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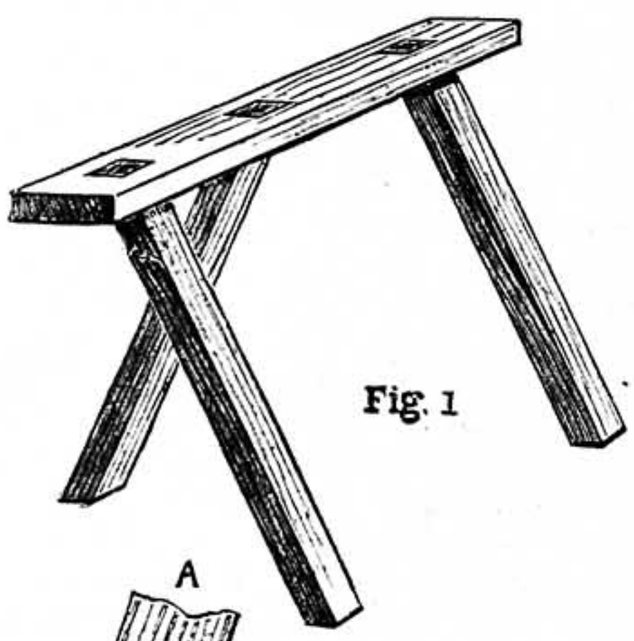
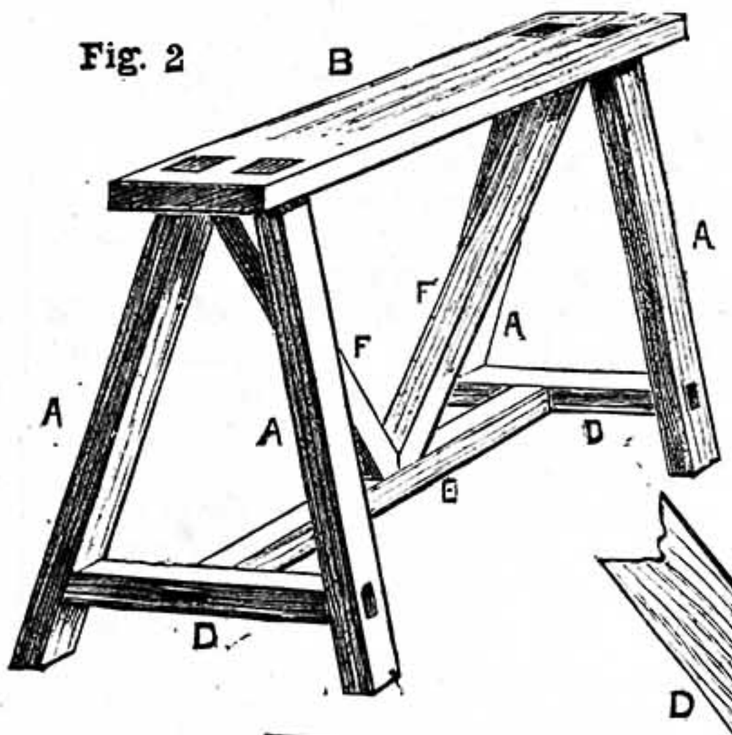


Fig. 1



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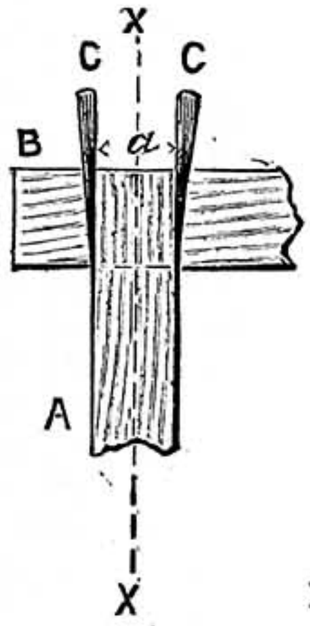

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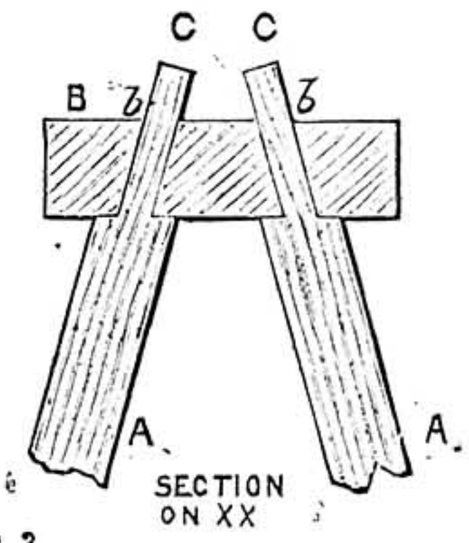
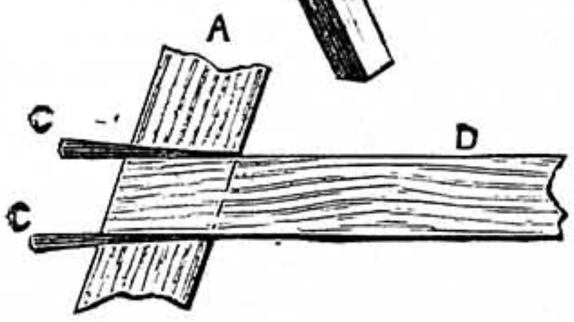


Fig. 3



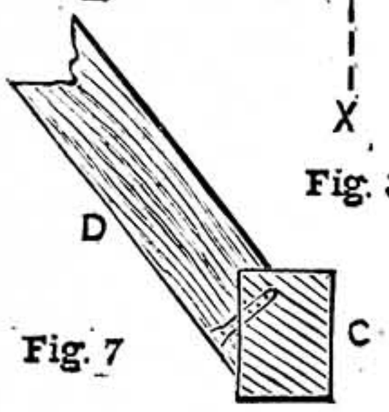


Fig. 7

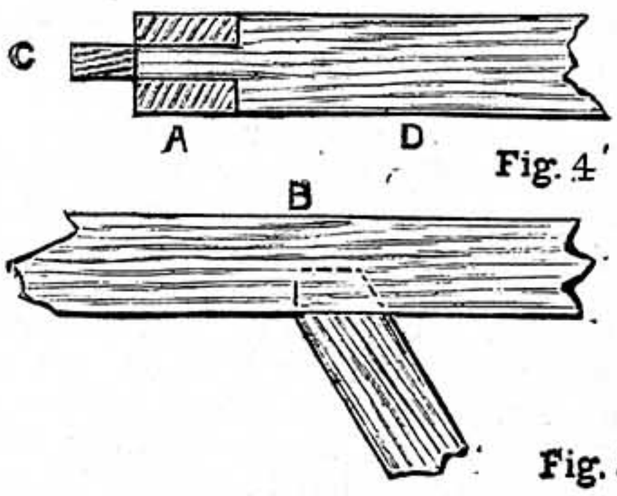


Fig. 4

Fig. 5

Fig. 8

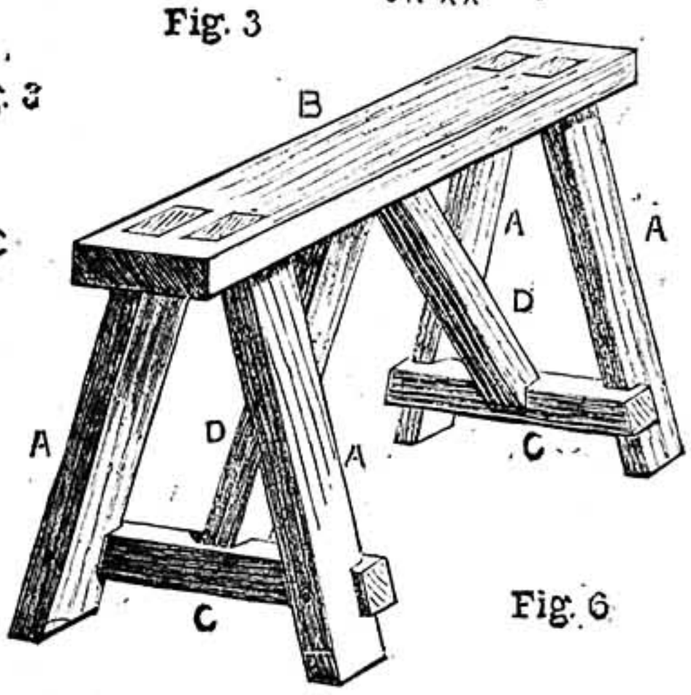


Fig. 6

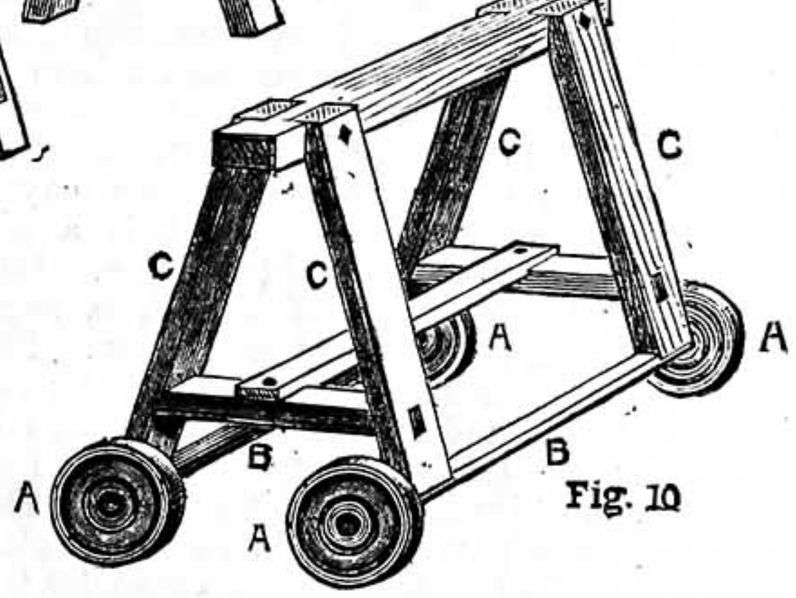


Fig. 10

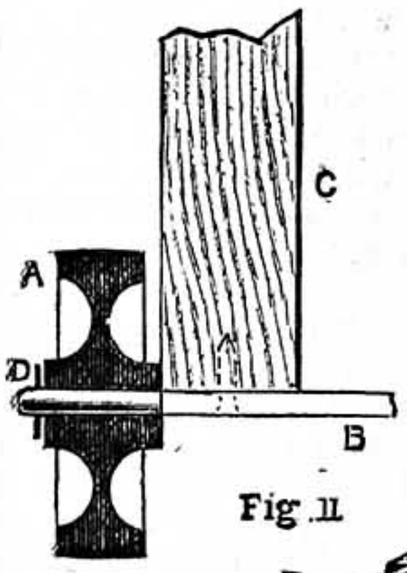
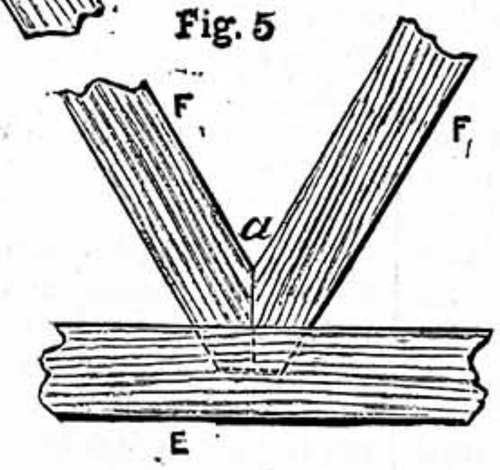


