given data. It will also be seen that the conductors, as I prefer to call them, and the struts, are *slighter* in the centre than at the ends, *i.e.*, that as they become necessarily longer they require to be of proportionately greater breadth. Logically, this is correct construction, as the weight at the breaking point is reduced, while it increases the nearer it gets to the supports at each end. It will also be noted that the diagonal struts, *a*, *e*, *a*, *e*, *a*, *e*, are not only much lighter than the conductors, but are also proportionately heavier, as they require of the other half, like two cantilevers independent of one another, each carrying away to the pier supporting it, and through it thence to the ground, the whole of the inimical forces. The nearer this ideal is approached the stronger the bridge, be it arch or girder, will become, because at the centre, which would be its natural breaking point, there is no strain whatever, and its stability would not be impaired even if it were broken.

In Fig. 1 I give what I consider to be the strongest means of strutting a lattice girder. Here the lower girder is flanged of an L section at bottom, and both conductors and struts are riveted to the opposite sides of the web; the web is double, with a centre web-plate. The top web is flanged at the top, and to this the conductors and struts are riveted—again leaving the flange intact. Instead of the conductors being solid, they consist of two separate pieces, riveted one bolted or riveted to the top flange of the upper member, not to the web already pierced to the full extent for the bolts and rivets of the framing.

In addition, is the latticing of struts and conductors, which I have shown shaded in the drawing (Fig. 1), so as to more clearly distinguish them from what may be called the secondary construction, which latter consists of the diagonal framing of the pieces *a*, *e*, *a*, *e*, *a*, *e*, which are riveted at top and bottom to the middle web-plates, *m*, *m* (see Figs. 2, 3, and 4), and to both conductors and struts where they cross them. But as, if these diagonals were made straight, being fixed at each extremity to the middle web-plate, they could not touch the outer framing on each side of them, consisting of struts and conductors riveted to the angle-iron portion of the top and bottom girders (the one straight, and the other, the lower member, arched), they must be cranked, so

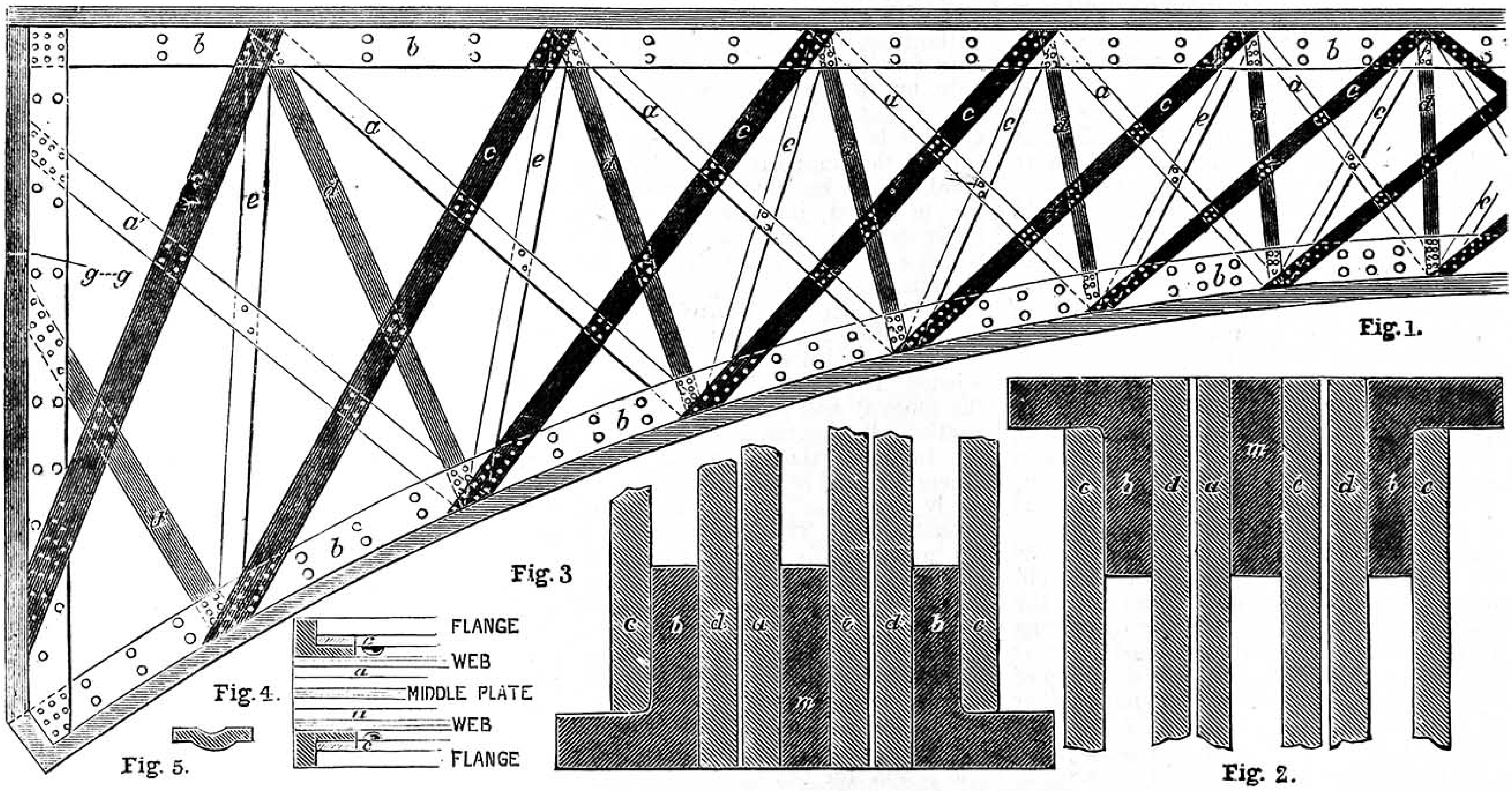


Fig. 1.—Half Elevation of Lattice Arch Girder—*a′*, *a*, *a*, *a*, and *e*, *e*, *e*, *e*, Secondary Diagonal Framing; *b*, *b*, *b*, *b*, etc., Web-Plates; *c′*, *c*, *c*, *c*, Conductors of Strains; *d′*, *d*, *d*, *d*, Radial Struts. Fig. 2.—Enlarged Section of Webs with Angle Flanges and Middle Web-Plate (*m*) of Upper Member. Fig. 3.—Ditto, Lower Member. Fig. 4.—Section at *g g*, Fig. 1. Fig. 5.—Section of Conductor or Strut, dished.

to be longer, which they become the further away they are from the centre. In short, every construction in the form of a bridge (which may be defined as construction supported at the ends only) depends for strength on its being capable of converting downward thrusts into compressive strains. This is done, as in every arch, by making the length of it greater than a straight line, which, so long as the piers or supports do not give way, can never, by any weight, be compressed or crushed till it only measures the length of a straight line from pier to pier. If the material of which an arch be constructed be such that downward pressure of any weight placed thereon, converted, at a loss of force, as it must be into a compressive strain acting outwardly from the centre, or keystone, in the direction of the piers, is capable of compressing it sufficiently to reduce its normal length to that of the distance between the piers, down it comes. The ideal arch, however, is one where each half or side is entirely self-supporting, irrespective on the outside of each of the webs, and the strut passes between the two. Instead of straight bars of sufficient strength for the conductors and struts, lighter ones may be used if they are dished under the steam-hammer to the section shown in Fig. 6, except where they require riveting. This would give sufficient strength to allow of them being thinner, not narrower. I am inclined to think that the struts should all be radial to the centre of the circle of which the arch is an arc, as shown, whilst the conductors form diagonals corresponding to the diagonals of the ascertained forces—and thus, denoting the distances apart of the struts, would connect the top of one strut with the foot of the next but one, and so on, always, however, maintaining the true proportion of breadth to length in both. In roofs, all ties and braces should, if possible, be bolted or riveted to the flanges, and not to the web; and in bridges, the flooring, which acts as both bracing and tie in one, should consist of buckled or dished plates as to meet the outer or primary framing at the various points of intersection.

This construction has a two-fold purpose: it strengthens the whole fabric longitudinally, giving greater rigidity; whilst it also braces the two outer framings firmly to each other and to the middle web-plate, thus strengthening the fabric transversely. In order to connect the left and right angle iron webs with the inner or middle web-plate, these should be bolted right through between the ends of the struts and conductors, washers of the proper thickness being used in the interstices between them, as shown in Fig. 1. The end of the girder next to the abutment of the pier should be of the section shown in Fig. 4, and should not only be riveted strongly to both top and bottom webs, but should carry also the end of the conductor, *c′*, the strut, *d′*, and the diagonal, *a′*, where they finish and die into it. The lower portion of it should be forged, as shown, to form a shoe at a radial angle to rest upon the springer of the abutment pier. It should be mentioned that the whole construction should be of wrought iron, as cast webs would be too much weakened by bolting or riveting the struts, etc., to them, to stand any strain. Figs. 2, 3, and 4 are three times the size of Fig. 1, but none of them are drawn to scale, as none of the strengths have been calculated, and I do not presuppose any data. They are merely diagrams showing the general principle of construction only as applied to an arch girder.

SOME ELEMENTS OF PATTERN-MAKING.

BY FRIDAY.

I SUPPOSE many a reader of WORK has had, or at some time or other will require, the iron-founder's aid in the execution of his work, the use of cast iron being so general that it is used in some shape or form in almost every craft represented in this paper.

But an iron casting cannot be obtained without its corresponding pattern is first prepared, and the intention of this paper is to put novices, either amateur or professional, on to the right track in the matter of pattern-making.

The average run of patterns sent to the foundries by amateur and professional workmen, other than those actually engaged in some branch or other of foundry practice, are constructed without any regard to the use for which they are intended. They are neat and well finished in many cases, but, from ignorance of a few elementary rules in pattern-making, are often quite useless as patterns, and have to be cut and altered by the founder before they can be used at all.

The first thing necessary to understand is the process known as "moulding."

Briefly, this is the art of producing, in suitable sand and under proper conditions, an impression of the required casting, which can best be obtained by ramming up in the sand a pattern or model of the article required.

Now, a moment's consideration will convince the would-be pattern-maker that this model must be withdrawn from the sand before the mould can receive the molten metal, and, therefore, the necessity of so making the pattern that it leaves the mould without disturbing the sand about it.

It is the non-appreciation and consequent non-application of this essentially fundamental knowledge that produces so many indifferent patterns from the hands of the amateur pattern-maker.

There will be cases in which a fuller knowledge of the art of moulding is required in order to construct a required pattern, but our paper is too limited in its scope to deal with such cases, our object being an explanation of the principles used in the simplest types, and leaving the reader to apply them to other and further examples.

It is obviously impossible to consider more than a few simple examples in this paper, though we fully expect to please but one in a hundred by our selections; and if this is so, we hope the ninety-nine will do no more than exercise their national privilege and grumble, as is the bounden duty of every aggrieved Englishman. The first thing necessary to pattern-making—given the tools and material, and, by the way, a pair of callipers are almost indispensable in this craft, and should be added to the ordinary joiner's kit if possible—the first thing to remember is that a pattern requires to be tapered, to allow for draft. To illustrate this, I append in Fig. 1 a sketch of a common pillow block, showing the taper on a rather exaggerated scale.

It will be obvious that such a model used upside down in the sand, as it would be, would very readily "draw" or leave the mould.

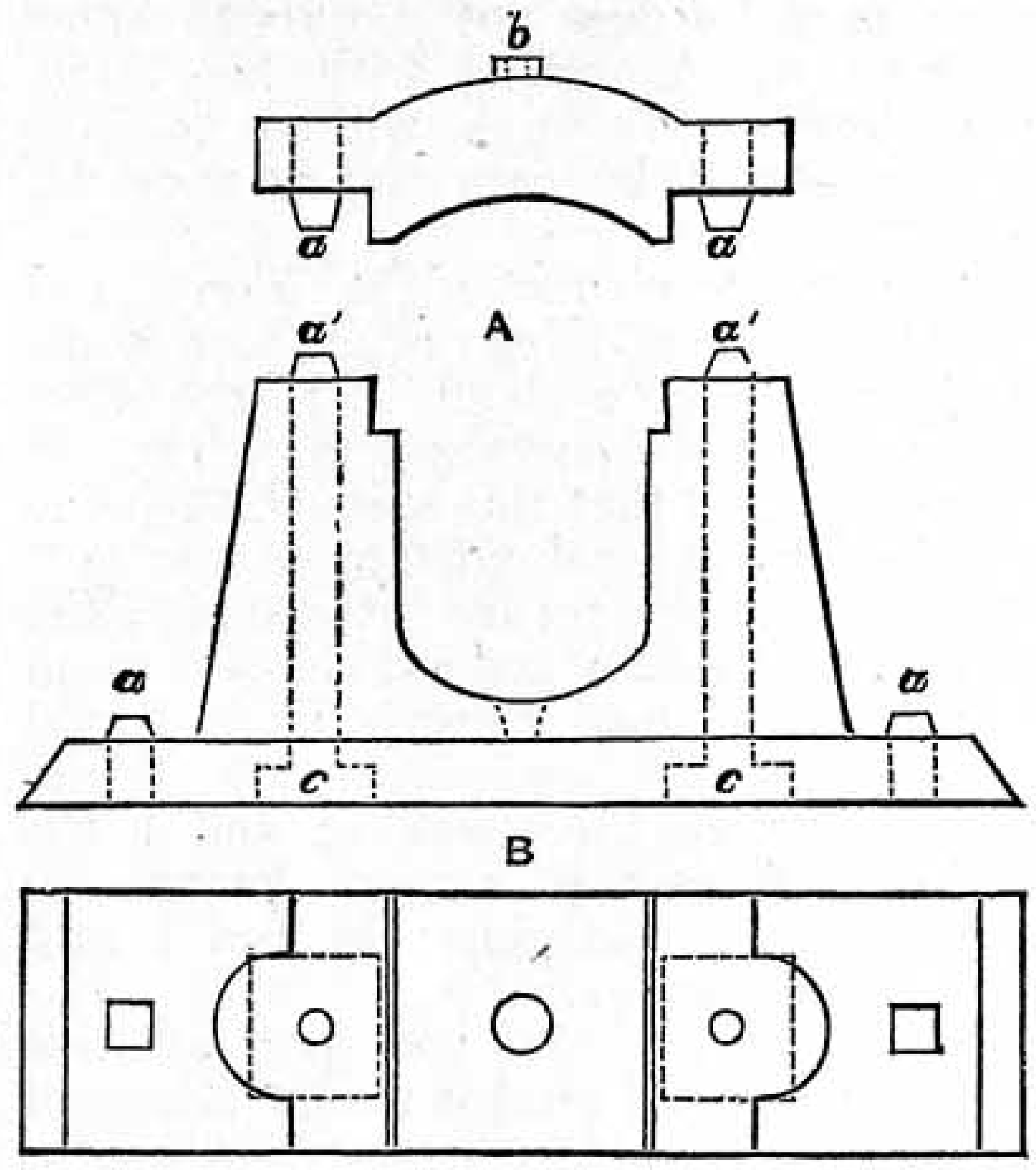


Fig. 1.—Pattern of Pillow Block and Cap, showing Taper in Elevation (A) and Plan (B)—*a, a'*, Prints for Cores; *b*, Oil Cup and Hole; *c*, Core Holes for Bolt Heads.

The same diagram illustrates another point—viz., the use of prints in pattern-making. These prints (a, a^1) are little pieces of wood, the size and shape of any hole that may be required in the casting: in this case for the necessary bolt-holes. It will be easily seen that a long taper core of green sand through a^1 would not withstand the metal when it is poured in the mould, but by use of a print an impression of the required hole is made in the mould, and a hard dried core may be stood in such a print hole, which will be strong enough to resist the inrush of metal.

It is not usually necessary to make the prints very prominent—just sufficient to supply a firm seat for the core. In our present example in Fig. 2, which is from a pattern for a 2 in. block, $\frac{5}{8}$ in. is the size, and even less would answer. The actual taper in the same model is $\frac{1}{16}$ in. all over: just enough to render moulding easy, without spoiling the shape of the block

Another simple example will illustrate two other elementary principles. The sketch illustrates a double-flanged cylinder. Here the hole is required right through; hence the prints are tacked on each end, thus providing a double support for the core, such a

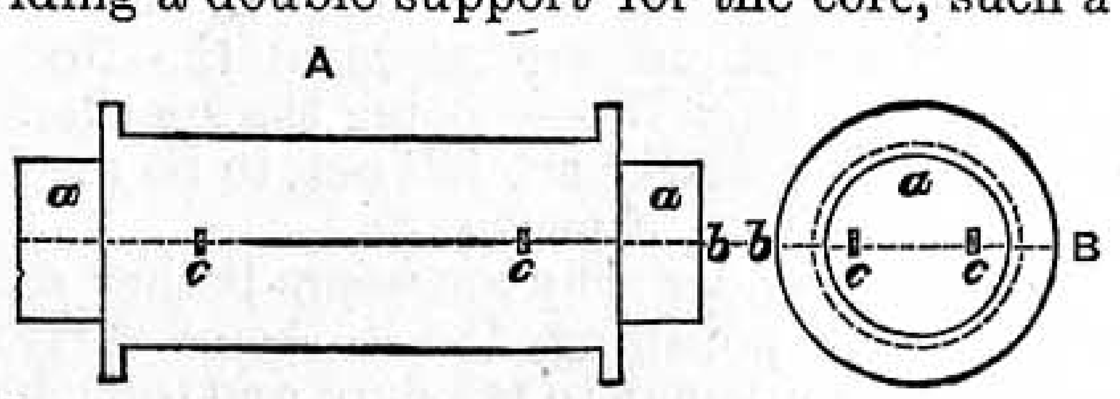


Fig. 2.—Pattern for Cylinder in Side View (A) and End View (B)—*a*, Prints of Cores; *b*, Line showing Cut through Centre; *c*, Pins for dowelling same.

casting being made on its side, as shown. Should the hole be required but partly through, one print will do, but it may be necessary to lengthen that one very considerably, unless there be no objection to the use of a chaplet at the inner end of the core. In either case it will be simply necessary to state the required depth to the moulder. Patterns of this type are much more convenient in use if they are cut in halves through the dotted line, and then dowelled together. They then part when the moulding box is uncovered, half remaining in the upper part and half in the lower part, thereby rendering their removal from the sand more ready and simple.

In the construction of patterns, glue suggests itself as a convenient article to use; but may I make one other addition to a well-known book of manners and morals, and remark that as far as possible in pattern-making, "Don't?"

Glue so frequently gives out when the damp sand comes into contact with it, and a pattern which possibly has taken hours to prepare often comes to pieces almost the first time of using, so that so far as possible the use of joiners' brads, or, better still, fine wood screws, is recommended as more likely to ensure the longevity in use of a pattern.

When, however, glue is necessary, it is well to use the very best; use it thin, and use it fresh. A little quick-drying linseed oil, well stirred in while the flue is quite hot, enhances its resistance to moisture; but even then a coat or two of a good oil paint is necessary to protect the joint from the moisture arising from the sand.

A word about core-boxes. Most founders have core-boxes, both square and round, varying from $\frac{3}{8}$ in. upwards, and the judicious use of the rasp or file will produce almost any plain core; but when the hole required in the casting is irregular, or peculiar in shape or position, a proper core-box will be necessary. Reverting to the "plummer" block, the hole through a^1 is required to contain a square head-bolt, as shown by the dotted lines at c, and the core will therefore take that shape; and a core-box for the same may be made by cutting away in two pieces of wood one half of the bolt, and then dowelling them together, leaving the ends open, so that the core sand may be well rammed into the space, from which they are subsequently removed, dried, and otherwise finished. In making core-boxes, the taper required for draft is similar, but opposite to that referred to in pattern-making. In making up dowelled patterns or core-boxes, it is very necessary that the joints should fit quite accurately, or the casting will be more or less irregular in shape, and out of truth.

A very important point in pattern-making is the due allowance for shrinkage. Castings in iron vary in shrinkage, according to their mass; for metal 1 in. in thickness, allow $\frac{1}{10}$ in. to the foot in making the pattern, while thinner castings require more, and thicker a shade less allowance.

Brass shrinks rather more, and $\frac{1}{8}$ in. may be substituted for the $\frac{1}{10}$ in. afore-mentioned. For castings under one foot, shrinkage need scarcely be taken into consideration; the rapping of the pattern by the moulder usually suffices. This rapping, which is done to loosen the pattern before drawing, is usually done by boring a hole in the pattern, and inserting a spike in the same, and then rapping the spike on all sides with a hammer. This necessarily tries the strength of the pattern, and if many castings are required off one pattern, it is well to cut a small mortise when the rapping hole is wanted, and insert therein a small iron plate with a hole in it, thereby saving the wood from the actual contact with the spike.

In making patterns of articles which have to be worked up before use, it is well to allow sufficient metal for the process. A file or lathe will easily remove a superfluous $\frac{1}{16}$ in., but no mechanical method can satisfactorily add the same if it be lacking at the first. The material most used and most readily worked in pattern-making is undoubtedly pine or deal, and on the whole it is the best for most purposes, though a mahogany pattern soon repays its extra cost when a large number of castings are required from one model. In selecting pine, pick out the best-seasoned, but not the very driest and hardest, as these conditions develop into cracks and warps when in actual use.

To finish and preserve your pattern, the readiest and simplest method is a coat of hard-drying paint, which should afterwards be well sand-papered, and finally brushed well with dry blacklead or chalk. This gives it a fine smooth face, and renders it easy of use, and at the same time preserves it from the damp and moisture of the moulding shop.

Another preservative is a shellac varnish, prepared by dissolving one and a half to two parts (by weight) of shellac in twenty parts of methylated spirits. This takes longer to prepare and requires more skill in applying; and, on the whole, the first method is more simple and convenient to the occasional pattern-maker.

I find that, spite my efforts to refrain from the use of foundry phrases and terms, I have been compelled to use several trade terms, and would explain now that green sand is the sand usually found on the shop floor, and forming in use the main part of the sand; while a chaplet or frame is a wrought-iron stud, used to keep a core in its place in the mould. For example, the core of a column is often supported by chaplets, and their ends may often be seen covered by a little button on the columns of public buildings. Ramming up, rapping, draft, and some other words are, I think, sufficiently explained by their context.

In conclusion, the approximate weight of a casting may be arrived at by allowing fourteen pounds of iron to one pound of deal pattern, or eight pounds to one if the pattern be mahogany. Zinc castings are about the same, while copper, brass, and gun-metal are from twenty to twenty-five per cent. heavier.

A CHAT WITH A FRENCH POLISHER.

BY "AMATEUR WORKER."

PRELIMINARY—REMOVING POLISH FROM HANDS—WORKSHOP HABITS—NAPHTHA POLISH—MAKING POLISH—AMATEUR *v.* PROFESSIONAL POLISHING—STAINING.

LIKE many readers of WORK, my favourite hobby is working in wood, making odds and ends of furniture, and such like. Now, as an amateur, I like to finish my own work, and to do so of course I have to change myself from a cabinet-maker to a polisher when the proper time arrives—that is to say, I do the work of the latter instead of that of the former. As I am supposed to know a good deal about polishing, I am often appealed to by friends of kindred tastes to my own to help them out of their difficulties. Sometimes I am able to do so, sometimes not; for whatever I may or may not know about the work, I do not delude myself with the notion that I know *all* about it. There is always a little more to be learned, and when that has been done, still something further—a kind of "Will-o'-the-Wisp" chase, extending the field of operations, but not getting hold of finality in the particular line of work. I am, however, more fortunate than some, inasmuch as I have many acquaintances among professional workers, and when I am in a difficulty they are generally ready to help me out with it.

Well, to come to the point, I have an old friend, a beardless youth of fifty years of age, or thereabouts, who has been a French polisher all his life; though, strangely enough, even he does not profess to know *everything* in connection with his trade. He is, however, always willing to give any information he can, and is a reader of WORK.

Sitting together one night lately, and a copy of WORK lying near him, some remarks were made about it, to the effect that he saw Mr. Denning was writing on "Polishing," and that this seemed, to judge from the "Shop" columns, to be a subject in which many readers are interested. The conversation became general shop—I mean polishing shop—talk, though I am bound to say it was all one-sided, my friend W—— doing all the speaking, and I the listening. It was a regular lecture on polishing, considered generally, and I said to him after a bit—

"W——, why don't you put all this down on paper, and send it to the Editor of WORK?"

He replied, after a few thoughtful moments, which were apparently occupied solely in filling his pipe—

"Well, you see, there is nothing in what I am saying except what everyone knows, and Mr. Denning will, no doubt, tell anything that is important before he has done."*

I could not agree with the first part of his remark, for there was a good deal in what he was saying which I am sure interested me, and would, no doubt, be equally interesting to others could they have heard him. As for the rest, possibly Mr. Denning may not think it worth while to touch on such general topics in his series of articles on Polishing; and, in any case, I do not think he will object to seeing these remarks regarding polishing viewed from a different side to his own. I am inclined to think he will be very glad to see them published. Finally, I suggested to W—— that if he would not write to WORK, I should. Agreed; and this is the result. I do not pretend to give the words, only the general tenour of what was said.

The opinions are those of an experienced polisher, who served his apprenticeship, worked as journeyman, and for many years has been foreman over a number of others. They are, therefore, worthy of attention; and the writer has the privilege of being the mouth-piece, or rather the pen-holder, which makes them public in WORK.

The observations are made in the first person, my friend W—— being the speaker, and my own remarks are left out, to be read between the lines, if necessary.

"I often wonder why amateurs bother so much about polishing, for it seems dirty work for a gentleman to take up; and though I like it very well as a trade, I don't care about it for amusement; but then, I suppose no one does look on his own business as being a pastime. It's his work, and by way of a change he takes to someone else's when he has done with it. My hobby is photography, and I daresay a photographer would think this anything but an amusement, so that, after all, there is not much wonder that amateurs, when they have made anything, like to finish their work. The dirt—or it's not that so much as hardened polish and other things on one's hands—can easily be washed off with a little (methylated) spirit or soda and water. No, I don't mean spirits and soda-water internally. Yes, it's a fact that some men will drink even methylated spirit if they can't get anything else, though it is horrible stuff: nothing better than poison. They will even suck it out of the spirit-rubber if they get the chance. It is best not to have too much of it about. There is no risk of youngsters learning bad drinking habits from the polish or spirit used; though, of course, if they are in a shop with dissipated men they may get spoiled, but that would be the same in any business. The fumes from the spirit are not strong enough to hurt anyone.

"It was different with naphtha when it was used instead of spirit, for the vapour affects the eyes. Naphtha, anyway, is nasty stuff. It smells horribly, and is not so safe as spirit. Why, in a full, close shop at the end of day one could see the vapour flashing as it came in contact with a light. I should never use naphtha when I could get spirit. I prefer to make my own polish, and, whatever the books may say, there is nothing better than shellac and spirit. Some of the bought polishes are very good, but I like to make my own, for then I know exactly what it is. That is the principal reason why good polishers prefer their own preparations, even if they use something besides shellac and spirit. Opinions differ, and men have their fads in polishing as well as in anything else. Then there is a good deal in a man being accustomed to his materials. I think the chief reason why polishes often contain something besides shellac is on account of price. Take resin, now; it seems to give a better substance and body to the polish, but it is cheap. Polish with much of it in will not stand well, and something is put in to make it more durable and work better. I have never been in a polish manufactory, and do not know what manufacturers use, so I don't want to run them down; but I don't see how a lot of the low-priced polish can be sold, unless it is adulterated. It really does not much matter what kind of polish amateurs use; for, of course, they can't get as good a finish, even with the best, as a regular polisher, though they often seem to think they ought to, and wonder why they can't. They blame the materials, and perhaps something may not be just what it should be, but the chief reason is want of practice. How can an amateur or beginner reasonably expect right off to do what a polisher has to learn during a long apprenticeship, with those over him to show him how to do anything? It is unreasonable for anyone to think that he can know all about polishing at once. Even if he is told, and may have all the ways and methods clearly explained to him, he still wants practice. Even among polishers there are plenty 'not worth their salt' when they have to do anything but plain straightforward work, such as staining, matching-up, and the like. Anyone can do staining—after a fashion—but to do it thoroughly a man must have used his eyes and his brains. He must have studied the different kinds of timber, with their varieties of marking, not only in colour but in configuration. He must enter into the spirit of the different features, so that he can convey the impression of the wood he intends to represent. There is nothing

*I have in my hands papers from Mr. Denning on "Spiriting-off," "Glazing," and "Dry Shining," in connection with French Polishing, and these will appear in due course.

mechanical about this kind of work; simply copying will not do, though for purposes of study useful knowledge is gained by doing so. A man may know all about staining so far as the most useful colours and the preparation of the stains, but may signally fail in using them properly. Anyone can wash them on, and so darken the wood to the same extent all over; but then, if an imitation of a darker wood, except as regards colour, is wanted, this is not sufficient. The characteristic markings are absent, and it is certainly better to let them be so than to perpetrate the hideous libels on the real material which are so often seen. Then, again, even in colour there are minute differences which can be got only by adapting the stain at the time, modifying one with a little of another, and so on. All stains must be used with discretion, and one cannot tell another how to apply them with equal success always, even on the same kind of wood, for in any, great variety will be found. To take one, now very fashionable—viz., mahogany. It varies in texture and colouring very considerably; and supposing we want to stain it a 'Chippendale' colour, even after the exact darkness of this is known or specified, to get several pieces equally matched, the stain must be strengthened or reduced at the discretion of the polisher. How is it possible to explain to anyone else exactly what will suit all the pieces, even in one piece of furniture? It cannot be done. Just the same might be said of oak, or almost of any wood.

"Then amateurs make a lot of fuss about having different fillers and different little preparations for varieties of woods. Of course, each polisher has his favourites, but then he could manage very well with any of those generally used; and it is almost nonsense for a beginner to think that he could have managed better if he had used something else to fill or polish with. It is only a man who has been constantly at the work who can appreciate the differences between one material and another for the same purpose. So you see, after all it is principally experience that the amateur or beginner lacks when he cannot do polishing properly."

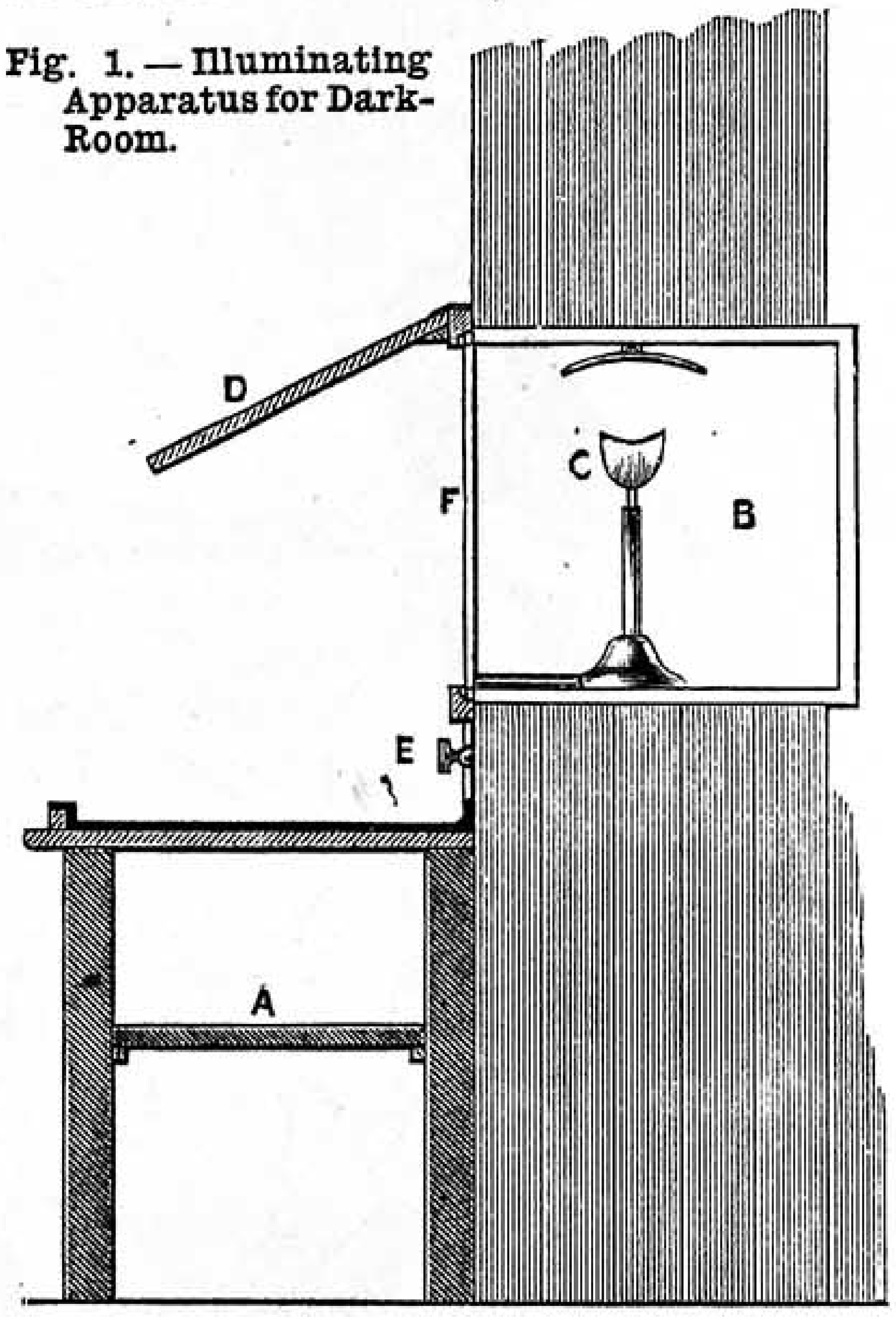
LIGHT FOR THE PHOTOGRAPHIC DARK-ROOM.

BY WALTER E. WOODBURY.

PRELIMINARY CONSIDERATIONS—UNHEALTHY AND INJURIOUS DARK-ROOMS—REQUIREMENTS OF A PERFECT LIGHT—A SIMPLE ILLUMINATING APPARATUS—NO LIGHT ABSOLUTELY NON-ACTINIC.