Fig. 11



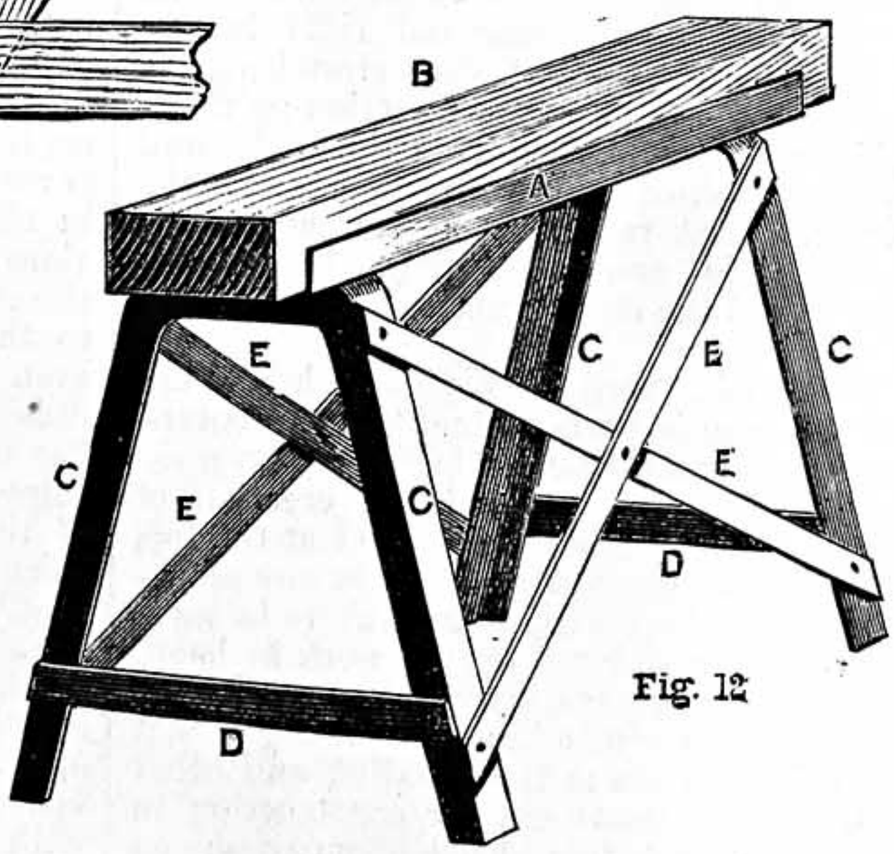


Fig. 12

Fig. 9

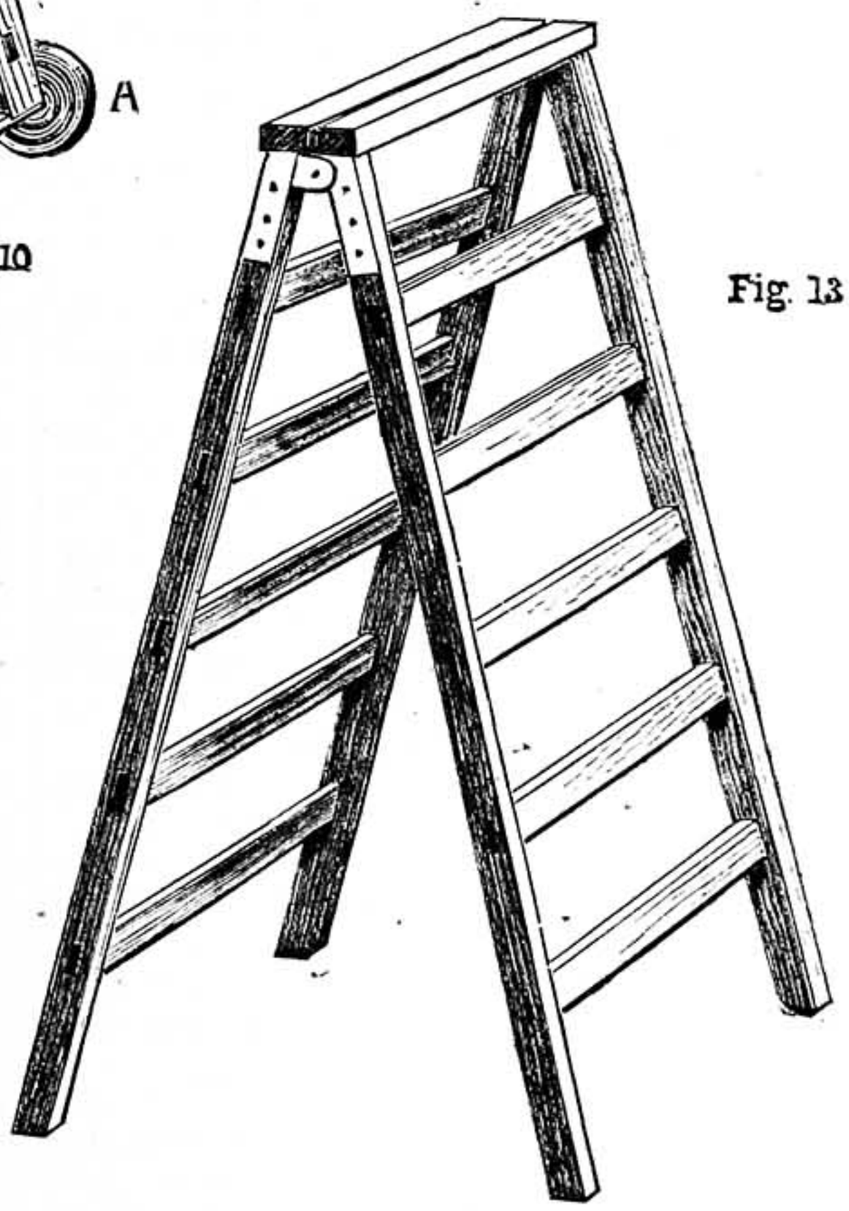


Fig. 13

ABOUT TRESTLES. Fig. 1.—Three-Legged Trestle. Fig. 2.—Typical Form of Trestle used for General Purposes. Figs. 3, 4, 5.—Details of Jointing. Fig. 6.—Trestle with New Mortised and Tenoned Joints. Fig. 7.—Detail of End of Strut. Figs. 8, 9.—Sawing Trestles. Fig. 10.—Trestle on Wheels. Fig. 11.—Detail of Wheel and Axle. Fig. 12.—Boiler-Maker's Trestle. Fig. 13.—Builder's Trestle.

ABOUT TRESTLES.

BY J. H.

DIVERS FORMS OF TRESTLES—THREE-LEGGED FORM—TRESTLE FOR GENERAL PURPOSES—METHOD OF JOINTING—A SIMPLIFIED FORM—SAWING TRESTLES—TRESTLE ON WHEELS—IRON TRESTLE—TALL BUILDER'S TRESTLE.

Divers Forms of Trestles.—These occur in divers sizes, forms, and proportions. They are used by paper-hangers, carpenters and joiners, pattern-makers, boiler-makers and platers, and in many other handicrafts. An article on their forms and modes of construction may therefore be of service.

Three-Legged Trestle.—Fig. 1 shows the simplest and also the most unsteady trestle that can be made. It has but a limited use, being employed chiefly by paper-hangers and glaziers, who lay boards across two such trestles, and cut their paper or glass upon the boards. These must be used in pairs. A single three-legged trestle would be too unsteady to be of any service.

Trestle for General Purposes.—A very generally serviceable form of trestle is shown in Fig. 2. Quartering of light or heavy scantling may be used, according to the purpose for which such a trestle is required, and the method of framing together may vary, but the type is useful for supporting almost all kinds of work, from a common washing-tub to a piece of joinery or pattern-work in course of construction.

Method of Jointing.—The trestle in Fig. 2 is framed together with mortises and tenons in a workmanlike manner as follows.

The four legs, A, A, A, A, are mortised into the top, B. The detail of the method is shown in Fig. 3. The mortise in B is cut longer than the width, *a*, of the tenon of A, to allow of the driving in of wedges, C. The complete joint thus assumes a dovetailed form, wider at top than at bottom, and the legs, therefore, cannot fall out. The wedges must be driven in as shown, against the *ends* of the tenon and the *end grain* of the top, B, and not against the flanks, *b*, of the tenons. If they were driven against the flanks, *b*, they would split the top, B.

The stretchers, D, Fig. 2, are mortised into the legs, A, as shown in Fig. 4, with wedges, C, driven against end grain, as in the previous instance. The longitudinal stretcher, E, Fig. 2, between these short stretchers, D, is also mortised in the same fashion.

A trestle made thus with close joints will stand a considerable amount of rough usage. If the legs were short and the scantling of large section, as in the case of a sawing stool, strutting would not really be necessary. But it is always advisable to strut high trestles made of slight scantling, say not exceeding 2 in. by 2 in., or 2 in. by 2½ in. cross section. In Fig. 2, struts are shown at F, F. Though it is necessary that these struts be mortised into B and E, the tenons will not pass through nor be wedged.

It is quite enough to stump tenon the ends of F, F, Fig. 5, at top and bottom. Note the abutting of the two struts at *a*—a further steadiment to the framing. If these shoulders are all fitted closely, and if the tenons make a tight driving fit, the trestle, when glued together, will be as firm as a rock.

A Simplified Form.—There is, however, a simpler method of framing trestles of this type together. It is shown in Fig. 6. The only members that are mortised are the legs, A, into the top, B. The cross stretchers, C, are simply let for about ⅛ in. into the legs, and screwed, or, preferably, secured with small bolts. The struts, D, are stump tenoned into the top, but at the other end they are merely shouldered back to fit over the stretchers, C, Fig. 7, and screwed or bolted. For a trestle of somewhat heavy scantling, like that shown in Fig. 6, this simpler method of jointing is quite good enough; but for a lighter trestle, like that in Fig. 2, the method of framing together with longitudinal bottom stretchers, E, and mortised joints throughout, makes a more steady job.

Sawing Trestles.—Figs. 8 and 9 show the low form of stool used chiefly for sawing boards upon. These are about 20 inches in height, and firm and stiffly made. In Fig. 8 all the parts are mortised, and tenoned, and strutted in workmanlike fashion, as in Fig. 2. But in Fig. 9 nothing of this kind is done. Here the legs, A, A, A, A, are simply shouldered into the sides of the top, B, and a single bolt passes through each pair of legs and the top. The cross stretchers, C, are slightly shouldered back, and screwed or bolted to the legs.

Trestle on Wheels.—A form of trestle that I have used for several years, and found very handy for heavy pattern work whose position in the shop sometimes requires to be shifted, is shown in Fig. 10. It is useful also for pushing heavy timber along to the circular saw. It is simply a strongly-made trestle mounted upon small iron rollers or wheels, A. The detail of the latter, with their axles, is shown in Fig. 11. The axles, B, are rectangular bars of iron of oblong section. These are screwed to the bottoms of the legs, C. The ends are forged or turned down to circular section to receive the wheels, which are kept on with a pin, D. The wheels are castings, about 6 in. in diameter, and dished or hollowed out on each side for diminution of weight.

Boiler-Maker's Trestle.—Fig. 12 shows an iron trestle, used by boiler-makers and platers, fitters, fettlers, and others in the engineering trade. This also is made in different sizes and scantlings, but the figure gives a good idea of what we may call a standard type. In this, A is a piece of channel iron of suitable section. Into this is fitted a length of a deal, B, somewhat longer and deeper than the iron. Pieces of bent angle iron, C, form the legs; they are riveted underneath to the channel iron. For light work pieces of flat bar iron may be used instead of angles, but of course they are not nearly so rigid as the angles; but then the trouble of bending angles is saved. The angles, C, are rendered rigid in one direction by riveting the stretchers, D, across, and in the other direction by riveting the diagonals, E, both to the angles and to each other where they cross at the centre. The result is a perfect trestle, strong, rigid, and everlasting. In an engineer's yard the cost of making these is but slight.

Builders' Trestles.—Fig. 13 shows tall trestles used in pairs by builders, carpenters, engineers, and others, for laying planks upon for the building up and the erection of work. The uprights are hinged at the top, and planks are laid along upon any of the cross-bars whose height happens to be most conveniently situated for the work in hand.

Thus I have endeavoured to group together the various kinds of trestles that are chiefly in use in the building and other trades, and describe their construction in the hope that this little monograph on the subject will not be without its use to the readers of WORK, professional and amateur.

FRENCH POLISHING: GLAZING.

BY DAVID DENNING.

DIFFERENCE BETWEEN SPIRIT AND GLAZE FINISHES—REAL OBJECTION TO GLAZING—LESS PRACTICE REQUIRED—GLAZING OF ADVANTAGE IN INLAID WORK—OTHER CASES IN WHICH IT MAY BE USED WITH ADVANTAGE—GLAZE TO BE BOUGHT READY-MADE—HOW TO MAKE IT—GUM BENZOIN—HOW TO APPLY GLAZE—REVIVAL OF OLD FRENCH POLISH WORK.

AT the close of the article on Spiriting-Off in French polishing, one on finishing by means of glazing was promised to readers, and it will be of special use to those who are unable, through want of time, to learn the better process, or who want to finish any polished article with the smallest amount of labour.

The difference between the spirit and glaze finishes may be described as being in the one case by friction, and the other by the addition of a thin fine varnish to the surface of the body of polish. In the former case the polish itself is polished; in the latter it is varnished with a mixture known commonly as glaze, but to which other names, such as slake finish, are sometimes given. As may readily be surmised, finishing by means of glaze is not so good as the legitimate method by spiriting, and can hardly be considered as being anything more meritorious than a means of getting the same effect easily and quickly—an imitation, in fact, of the real thing.

Why, then, it may be asked, should space be devoted to telling people how to imitate good French polish? And it is more than likely that some professional polishers may object to an explanation of what may almost be called one of the "tricks of the trade."

Even if it be granted that glazing is an imitation, it has such a recognised acceptance among polishers, is so remarkably convenient occasionally, and in some cases possesses an advantage over spiriting, that it may fairly be classed among the ordinary processes of polishing. When done in moderation, I, for one, can find no fault with glazing, which I hold to be just as useful as, say, the application of spirit varnish on the carving of a piece of work said to be, and justly considered as being, French polished. These remarks, I think, are sufficient justification to those members of the trade—were any justification necessary to such people—who do not believe in letting the public know too much. The only thing in connection with glaze that may be reprehended is the finishing of whole pieces of carcase work with it, to delude purchasers into the notion that it is French polished; or, if this is too much to say—for the work is really French polished—that it is finished in the best manner. The real objection to glaze finish is that it is not so durable as the other, for at first the appearance is equal to that got by any other process. It may even be said to be superior to badly spirited finish, and herein consists the chief claim it has for notice by amateurs. With all due respect for their skill, it is seldom that any of this class of worker can manage to do spiriting thoroughly, for the simple reason that they have not sufficient opportunity of acquiring practical experience.

Glazing does not require so much practice, so that, comparing it with finishing by spiriting off, results certainly equal to the latter, and probably superior, will be got with the former by inexperienced people. The practical polisher, of course, will learn glazing in the ordinary routine of his work, and must judge for himself when its use is

legitimate or not. Without putting myself up as a commercial moralist, I should unhesitatingly say that when a customer will not pay more than a sovereign for polishing a job on which good polishing might fairly cost double, the polisher is fully justified in using as much glaze as he likes. Perhaps it would be just as well to explain the difference to the customer, in order to give him an opportunity of having the work done well.

As any one who has had any experience in the furniture trade knows, though, there are some buyers or customers who always want to get work done for half its value. Knowing any one to be such, I do not think it would be worth the polisher's while to explain to him—or, more probably, her—anything about different methods. Perhaps the most delicate way of giving the information would be to send the number of WORK in which this appears to the "other party" in the transaction. I am a believer in letting people know what they are getting for their money, and if they are content to have a glazed finish, the onus of supplying it is off the polisher's shoulders. I therefore do not see why any unprejudiced polisher should object to easy processes being told any more than to those which are more difficult. Any way, my duty to the publishers of WORK and the readers who look to it for information impels me to tell all that is likely to be useful.

Among respectable polishers who can command a reasonable price for their work, glaze is of comparatively limited application, and is confined to those parts of a job where the spirit rubber cannot be conveniently used, or where its use is not necessary. Instances of such may be found in chair rails and various parts of the frame. This, as is no doubt well known to all engaged in the furniture trade, is usually polished to a greater or smaller degree before it is upholstered, or at any rate, before the outer covering is put on, the finishing being almost necessarily done last of all. The less the chair is handled then by the polisher the better, especially if the covering is a delicate one, for it does not require any practical experience to perceive that there is less risk of injury with one or two wipes over with the glaze rubber than with the more prolonged spiriting.

Another instance where glaze may be used with advantage is in inlaid work, where the inlay is slightly, though perhaps not intentionally, a trifle higher than the surrounding wood. In such a case I think most polishers will agree with me that it is better to resort to glaze than to finish with the spirit rubber. On fretwork also glaze may often be used with advantage, but remarks about this must be reserved till later on, when I shall have something to say specially applicable to fret-polishing.

As a rough guide to those who do not know when glaze may be used without risk, I may say generally that it is unobjectionable on parts which are not subject to wear and tear. It will stand a moderate amount of handling, but not so much as good hard spirited off polish; and even when left alone the lustre is not so durable. Beyond this it is almost impossible to define the extent to which glaze may be used on work which is intended to be really of the highest character, and every one must use his own discretion as to its application.

Glaze under one or other of its different names, some of which are specially given to their own preparations by manufacturers, may be bought ready made, but for similar reasons to those given in connection with French polish, the home-made article is to be recommended. The preparation of glaze is equally simple, the ingredients being gum benzoin and methylated spirit. The proportions may vary, but those given for polish will do very well, and with the substitution of benzoin, which should be crushed, for shellac, the process is exactly the same. After the benzoin is dissolved, the solution should be strained through muslin to free it from impurities in the shape of pieces of twig and similar foreign matter.

Gum benzoin—or, as it is sometimes called, gum benjamin—differs greatly in quality, and it is almost needless to say that the best should be used by the polisher. Compared with lac, it is expensive, so that the saving which is attributed to its use is mainly in time, which readers need hardly be reminded is, from a trade point of view, money.

As some guide to quality, it may be said that the whitest sample should be chosen; and I have been given to undertand that, as the light benzoin is better than the other, white lead is used as an adulterant. White lead, it need hardly be said, is not a recognised ingredient in any of the French polisher's preparations, so that benzoin containing it cannot be considered fit for his use.