BY far too little attention is paid by photographers, either amateur or professional, to the subject of dark-room illumination. Perhaps to the amateur, who practises the art but little, making a photograph but now and then, the subject is one of little interest, as any lamp will do, provided it be perfectly non-actinic, and give sufficient illumination for his purpose. But there are many, however, who remain for considerable lengths of time shut up in a room lighted only with a ruby or yellow light. In this case, two important conditions must be studied if the health of the worker is to be considered. First, with regard to proper ventilation; and, second, the injurious effect of the light upon the eyes. It cannot be disputed that remaining in a dark-room, usually of very confined limits, for any length of time with a light burning, and no proper ventilation to carry away the noxious gases formed, can but be extremely detrimental to the health. Again, too few have any idea of the injurious effect constantly looking at a red or ruby light has upon the eyes, producing eventually a form of congestion. Taking these two points into consideration, I have devised a form of dark-room lamp that should, I think, meet with all requirements. These may be briefly stated to be: first, a light that will not produce fog on a sensitive plate on reasonable exposure; second, that shall throw a sufficient quantity of light to work by upon the dish containing the negative where the light is required, and that shall be shaded from the eyes of the worker;

Fig. 1.—Illuminating Apparatus for Dark-Room.



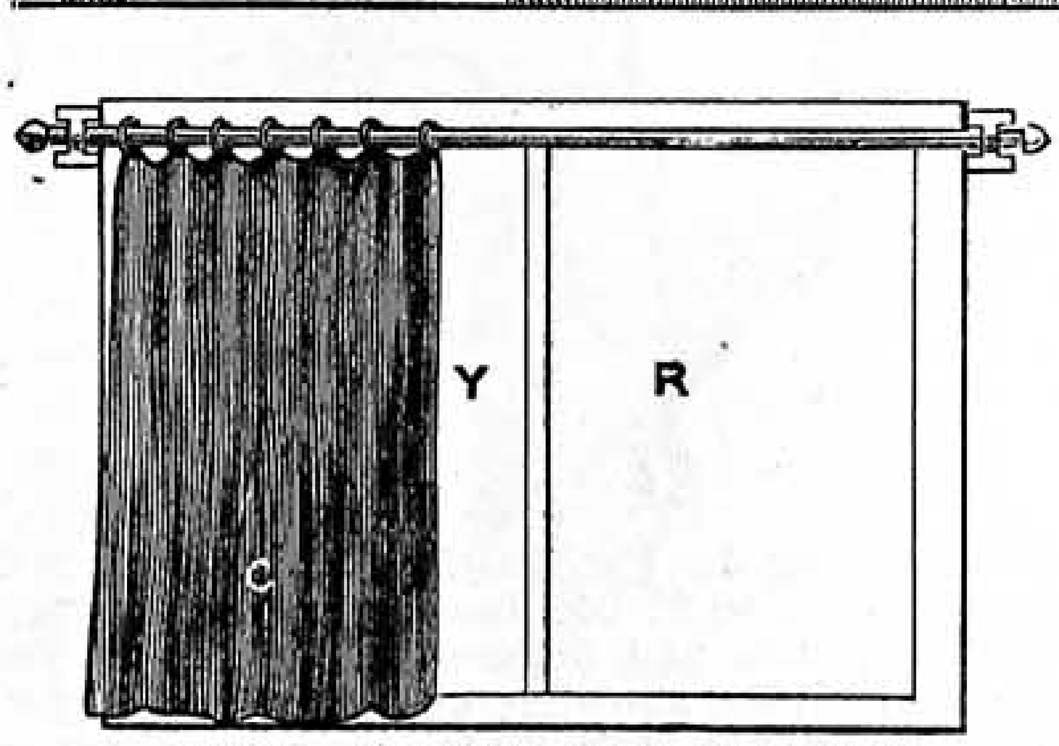


Fig. 2.—Construction of Window.

third, that shall be outside the dark-room, yet capable of being controlled from a convenient part inside; and, fourth, that shall give intensities of illumination varying at will with the necessary requirements.

In Fig. 1 I have endeavoured to give a sketch of an illuminating apparatus that fairly well meets all these requirements. A is a bench with a leaden sink top; B is a box or chamber fitted outside the dark-room, preferably with a special outlet for the vitiated air; C is a gas flame, the size of which can be controlled from the outside by means of the tap E. The light passes through the coloured media at F, and is reflected on to the working table by means of the reflector D, which has also the effect of shading the light from the eyes. Fig. 2 will serve to show the construction of the window through which the light passes. Two pieces of glass are required, one a canary-yellow colour, and the other of a ruby-red. In front is arranged a curtain of black material. With this arrangement, it will not be difficult to see how the strength of the light can be altered at the will of the operator by shifting the position of the opaque curtain. For developing very sensitive plates, the curtain is drawn completely over the yellow glass and half way over the red. For working bromide paper, or with the material of low sensitiveness, the yellow glass will be found suitable. This can also be used for examining the plate during the progress of development.

It should always be remembered that there is no medium which is absolutely non-actinic. The deepest ruby light will fog a plate if it only be allowed sufficient time for action.

Therefore every care should always be taken that it is not exposed to the light more than is absolutely necessary. A cover should always be placed over the dish when it is not required to examine the plate. Another advantage gained with this light is that at any time, if desired, the whole room may be illuminated for convenience in finding articles placed about. For extra convenience in this, the reflector D should be hinged so that it can be lifted out of the way. This is also necessary when examining the progress of the negative.

The window should also be removable, for exposing bromide paper and lantern and transparency plates.

The construction of the whole apparatus is not very difficult or costly; and I claim that those who work for great lengths of time in the dark-room will find it invaluable.

BOOT AND SHOE REPAIRING.

BY WILLIAM GREENFIELD.

INVISIBLE PATCHES ON UPPERS—HOW TO BLINDSTAB—THE FINDING OF THE HOLE INSIDE.

THE neatest of patches is what is called an "Invisible Patch." It is stuck on with a solution of gutta-percha. Its solvent has a very unpleasant smell, but as it evaporates very quickly, it is not smelt much by the one using it; but if used in a room with the door shut, it will soon be smelt by whoever opens the door. To do this part of the business, an outhouse is best, or any way, when no one is near.

This solution can be bought at 2d. per bottle, and when not in use it must be kept well corked. Worman's has a scent mixed with it, so it does not smell quite so bad; but I prefer Sand's, not for smell, but for quality.

I will now show how to fit the new patch on the old leather. First, it is of all importance to have a last, boot-stretcher, tree, or something in the boot, that the part you are going to operate on may be quite solid.

But before going further, it will be best to state that during these articles I have, and shall have, often cause to refer to what in the trade is called "skiving." It is a thing that is so essential; therefore, I here advise all who do not know how to do it well, to try their hand at it as much as possible upon any old odd piece of upper leather, with a sharp knife, on a piece of smooth marble or board. Skiving means: to give a tapered edge to the leather, on one side or the other, and skiving is the principal thing in this sort of patch, for it is fitting it to a nicety that makes the patch invisible.

The safest way to get the piece the right size is to cut a piece of paper out, about

¼ in. larger all round than what is really necessary to cover the worn or cracked parts, or than what you would in the ordinary way. This is to admit of the skiving. Then, seeing that this is of good shape, cut the new piece of leather to it. This should also be as described in the last article, "Calf for calf, kid for kid," etc. After the piece has been cut out a nice oval or curved shape (Figs. 1 and 2), proceed to skive the edge. Skive all round, if oval; and round the top only, if curved (Fig. 2). It should be skived from the letters A A A to the edge, B B B, and at this part it should be positively skived to nothing.

The difference between preparing these patches and one to be closed in is that the new piece is fitted first, and after the old leather fitted to it, and that the old piece of leather is not taken away, as for closing in.

It will only be necessary to explain how to put on the oval piece in this instance, for in all other shapes the rule is the same, excepting where the pieces have to be sewn down to the sole; and instructions for this were also given in the preceding article. Now, when the piece is skived, lay it on the worn part of the boot, overlapping the worn part equally all round, as A A (Fig. 3), which is a section of the patch. Now chalk the edge all round, and on the old leather as well, as shown at B, and draw a line right across, as at C C, that you may get the piece back into its proper position.

Then skive the old leather, at D D, just enough to receive the patch, starting at the edge of the chalk mark, and skive towards the centre, all round, being careful to get it regular.

Then nicely rough both the new and old leather with a file, piece of coarse sandpaper, or scrape with a buff-knife. Now lightly brush out all the dust of leather, and apply the solution with the finger; shake the bottle and give one thin coat, both to the patch and old leather; let them dry, and then give another coat, but only thin; let this dry. It should dry white, and if it does not do so, it will need a little more solution. Care should be taken to see that the edge of the patch has taken the solution properly, and that the old leather has it only on the rough part.

It may be considered that it would be best to solution a patch like Fig. 1 all over, but it is not so, as it would make it very stiff, and it would not yield in wear, but only perhaps wrinkle and soon work off. The whole of the solutioned part having dried white, warm both before a very slow fire, and when the whole of the white has changed its colour to a brown, stick the piece on the boot, just as you first fitted it; press it on tight, and, with an iron only just warm, iron on a little soft heelball all over; let it get quite cold, then gently rub off the heelball, smooth with a cloth, and polish with blacking, and it is finished.

Our next system of repairing the tops is "Blindstabbing," so called from having to find the hole inside a boot, where it is impossible to see. Blindstabbing is one of the most important things to learn regarding the repairing of the tops, inasmuch as all repairing to the tops can be done by this means in one form or the other—as patches, rips, toe-caps, new springs, etc., etc.

One thing it is very handy for indeed, and that is when a vamp has (which is very often the case) a small crack in it. You can darn this up in two different ways. First, with using two ends, and setting a zigzag stitch from one side to the other, as at A (Fig. 4); or by setting the stitches with one end only, as at B. This is by far the neatest way of the two, but, like anything else where an advantage is to be gained, it needs more care and attention to make it so.

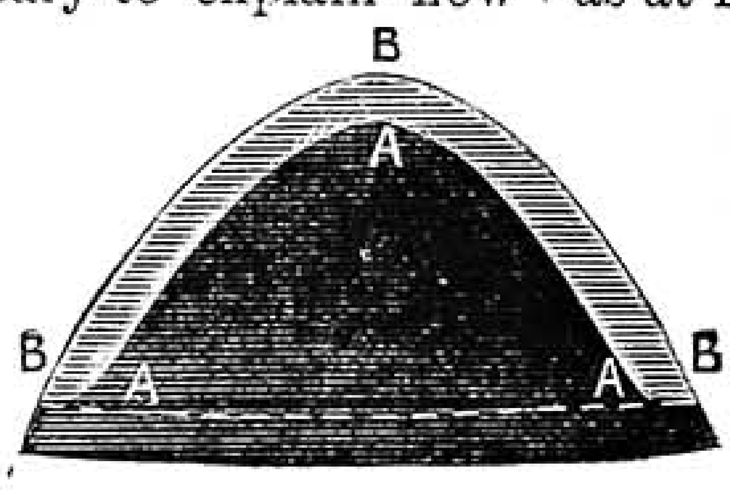


Fig. 2.

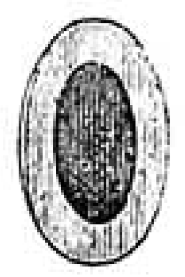


Fig. 1.

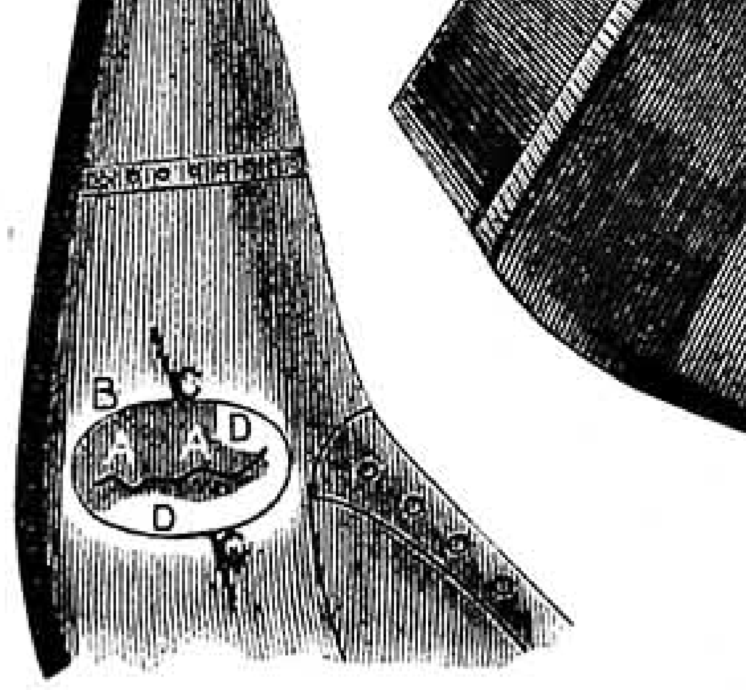


Fig. 3.

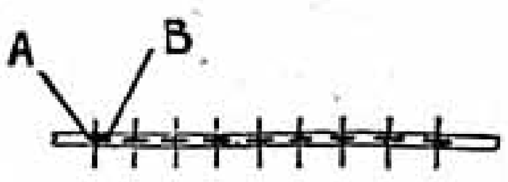


Fig. 5.

Fig. 6. Fig. 7.

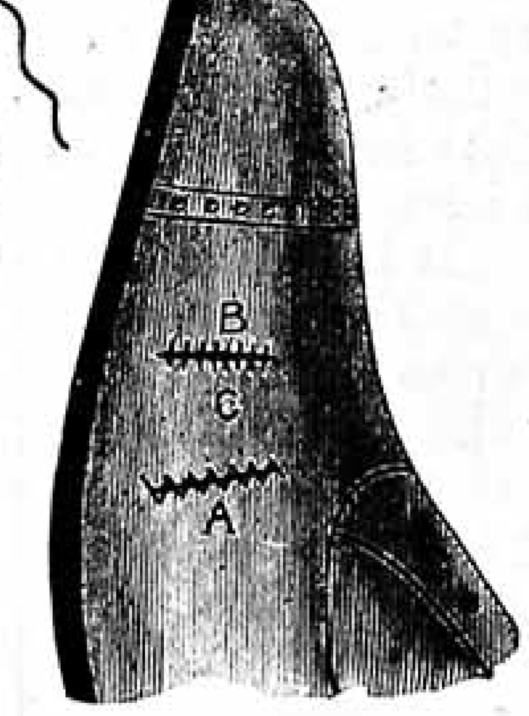


Fig. 4.

Fig. 1.—Patch fitted and skived for Fig. 3. Fig. 2.—Patch that has to be sewn down to Sole. Fig. 3.—Portion of Boot showing how to fit Old Leather to receive Solution. Fig. 4.—Showing how to mend Crack by Zigzag Stitch and Cross-Stitch. Fig. 5.—Full-size Sketch of Cross-Stitch. Fig. 6.—Boot with Hand inside, showing how to find Hole by using Awl as Leader. Fig. 7.—Another Method for Out-of-the-Way places, and for those whose hands are large and not lissom.

In either case it is well to put a piece of leather under the crack. It will want skiving at the edge—in fact, Fig. 1 would do very nicely. It is very easy to get under if it is rolled up and passed through the crack, then levelling by putting an awl through and unrolling it, and then seeing that it is exactly under the crack.

In darning it, set each stitch from B to C (Fig. 4), but taking hold of no more on either side than you can possibly help; and when this is done the whole length of the crack, start stitching backward, setting the stitches from A to B (Fig. 5), which is a full-size sketch of the crack and stitches. This second stitching is to draw down the first row, and make them look small. A fine end or piece of twist should be used, and when it is lightly hammered down, and a piece of soft heelball rubbed in, it can scarcely be seen. Fig. 6, it will be seen, is to illustrate the way to do blindstabbing. The left hand must be put inside the boot, with one of the bristles between the thumb and finger, with the point of the bristle about level with the tip of the finger. The stab-awl, which is an awl with a thin, straight blade, is held in the right hand, and at the same time holding the other bristle. It is well to first put the two bristles together, and halve the thread; give it a twist, as at A, so that both ends may be the same length in working.

The awl is then put through about halfway, and its exact position felt with the finger of the left hand, and then lay the bristle parallel with it, as at B; place the finger against the lining of the leather at C to steady the hand; draw out the awl within about a quarter of an inch, pushing up the bristle with it, and letting the bristle lie on the flat side of the awl; and keep moving the awl up and down (not in and out), and the bristle with it, until the point of the bristle finds its way into the hole with the point of the awl. It is quite easy to keep putting the awl up and down if the first finger of the right hand is kept on the leather at C. When you find the bristle in the hole at D, pull the bristle and end through with the right hand; hold it in the hand with the awl, as E; put the left hand in the boot again with the other bristle; make a second hole, and repeat, as shown above, till the bristle is in, and then put the right one through. Take the right one (E) in the left hand, and the left one pull out with the right; pull them both out together the whole length of the thread, pulling somewhat sharply; then give a second pull, just to tighten the stitch. The first stitch is set, and this is continued as far as necessary, putting from twelve to eighteen stitches to the inch.

The position of the boot, as shown in Fig. 6, will give the student the knowledge of how it should be held upon the knees; but while drawing out the thread, it will have to be held fast between the legs, with the toe against the right knee and the heel against the left thigh, and this according to where the repair is being made.