Certainly cheap benzoin is not be relied on, and in a strange place I would look with suspicion on any offered to be sold in ordinary retail quantities at much under 2s. 6d. per lb., however satisfactory its appearance. In this, as in other cases where anything is liable to adulteration, the best way to avoid imposition is to go to a reliable dealer and to pay a fair price.

As "patent" benzoins are sold at a very much lower price—one kind, I believe, as low as 6d. per lb.—some may be tempted to buy them. That they are much used there can be no doubt, so it may be presumed some polishers find them satisfactory. I can only say that personally I do not recommend them, unless perhaps when extreme cheapness is the main consideration.

They—I refer to the only two "patent" benzoins which have come under my notice—form glazes which are liable to crack, and one of them especially is such a bad colour that its use on light wood is not beneficial. There may be more patent benzoins than those I have alluded to, and if I meet with a satisfactory one I shall have no hesitation in speaking favourably of any good qualities it may possess. Meanwhile, I prefer the genuine article.

Glaze may be applied with rubber, sponge, or brush, and in the majority of cases the first named medium is the most suitable and that most commonly used. It is made in the ordinary way as if for polish, but if anything softer, as glaze, must not be applied with pressure. It is rather painted on than rubbed into the work, which, to prevent any misapprehension, I repeat must have been previously bodied in. I am particular about this, as there seems to be a sort of idea prevalent among amateurs that glaze or "something" can be put on bare wood and cause a gloss right off. Let me say that there is nothing of the kind, and that a polish cannot be got on wood, except by varnish, by any other means than one of those indicated.

When using glaze, the rubber should be made wetter than when polish or spirit is used; but still, there should not be sufficient to drip from it. What is wanted is to glaze or wet the wood when the rubber is very lightly pressed on it. One or two wipes over, always in the direction of the grain of the wood, with a somewhat quick motion, though not by any means a "slap-dash" one, will put the glaze on, and on no account should the rubber be passed over a wet surface. Always let the previous one be dry before applying the rubber again to the same place. The defect that will be caused if care in this respect is not taken will be so obvious to anyone who makes the attempt—which he may as well do on a piece of waste wood, by way of experiment—that nothing need be said about it further. The coats may be repeated till the gloss is satisfactory, but the film of glaze should never be a thick one.

If a sponge is preferred, it is used exactly as a rubber would be, and on the whole it is questionable if there is any advantage gained by using sponge. Like a good many other details in connection with polishing, it is a matter of fancy.

When a brush is used the glaze may be regarded as a varnish pure and simple. With a brush a mixture of glaze and French polish, either white or brown according to the work, in equal quantities may be used with advantage, though on this point there are differences of opinion, chiefly, as far as I have been able to observe, arising from the nature of the work the polisher is most accustomed to.

If the glaze is not quite so satisfactory in appearance as it should be, it may sometimes be improved by passing a spirit rubber lightly over it, though this should only be done with great caution, to avoid washing the glaze away. When carefully and skilfully done, there can be little doubt that a glazed surface may be often, if not always, improved by slightly spiriting it.

It may be a useful bit of information to many that old French polished work may often be "revived" by being lightly gone over with glaze after the surface has been washed and cleaned with warm water. This treatment is at least as beneficial and often considerably better than that so commonly adopted with furniture pastes, polishes, creams, and revivers of various kinds, all of which will be dealt with in due course.

WIRE-WORK IN ALL ITS BRANCHES.

BY JAMES SCOTT.

SCROLL IRONS—"GOTHICS."

Now I must make it my business in this paper to refer to and explain the use of what are called "scroll irons." On the top of fencing, baskets, etc., it will be observed that some of the wires often terminate in a scroll. In instances where they are practicable the remarks which here follow will be applicable.

To the bench are secured, by means of fasteners, irons of the shape shown in Fig. 64, or of any pattern desired. The inside point of the irons (A in Fig. 65) must terminate sharply, for to this point will be hooked, as it were, the end of the wire to be bent. Then the wire is drawn tightly along the outside edge of the scroll iron, and pressed evenly and firmly against the latter. All the fasteners, let me say, must be brought on the inside edge of the scroll iron, in order that the outside edge may be quite level.

Wire-workers who have had much practice do not require the aid of scroll irons for performing this kind of work; and I

have seen my practical friend bend small and large scrolls in clean nice lines with the humble assistance of only the pliers, and, indeed, in some cases by merely using the fingers. But it is hardly reasonable to expect that any of my numerous readers, other than those who are or have been accustomed to wire-working, shall possess sufficient ability to accomplish the completion of wire scrolls by the help of only the fingers or pliers.

As it is possible that many who read these lines may be interested in practical fretwork, and as it is also probable that many of them may wish to try their hand at a bit of wire-working, I think it may be as well to say that, in the place of scroll *irons*, scrolls of hard wood of sufficient thickness *screwed* to the bench could be used with almost the same facility.

For the purpose of bending wire any curved shape, other than that of a scroll, it is also serviceable to have irons or fretwork of the line required.

If a rather large piece of work is in hand, and it is considered inconvenient to make the scroll terminals at the commencement, sufficient length of wire should be left for the purpose until the remainder is completed. The job can then be held against the side of the bench vertically, and the wires finally bent round the scroll irons; but in this case it is, of course, necessary that the latter be near the edge of the bench, whereas, if the scrolls are always to be made at the beginning of a job, it matters little upon what part of the bench the irons are situated, provided they are handily within reach.

It will be understood that this alternative of leaving the scroll work until the completion of the remainder is only necessary when the scrolls are in a position cross-wise to the length of the job, but that when they follow the length of the work the scrolls can be made at the beginning.

"Gothics" is the name given to wires when bent after the shape of Fig. 68. Those who have the smallest knowledge of architectural styles will notice that the title is an apt one.

This kind of ornamentation is largely introduced amongst articles in wire, embellishing the tops of them, although they are capable of being treated in what might be termed an artistic manner in adapting them as panels, by securing four or more in a geometric position, after that represented in Fig. 66.

In a piece of work along which a series of gothics are required, there is no need whatever that each gothic shall be separately made from the remainder. Of course, irons or fretwork may be used in the same way as scroll irons. Supposing separate gothics are required, the best course will be to cut up a number of wires, each of sufficient length to make one gothic and permit of its ends being bent round the work which it is to ornament; but where a series are required the wire need not be so cut: all that needs to be done is to proceed as in Fig. 65, bending the wires in consecutive gothics, afterwards bringing their tops and bottoms into a straight line.

It frequently happens that it is preferable to have the gothics slightly bent instead of being perfectly upright. This is nearly always the case when any circular piece of work is in hand. When this is so, it is only necessary that the gothics, thus far complete, are placed upon or below a cylindrical surface, and bent to the shape of it. It is best to do this while the whole of the gothics are in a straight line, for then it is more probable that each of them will be bent to the same degree as the remainder, and the two ends of the whole can be brought together and secured, if a circular piece of work is required.

For this secondary bending it is preferable to have metal tubes or rods, but, as a makeshift, wooden or other substitutes could be appropriately utilised. The sweep of the curve obtainable will depend upon the diameter of the article around which the gothics are bent; thus, if worked over something which is but one or two inches in diameter, the curve will be a sharp one, but if the diameter be about six or seven inches, the result will be but a very slight curve.

The above remarks apply where the whole of each gothic is bent from the straight; but now and again it may be considered preferable to merely bend the top over. In such cases as these the same particulars will hold good, excepting that only that portion required to be bent must be placed over the cylindrical surface.

There are other ways of obtaining these gothics. One of them is to bend each portion of wire which is to compose one of them round a half-circular block instead of a gothic-shaped one. Each half circle should then be bent at the point A (Fig. 68), bringing each half closer together, and at the same time frontwards.

The other method is to bend the whole length of the wire to be "gothicked," as shown in Fig. 69, in which diagram the wire is supposed to be laying flat. If each of the upper projections is then bent upwards or outwards, it will be found that when they are drawn apart at A, A the result is precisely the same as that gained by proceeding by means of either of the other two modes.

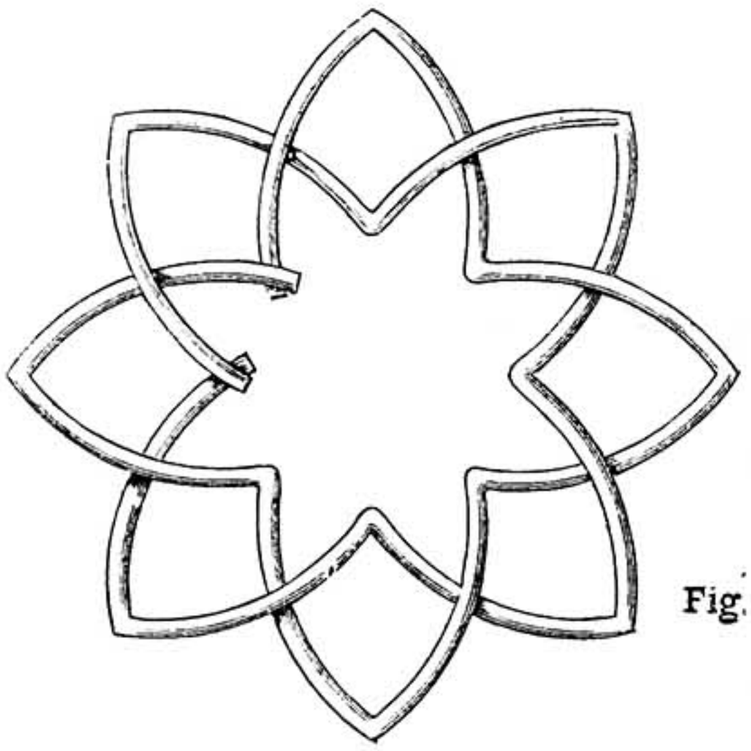


Fig. 66.

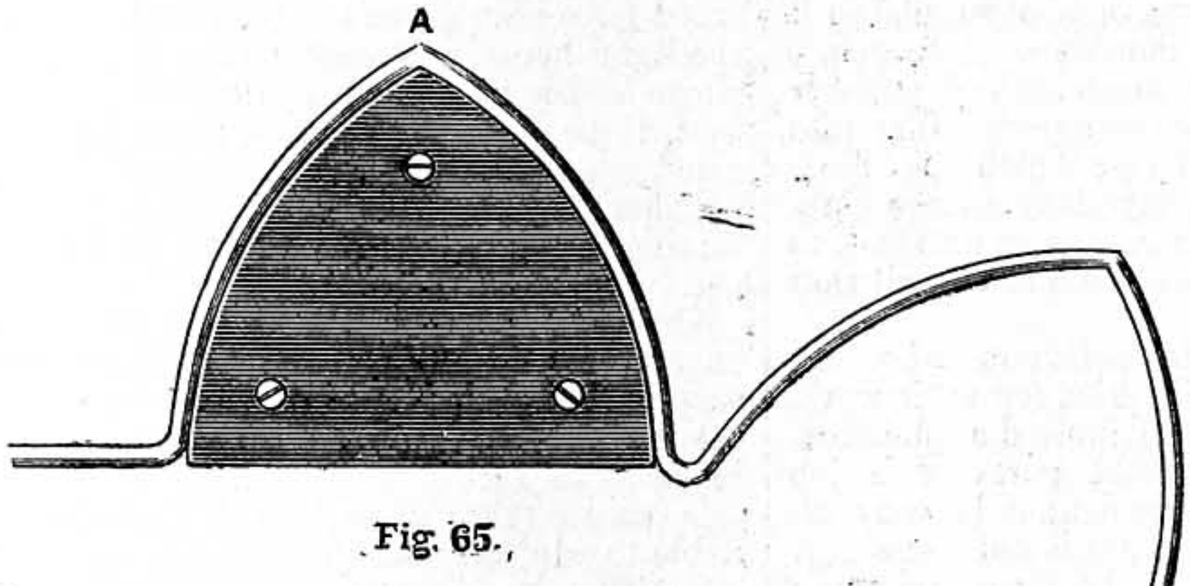


Fig. 65.

Fig. 67.

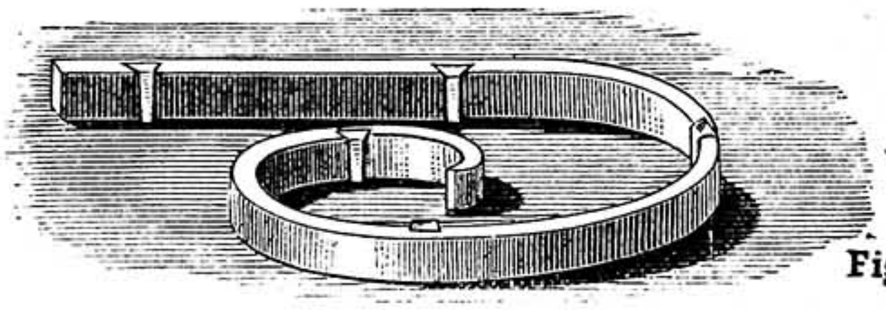


Fig. 64.

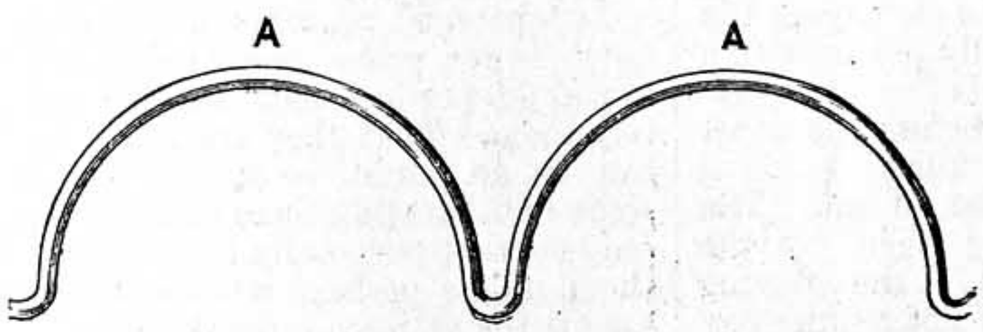


Fig. 68.

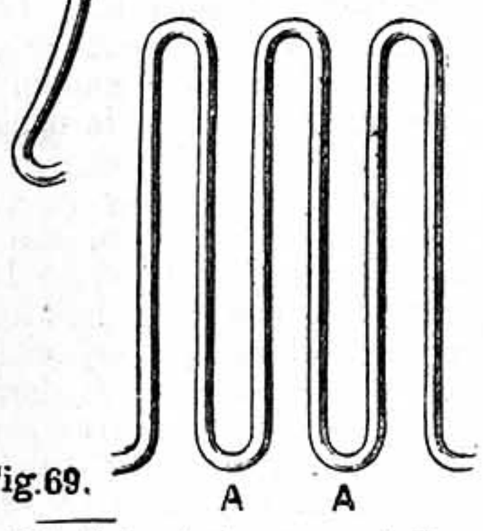


Fig. 69.

Fig. 64.—A Scroll Iron for forming Scroll Terminals. Fig. 65.—One Method of bending "Gothics." Fig. 66.—"Gothics" treated ornamentally. Fig. 67.—End View of a "Gothic" when completed. Fig. 68, 69.—Two Additional Methods of proceeding to form "Gothics."