It may be noticed here that all methods of doing anything has been, and will be, explained for a sitting posture, unless specially notified at the time.

When it is wanted to sew up towards the toe, or anywhere out of the way of the position of the hand in Fig. 6, there is another means of doing so. This is by holding the bristle between the first two fingers, as Fig. 7. The bristle is put on the cushion of the second finger, and held there with the nail of the first, as shown at A.

To blindstab like this is more difficult to learn, but, it being so very useful afterwards, it well pays for the extra trouble.

Boys can soon learn to blindstab, as their hands are small; and it is a thing that will always be of use to them, and a good first step to industry as a pastime.

SMOKY CHIMNEYS AND HOW TO CURE THEM.

BY "EXCELSIOR."

WHERE THE FAULT LIES—USUAL MODE OF SETTING RANGE—COURSE TO BE ADOPTED—PROPER FORMATION OF FLUE—REGISTER GRATE—USUAL AND PROPER MODE OF SETTING AND FORMING FLUES—REDUCTION OF CHIMNEY FLUES AT TOP—INSUFFICIENT SUPPLY OF AIR TO GRATE.

MOST people, in trying to cure a smoky fireplace, look for the fault at the wrong end of the chimney—viz., at the top.

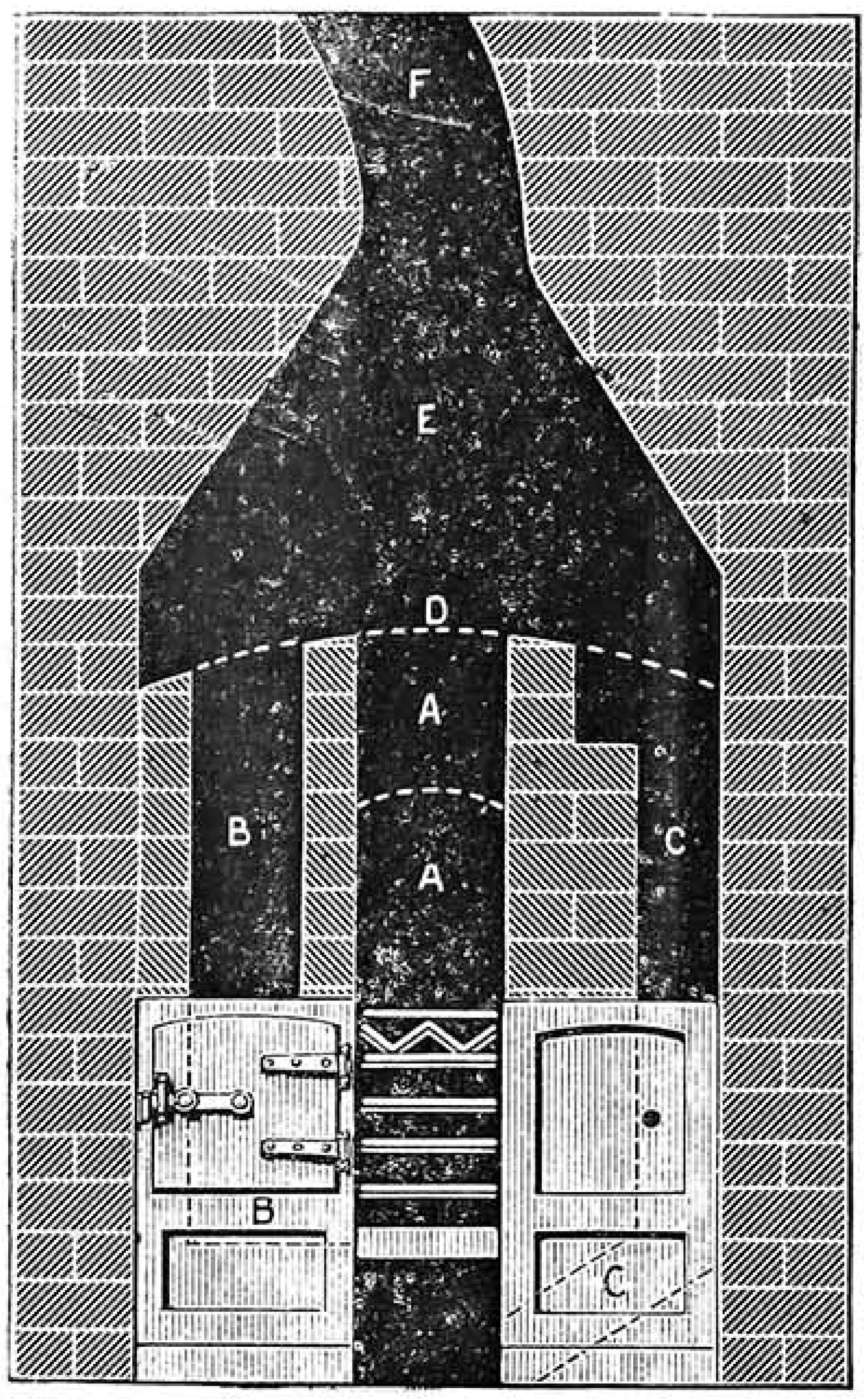


Fig. 1.—Usual but Improper Method of setting Oven Grate or Range. In this Fig. and Fig. 2 the Iron Back and Chimney-Breast are removed to show Construction of Flues. A A, Main Flue from Fire; B B, Flue under and behind Oven; C C, Dust Flue; D, Level of Top of Grate Back; E, Drum or Open Space into which Flues discharge; F, Chimney reduced to proper size.

I venture to assert that, in nine cases out of ten, the fault is at the bottom, and rests with the setting of the grate, and I will show that this can be cured by the outlay of a very few shillings.

When building the house, the workman makes the opening to receive the grate the full width, height, and depth of the grate intended to be used; he then gradually tapers off the opening inside till he reduces it to the size of flue required, which is generally about 14 in. by 9 in., which size is reached about 3 ft. above the top of opening left for grate, as shown at E in Fig. 1.

Now for the setting, or fixing, of the grate. We will take, first, the oven grate or range—whichever is intended to be used. This is set up in the opening, and the flue, A, from fire in the centre, and also flues B and C from oven and boiler, are carried up separate to about 6 in. above the top of the

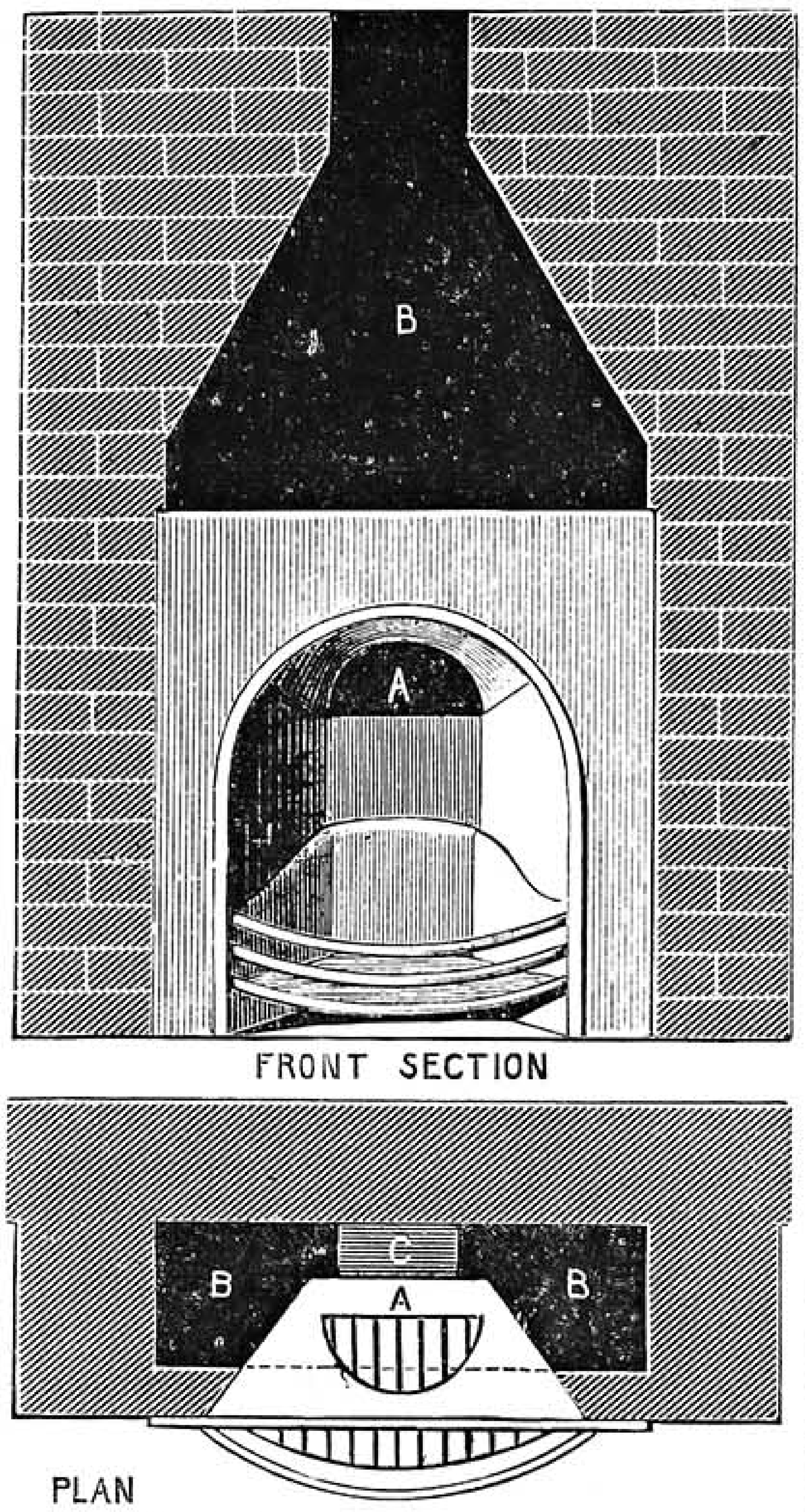


Fig. 3.—Usual Way of setting Register Grate; Chimney-Breast removed—A, Lid of Grate; B, Drum or Open Space round Grate; C, Bricks as Back of Grate.

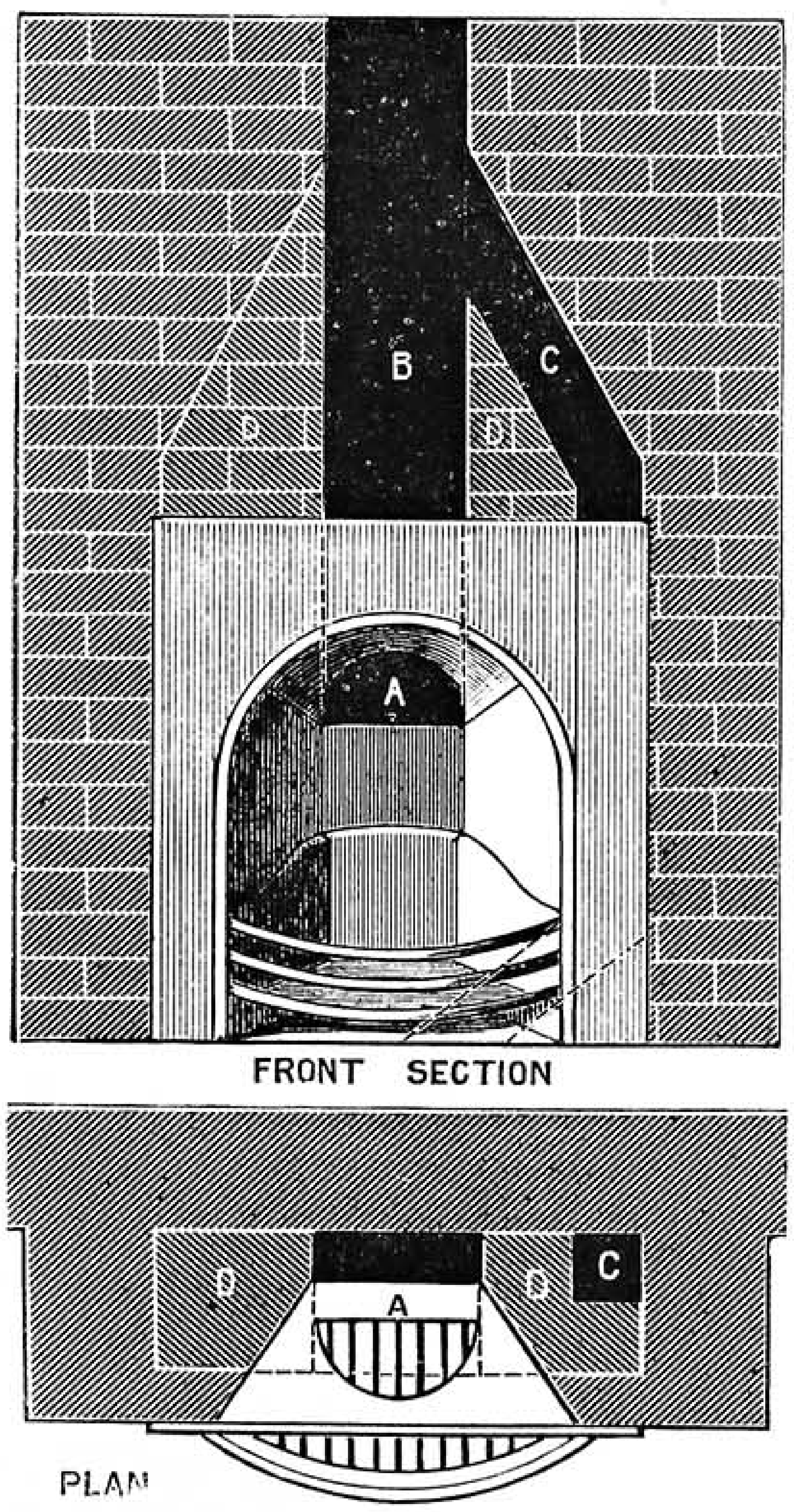


Fig. 4.—Proper Mode of setting Register Grate; Chimney-Breast removed—A, Lid of Grate; B, Flue from Grate; C, Dust Flue; D D, Proposed Brickwork forming Flues.

grate or range, where they all discharge into the gathering, or taper opening, E, between the top of the grate and the flue proper.

Here lies the fault. Here is a large open space or drum, in which the smoke, so to speak, wanders aimlessly about, interfered with by currents of air, instead of making its way at once up the flue and away, at the same time losing much of its heat, thus making it still more difficult for it to ascend quickly. As will be at once seen, this can be easily cured by getting rid of this open space.

To do this, get a bricklayer to start the centre flue from the grate at the same size,

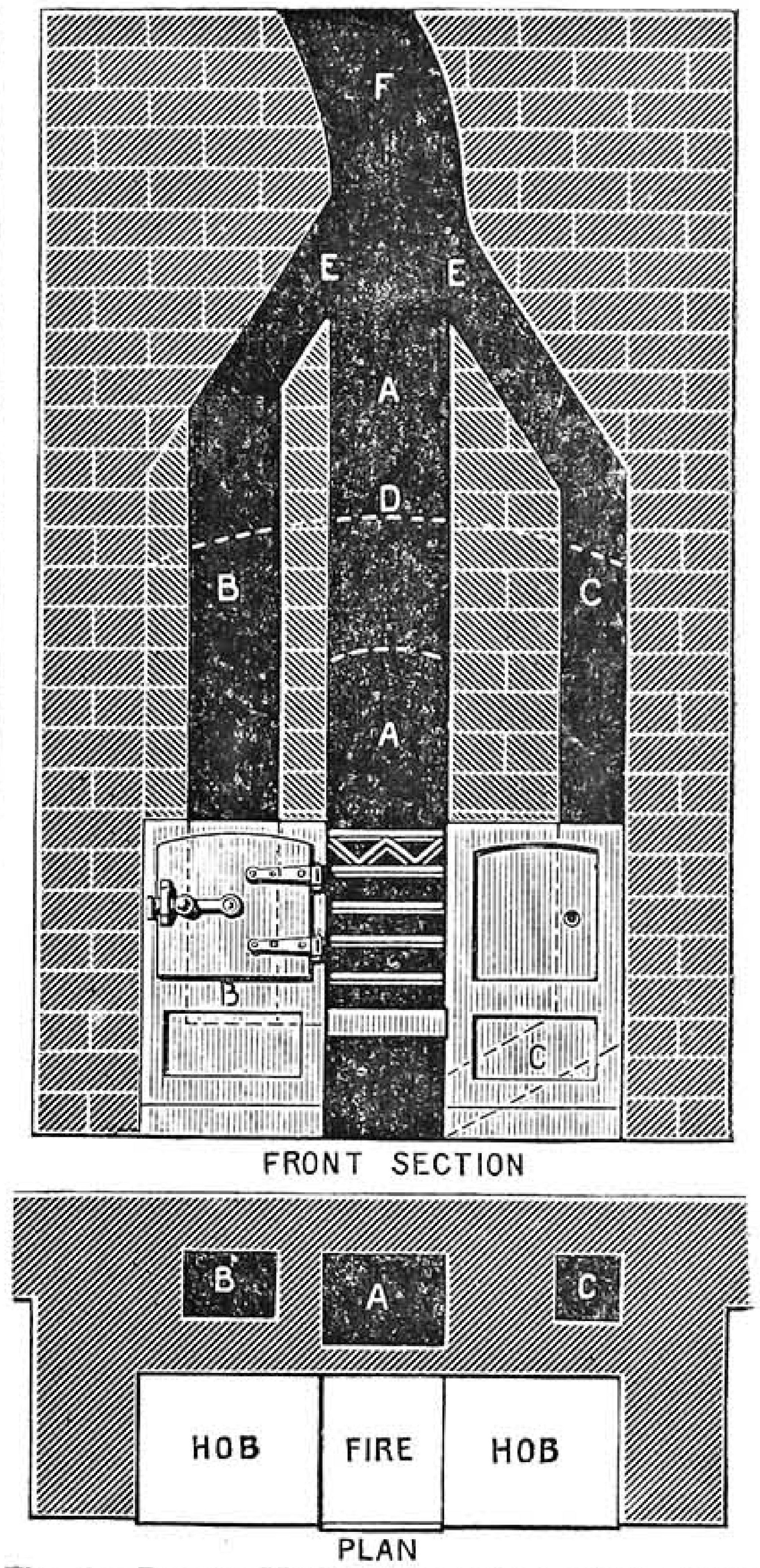


Fig. 2.—Proper Method of setting Oven Grate or Range, shown in Front Section and Plan; Iron Back and Chimney-Breast removed—A A, Main Flue from Fire; B B, Flue under and behind Oven; C C, Dust Flue; D, Level of Top of Grate Back; E E, Diagonal Openings of Side Flue into Main Flue; F, Chimney reduced to proper size.

or, preferably, a little less in size than the flue above, and carry this up until it joins the flue above, at the same time carrying up and bringing nearer, in the same manner, the side flues from ovens, etc., until they join the centre flue through an opening in each side, as shown in Fig. 2.