A USEFUL COMBINATION BEDROOM SUITE.

BY CLERICUS SECUNDUS.

NATURE OF SUITE—ITS PROTOTYPE—LENGTH OF TABLE-BED—MATERIAL—LEGS—CROSS PIECES—PUTTING SKELETON TOGETHER—PANELS AND PANEL FRAMEWORK—PLANKS FOR HEAD AND FOOT—FLOORING FOR MATTRESS—SIDE PLANKS—FINISHING CUPBOARDS—FLOOR—TOP—DESK TOP—FRAMES—SECTIONS AND LEATHER—COMPLETION.

IN Vol. I. of WORK a description and design are given of one of the most ingenious articles of furniture I have seen for some time, and one which should "come as a boon and a blessing to men," or such of them as by duty or necessity are cramped in the matter of living room. Looking over the design, and thinking of those whom it was

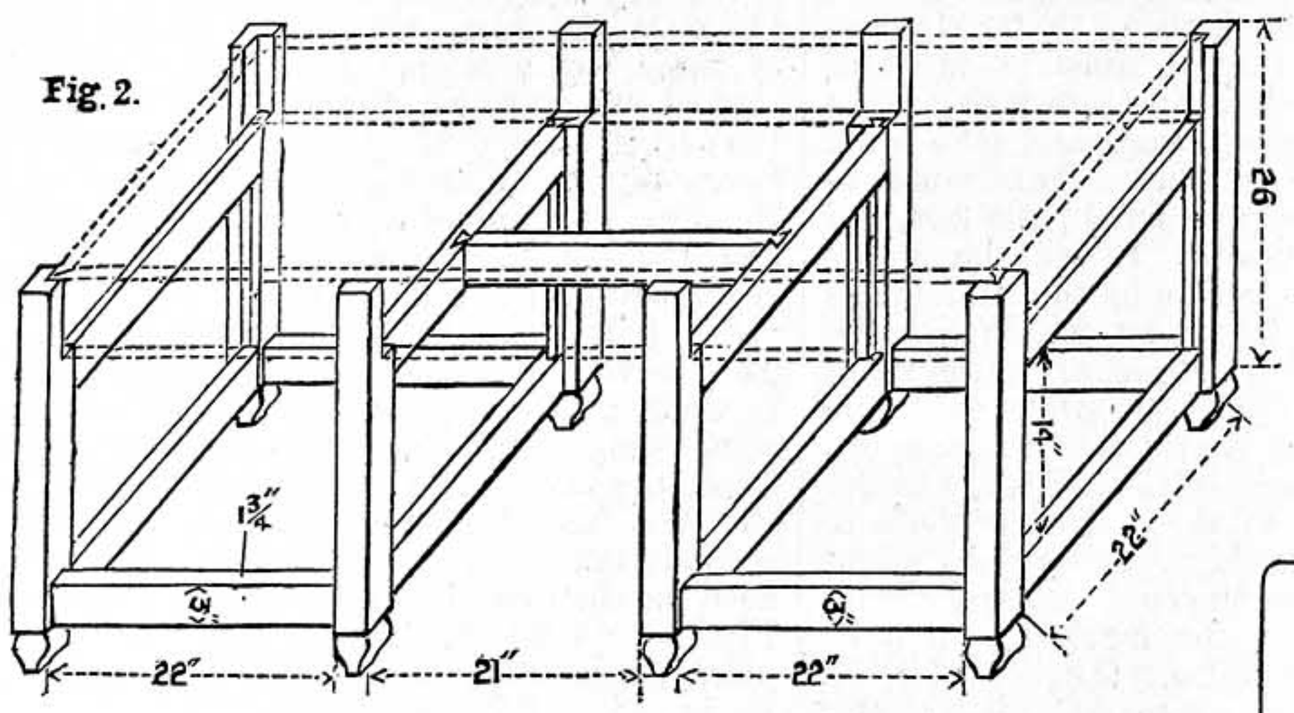
chiefly intended to benefit, the idea flashed across me: But what of the sleeping accommodation?—for among its multifarious uses this combination does *not*

"Contrive a double debt to pay:
A bed by night—a chest of drawers by day."

True, the possessor thereof may have a separate sleeping apartment, but in that case the contrivance is hardly necessary; obtained protection for his desk in England, it might be dangerous for any maker to reproduce it for purposes of sale Amateurs, however, may safely make one for themselves on the lines herein laid down, as, never having seen Mr. Zwicker's arrangement, there is, so far as I know, nothing in common between the two, except the utilisation of the library-table for sleeping purposes, and the transformation of a part of complete appointments of the settled home, if only for the accommodation of some member of the family when a "little stranger" or a bigger, if not more welcome, one arrives.

But before setting to work, two questions must be settled: Firstly, what shall be the length of the desk? We are not anxious to modernise the bed of Procrustes, whilst a bed 6½ ft. long for a man who stands five feet

Fig. 2.



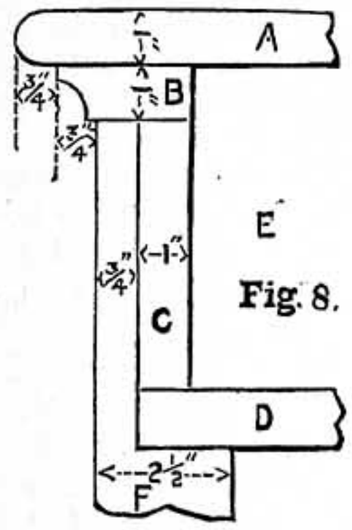


Fig. 8.

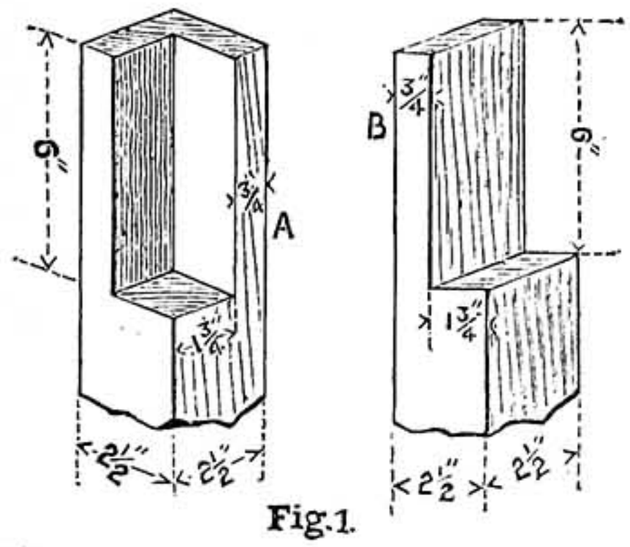


Fig. 1.

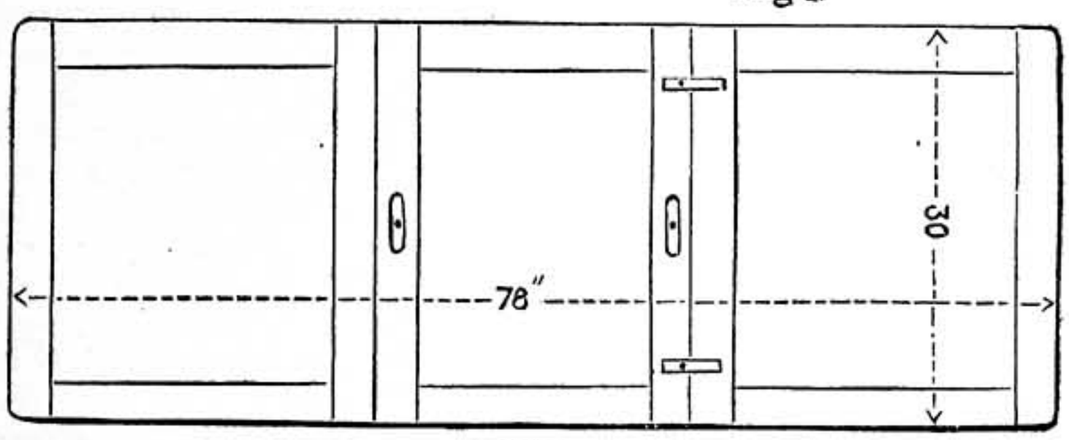


Fig. 9.

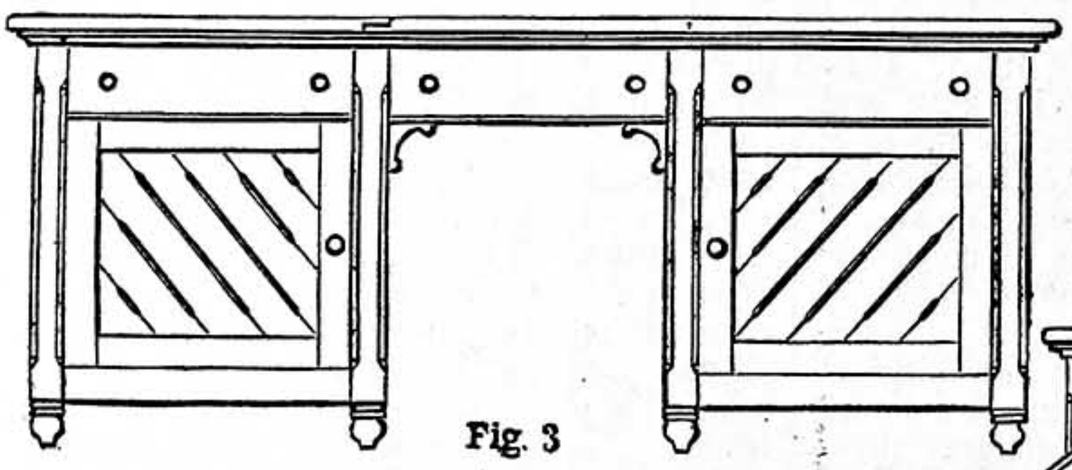


Fig. 3

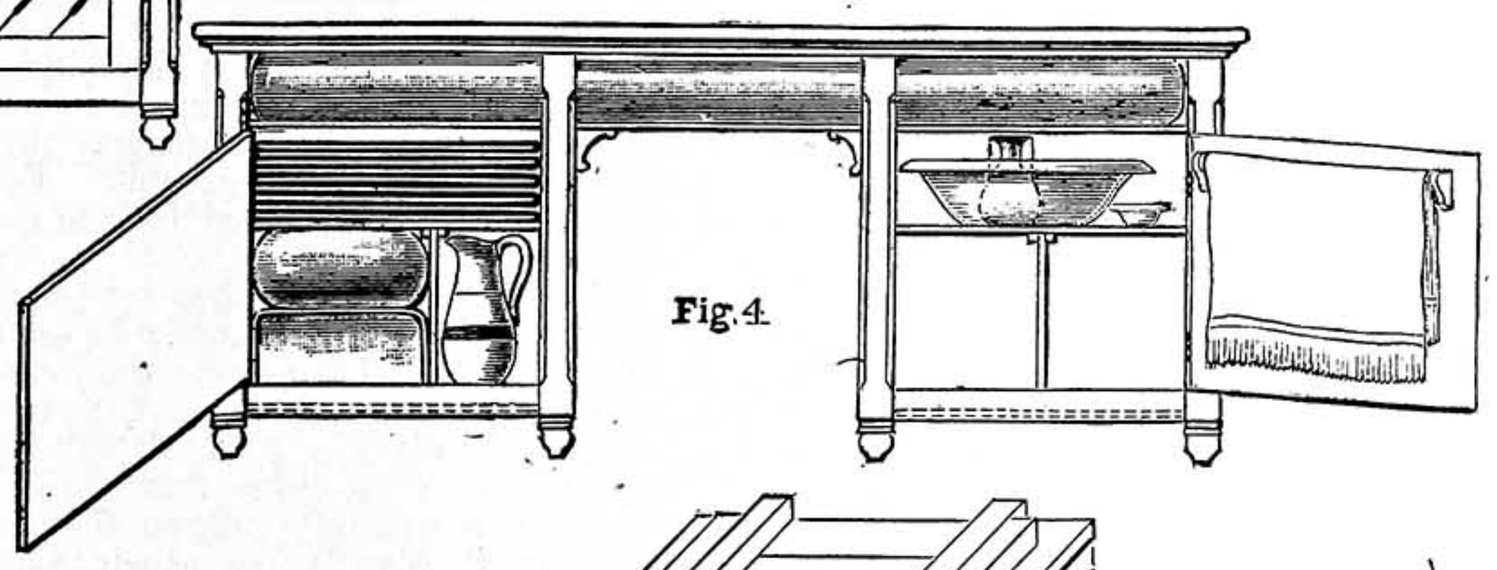


Fig. 4.

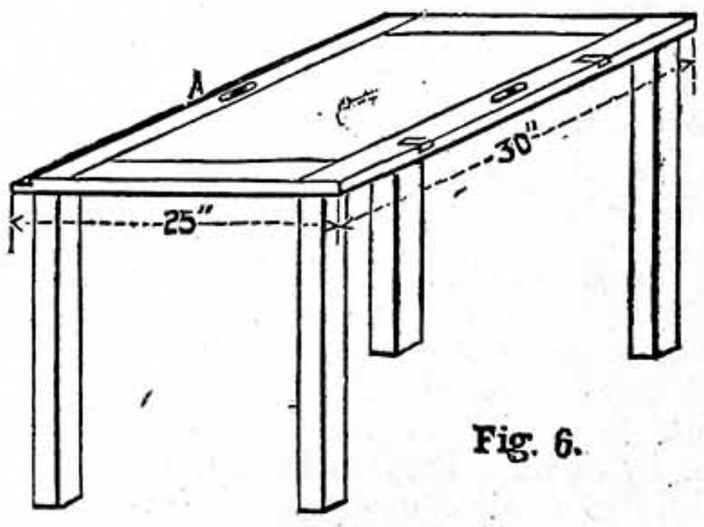


Fig. 6.