Carry these side flues up as high as possible before joining the main flue, as this will give a better draught to them. Another advantage of this is that the openings into the centre flue being vertical, falling soot cannot get down them, blocking them at inaccessible places. The truth of this will be seen by looking at E E, in Fig. 2.

Now with respect to that abomination called a register grate, generally used in the sitting-rooms or parlours of middle-class and the better class of workmen's houses.

These, being constructed so as to be complete in themselves, are oftentimes worse fixed than oven grates, which must of necessity have some brickwork. I have been called to some scores of register grates, to find them just placed in the opening below the chimney, with, perhaps, three bricks behind them to support fire-brick back as shown at C in Fig. 3, and all the remaining space, B B, round and above them being left open.

What else can we expect from a grate set like this but smoke and annoyance?

To cure this, have the whole space at back and sides filled up solid with brickwork, as shown at D D, Fig. 4, of course forming the flue, C, from dust-hole on one side, and then start the smoke-flue, B, at once off top of grate (leaving just room for the lid, A, to lift up), and carry it up to where the chimney is reduced to its proper size, as described before, bringing the dust-flue, C, into it at one side, and having the mouth of it vertical, as in the oven grate or range.

Another advantage of having the grate made solid behind will be that a greater amount of heat will be radiated into the room, which before penetrated through the sides into the space at back, and was lost up the chimney.

Again, pay particular attention to the fact that the smallest place in a flue should be immediately over the grate, as the farther smoke travels the more heat it loses, and consequently the more room it requires in which to get away.

This brings us to the consideration of chimney-tops.

A few months ago my attention was called to a chimney on which pounds had been spent without any improvement. I had the flues carried up as directed, which made an improvement, but not a perfect cure.

I then examined the top, and found the flue—which was a 12 in. circular one up to that point—reduced to 7 in. by a chimney-pot. The removal of this completed the cure.

Yet another failing may be insufficient supply of air: this is readily supplied by piercing a few holes in the hearthstone, immediately in front of the grate, and connecting these with the outside of the building by means of pipes laid in the floor.

If these simple suggestions are carried out, they will cure the majority of smoking chimneys; if they do not, some special cause must be looked for—such as position, whether surrounded by high buildings in such a way that there are gusts of cold air beating down on top of chimneys. Such chimneys would require special treatment—only to be decided by a study of the special causes.

Should the subject be thought of sufficient general interest, I will at an early date give details for constructing a simple, cheap, and most effective grate, in place of the ordinary register.

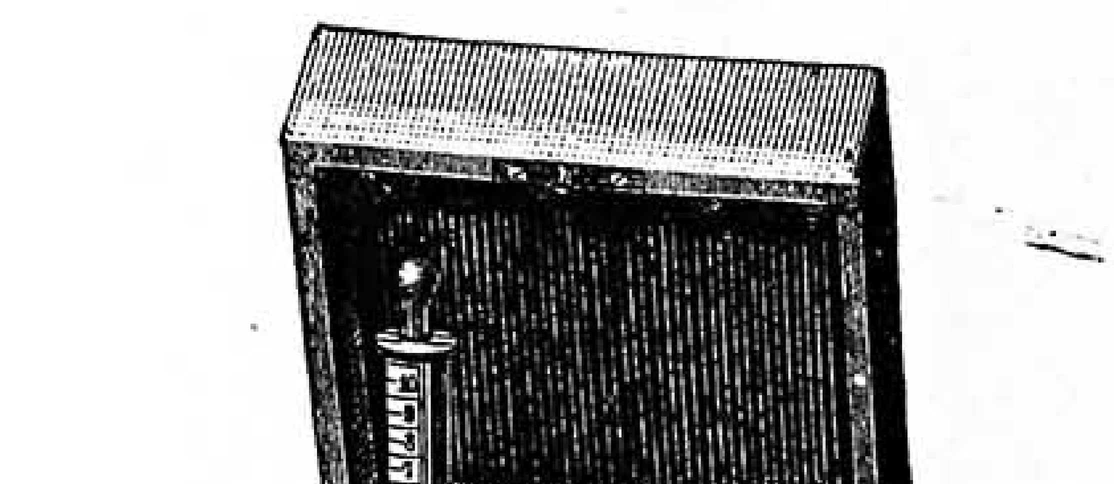
[As the cure of smoky chimneys, and the construction of grates on a simple and efficient plan, are subjects which are interesting to all householders, it is hoped that "Excelsior" will soon redeem the promise made in the last paragraph. The present time is an opportune one for the appearance of papers of this kind, for there is ample time to act upon the advice given and to get the work of reconstruction completed before the time for lighting up fires has come round again.—ED.]

OUR GUIDE TO GOOD THINGS.

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

43.—SCHALL'S ELECTRO-MEDICAL APPARATUS AND INSTRUMENTS.

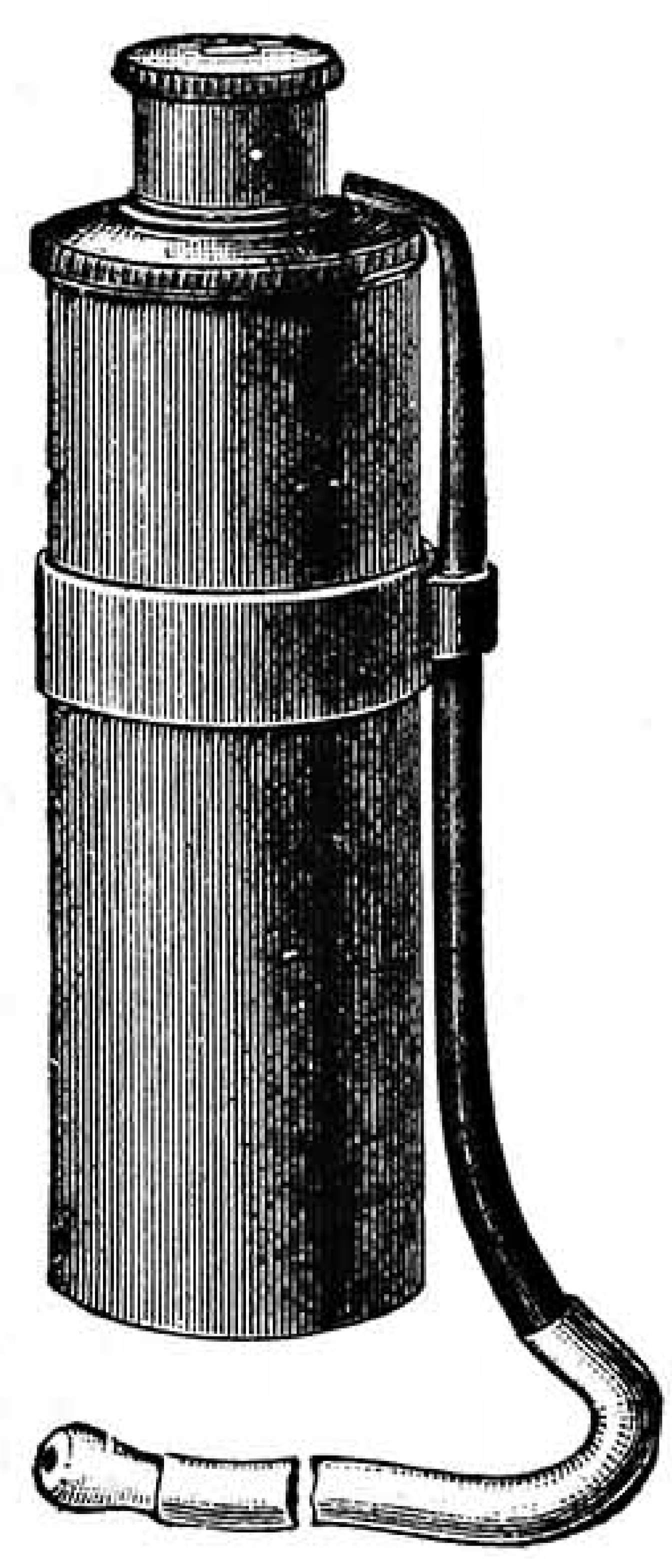
I HAVE received from Mr. K. Schall, Medical Instrument Maker, 55, Wigmore Street, London, W., a copy of his new illustrated price list, and a specimen of the medical coils made by him. The neat little coil sent is known as Dr. Spamer's Induction Coil, and is enclosed in a polished mahogany box measuring five inches square. The box contains a small glass cell, fitted with zinc and carbon elements to form the bichromate battery for actuating the coil; a small vertical coil, with movable iron core to regulate the strength of the current, and a drawer containing conducting cords, several rheophores, a pair of polished rheophore handles, and a set of spare zinc plates for the battery. This bijou electro-medical coil is well suited to the requirements of a county practitioner needing a portable means of applying a faradaic current to his patients, since the whole can be sent by parcel post for 9d. This will give some idea of its lightness. It is furnished with a separate quick-acting rheotome of the horizontal form, and very sensitive in action. The faradaic current from the secondary coil is, therefore, of a mild character, easily borne by a child of tender years when the coil is actuated by a current of $1\frac{1}{2}$ volts, even when the core is fully in the coil. Every part of the apparatus shows good workmanship, and is well worth the two guineas charged for it. Mr. Schall has been engaged for several years as a maker of electro-medical apparatus to the London and provincial hospitals. He is now open to supply the medical profession generally with high-class apparatus at a reasonable price. Medical gentlemen interested in this subject should obtain his new illustrated price list of 128 pages, which contains some good information on galvanometers, electrical measurement, the care of galvanic batteries, and a list of books on electro-medical subjects, published in the English, French, and German languages.



Dr. Spamer's Induction Coil.

44.—GLASS-TOPPED SPECIMEN BOXES.

The boxes known by this name have been very recently brought into the market, and will be found useful by a great variety of persons for a number of purposes, which space forbids me to attempt to enumerate at length. They were shown to me for the first time a few days since by Messrs. Moseley & Son, 323, High Holborn, London, W.C., who supply them in the four sizes in which they are made—namely, No. 1, at 2s. per dozen: No. 2, at 2s. 6d. per dozen; No. 3, 3s.; and No. 4, 4s.; all post free at the prices named. The diameter and depth outside measurement of the four sizes respectively are as follows: No. 1, $1\frac{1}{2}$ in., $\frac{5}{8}$ in.; No. 2, $1\frac{3}{4}$ in., $\frac{5}{8}$ in.; No. 3, $2\frac{1}{4}$ in., $\frac{7}{8}$ in.; No. 4, $2\frac{3}{4}$ in., 1 in. The boxes are neatly made, and present a pretty appearance, some being of a dark gold colour and others like frosted silver. The method followed in making them is ingenious. First of all, two pans are made of equal diameter, the upper one having the top edge neatly turned over to take the glass top, which is dropped in on it. A narrow ring of metal, resembling a flat indiarubber band, is then dropped in on the glass, and is held in place by points of metal driven in by pressure from without. A broad ring of bright tin is then put into the lower pan, and projects above it. The cover is then closed down over this ring on to the lower part, and the box is complete. The boxes are made on Jahncke's patent, and presumably come from Germany. Entomologists will find them useful, and so will all who need receptacles for small articles, such as screws, fittings for fretwork, etc.; for, as the contents of the box can be seen without removing the cover, much of the trouble will be saved which invariably ensues when such articles are stowed away in pill-boxes or match-boxes.



Jones's Patent "Multum in Parvo" Spirit Lamp and Blowpipe.

45. — JONES'S PATENT "MULTUM IN PARVO" SPIRIT LAMP AND BLOWPIPE.

The accompanying engraving shows very clearly the appearance and construction of this useful and appropriately named "Multum in Parvo" Spirit Lamp and Blowpipe, made on Jones's patent, and supplied, post free, by Messrs. Moseley & Son, 323, High Holborn, London, W.C., for 4s. The lamp itself, including the top, is 5 in. in height and $1\frac{1}{2}$ in. in diameter The cover of the top unscrews, and when put or is screwed down on a washer of yielding material, so as to prevent the escape of the spirit within. The blowpipe, as may be seen, is bent inwards towards the flame at the upper and smaller end, and outwards at the lower end, on which is fitted an indiarubber pipe about 15 in. long, with a bone mouthpiece. It will be found to be a most useful and handy article by gas-fitters, plumbers, etc., and all who are frequently obliged to make use of a blowpipe. The flexible indiarubber tube and mouthpiece with which it is fitted admit of its use in many places where it would be impossible, or, at all events, difficult, to work with an ordinary blowpipe applied to a flame from an ordinary lamp. It can also be used with advantage as a torch or light, when working in dark places, by unscrewing the loose top. The lamp is charged by filling the cylinder with lamp cotton or cotton waste, which must be saturated with methylated spirit for light work, or with benzoline for heavy work. The blowpipe is inserted in a brass band which can be moved up and down at pleasure. Thus the blowpipe can be adjusted at any height up to $2\frac{1}{4}$ in. above the top. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

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

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

House Gas.—E. F. B. (*Liverpool*).—I am not aware that coal-gas has been liquefied. It consists of a mixture of gases, of which the chief are hydrogen, marsh-gas, olefiant-gas, and carbonic oxide, and each gas requires a different amount of pressure to liquefy it. Thus, whilst marsh-gas requires a pressure of 180 atmospheres at 7° centigrade, hydrogen requires 650 atmospheres at -140°C. (One atmosphere is 15 lbs. per square inch.) Very powerful machinery would be required for this, and these gases are only liquefied for chemical research. With regard to your other question, the following gases and vapours will not burn: nitrogen, carbonic acid gas, steam, and, in some senses of the word, chlorine.—F. B. C.

Ornamental Bookcase.—BOOKWORM.—Bookcases have had a fair share of the space of WORK. Through Vols. I. and II. you will notice by the indexes there are several, although whether any of them are ornamental it is for you to decide. There are also one or two in the few numbers already issued of Vol. III. Look diligently through "Shop."—J. S.