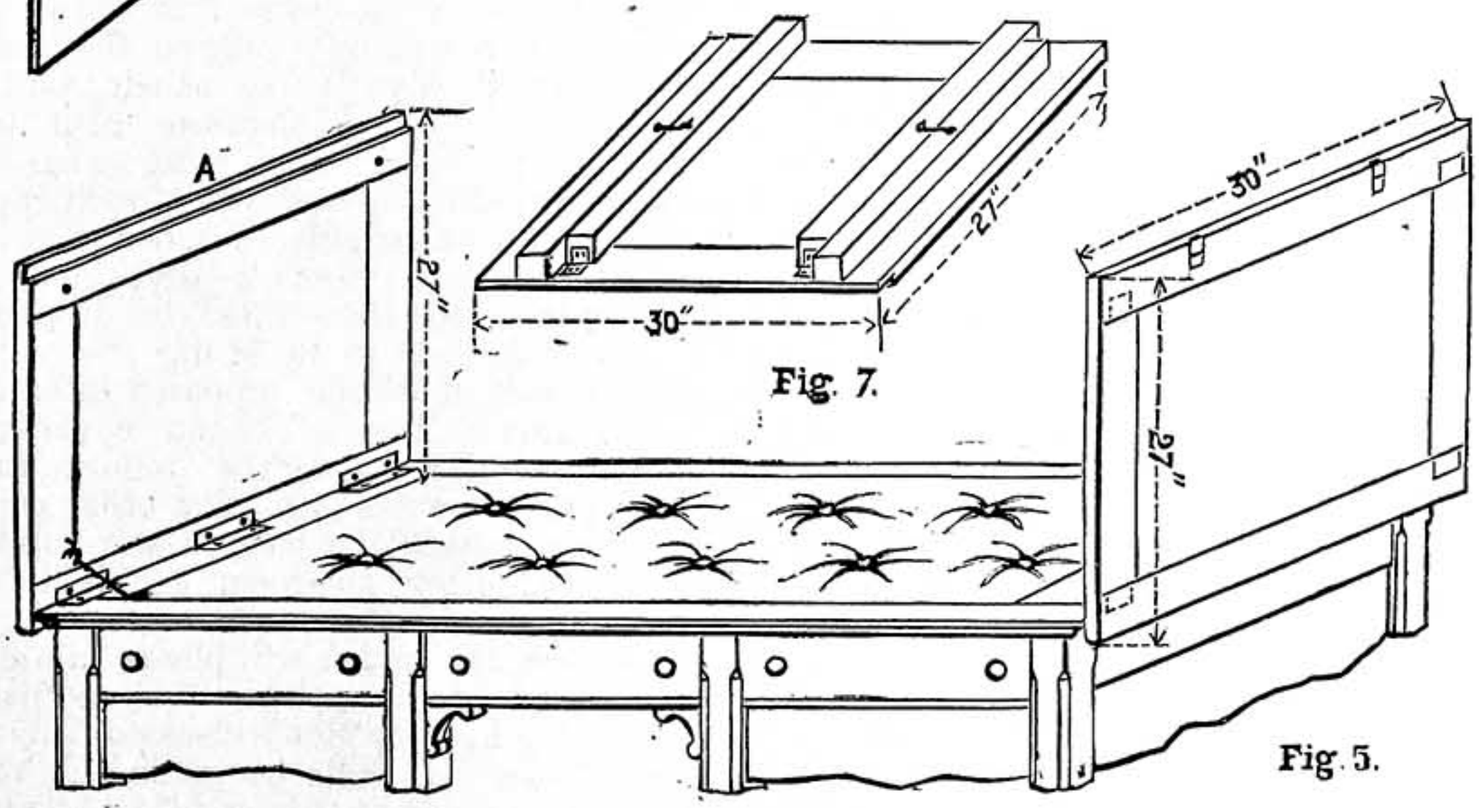


Fig. 7.

Fig. 5.

Fig. 1.—Shaping of Legs at Top for Corners (A) and for Sides (B). Fig. 2.—Skeleton of Desk. Fig. 3.—Elevation, Front and Back. Fig. 4.—View of Interior, showing Arrangements. Fig. 5.—Desk opened, showing Mattress—A, Rebate to keep down Middle Section. Fig. 6.—Table—A, Rebate to fit under Left-hand Section. Fig. 7.—Table reversed, showing Legs folded. Fig. 8.—Section of Desk Top—A, Top Plank; B, Moulding; C, Front Plank imitating Drawer Front; D, Flooring for Mattress; E, Mattress Space; F, Leg of Desk. Fig. 9.—Top of Desk.

*** All Figs. on Scale of ½ in. to 1 ft. except Fig. 1 not to Scale, and Fig. 8 on Scale of 2 in. to 1 ft.

and if not, to be able to stow away one's brush and comb—even including the et-ceteras—when one's bed is exposed to the public gaze, is a rather doubtful advantage.

It was whilst cogitating on this knotty point that I remembered having heard of, or seen advertised, a combination of library-table and bedstead, which seemed to me to exactly meet the needs of the case.

The inventor and patentee is a Mr. Zwicker, of Brussels, and anyone wanting the complete and thoroughly finished article had best apply to him. As Mr. Z. has the desk-top into a table. Furthermore, being "only an amateur," and not much of a one at that, I have no pretensions to teach my superiors in matters mechanical. I write only for the benefit of such amateurs as may be doubtful of their abilities for such a task, for they may be sure that where I lead anyone can follow; the result being, I trust, a piece of furniture which will be no disgrace to any room, whilst it will be found convenient, not only by the young men compelled to live in chambers or hired rooms, but even amid the more nothing in his socks is sheer waste of good material. Let each man take his own measure (a most difficult operation), and cut his wood accordingly. The desk here designed is meant for a fairly tall man, and gives nearly six feet of mattress. Any alteration in this particular will simply entail a corresponding alteration in the working plans. Secondly, what shall the desk be made of? Here another unknown quantity stands in the way of a correct solution—to wit, the length of the maker's purse. This too, then, he must settle for

himself. Oak, walnut, mahogany, good pitch pine, have all their qualities and recommendations, but the supposition being that the amateur belongs to that large class which does not suffer from plethora of money-bags, the last named material has been in the writer's mind when drawing out the accompanying plans. So now to work!

We shall need eight legs 2½ in. square and 2 ft. 6. in. long, finished size. Four of them will have to be shaped at the top like, A, Fig. 1, for the corners, and four like B, Fig. 1, for the sides. The feet will have to be turned; they stand 4 in. high. Should the maker not have a lathe, and wish to do the whole work himself, the feet may be dispensed with, and a skirting-board, with a simple moulding at the top, run completely round. In that case the bottom cross-pieces should be tenoned into the legs nearly at the ground level, and the sides of the cupboard lengthened accordingly. Thirteen cross-pieces will be needed, all 3 in. wide. They should be as follows:—ten pieces 22 in. long, 1¾ in. thick; one piece 21 in. long, 1¾ in. thick; two pieces 22 in. long, 1 in. thick.

Let us begin to put together the skeleton of the desk. It will perhaps be best to first bind the front and back legs together. Pair them and arrange them in sets of four as they stand in the completed article. In marking for tenon and dovetail, a little care will be needed to prevent mistakes. Bear in mind that in each place the fixed cross-pieces must be flush with the *inside* of the cupboards; this will give us on the outside recessed panels ¾ in. deep. The bottom cross-pieces must be tenoned, the upper either tenoned or dovetailed, the latter preferably. The 1 in. thick cross-pieces are meant to be upper and outer ones. The cross-piece 21 in. long must be fixed across the leg space to hold the cupboard frames together. This is to take the strain partly off the sides and flooring of the mattress space, which otherwise would have to be wholly responsible for keeping the parts together should the desk need to be moved about.

Fig. 2 will, I think, make the arrangement of the cross-pieces perfectly clear. It will also show the grooves in the corner legs and the ledgers which are fastened to the middle ones, all being flush with the *outside* of the cross-pieces. These are to take the panels which form the sides of the cupboard. It will be observed that the 1 in. thick cross-pieces are reduced to that thickness in order to leave the grooves free for the end panels to be slipped in.

I have endeavoured to draw all the designs to scale, but not being a draughtsman, I have in each case added the dimensions for fear of error.

When all the legs and cross-pieces have been cut and fitted, they must be taken apart, the legs stop-chamfered, and the whole jointed up firm and tight. The end panels had next better be prepared. They may of course be plain, but as our desk is not overloaded with ornament, the planks which form the panels had better be stop-chamfered and fixed diagonally (see doors of cupboards, Fig. 3). The panel framework must be ¾ in. thick (the cross-pieces being tenoned into the uprights), and the panel proper of ⅜ in. wood and let into a groove in the framework. The dimensions, assuming the grooves in the desk-legs to be ½ in. deep, will be 17 in. by 23 in.

The panels having been slipped into their places, the planks at the head and foot of the mattress must next be fixed. They must be 2 ft. 1½ in. long, 6 in. wide, and 1 in. thick. The ends, instead of remaining square, must be bevelled off to an angle of 45 deg., so as to form a mitre with the planks to form the sides. They may be screwed to the legs from the inside. When fixed, the end planks will come right down on the framework of the panels, which, as will be seen, is not the case with the side planks.

The "flooring" for the mattress must now be prepared. The requisite dimensions will be found to be: Length, 5 ft. 11½ in.; breadth, 2 ft. 1½ in. It must be made of 1 in. wood, jointed in any safe way within the worker's powers, dowels and glue being perhaps as good as any. This must be dropped into the space left by the legs, and firmly screwed down. It will be amply supported in the centre by the cross-pieces underneath, and in my estimation likewise at the ends. In consequence, however, of the end planks being 6 in. wide, only ¾ in. of the cross-piece is available as a support. Should this be deemed insufficient, a ledger may be fastened to the end cross-pieces to increase their width. A cross-piece might also be fixed across the cupboard space similar to that across the leg space, if it be deemed safer to support the flooring along the whole length of its central line, but this appears to me to be superfluous.

The side planks must now be fitted. They must be 1 in. thick, 6 ft. 11½ in. long, and 5 in. broad. They will rest on the flooring, allowing the (inch-thick) edge of the flooring to be seen both front and back (see Figs. 3 and 5). The object of this is of course to represent the bottom planks of the drawers' space which would be there under ordinary circumstances. To carry out the illusion. drawer-knobs are fixed along the front. These can be readily purchased and glued into a hole bored with a centrebit. Four other knobs will be required for the cupboard doors.

It is immaterial whether the next process be the finishing of the cupboards or the fixing of the top. Let us take the former. The end panels being already fixed, the inner ones have to be placed. Nail ledgers to the top and bottom cross-pieces, flush with the *outside* (there are already some on the legs), and fill in with glue-jointed panels, which may be ½ in. thick. Dimensions, 22 in. by 14 in. For the floor, ledgers must be nailed to the four bottom cross-pieces of each cupboard—on the inner side, of course, and as near the bottom as possible—and the floor of, say, ¾ in. wood, glue-jointed, be dropped in. Dimensions, 22 in. by 22 in.

Fig. 4 will show the proposed internal arrangements. The left hand cupboard contains the bed-linen, the pillow, the bolster, and the water-jug. The other cupboard may contain the basin, water-bottle, and all the other bed-room and toilette requisites.

Of course, the maker will please himself in all these particulars, the shelves and partitions being held by glued blocks or ledger in any case. He will be guided in the matter by his special needs, and if he possess the "combination suite" already alluded to, or any other facilities for stowing away his bed-linen or other bed-room paraphernalia, the cupboards may be utilised for their more legitimate purposes. The object, however, is to make the desk-bedstead as complete in itself as possible, and the arrangement as sketched will be found convenient.

The doors call for no special mention, being made like the end panels, and as to size, 22 in. by 17 in. Of course, the appearance of the whole (see Fig. 3) will much depend upon the exactness of the work put into the panels. The doors must be hung upon butt hinges let into the legs and into the thickness of the door frames, the joint of the hinge being outward. It will be found more convenient to have doors front and back, though, of course, fixed panels may be substituted for one set of doors.

Now comes the top. Procure two lengths of 1-in. wood, 6 ft. 4½ in. long and 2½ in. broad, also two lengths 2 ft. 4½ in. long and 2½ in. broad. Along the outer edge of each of these run a simple moulding such as that shown at B, Fig 8, and mitre them at the corner, the moulding being underneath. Screw this moulding firmly to the frame of the desk. It should fit close to the leg top and the planks surrounding the mattress space, and project ¾ in. all round.

We now come to the desk-top proper. This, as will be seen on reference to Fig. 9, is made in three sections, the two outer ones being hinged to the moulding just fixed, the centre one being removable (see Fig. 5). The framework of each of these sections must be of 1-in. wood, and we will need for their construction the following:—Five pieces 30 in. long, 5 in. wide; one piece 30 in. long, 6 in. wide; four pieces 20 in. long, 5 in. wide; two pieces 17 in. long, 5 in. wide. The last mentioned six pieces, having to be tenoned into the others, have 2 in. extra allowed for a 1-in. tenon at each end. Now run a ½-in. rebate along those sides of the pieces which when fitted together will form the *inner upper* sides of the frames. This is for the purpose of afterwards fitting the leather or cloth-covered panels. Proceed to tenon the shorter into the longer pieces, putting the 6 in. wide piece to the left of the middle frame. Next form a 1-in. rebate on the under right hand side of the left hand frame, and another on the upper left hand side of the middle frame (see A in Figs. 5 and 6).

Now come the panels which are to fit into these frames; ½-in. wood, which must be glue-jointed, will, when planed down, do well if the rebate has been made exactly ½ in. deep, as the panels *when covered* should be flush with the frames. This at least is essential, and must be seen to. The exact dimensions should be, for the end panels, 18 in. by 21 in.; for the middle, 15 in. by 21 in. They must not, however, fit tightly, as allowance must be made for the thickness of the material with which they are to be covered. What shall this material be? Leather, if it can be afforded, and especially if the desk be made of one of the more valuable woods. In that case you must put a coat of paste evenly on the panels, lay the leather on, and press from the centre outwards. Afterwards the edges must be pasted down. For a desk made of the cheaper materials, however, I consider that green cloth or baize will look and answer quite as well as leather, and it has of course the advantage in the matter of cost. This must be "shrunk" by being wetted and dried, and then proceeding as just described. I would, however, advise glue rather than paste, and not too liquid, or it will show through the material. With their covering the panels should fit pretty tight, and a few small screws into the rebates from the under side will suffice to hold them in place.

The two larger sections must now be hinged on to the moulding as shown in Fig. 5. See to it that the hinges are of a size to come well over the moulding, for otherwise the piece of moulding might be torn away. They should certainly not be

less than 3 in. across when open, and may well be wider. Let them into the wood both of the table and of the cover, and see that the joint of the hinge is well to the edge of the moulding. They should be so fixed as to allow the "flap" to open until it stands at right angles to the desk, and no more (see Fig. 5). A hook may be fixed as shown to take off the strain and also to prevent the flaps from falling back on the occupant of the bed. When closed the left-hand flap should be fastened down with a couple of hooks and eyes, the hooks being attached to the inside of the sham drawer fronts.

On the longer sides of the centre section are drawn (Fig. 9) contrivances to serve as handles. They are made of brass, and consist of a small, shallow, oblong tray with a flange all round and a bridge across. The flange serves to screw them flush with the table top and the bridge to hold by when lifting off the top. These, if not readily procurable, may be replaced by some other contrivance, or for that matter dispensed with altogether. There are also two small brass bolts which are let into and lie flush with the wood. As the central section must be fastened to the right hand flap, these bolts, or something similar, are essential.

To cover over the bed and form the desk top, the left hand flap is lowered and fastened down, the rebate of the central section is slipped under the rebate in the closed flap; the right hand flap is then lowered and bolted to the central part.

Should the amateur prefer it, the rebates which interlock the left hand and middle sections may be done away with, and in that case the left hand piece of the middle framework will only be 5 in. wide instead of 6 in. The right hand flap must then also be provided with some means of fastening it down, and the two flaps will have to be closed before putting on the middle section. The latter must in that case be provided with bolts on the left hand frame as well as on the other.

If the amateur is fairly off for furniture, the desk may now be considered completed. If, however—as is more likely—his office or study is not encumbered with too many tables, Figs. 6 and 7 contain a suggestion which will be welcome. Get four pieces of wood 2 in. square (if a little less, it does not matter) and 22 in. long—less rather than more. Hinge these pieces on to the reverse side of the centre section of the desk-top, arranging them as in Fig. 7. The hinge end of the outer leg must be 3 in. from one side, and those of the inner legs 3 in. from the other. Note also that the outer legs must be $2\frac{1}{2}$ in. *full* from the edge, say $2\frac{3}{4}$ in.

A small bolt had better be fixed on, say, the inner legs, the socket being fixed on the outer. The bolt when shot will prevent the legs from swinging about when the table is lifted on and off.

When on the desk, the legs will lie along the side of the mattress, which must be stuffed very hard indeed if it does not "give" sufficiently to readily accommodate them. When the legs are unfolded, the table will appear as in Fig. 6, and be found handy if only for toilette purposes.

Our desk is now finished, and needs only to be stained and varnished or polished. In this, as in so many other details, the amateur must please himself. Personally I should prefer a dark walnut stain, French polished; but, once more, it is a question of taste. So, for that matter, is the whole style of the desk, which, but for facility of execution, might have been made otherwise.

But at least the amateur is now in possession of what the French call the "mother idea," and he can apply it as he thinks fit. I only trust that the results will be so satisfactory that no haunting sense of imperfections may disturb his dreams when he comes to lie on the desk-bedstead herein described.

A FEW HINTS ON MAKING TAPS AND REAMERS.

BY DAMON.

TAPS: HOW MADE—GROOVES—SHANK—FINISHING HAND TAP—ALTERATION IN HARDENING——LENGTH—NUMBER OF FLUTES—THEIR SHAPE—CUTTING FLUTES—FINISHING CUT—BACKING-OFF—HARDENING—TEMPERING—POLISHING—MAKING REAMERS.

ALTHOUGH amateurs do not, as a rule, make their own taps and reamers, it sometimes happens that some special thread tap, or some particular size or taper of reamer, which one does not already possess, is required, when it is much quicker and cheaper to make it oneself instead of having one made by a specialist. A few hints on the usual method of manufacture may, therefore, be acceptable to novices. There is nothing new in what follows; but I am only writing for those who know nothing about the subject, and not for proficients.

Taps are generally made in sets of three. Fig. 1 shows the usual forms. Fig. 2 is a section to show the shape of the grooves or flutes. The dotted circle in Fig. 2 represents the bottom of the thread cut by the tap. The shank of the tap, marked *a* in Fig. 1, is turned down to rather less in diameter than the bottom of the thread, so that the tap may be passed right through a hole which has been tapped by it. This saves time which would be occupied in unscrewing the tap. The end of the shank is filed or shaped square to fit the tap-wrench which is used to turn it, if a hand-tap; or has a flat on it, or may be tapered to fit the chuck which holds it, if a machine tap. The thread is cut on a screw-cutting lathe in the usual way. Hand taps are usually finished off a trifle small (a very little), because hardening a tap makes it slightly thicker and shorter, so that it cuts a thread bigger in diameter than the tap was originally cut. Machine taps, however, are generally full, so that screws and bolts will be an easy fit. No definite rule can be given for allowances to be made for alteration in size during hardening, because different brands of steel vary so much.

Experiment with a piece of the steel being used is the only method of determining the amount. Then if the same brand of steel is always used, and the same process gone through in hardening, the same results may reasonably be expected, and the probable variation either in thickness or length allowed for. For all ordinary purposes, however, it does not matter, because the hole is tapped first, and then the screw is made to fit; and no amateur would attempt to make templet taps. Always use good steel for tap-making, and, in fact, for cutting tools generally. It does not pay to use poor stuff, for it will not take a good even temper, and, consequently, will not wear well.

There is no universal rule for the length of taps, but a proportion of about four times the diameter for the length of the threaded portion, and about four times for the length of the shank answers very well, and makes a nice-looking tap. It is better to adopt some system in making all kinds of small tools, so as to have the series uniform. Neglect of this principle is one of the great failings of amateurs and others who only occasionally make their own tools. The proportions given above are shown in Fig. 1, the diameter being taken as unity. The square on the end of the shank is usually made one diameter long.

The number of flutes is usually three, but in very large taps five may be cut, as it saves weakening the tap by cutting deep, and lessens the work on each cutting edge. An *odd* number, however, should always be used. If three flutes are cut, the width of the flute should be one-sixth the circumference of the tap, so that the width of the thread left is equal to the width of the flute. If five are put in, the width of the thread between them should still equal the width of the flutes. This is the proportion usually adopted, and is one easy to work to, and makes the taps look uniform; besides which, it provides plenty of room for the cuttings to lodge as the tap is screwed down: an important factor in the satisfactory working and length of life of a tap or reamer.

The shape of the flutes should be something after the style of those shown in Fig. 2, the corner, B, being well rounded. If a small corner is cut, as in Fig. 3, the tap is very likely to crack in hardening at the point B, and as soon as it comes to be used it will break. Some tap-makers cut the groove as shown at C, Fig. 3, but personally, I prefer Fig. 2, because the cutting face is radial, you get plenty of room for the cuttings without going deep with the flute, and one milling cutter will serve for fluting many different sizes of taps. Three cutters are all that are required for all sizes of taps—one to use from $\frac{1}{2}$ in. downwards, one from $\frac{5}{8}$ in. to 1 in., and a large one for $1\frac{1}{8}$ in. upwards. If the cutting angle of a tap is made too obtuse, and it is a large one, the force required to turn it round is very considerable; while, on the other hand, if it is too acute, although it cuts very freely, it soon gets the edge broken, and is spoiled. A radial face, and the thread only backed off a little, seems to be a good medium, especially for small taps. For large ones the angle may be made more acute, as the threads are stronger in proportion to the amount of metal they have to remove.

The flutes may be cut either in a shaping, milling, or slot-drilling machine, or, failing any of these, in the lathe by means of the slide-rest and overhead motion. This latter method is the one the amateur will most probably adopt. If it is intended to cut the flutes in the lathe, the tap must be fastened rigidly to the face-plate, so as to revolve with it. The ordinary driver will not do for this purpose, as it allows backlash. Fig. 4 shows the driver I generally use. An ordinary carrier is fastened on the shank of the tap. The end of the carrier passes between the two jaws marked *a*, *a*, one of which is tapped at A to receive a screw which holds the carrier fast against the other jaw. Of course an ordinary bell-chuck or jaw-chuck may be used; but I have found the above-mentioned driver so useful, that I consider it well worth the time spent in making it, as it can be used without taking off the face-plate, whereas a chuck cannot. There is one thing in making milling apparatus which should not be lost sight of—always make it strong enough. The action of a milling cutter tends to make the work spring and "chatter," which would effectually prevent a good finish being put on the work, besides, probably,

breaking some of the cutter teeth. To have a good appearance, the flutes should be cut the same length and depth. Nothing looks worse than irregularity in this respect. In fluting, it is best to work round the tap backwards—that is to say, having cut the flute marked *a*, Fig. 3, cut *b*, the one behind it, next; so that you can readily see when you have gone deep enough. If the flutes are cut in a lathe having no dividing-plate, three centre-dots may be made on the boss of the face-plate, so as to divide it into three equal parts, and one on the face of the head-stock as a pointer. The dots are then carefully brought opposite one another, the spindle locked, and the loose head-stock centre screwed up tight before cutting. Start the cutting at the point of the tap. The finishing cut should be a light one, to avoid springing the work as much as possible. The flutes having been cut, the next process is filing the "burrs" off. It will be noticed that a considerable "burr" is left on what will be the cutting face of the tap, spoiling the shape of the thread. This must be got rid of. By filing the face a little the "burr" may easily be broken off, using a chaser or anything of that kind for the purpose. On no account should the sides of the thread be touched with a file.

The threads will now require backing off to give them clearance. The taper tap will require the most clearance, the plug tap the least. The plug tap, in fact, has very little to do, being merely to ensure the holes being the same size and to cut a full thread at the bottom of a hole. There should be very little clearance from the circle, but a little is necessary. The next thing is to stamp on the diameter of the tap and number of threads per inch, with the maker's name, if thought requisite, as shown in Fig. 1. Squaring the end of the shank is also sometimes left till now. Reamers are generally stamped with the diameter, or the taper per foot if tapered.

The taps are now ready for hardening. This is by far the most difficult part of the job, owing to the uncertain behaviour of the steel. Before the steel is used at all it should be thoroughly softened by heating it to a dull red, and leaving in sawdust till cold. It is then much better to work, and is more likely to harden properly. One of the most annoying things in tap-making is to find a long tap or reamer, on which great trouble has been spent, bent or crooked after hardening, perhaps to such an extent as to render it useless. This is an occurrence which amateurs often experience. Annealing before using tends to lessen the danger, while much hammering increases it. If possible, therefore, a tap or reamer should be turned down to shape out of the solid, and not forged. If forging is necessary, the steel should be thoroughly annealed after it, then roughed out in the lathe and annealed again. Hammering sets up strains in the metal, which suddenly show themselves in hardening by causing the metal to bend. Roughing out even, if a heavy cut be taken, may cause strains, which may affect the satisfactory hardening. If the greatest accuracy of size and pitch is required in a tap, it is best to anneal after roughing out in all cases, whether the tap has been forged or not.

As to the proper heat for hardening, a deal depends on the particular brand of steel being used. Some steel will harden at a lower temperature than others, and the best heat is undoubtedly the lowest which will give the requisite degree of hardness. Experiment only will decide what this heat is. It is very little trouble to try a piece, and it may save a deal of time and money. Of course you have only the eye by which to judge the heat, and some practice is required to tell properly when two pieces of steel have been heated to about the same degree. Any way, steel must not be overheated, for *burnt* steel is undoubtedly *spoilt* steel. What smiths call "cherry red" is about right as a rule. In heating, the greatest care must be taken to heat evenly, and to prevent burning the thin cutting edges before the thicker part is properly hot. The fire should be clean and bright, but not too hot. It is a good thing when hardening taps or milling cutters to get them slightly red, and cover them with the ordinary mixture used for case-hardening, and then continue the heating. This has a tendency to prevent the cutting edges being burnt.

In spite of the quantity of different mixtures which are given as hardening medium, I prefer water. The ordinary cooling trough in the smithy will do as well as anything if the water is not greasy or too warm. Never try to harden a large tap in a small quantity of water. Always have the tank large enough, and plunge the tap steadily and quickly in, holding it meanwhile in a vertical position. If the tap is plunged in in an inclined position, it is nearly sure to be crooked.

When the hardening is accomplished the flutes must be brightened with emery-cloth. About half an inch of the shank nearest the thread should also be polished to show the colour while tempering.

Tempering should be done slowly. The slower the steel is heated the more uniform the temper is likely to be, and consequently the less likely are you to have the cutting edges too soft, while the rest of the metal is too hard: a frequent fault with novices, and one which is ruinous to the lasting qualities of the tool, as the edges wear away almost immediately it is used. If the temper is let down too low, the only thing is to re-harden and try again. A few failures must be expected at first, as some experience is required to tell when the temper is just right.

A good way of tempering taps, reamers, and tools of that class, when there are not many to do, is to get some pieces of tubing large enough to let the tap pass easily in. Get one of these pieces to a nice red heat, and then commence to heat the next, so that as you are using one and it cools, the next is getting ready. The tap should be oiled all over, and held with a pair of tongs in the hot tube, which may rest on a V block on the anvil. The tap must not be held still, but be moved about and turned round, keeping it meanwhile in the middle of the hot tube so as to temper it evenly. The colour must be carefully watched on the brightened parts until it reaches a "nut brown," or "dark straw" colour, when the tap must be rapidly cooled in water. These colours are rather difficult to describe, but by examining a new tap or milling cutter it is readily seen and should be carefully noted. If the tap is only intended to be used on brass, it may be left harder.

After tempering, the shank is polished

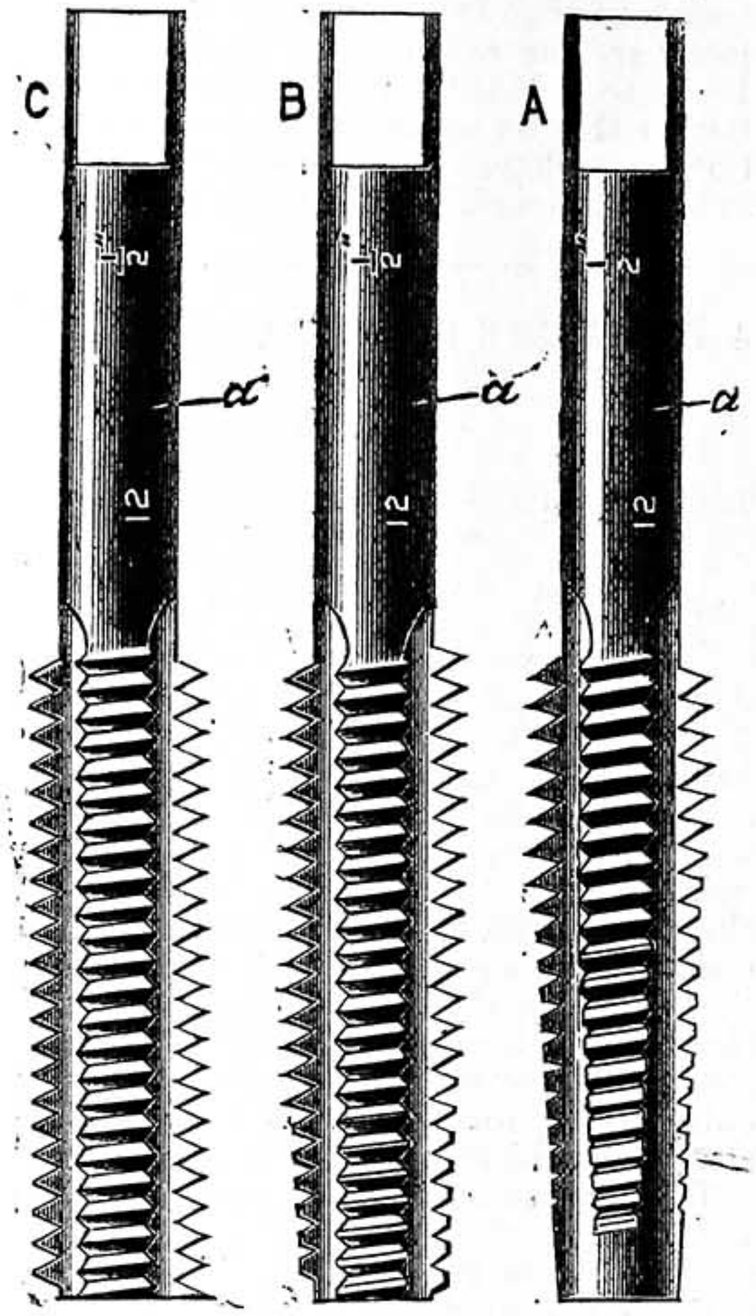


Fig. 1.—Taps of usual Form in Set of Three—A, Taper Tap; B, Tap; C, Plug Tap.