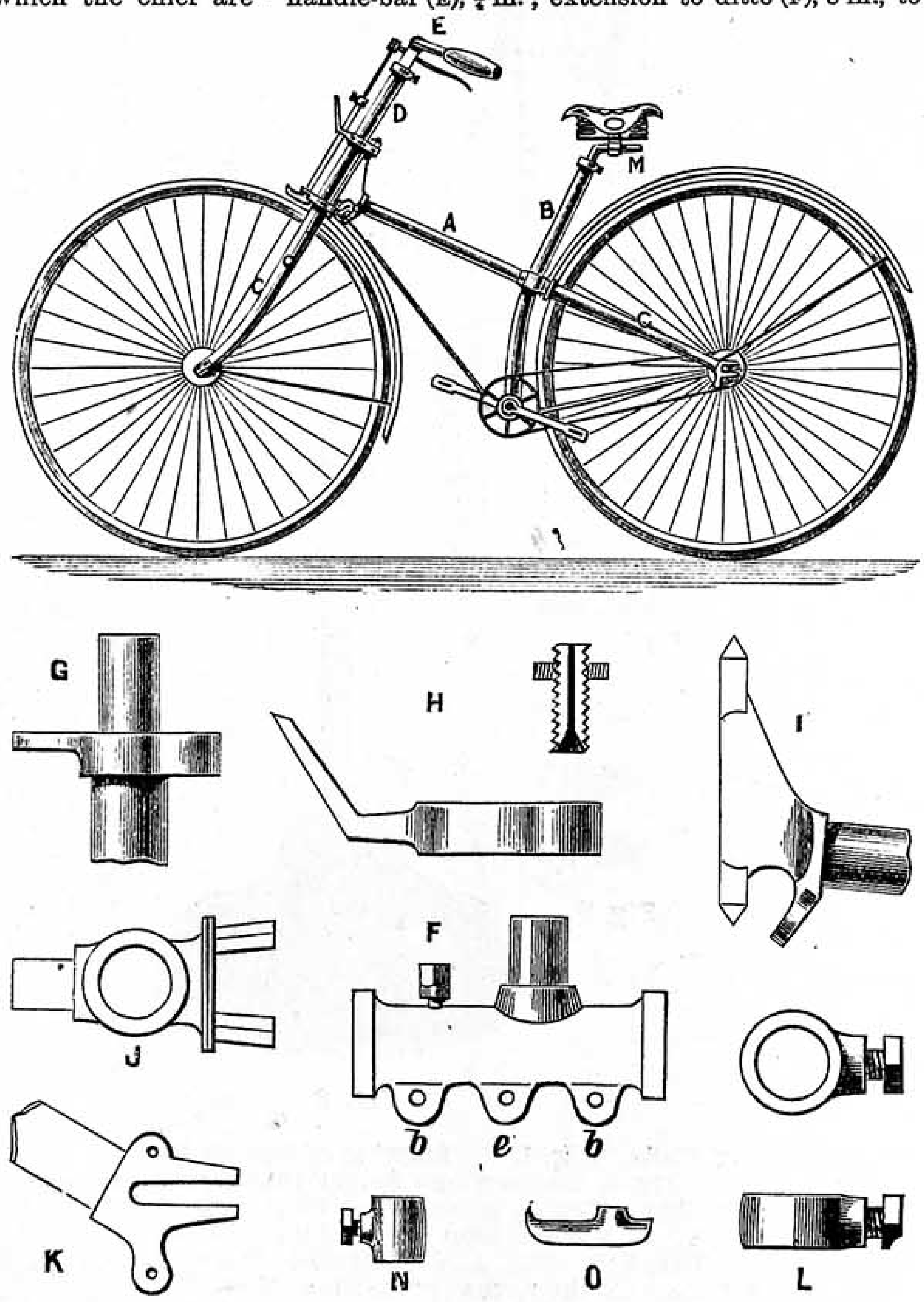
Home-Made Printing Press.—AMATEUR PRINTER.—To describe the construction of such a press for amateurs, with the necessary drawings, would take too much space for the columns of "Shop." Wait for a short article.—S. W.

Gelatine Slab for Copying Writing.—PATRON.—Gelatine, $\frac{1}{2}$ lb.; glycerine, $\frac{1}{2}$ lb.; a little French chalk or sulphate of baryta to give opacity, and sufficient water, form the composition used for this purpose in the Scriptograph.—S. W.

Planing Wood.—R. J. (*Monkland*).—You have in your letter indicated the great difficulty of manual work and the chief defect of printed teaching. I fear "Shop" is too crowded for a long lesson. As a daily teacher, I find that no progress can be made until the critical faculty is awakened. You evidently have that. Now, what is a flat surface? and how can we test a surface to ascertain if it is flat? A flat surface is one which is touched everywhere by a straight line applied to it; no matter in what direction the straight-edge is applied, it should touch the surface throughout—be in contact. I suppose you will try to make a straight-edge? You can have no better lesson. Do it in two ways. (1) Fix together two thin boards by means of three or four screws. Try to plane the edge of the board thus formed as straight as you can; take out the screws, and bring the planed edges into contact. See if they touch throughout; if not, replace screws and try again, noting what fault you discovered, and try to remove it. (2) Plane the edge of a board, and, using it as a ruler, draw a line; turn it over, and bring it up to the line. See if it agrees, knowing, as you do, that two straight lines cannot enclose a space. When you are successful in making a straight-edge, keep it for testing your work, but do not expect to obtain quite accurate work on wood which is thin enough to bend under the pressure of the plane. Thin boards need careful treatment and a flat bench. In the article on Piano Back Making there is embodied an excellent lesson on planing.—B. A. B.

Indexes of Work.—A. F. L. (*Manchester*).—The numbers after each article refer to the *pages* of each volume. Quote the page and the volume to the publishers, Messrs. Cassell & Co., Limited, and you will be able to procure any number you require. Each number consists of 16 pages; therefore the process of division by 16 will give you the number containing any special article: thus, page 34 by 16 will make it clear to you that page 34 will be contained in the *third* number of any volume. But why not subscribe regularly for so small an outlay as one penny per week?

Safety Bicycle Model.—J. G. (*Aberdare*).—The parts to make the machine shown in the sketch can be had of Brown Brothers, 7, Great Eastern Street, or St. George's Cycle Company; or in Birmingham of W. A. Lloyd, Lionel Street. All the above will send their price list of materials. To make a cheap machine the bearings would have to be plain or coned, not ball. Cheap lap-welded tubes can be had, but I should recommend weldless steel. In the sketch the wheels are 30 in. by $\frac{3}{4}$ in., direct No. 10 spokes, forty in the back wheel and 36 in the front. Backbone (A), 14 in. by $1\frac{1}{4}$ in.; upright seat tube (B), 18 in. by $1\frac{1}{8}$ in.; two pairs brazed hollow forks (C, C); front steering-tube (D), 12 in. by $1\frac{1}{8}$ in.; handle-bar (E), $\frac{7}{8}$ in.; extension to ditto (F), 8 in., to



Safety Bicycle—F, Bottom Bracket, coned; G, Front Crown with Lug in one; H, Upper Lug with Lamp Bracket; I, Neck; J, Centre Bracket; K, Fork Ends; L, Lugs for Top of Steering-Post and Seat-Tube; N, Brake-Rod Clutch; O, Brake Spoon.

fit inside steering-tube (D). The stampings are: Front crown piece (G); two lugs, with screw for fixing neck (H); neck (I), to be fitted into forward end of backbone (A); centre bracket (J), through which passes the upright seat-tube, and to which are fitted backbone and rear forks; two fork ends (K), one having extension for step; two lugs (L), one to fit on top of steering-post, other on top of seat-pillar; L pin (M), to fix saddle, should fit inside seat-pillar.

Workman's Clock.—T. A. (*Old Kent Road*).—Thanks for your ideas on the subject. If you will turn to page 699, No. 95, Vol. II., of WORK, you will find your idea fully described and illustrated. Workmen who may wish for a few ideas on electric time alarums to call them in the mornings, will find them in plenty on pp. 157, 175, 226, 416, 582, 699, and 723, Vol. II., of WORK.—G. E. B.

Incubators.—SUNDERLAND.—Your query being somewhat of a business nature, if you will send me your address under cover of the Editor, I will write you privately.—LEGHORN.

Framing Engravings.—J. B. (*Manchester*).—There are many modes of framing good engravings (etchings, mezzotints, and line). I will describe two of the most artistic. (1) Suppose that what you describe as the tinted border (properly called the India paper) measures $17\frac{1}{2}$ in. by $12\frac{1}{2}$ in., you should procure a panelled strainer $23\frac{1}{2}$ in. by $18\frac{1}{2}$ in. You will see that this allows a margin of 3 in. all round. You must then cut down your white outside paper to such a size as to leave two to three inches to overlap the strainer on all sides. Sponge the back of the print, paste (round edges, say, 3 in. only), and lay down on strainer. (2) Strain as above; then get an overlay Whatman mount, either white or French grey. Cut the opening with bevelled edge, to show the engraving itself only if it is without India paper border; if with, show the border, and allow 3 in. to $3\frac{1}{2}$ in. margin of mount on all sides equal. You need not glue mount down, for in fitting up frame it will set all right.—F. B.

Manganese for Leclanché Cells.—R. L. (*Ruabon*).—The manganese used in charging the porous pot of a Leclanché battery is the common black ore of manganese, named in some districts "black wad." It has also the names pyrolusite, binoxide of manganese, and peroxide of manganese. It has a black colour, something like rock powder, and must be used in grains of this size, or about the size of peas, for the purpose of charging the cells. If this is the variety found in your locality, use it in charging the cells, but sift it free from dust before putting it in the cells.—G. E. B.

Standard Ohm.—J. N. (*York*).—The standard ohm recognised by the Board of Trade is a small instrument for measuring the resistance of electric currents. It consists of a length of German silver or of platinoid wire having a resistance nearly that of 6 ft. of No. 36 pure copper wire. This wire is made into a coil, mounted on a bobbin, and furnished with suitable terminals. I do not suppose you could make one yourself, as you have not the necessary appliance for ascertaining the exact resistance of the wire.—G. E. B.

Medical Coil.—G. T. (*Hollinwood*).—I think you have committed a serious error in undertaking to treat patients with doses of electric current from a medical coil before qualifying yourself in electro-therapeutics. I can easily gather this from the contents of your letter. You may be an expert in medical botany, but you know little or nothing about the use of electricity in the relief of pain and cure of disease. If you will take my advice, you will abandon the use of the medical coil until you have studied well how to use it by reading some good books on the subject. Get first "How to Use a Galvanic Battery in Medicine and Surgery," price 4s., published by Messrs. J. and A. Churchill, London. Then read "Electricity in Medicine and Surgery," price 8s. 6d., published by Messrs. Smith, Elder & Co. You will find other useful books in the lists of these publishers. When you have read the first two, you will not need ask anyone the questions put in your letter. Instructions on making medical coils are given in my last paper of the series on Induction Coils. Much harm may be done to your patients by wrongly applying to them the electric current from a medical coil.—G. E. B.

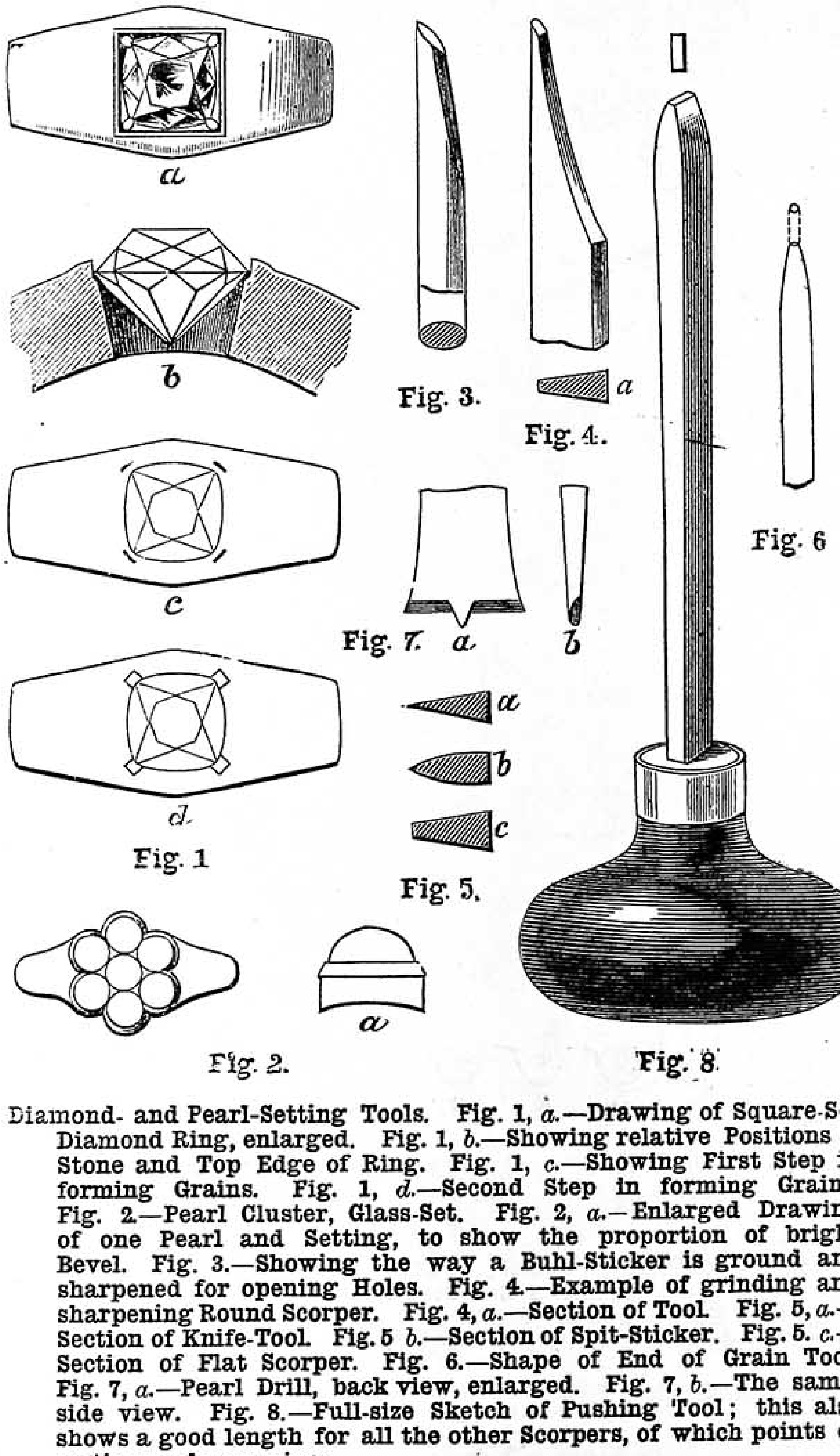
Faulty Dynamo.—C. T. B. (*Chapel-en-le-frith*).—I should have been glad had you made your letter long enough to include the sizes of wire used in winding your machine. The cause of failure to light a 5 c.-p. lamp with your machine is evidently due to want of current. This may be caused by an insufficient quantity of wire on the armature, or this driven too slowly. In either case the voltage of the armature current is not high enough to send sufficient current through the F.M. coils to magnetise their cores. You must therefore drive the armature faster. Very little current can be got out of a small machine when driven under 3,000 revolutions per minute. Have you tried shifting the brushes until the best working angle has been obtained? As you have the F.M. coils in shunt with the armature, you will gain nothing by placing a shunt in the main circuit.—G. E. B.

Repairing Medical Battery.—J. W. N. (*Gateshead*).—Scrub the zinc block clean, then put it in a saucer or shallow dish, and pour on it a mixture of one wine-glassful of sulphuric acid to four wine-glassfuls of water. Pour on the water first, then the acid, slowly and carefully. The mixture will get scalding hot. Next pour on the zinc about an ounce of quicksilver, and turn the zinc block about in the mixture until well coated with the quicksilver. When it has cooled a little, brush off all surplus quicksilver from the zinc, and put the mixture with the quicksilver not used away in a bottle for future use. This process is called "amalgamating the zinc." You will have to repeat it whenever the zinc gets black and dirty. Charge the cell with 3 oz. chromic acid and a wine-glassful and a half of sulphuric acid in one pint of water. The chromic acid can be obtained by post at a cheap rate from Mr. S. R. Bottone, Wallington, Surrey.—G. E. B.

Boot Tools.—A SNOB.—The best shop for kit tools is C. F. Jupp, 78, Wardour Street, Oxford Street, London, W. He will send you anything you need, and I know his kit cutter is one of the best, and each piece is ready for use. His seat wheels are 5s. each, fore-part irons 1s. 3d., double irons 1s. 6d. Should you require further prices, send for list. See WORK, No. 37, Vol. II., page 568. I answered question to M. M., the last of which explains how to cut a fore-part iron. If you do not think you could re-cut the tools you have, it will show some of the essential points to be noticed in buying new.—W. G.

Making Hinges.—BUTT.—The substitution of one material for another in manufacture is not the subject matter of a patent. An inventor may prepare and lodge some papers, and receive a certificate from the Patent Office that he has done so, but this is *not* protecting an invention. An inventor who has no means to pay for having his work done in a proper manner by a duly qualified person must be content to find out by his own exertions whether his invention is new, or what part of it has been forestalled; and then comes the proper preparation of the documents, so that they shall properly explain, define, and cover his rights. This, it is needless to say, cannot be done by one inventor in ten thousand. It seems to us that the section would have to be cut into the lengths required, and then drilled, which, with proper apparatus, there should be no difficulty in doing. We are not quite sure that we have not seen something of the kind proposed before, but cannot speak decidedly off-hand. The only course open to BUTT is to get someone to take an interest or share in his invention and provide the means, so as to be able to have a property created in it. The mere fact of a patent being granted in response to an application no more makes it a property, or proves it to be such, than does an idea of a railway to the moon show how it is to be done, or prove that it can be. If BUTT will refer to No. 44, Vol. I., of WORK, page 691, he will there find some information respecting patents of which he, inventors, and the public have little or any knowledge, but which is of the first importance to all persons desirous of creating a property in inventions.—C. E.