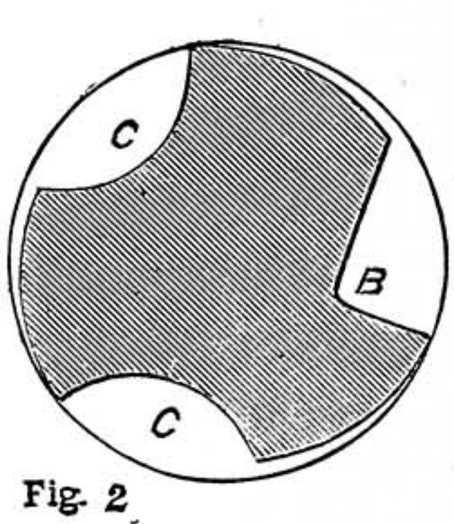


Fig. 2.

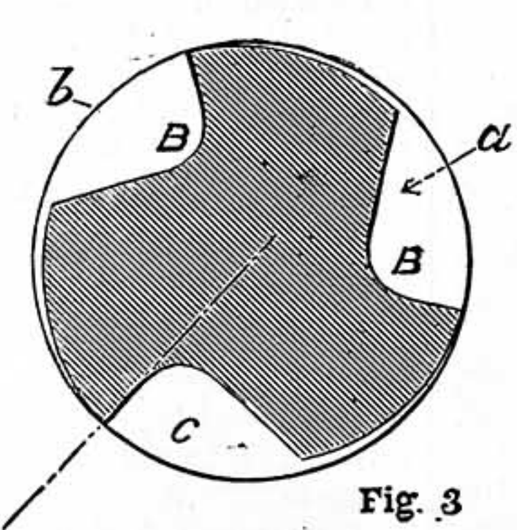


Fig. 3.

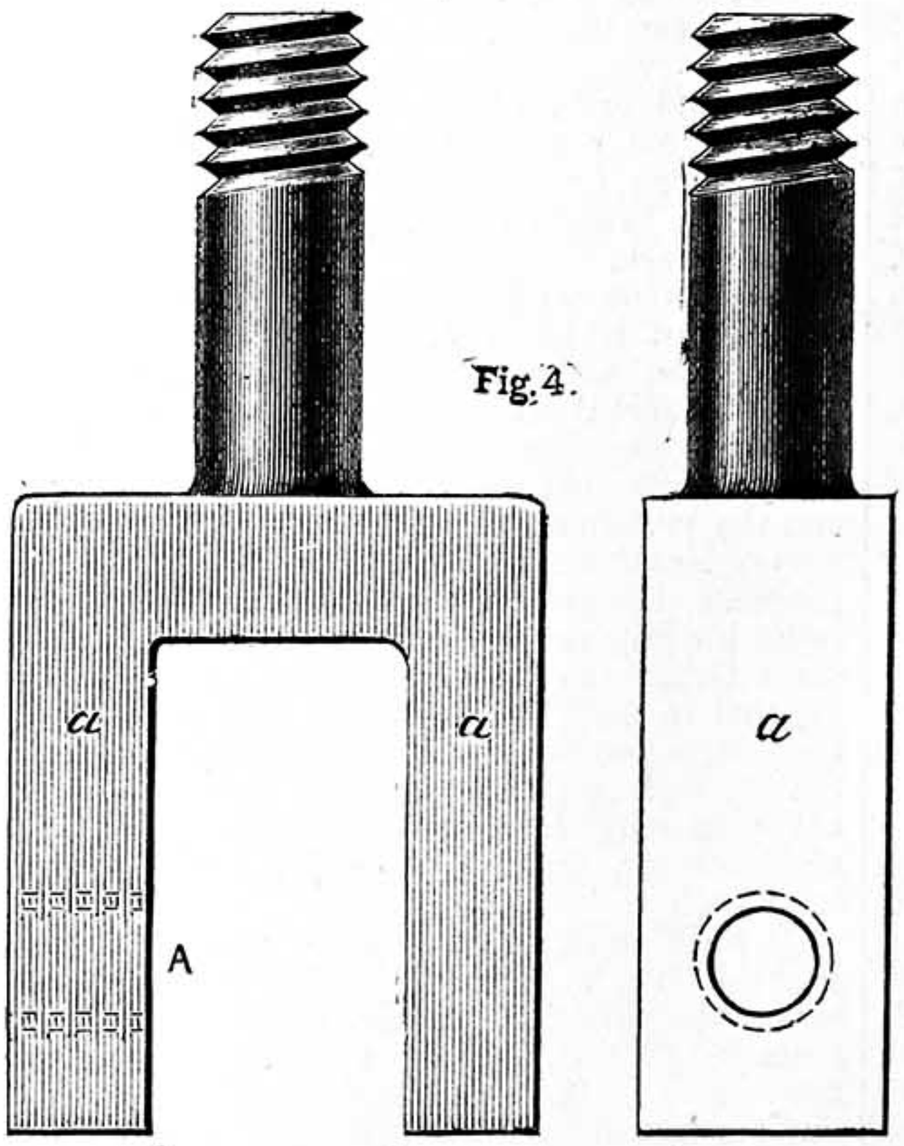


Fig. 4.

Fig. 2.—Section showing shape of Grooves or Flutes, with Cutting Faces Radial. Fig. 3.—Section with Corner Cut at B. Fig. 4.—Driver—A shows where Tapped for Screw.

in the lathe, leaving the colour on the flutes and about a quarter of an inch up the shank. The tap is then oiled all over, and is ready for use.

The method followed in making reamers is similar to that followed in making taps, In turning they are usually left full, and ground to templet size after hardening and tempering. If the reamer hardens a bit crooked it will often grind up to size. In fluting, cut a little deep, to allow for this grinding. More flutes are usually put in reamers than in taps; an inch reamer may have nine, or even more, depending on the nature of the work to be done with it. A good pitch for the flutes is from $\frac{1}{4}$ in. to $\frac{5}{16}$ in. Always put in an *odd* number of flutes. If there are longitudinal grooves in the hole to be reamed, the flutes should be cut spirally. Reamers are somewhat given to "chattering." An irregular spacing of the flutes in a great measure obviates this, and should always, if possible, be adopted. The difference of spacing must only be slight, about ·0025 being quite sufficient. The cutting faces should be radial; the bearing surfaces should be narrow. In backing off, much clearance should not be given, but a little is necessary to allow the cuttings to get clear of the bearing surfaces, or they will make the hole rough. If too much clearance is given the chances of chattering are increased, which will cause the cutting edges to wear very fast, or perhaps break, and the reamer will be spoiled. For brass or gun-metal more clearance may be given than for iron, and the temper may be left quite hard.

In conclusion, I hope these few notes will make the paths of the novice in tap-making a little smoother. The hardening will be found to be the greatest difficulty; the way in which a well-finished tap or reamer will bend or crack is most exasperating after some hours have been spent on it. Thoroughly annealing the steel before using, and leaving no sharp corners in the flutes, will do much to prevent these two evils.

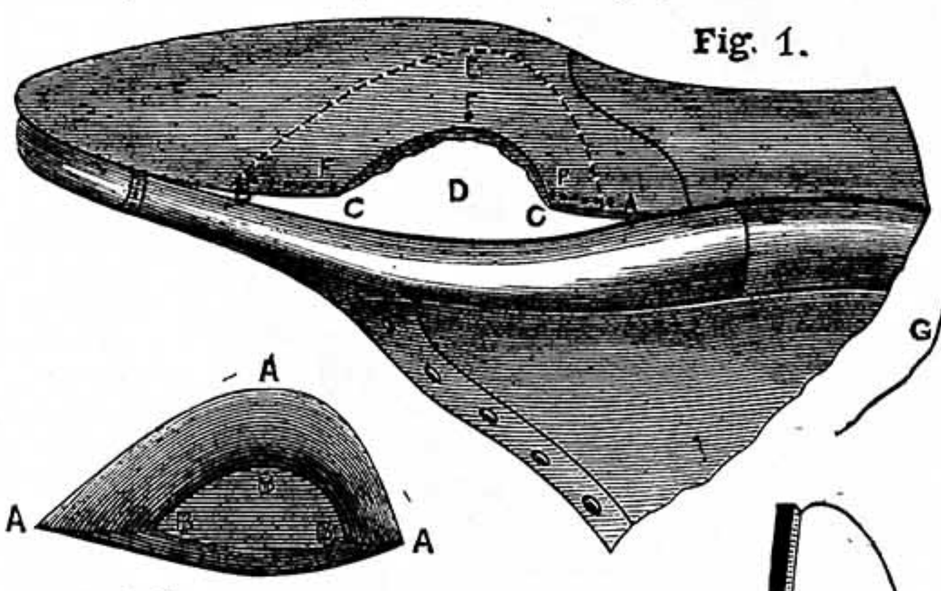


Fig. 1.

Fig. 2.

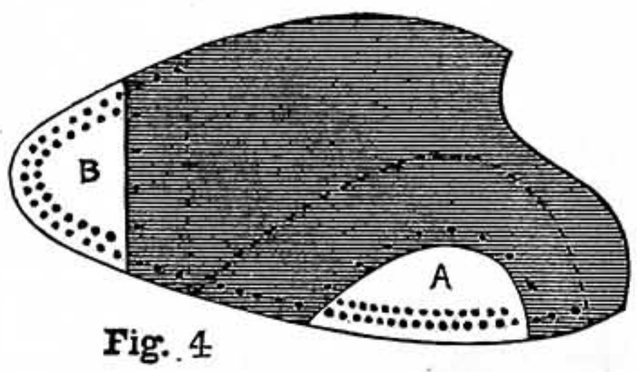


Fig. 4.

Fig. 3.

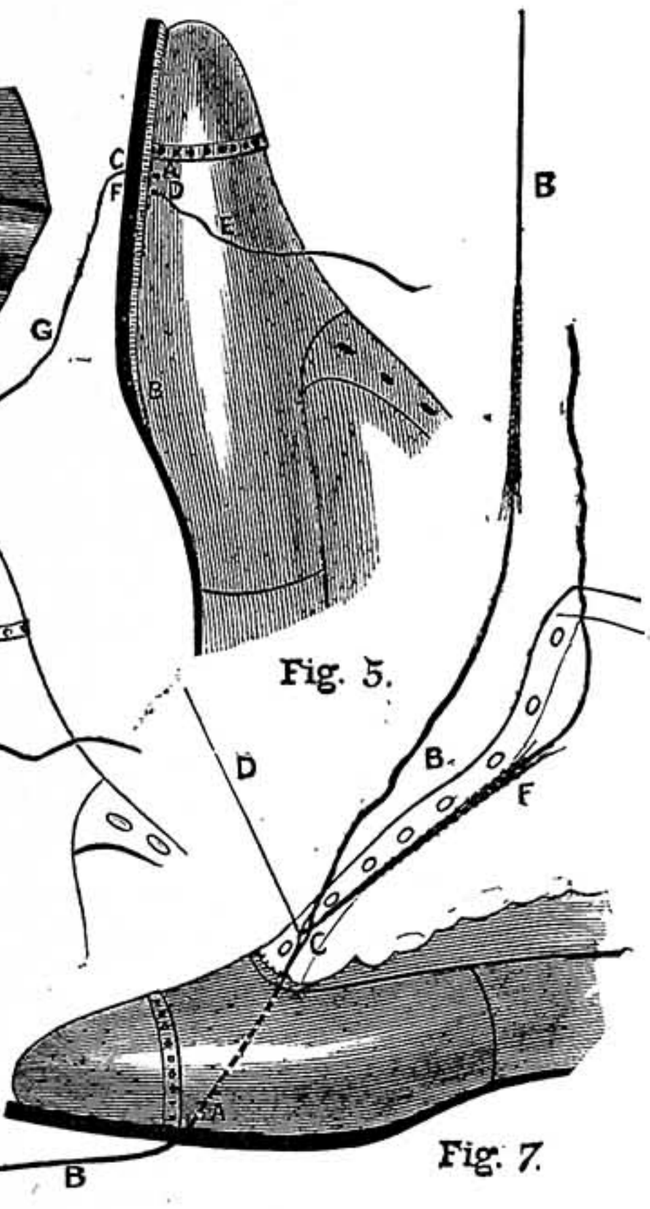


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 1.—Section of Boot, with Sole Prised and Fitted to receive Underlay. Fig. 2.—Underlay, showing way to Fit and Skive it. Fig. 3.—A Skiver for Levelling. Fig. 4.—Half Sole, showing how to Underlay and Toepiece, and where Nails should be close to resist Wear. Fig. 5.—The Way to Loop-Stitch the Upper to the Sole. Fig. 6.—The way to make use of the Seat-Stitch in the forepart. Fig. 7.—The Way to Stitch-Draw, or a Substitute for Blind-Stabbing.

BOOT AND SHOE REPAIRING.

BY W. GREENFIELD.

UNDERLAYING—TOE-PIECING — THE LOOP-STITCH—THE SEAT-STITCH—HOW TO STITCH-DRAW.

WE will now deal with the minor subjects in repairs that have connection with the sole, or bottom.

By underlaying is meant putting a piece under a sole where it is worn. Many people wear away the sole very quickly on the outside, while a few do just the same on the inside, and in either case an underlay in time will often save a sole.

When this kind of repairing is necessary most shoemakers (if they term themselves such) put the piece on outside—on top. This they do because it is less trouble, but I want you to spare no pains to do a small job well, because it is that alone that will make a large one come easy. Besides, anything that needs repairing is quite old enough. What it wants is to be made to look as much like new as possible.

To underlay, a last or iron foot must be put inside to keep the part that wants repairing quite solid. If the boot is machine or hand-sewn, rip it with a knife from A to B (Fig. 1), and lift it up as C C. If it is riveted it will have to be prised up with a chisel, and the rivets drawn out from A to C and B to C. Then cut out a piece of good sole leather, wetted, to the shape of Fig. 2; roughly skive it round the curved side, A A A, and then push it under the old leather at D (Fig. 1), but not quite as far as you know it will have to go; then trim the old leather round from C to C with a knife, not taking off much, but all that is weak and thin, and being careful not to cut the new leather if you can help it. This done, knock the piece in to where it is wanted—that is, the dotted line E—and now draw a pencil mark round the curve you have cut, from C to C, on the new piece. Take the piece out again, and from the line B B and B scoop it out with the knife to A A and A, in the same way that you did the old in grafting a half sole, for in that case the old leather had to receive the new, and in this the new has to receive the old (C C, Fig. 1). Now put the piece in again, and put three short rivets in at F, F, F. Trim up the edge, leaving it quite full to allow for graving, rasping, etc.

If the boot is hand-sewn, then it must be sewn down from A to B, and it will look neater if a channel is cut in the new piece to receive the stitch, but as I shall have to give full particulars of this in another article, it will be out of place here, so it must be sewn through in the same way that the patch on the upper is sewn down. If it is riveted or machine sewn it can be riveted down from A to B, about the same distance from the edge, and in a like manner to that shown in half soling, in No. 112 of WORK, and in either case the edge can be knifed, pared, rasped, and finished as there described.