Diamond and Pearl Setting.—H. C. (*Norwich*).—This answer will be kept to the particular kinds of setting for which details are asked; but as any attempt at describing the art of setting will probably fail without actual demonstration, I trust that H. C. will write again if he finds some particular point overlooked or not described sufficiently. There are no details of preparation of the work asked for, except on one point, and that is: "Are rings, etc., coloured and scratch-brushed before setting?" No absolute rule can be given for this, but it is well, when we can, to leave the scratch-brushing of all work until the very last, because the surface of coloured gold is so delicate that ever so little rubbing deteriorates it. As these processes can neither be done with stones set with either painted or foiled backs, it follows that the article must therefore be coloured and scratch-brushed before setting; hence we have to do the best we can to protect it with goldbeater's skin. With such stones as pearls, turquoise, corals, etc., no harm should come to them when being scratch-brushed after being set, neither will it harm any stone set with an open back; but do not on any account risk getting water under such things as rose-diamonds by leaving scratch-brushing until the last with them. In short, just think of the particular conditions of each job, and act accordingly. A word as to holding the work during the process of setting. I strongly advise putting all work on a cement-stick, or shellac-stick if the latter be preferred. (Jewellers' cement can be bought at about 6d. per lb. from most tool and material shops.) By this means the article can be held firmly, and does not get out of shape, as many things do when held between clamps, rings particularly. If the work is wrapped round in goldbeater's skin, it must be dried before being put in the warmed cement-stick. It saves trouble if care is taken to keep the cement out of the holes, hall-marks, carvings, etc. This is, of course, done by the "goldbeater" when used, but by paper or whiting in other cases. Another tip to prevent the cement sticking to the work is to pass the very thinnest film of oil over it. This is what would be done with most bright polished work. Now to try and write down all the important steps taken to set (1) a diamond in a ring square-set; (2) a pearl cluster with bright bevelled edges—*i.e.*, glass setting; (3) a pearl cluster with cut down grain setting. No. 1. Fig. 1, *a*, *Square-set Diamond Ring.*—To open the ring for the stone, first drill a hole right through, and let it be a little smaller than the stone. Then open the hole: I mean that the top edge of hole is to be made exactly the size of stone, then file out the hole quite clear to the back, and polish it. See that the ring is polished now before the stone is set, which is the next step. Fig. 3 shows the way a buhl sticker should be ground and sharpened for use in opening holes or for "letting in" stones. This tool is made to cut round the hole and partly downwards, thus clearing out the hole at the same time that it opens it to the stone. Letting the stone in means that the girdle of the stone is to be made to rest on a bearing, which is to be cut at such a depth that the edge or girdle of the stone is just below the top edge of the gold. This condition depends on the preceding one, for if a stone be correctly "opened to," then merely cutting the gold out below the edge will bring everything right—that is, if the correct depth be obtained. Fig. 1, *b*, indicates this condition in an enlarged section. The next thing to do is to hold the stone in the ring. This will be done by the aid of a medium-sized round scorper ground like Fig. 4. This tool is forced in the gold at four places as marked (Fig. 1, *c*), and the portion of gold between the notch thus made and the stone is pushed forward towards the stone until each piece in turn is over the stone. These pieces, which are rudimentary grains, have to act as points or claws to hold the stone in. That being so, a suitable distance must be chosen for the first hollow that is made by the round scorper, and must, of course, be well within the square we intend to make. Next to "clear away the sides of the grain," a knife-tool (Fig. 5, but sharpened like Fig. 4) is used to make the side cuts, which will leave the work like Fig. 1, *d*. If the grains be not sufficiently over the stone, they can now be pushed up by applying pressure at their bases. The stone now is practically "set," as far as safety is concerned. All that remains is to finish the work, by using the knife-tool to make the grain to the desired size, and then to cut the square with a bright spit-sticker (Fig. 5 *b*), finally finishing it all with a grain tool. The ways to brighten or "gloss" a scorper are many. The one given here is an easy one. It is by making a buff of a piece of very finest emery-cloth glued to a piece of wood, on which the surface that is to be brightened is rubbed until quite smooth, and then the same surface should be rubbed on what is known as a piece of "black-stone." This is to be obtained at tool warehouses as a rule, but failing that, a smooth piece of lump emery, followed by a leather buff charged with putty-powder or rouge, will give a fairly good bright surface. As to the grain tool, it must be of suitable size, of course, and can be made out of a piece of steel rod, like Fig. 6, the end of which does not come to a point, but has a very smooth, rather shallow hollow in it. On the true shape and the surface of this tool the finish of the grain will depend. A most necessary tool for keeping grain tools in order is a flon. This is but a row of different sizes of hard, bright, round steel points, which act as burnishers to the cup-like, or, rather, saucer-like hollow of the grain tool. No. 2. *Glass Setting a Pearl Cluster.*—Fig. 2 is intended to represent a pearl cluster, the gold setting of which is finished in the form of a bright bevel. It is done as follows: The pearls are let in with the utmost care as far as fitting is concerned; and if the mount in which they are to be set be a deep one, then a buhl-sticker can be used as before; but as a rule, pearls and such-like stones are set in a plate of about $\frac{1}{32}$ in. in thickness, so in its place a round scorper is used, ground and sharpened diagonally. This can be used to open the hole from the commencement, but it is better to make a few "pearl" drills, with points the shape of Fig. 7, which, as you see, is not so likely to go through a thin plate as a spear-drill would be; and, besides, it clears the hole out, and if made the exact size, will not only open the work, but almost let the pearls in, if they are quite round in shape. Before fixing the pearls, it is well to put a layer of very fine plaster of Paris all over the bottom of the hole, not to stick the pearls in with, but to give a level surface to rest the pearls on, and to keep dirt away from the backs. To fasten these, a tool shaped like Fig. 8, and made of soft steel roughened on its face by filing, is used. With this "pushing tool" the gold is forced up to and over the edge of the stone. When the gold is close up, then a flat scorper (Fig. 5, *c*) is used to cut a bevel all round it, as shown in Fig. 2, *a*. This bevel is to be bright cut, and to brighten the scorper, the same process is gone through as was done with the bright spit-sticker in the previous job. This setting, from its very simplicity, is a very difficult job, and will take much practice before the settings are properly finished. No. 3. *Setting a similar Cluster with a Cut down Grain Setting.*—The stones are to be "let in" and the gold pushed over, as in the preceding case. Then proceed to mark the places with ink where the grains are to come, and cut away some of the gold in between the grains. Then push up the gold once more, and be sure that all round the stone the gold is quite close. All that remains is to trim the grains into shape, and cut down the parts between them with a similar bright scorper to that used in the second job, finishing off by nicely grain-tooling the tops of grains. The shape and proportion of grains are shown in some of the illustrations on "Ear-Rings," which were printed in preceding numbers of WORK. All the tools here drawn are given merely as types, not especially for the particular size required, although they are sketched from tools actually in use. The art of setting is one that almost teaches itself, as far as its principles are concerned, but practice and experience are the chief factors of one of the sections of jewellery manufacturing in which good wages are still earned by competent men. And I may say, in conclusion, that, like poets, good setters are born, not made.—H. S. G.



Diamond- and Pearl-Setting Tools. Fig. 1, *a*.—Drawing of Square-Set Diamond Ring, enlarged. Fig. 1, *b*.—Showing relative Positions of Stone and Top Edge of Ring. Fig. 1, *c*.—Showing First Step in forming Grains. Fig. 1, *d*.—Second Step in forming Grains. Fig. 2.—Pearl Cluster, Glass-Set. Fig. 2, *a*.—Enlarged Drawing of one Pearl and Setting, to show the proportion of bright Bevel. Fig. 3.—Showing the way a Buhl-Sticker is ground and sharpened for opening Holes. Fig. 4.—Example of grinding and sharpening Round Scorper. Fig. 4, *a*.—Section of Tool. Fig. 5, *a*.—Section of Knife-Tool. Fig. 5 *b*.—Section of Spit-Sticker. Fig. 5, *c*.—Section of Flat Scorper. Fig. 6.—Shape of End of Grain Tool. Fig. 7, *a*.—Pearl Drill, back view, enlarged. Fig. 7, *b*.—The same, side view. Fig. 8.—Full-size Sketch of Pushing Tool; this also shows a good length for all the other Scorpers, of which points or sections only are given.

Wood Photography.—J. M. (*Kilmarnock*).—The tools you require may be obtained at Buck's, in Tottenham Court Road, London, or Moseley's, in New Oxford Street, W.C. Photographing in wood may be done in several manners. The chief condition to be borne in mind in adopting any process is that it shall be as much *on the wood* as possible. A thick film of any kind is a fatal objection, as it chips off in cutting. The best plan is a transfer in greasy ink from a collotype cliché. Another plan is to put a thin even coating of salted gelatine mixed with zinc white, sensitised by brushing a strong solution of nitrate of silver on the dried gelatine surface; dry, and print under an ordinary negative to the proper depth, and fix with hyposulphite of soda: wash and dry. This is a process very frequently adopted. Certain precautions must be taken to prevent the wood warping. All the parts of the block not to be printed on should have a coat of some waterproof varnish. In washing, only the printed surface should be moistened with water, the block being held in the hand, and the water applied with a soft brush. This carefulness to avoid excess of moisture applies both to salting and sensitising, strong solutions of each kind being used. Salting solution is made of bromide of ammonium, 20 grains; gelatine, 5 grains; water, 1 oz.; oxide of zinc, 1 drachm. The silver solution is nitrate of silver, 90 grains; distilled water, 1 oz.; citric acid, 5 grains. Fixing solution: hyposulphite of soda, 1 oz.; water, 4 oz. The block must be allowed to dry spontaneously by standing it on its edge in a current of dry air. Artificial heat, such as holding it to the fire, will cause it to warp, and be useless for printing. This process is easily worked, and very good results may be obtained with ordinary care.—D.

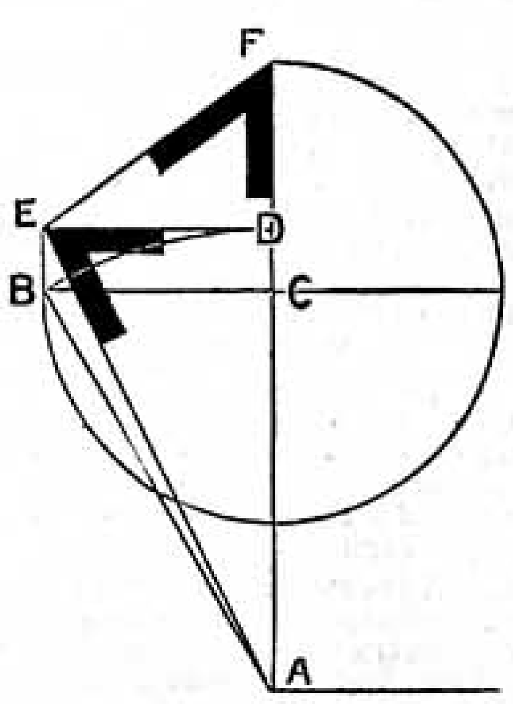
Cameras. — CAMERA. — Some time may elapse before such a paper as you ask for on camera construction can be presented, so much having already appeared in the body of WORK and in "Shop" upon the subject. If, in the meanwhile, you want a thoroughly good camera, you cannot do better than write to George Hare, 26, Calthorpe Street, London, W.C., who does excellent work.

A Small Sideboard.—NEMO.—The gable rails are 1¼ in. thick, and are set back ¼ in. from the face of the posts. The mortises are cut in the posts for the front and end rails, as shown in the sketch annexed. These are fitted closely, and glued fast to keep them firm. The top is secured by a number of screws, all from the front, back and end rails—none from the posts at all, as you seem to think. The rails are pocket-holed for this purpose, as shown in the drawing. Perhaps two screws in each end rail and four in front and back rails will be as many as anyone need wish for, and will be quite ample for the purpose. Oak is certainly the better wood for such a job as this is, as far as appearance goes; but mahogany is decidedly easier to work, as it is less gritty. Good Spanish mahogany is the best to use, though of course it is the dearest. I am sorry I cannot recommend any of the firms you speak of, as personally I know none of them. You cannot go far wrong, however, in dealing with any respectable merchant; and if you care to do so, you can see and get prices of wood from several before purchasing.—N. M.

Sideboard Mortises.

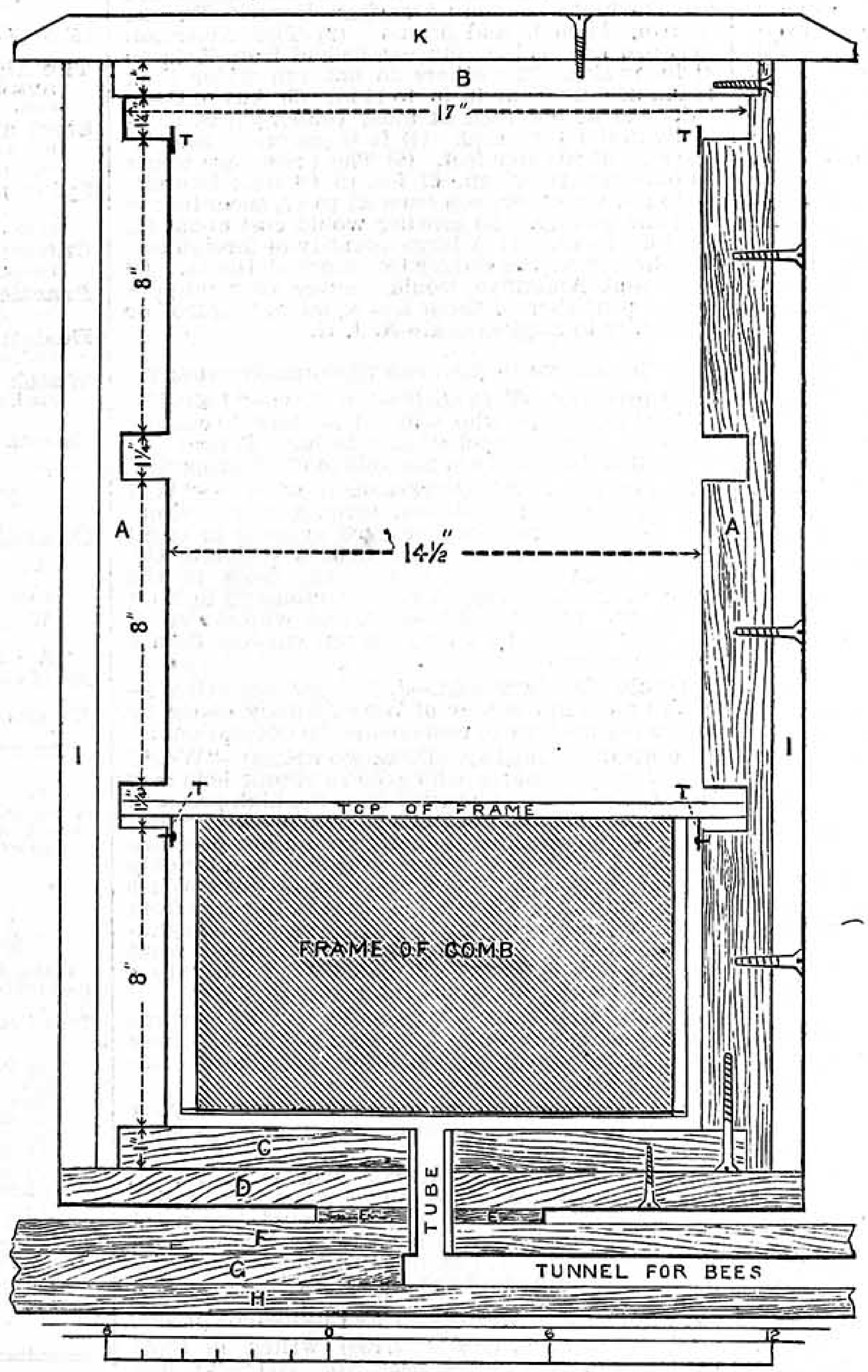
Stains.—J. M. (*Fulham*).—I know of no book devoted entirely to stains for wood. Most works on French polishing usually devote a few pages to the subject. Perhaps Mr. Denning may do so in the series of articles on French polishing appearing in the present volume of WORK. To give full particulars of *how* and from *what* stains are made to imitate the various woods and self-colours—such as black, blue, green, etc.—would take up more room in "Shop" than I think the Editor can spare at present. If, however, you will write us again, stating any particular stain or colour you may require, we shall be happy to assist you.—LIFEBOAT.

Bevels for Dovetailing. — SIDEBOARD.—Set out angle of sides on a drawing-board. We will call the angle section angle, said section being at right angles to base, A B C on diagram. Square up from A. Cutting top line at C, with A as centre and A B as radius, describe arc, cutting perpendicular line at D. From D, draw D E parallel to B C, draw B E parallel to A D, join E A, then A E D is the angle of the boards. From C as a centre, with C B as radius, describe arc cutting A D, produced in F; join E F; D E F is the angle to mitre the boards cut as before directed. QUERIST might look in back numbers again, however; see also Vol. I., pages 173, 414, and 731.—B. A. B.



Bevels for Dovetailing—A B C is the Angle of Side Elevation; A E D, Angle to cut the Boards; E F D, Angle to mitre Corners.

Observatory Hive. — J. J. (*Kidderminster*).—Of course you know that an observatory hive is one in which the operations of the bees can be watched through some transparent medium, usually glass. We must, therefore, have glass sides to the hive; but it would not do to have the light always entering, consequently shutters are provided for darkening up the hive, and for preserving the heat which the glass is only too prone to dissipate. It would not do to have more than one comb in thickness, as, if there were more, the secret operations of the hive would be carried on between them beyond the observation of the owner. The number of combs which the hive is to contain is a matter for consideration also. One, three, or six standard frames are usually found in observatory hives. In the figure I give an elevation of a three-comb observatory hive of simple construction, which I designed for my own use. The important parts are the side pieces, A, A, which ought to be very accurately cut to the dimensions shown. They are 2 ft. 5¾ in. long, 2 in. wide, and $1\frac{1}{10}$ in. or 1½ in. slack thick. When they have been planed true and square, they are to be clamped together, and the recesses cut out where shown. Then the pieces B and C should be prepared; they are 1 in. thick, $1\frac{1}{10}$ in. wide, and long enough to keep the insides of A, A, 14½ in. apart, and the inside surfaces of the recesses 17 in. apart. To do this, the recesses must be 1¼ in. deep, as shown in the figure. These four pieces must now be firmly screwed together out of winding, so that they will be flat and square, and this is the most important part of the work. Both sides of the frame thus constructed will now be found to be flat and uniform; and if not, the plane should be brought to bear until things are right. As the glass will lie against the outside surfaces of this frame, they should be covered either with cloth or wash-leather glued neatly on. The sides, I, I, and bottom, D, may now be put on. They are 3½ in. wide and about 1 in. thick, but the thickness does not much matter. As, however, they are intended for the outsides of the hive, they must be nicely finished. They are attached to the frame already made with brass screws, and if the corners are well done they will be a most important factor in strengthening the entire structure. The top, K, is 5 in. or 6 in. wide, and long enough to project about an inch over the sides, I, I. It is sloped from the centre towards the front and back like a roof, and the ends are also chamfered. Two sheets of good glass (either plate or flatted crown preferably), 2 ft. 5¾ in. by 1 ft. 6¼ in., must now be procured, and they can be laid one at each side of the inner frame, and bedding against the cloth or leather, will exclude all draughts from the bees inside. One of the glasses can be fastened permanently in place with small strips of wood tacked on outside; for the other we must put one strip along the bottom, and sink a little button into the thickness of the top to secure it above. A pair of doors must now be made to fit over the glasses. They should be panelled, and the sides next the glasses padded softly with hair or feathers, and covered with cloth. This will check the tendency of the glass to cool the inside. I must not forget to mention that little strips of tin must be tacked at the edges of the recesses to support the frames, which should be either of Abbot's broad shoulder type, or provided with metal ends, so that the space at each side will be uniform. With regard to an entrance, if the hive is meant to be stationary, a tunnel could easily be cut through one end. These hives, however, are often made to revolve; and when so, far more work is necessary. A vertical tube must be glued to C, D, and revolve on the washer, E, and the base-board, F. If this tube is of metal, the lower end could be slightly opened to prevent the hive from being lifted off by mistake, but I prefer a bit of elder-wood from which the pith has been removed, and in such a case it is necessary to leave the lower end rather thicker than the top, and to insert the tube from the bottom. A tunnel will, in every case, lead from the lower end of the tube to the open air, and a small alighting board should be attached. In case you wish for a unicomb hive, you may omit the two upper storeys, and if you require one to contain six frames, make it twice the length. As I said at the beginning, the important part is the frame, A B A C, and, if necessary, sheets of glass could be tied to the sides of this with string, and a few bags and tarpaulin tied round the lot to keep in the heat; but I think you are too worthy an apiarist to adopt this method. The movable glass should have its edges slightly smeared with vaseline to prevent propolisation. I shall be most happy to help you any further, and hope you will succeed.—APIS.



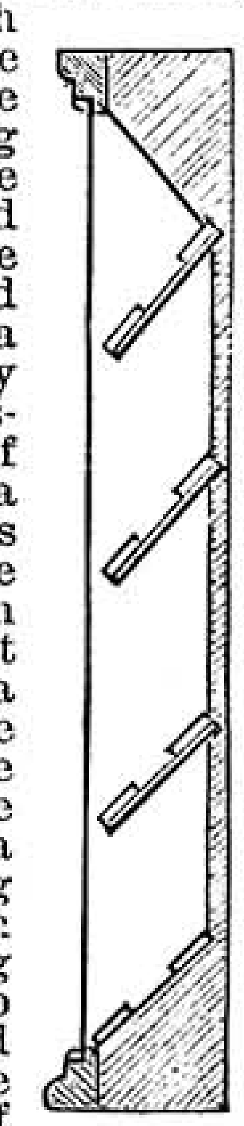
Observatory Hive.

Pigeon House. — R. V. B. (*Peckham*).—I give a sketch of above suitable for three pairs of birds. It is very simple, and all you require to make it is about 20 ft. of ¾ in. by 9 in. yellow boarding, 12 ft. of ⅜ in. yellow matchlining, and a few nails. I should cover the roof with a piece of old linoleum or floor-cloth, which can be painted with the rest. It should be fixed on a sunny wall. You will notice that the floor or bottom of nests is lower than the flying board, for the purpose of keeping the stuff, etc., from getting all over the place. I hope this will meet your requirements.—E. D.

Pigeon House.

Bending Tubes.—J. S. (*London*).—I find, on making inquiries, that there is no machine at present made for bending taper tubes. I fail to see why it does not pay to bend them by hand over a mandrel. Do you mean a taper bick iron? That is what I should use, and turn three at once half-round, and finish singly—the same as we make saucepan handles; and they are made quick enough for anything.—R. A.

Fixing Old Coins in Frame.—C. T. (*Boston*). — The coins would probably remain in place if fixed with Le Page's liquid carriage glue, and much might be done in way of supporting them by fitting the frame with a sheet of millboard pierced with holes of the size of the coins, which would thus rest in sockets. As a coin collector, however, I by no means advise C. T. to fasten his coins with cement of any kind. The reverse of a coin is often as interesting as the obverse—sometimes more so—and both should be open to inspection. If he is bent on exhibiting his coins in a picture - frame, his more rational plan will be to have a frame constructed as in the diagram — that is, with a series of narrow sloping wooden shelves, each shelf wide enough for a single row of his largest coins. Along each of these shelves he will glue a strip of millboard pierced with holes to hold the coins, which will thus keep in place without any cement. The glass front of the frame will, of course, be made to open and shut, and *lock*.—S. W.



Frame for Coins.

Pocket Accumulator.—J. B. (*Bradford*).—Low-priced pocket accumulators are not obtainable. Skilled labour must be employed in making them, and this labour must have its reward. The lowest price is half a guinea. The best in the market are made by Messrs. Cathcart, Peto, & Radford, 57B, Hatton Garden, London, W.C.—G. E. B.

Brass-Work and Re-silvering.—T. T. (*York*).—To re-silver your spoons, see the articles by Mr. Bonney on electro-plating in the present volume; and for lacquering your brass-work, you cannot do better than use one of the new substitutes for lacquer sold by the Frederick Crane Chemical Co., Newhall Hill, Birmingham. These very useful specialities were noticed in "Our Guide to Good Things," No. 106, and some information as to their use was given in "Shop," No. 107. The courteous manager of the Company, Mr. Charles Harrop, has intimated that he will send a sample bottle of any of their preparations for 1s., post free, to any reader of WORK.—R. A.

Bench Lathe. — B. O. (*Stoke-on-Trent*).—If I understand right, your $2\frac{3}{4}$ in. pulley works with the $24\frac{3}{4}$ in. one. To find the speed ratio, divide $24\frac{3}{4}$ in. by $2\frac{3}{4}$ in.; by putting both into $\frac{1}{4}$ in., you get 99 divided by 11, which is just 9 to 1: a very proper speed for small work in wood. You can calculate the other sizes yourself, but if the 4 in. pulley on mandrel works with the $5\frac{1}{2}$ in. on the crank shaft, you get quite a slow speed, and can turn iron up to 1 in. or so in diameter, and brass up to 3 in. or more. Now, if you want to reckon the weight of the rim of your fly-wheel without having to weigh it, you must find the number of cubic inches it contains of cast iron, and multiply that by ·26, and that will give you the weight of the iron in lbs., because a cubic inch of cast iron weighs ·26 of a lb. Since part of your rim is of lead, which is nearly twice as heavy as iron—namely, ·41 lb. per cubic inch—you must multiply the cubic inches of lead by ·41 to find the number of lbs. For instance, take the rim of lead, which you say measures $2\frac{1}{2}$ in. by $1\frac{3}{4}$ in.; multiplying these together, you get about 4 square in. of sectional area; now, if the mean diameter of the rim is 23 in., the length is 72 in.; multiply 72 by 4, and you get 288 cubic in. in the lead rim, and this multiplied by ·41 gives 118 lbs. as the weight of the lead rim. I think 50 lbs. is heavy enough for the fly-wheel of a 3 in. bench lathe, and that yours is unnecessarily heavy, and would do for a large 6 in. lathe. Now for the treadle, which you say rises too high. The crank has a throw of $2\frac{1}{2}$ in., and therefore, a stroke of 5 in. ($2\frac{1}{4}$ in. is a more usual crank); also it is 11 in. from treadle bearing to treadle hook, and $22\frac{1}{2}$ in. from treadle bearing to foot-board. In that case the foot-board will have a motion up and down of 10 in.—that is, twice the throw of the crank —because the treadle is a lever having one arm twice as long as the other. Now, if you carry the treadle bearing 11 in. further back, as you propose, then the arms of the lever will be 22 in. to 33 in.: about, say, 2 to 3. To get the movement of the foot-board, divide 5 by 2 and multiply by 3, so: $5 \times \frac{3}{2} = \frac{15}{2} = 7\frac{1}{2}$ in., which is the distance the foot will rise and fall, which I think about right for a small lathe; for a large lathe, where you want more power, I think 9 in. not too much. You could have easily found out what the movement of the foot would be without any figures if you had drawn out the treadle full size. Now for the axle bearings. You can have the axle hung on points, but it might be better to have the bearings fitted with new brasses, as your wheel is so heavy. If you wish to run on points, the pointed screws should be of steel, perfectly hard, and of an angle of about 60°; they may pass through $1\frac{1}{2}$ in. or $2\frac{1}{2}$ in. of cast iron, and be secured with a lock-nut. The iron crank-shaft may be drilled up an inch or so with a $\frac{3}{8}$ in. hole at both ends, and a hard steel plug driven into each; these steel plugs to be drilled right through the centre with a $\frac{1}{8}$ in. hole, and then deeply countersunk to exactly the same angle as the point of the screws, deep enough to hold nearly all the point, and even then the bearing is small enough; the hole in the plug forms a reservoir for oil. Vol. II. begins with No. 53.—F. A. M.

Violin Articles. — J. B. C. (*Liverpool*). — The articles on the Violin commenced in No. 105 of WORK.

Embossed Letterings.—L. S. (*West Hartlepool*). —If only an odd job, Messrs. Bentley & Sons, Embossers, Norfolk Street, Sheffield, would be a likely firm to address on the subject, sending to them the article to be embossed. On the other hand, if you require a large number of the embossed articles, your best plan will be to write to a die-sinker for an estimate for the die, and the price for stamping a given number, including metal. Mr. Wise, Tenby Street, Birmingham, or Mr. Pashley, Edward Street, Sheffield, will, no doubt, furnish estimates on application, enclosing stamped directed envelope for reply.—N. M.

Moulds for Carbon Plates.—S. H. (*Rochdale*). —I cannot think of any easier method than to make patterns of the moulds to the size of carbon plates or rods desired, and have the moulds made in cast iron. Each mould should be made in two halves, with the joints grooved and tongued. The two parts of the mould will be held together by a wrought-iron ring or clamp slipping on over both parts, and tightened with iron wedges. The mould will be in the form of a shallow box, open at one end. At this open end the paste must be pressed in and rammed tight, then a piece of iron must be fitted into the end to form a cover, and this must be secured by a clamp. All joints should be closely fitted, to prevent the syrup from squeezing out, but it is not necessary to attempt making them air-tight. —G. E. B.

Combination Bench and Tool Chest. — W. H. W. (*Great Yarmouth*).—Why not submit particulars of this through Section I. of "Shop"?

Lithography: Re-transfer and Plate Papers. —A. R. (*Blackburn*).—These papers are prepared as follows: Make a size by boiling parchment strippings, which when cold should be of the consistency of a *firm* jelly (gelatine is sometimes used instead). Grind flake-white in water, mix it with the size (which must first be warmed), and pass the mixture through a sieve. (*Note:* the proportion of flake-white must vary according to the uses for which the paper is intended; too much will prevent the pen working well upon it if *writing* be wanted.) Coat the paper twice with the size, letting the first coat dry before the second is applied. For this part of the process use a flat brush, and work the size *up* and *down*, but do not cross the strokes. Gamboge or rose-pink is added to the size simply to enable the litho-transferrer to see at a glance which side of the paper is sized. This size is suitable for plate paper, re-transfer paper, and writing transfer paper, the only difference being a variation in the strength of the size, quantity of flake-white, and weight of paper; plate paper is generally 48 lbs., re-transfer 32 lbs., and writing 24 lbs. The two last have to be rolled after sizing, but plate paper is left unrolled. After each coat of size the sheets should be hung across a line to dry. If, as would appear to be the case, A. R. is an amateur lithographer, he might find it to his advantage to get Mr. W. D. Richmond's "Grammar of Lithography," published by Wyman & Sons, Great Queen Street, Lincoln's Inn Fields, W.C. We should add that we very much question whether it can pay A. R., or anyone similarly situated, to prepare his own papers.—S. W.

Timber.—G. (*London*).—(1) The following oaks are imported into London: American, Dantzic, Trieste, Stettin, Memel, and Finne. (2) The American logs are the widest, and can be had from 16 in. to 24 in. in size. The others do not run wider than 14 in., usually from 10 in. to 14 in. (3) Any of these oaks can be obtained at most timber-yards, especially in the East End. (4) It is generally sold by the load of 50 cubic feet. (5) The prices are about as follows: American, £7 10s. to £8 10s.; Dantzic, £3 to £5; the others run from £4 to £7, according to size and quality. (6) Sawing would cost about 1d. per foot super. (7) A large quantity of foreign oak is unloaded in the Surrey Commercial Docks. (8) No doubt American would answer your purpose best, but neither of them are equal in "figure" or durability to English oak.—A. J. H.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Upholstery.—T. C. (*Belfast*) writes:—"I shall be obliged to anyone who will tell me how to cut the cloth to cover a couch or sofa to have it neat and without wrinkles. I am not able to cut it properly."

Xylonite.—L. S. (*Beaverstown*) writes:—"Will any reader kindly tell me, through the medium of 'Shop,' where I can procure xylonite in small quantities? I wrote to the British Xylonite Co. for as much as would veneer the front of the cabinet, the design of which was published in No. 1 of WORK. I wanted it in black and white to inlay, but they replied that they do not cut less than a gross of pieces."

Glacial Decorations.—J. H. (*Salford*) writes:— "Will any kind reader of WORK kindly oblige by informing me how to remove glacial decorations?"

Compound Engine.—PUZZLED writes:—"Would any of you engineers who take in WORK help me? How is the steam exhausted from the high-pressure cylinder so that it does not exert a back pressure equal to the pressure it exerts on the low-pressure piston? I have asked dozens of people, and the only answer you get is, 'Yes, I wonder how it is?' What size ought the receiver to be—that is, the pipe from high-pressure cylinder exhaust to low-pressure cylinder steam-chest? Also, how do you find out what size to make low-pressure cylinder? I am sure a good answer to this would interest many."

Bread Machines.—JEAN writes:—"Will anyone kindly tell me, through the pages of 'Shop,' where bread-dough kneading machines are made? Address and prices wanted."

Door-Mats.—JEAN writes:—"Will any of your readers kindly tell me how the common brown door-mats are made?"

Root's Blower or Blast Fan. — F. W. B. (*Huddersfield*) writes:—"Will anyone kindly give the name and address where I could buy a set of castings for a small Root's rotary blower, or a small blast fan, say, 4 in. to 6 in. diameter, suitable for brazing with small gas blowpipe?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Wax.—L. S. L. (*No Address*) writes, in reply to CARVER (see page 206, No. 117):—"I find the following recipe recommended, but do not know its value myself: Equal parts of beeswax, lead plaster, olive oil, and yellow resin; add whiting sufficient to form paste; mix well, and roll into sticks. The *exact* proportions will, I fancy, be modified to some extent by the temperature."

Turned Balusters.—J. E. P. (*Accrington*) writes, in reply to F. E. H. (*Lancaster*) (see page 158, No. 114):—"You could get stone balusters turned at C. Pollard & Sons, Meadow Tap, Accrington."

Band-Sawing Machine. — CHOPSTICK writes, in reply to BON ACCORD (see page 190, No. 116): —"I will describe a machine made of wood which I have used for many months, and have cut heavy wheel timber on it. It is too large a subject for 'Shop,' but if the Editor gives me permission, I will send the paper on at once."—[You may send in the paper on approval.—ED.]

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—AN OLD EDISONIAN; PLUMBER; F. K. B. (*London, E.*); W. B. (*Bruntcliffe*); T. G. W. (*Clapham*); W. G. C. (*Bradford*); A. M. (*Liverpool*); G. A. B. (*Normanton*); VULCAN; W. W. (*Hough*); S. S. (*Salford*); B. A. (*Kingston-on-Thames*); CONSTANT READER; W. G.; HUGH; H. H. P.; CURIOUS; T. L. (*Rischolme*); MIKADO; J. G. S. (*Stockton*); W. A. S. (*Bolsterstone*); J. M. D. (*Glasgow*); G. M. (*Reading*); LITHO PRINTER; J. G. L. (*Sheffield*); FRET MACHINE; GANELON; T. W. C. (*Springfield*); W. W. (*Caverton*).

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