When a boot is worn very bad the underlay is not always enough to make the edge the proper substance; then a little piece equal to what you want to fill that vacant place can be skived off a piece of hard sole leather, well wet, somewhat the shape of Fig. 3, put under the layer and riveted, or sewn down with it.

Toe-piecing. That is nearly a similar thing to underlaying, only it is at the toe; but everything is fitted and done in the same way as shown by A and B (Fig. 4), which also shows how they should be nailed both on the old and new leather, and that it is often wise to put an underlay and toe-piece as well to a sole—more especially if the boot is old—as it saves a sole, and uses up the odd pieces of leather.

It sometimes happens that the upper leaves the sole for some distance along the side of the boot, say from A to B (Fig. 5). One way to sew this to the sole again is by loop-stitching it; the loop, which is inside and draws the upper to the sole, can be set at every stitch, or each alternate one, but take care not to make the holes too large in the upper. To proceed, make a hole with the sewing awl through the sole from A to C, draw the thread through, and halve it; then with a fine stab awl make a hole in the upper; at A put the right hand end through, and draw it out through the inside of the boot; make another hole at D and draw the end through to the outside, as shown by E. The hole is found inside, as shown in the last article on blind-stabbing; though for such work as this it can be done another way, which I will show here, by the stitch-draw, later on.

When you are thus far, make another hole through the sole from D to F; put the left end (C) in first, then the right (E), pull them tight on both sides, and the loop-stitch is set.

Another way is the seat-stitch. For this a row of rather long stitches are set in the upper, as from A to B (Fig. 6). This can be done with a stout stab awl and a sewing thread (about 9 cord of "Patent, No. 9"), with the stitches quite close to the sole. Then, at A, bore a hole through the sole, as A C (Fig. 5), being careful to make it exactly opposite the centre of the first stitch on the upper, A (Fig. 6); then lift up this stitch by putting the point of the sewing awl under. Then put one end through this stitch and the hole you have made in the sole, and halve thread as above. This leaves one end in the sole on the left and one through the

stitch on the right, as at C and D, only there are three stitches set to show how each stitch is caught up and drawn down: the two loops at B are only left loose to illustrate. Of course, each stitch must be pulled in quite tight, as it is that that draws the upper to the sole.

The stitch-draw is a ready means of finding the hole inside a boot, where it cannot be seen. We will take, for instance (Fig. 7), the fore part of a boot, and that you want to get a bristle through at A from the inside; well, B B B must be a spare end; it can be put through the hole A from the outside, and drawn nearly through; then, some little distance away from the bristle, say at C, a hole can be made with a fine awl; then take one end of the thread you are going to sew with and put the bristle D through the hole C, till you get to the junction of the bristle where the thread goes between, as shown at C; then pull the thread, B B B at E, back again until the bristle D F is through to the outside; take it out of B B B, hold it at D with the left hand, while B B B is pulled through with the right from the inside.

This, it will be seen, is blind-stabbing, with less learning. But when blind-stabbing is learnt it will prove, although this is very handy, it is blind-stabbing with less speed.

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.*

53.—MASSEY'S SMALL LAUNCH ENGINES.

I TAKE the opportunity afforded me in the present number of WORK to call the attention of my readers to the specialities of Mr. Henry B. Massey, Engineer and Machine Tool Maker, Spalding, Lincolnshire, a manufacturer of amateurs' lathes, planing and milling machines, etc., who is well known in the Eastern Counties. It is not for these only, however, that he is noted, as he is a maker, also, of steam launch engines, one of which, an entirely new design, is illustrated in Fig. 1. These engines are of improved construction, having double steam jacketed cylinders and valve boxes in one casting, supported, as may be seen, on six forged steel pillars, which tend to render the engine as light as possible, and also imparts great strength to it just where it is most needed. The outside of the steam jacket is lagged with mahogany, and fitted with polished brass bands, giving the engine a neat appearance. Each

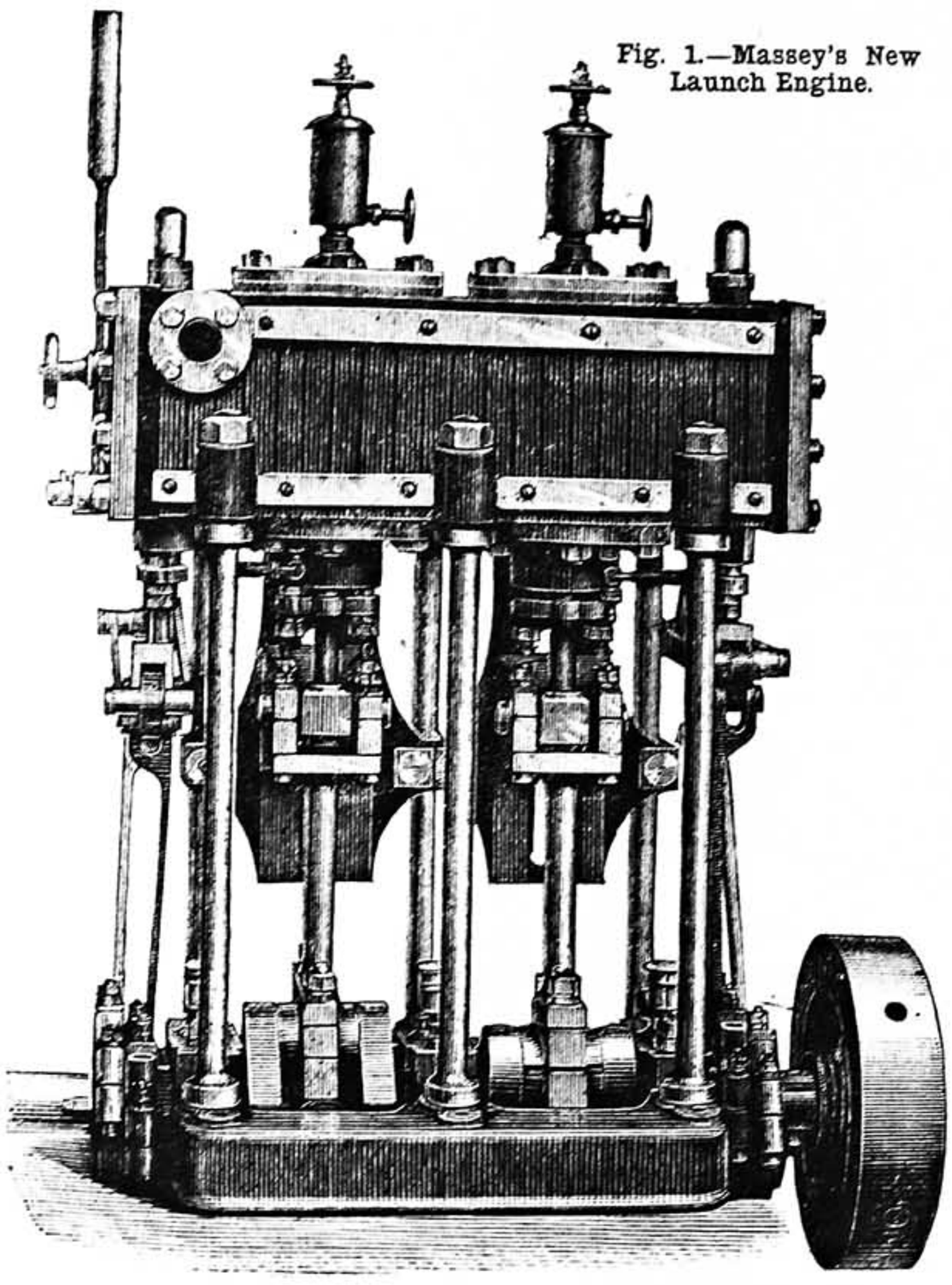


Fig. 1.—Massey's New Launch Engine.

piston is fitted with three steel rings. The crank shaft is of a special combination of cast steel and iron, which renders it very tough and strong. The reversing handle can be either vertical or horizontal as may suit the convenience of customers. The main bearings, eccentric straps, guide plates, glands, etc., are of hard gun metal, and set up with double nuts. The smallest size has a bore of 2½ in. and 3 in. stroke, and is suitable for driving a boat about twenty-five feet long. The price of the engine is £30. The illustration in Fig. 1 is from a drawing of an engine with 5 in. cylinders and 5 in. stroke, the price of which is £55. Intermediate and larger sizes are supplied at proportionate prices.

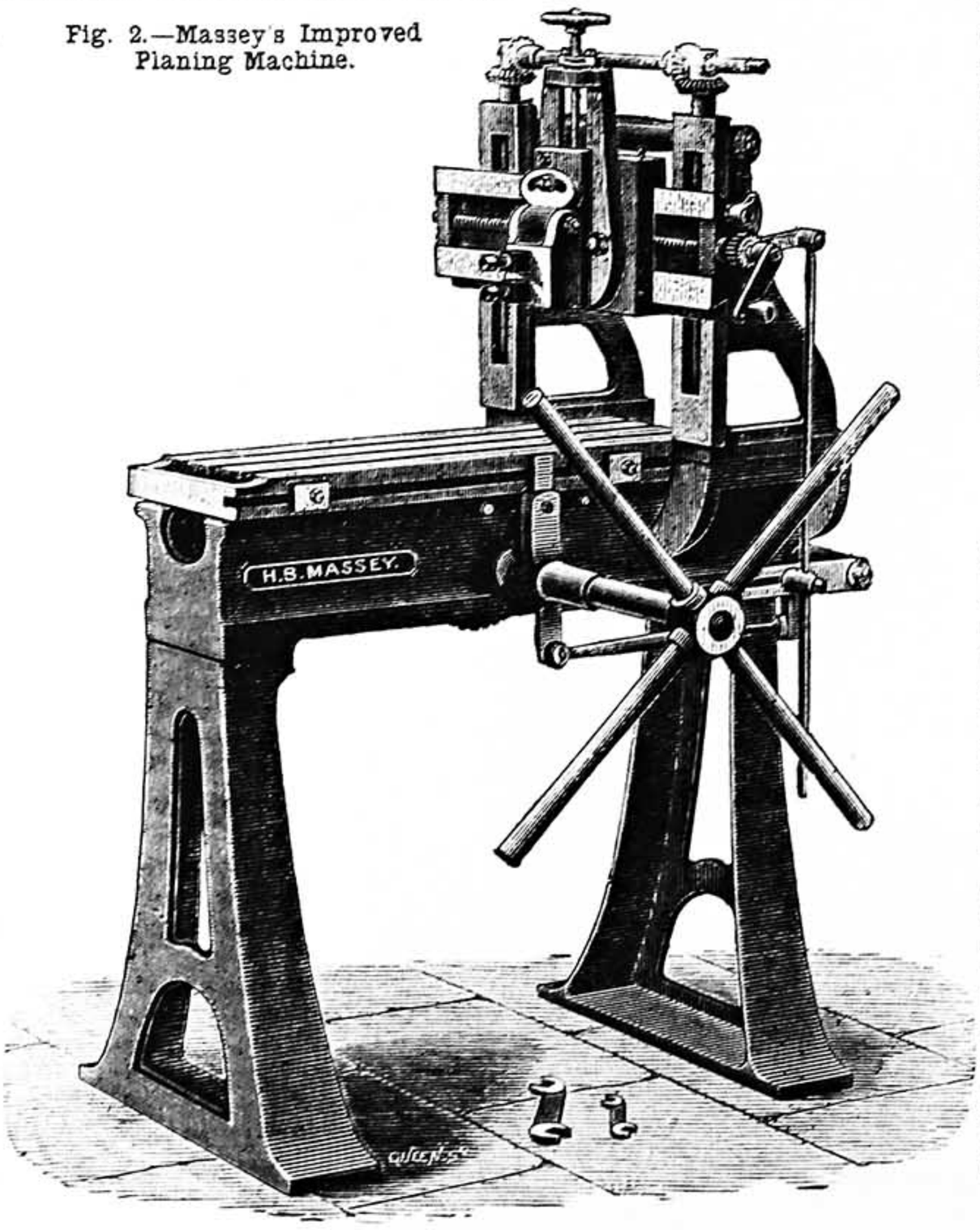


Fig. 2.—Massey's Improved Planing Machine.

54.—MASSEY'S IMPROVED PLANING MACHINES.

These planing machines are manufactured in five sizes, the three smaller sizes being specially suitable for the requirements of amateur engineers and others who require, and are desirous of doing, small but good work. They are of sufficient strength to take good cuts off any sized piece of work that they are capable of taking in, and are provided with a self-acting feed motion in the horizontal cut. The fiddle slide is made specially strong for vertical cutting, and is graduated for angular work. The T-slots in the tables of all the machines are cut from the solid metal, and all heading screws are of steel. The two larger sizes are similar in design to the smaller ones, and suitable for the purposes of mechanics, electricians, and amateurs requiring to do a larger class of work. Nos. 1 and 1A machines are fitted on short standards for bench, and plane in length 14 in. and 18 in. respectively. They are sold—No. 1 at £12, and No. 1A at £15. No. 2 size, which is represented in Fig. 2, planes 24 in. long by 12 in. wide and 10 in. deep. This is a hand-power machine, and is sold at £20. Nos. 3 and 4 machines plane, the one 3 feet, and the other 4 feet in length, and are made to drive either by hand-power or by steam-power, or by both. The prices of these machines are £30 and £36 respectively. Various forms of vices and special chuckings for angle work are made to suit all sizes of machines. The construction of these machines are sufficiently apparent from the illustration that has been given of No. 2 size, and there will, in consequence, be no necessity for saying anything further with reference to its parts and action.

55.—WATCH AND CLOCK MAKING.

Readers of WORK should not lose sight of the excellent series of scientific handbooks, entitled "Manuals of Technology," published by Messrs. Cassell & Company, Limited, and edited by Professor Ayrton, F.R.S., and R. Wormell, D.Sc., M.A. Neither professional clock and watch makers nor amateurs who like to try their hand at cleaning their own clocks should be without the manual. "Watch and Clock Making," written by Mr. David Glasgow, Vice-President of the British Horological Institute. It affords, first of all, a clear and succinct account of the progress of the watch and clock trade from the earliest time to the present day, and then proceeds to deal with the theory and practice of every branch of the art in an intelligible and exhaustive manner. For practical workmen it forms a most desirable book of reference.

THE EDITOR.

SUGGESTIONS FOR WORKERS AND HINTS TO INVENTORS.

A PERPETUAL CLOCK.—Mr. Justice Day has written a letter praising a new device in clocks, the invention, it is said, of a Leeds gentleman. He claims that his clocks are driven solely by natural electricity from the earth itself. If so, this opens up an entirely new field for invention, and, in effect, gives the world a new motor power. We cannot help thinking, however, that the vague description given of this new departure in horology scarcely conveys a very clear description of what is actually accomplished. An anode and cathode must, at all events, be used, and one of these must sensibly deteriorate within a limited period. But the idea is attractive and those having a taste that way might profitably experiment. A sufficiently powerful current once obtained, the mechanical arrangement offers no difficulty whatever.

TYPE WRITERS.—Patent agents are often asked what particular invention would be most likely to prove profitable to the designer, and a very common answer is a really cheap key-type writer. There are many machines in the market, such as the "Merritt," "Columbia," &c., which print beautifully, but do not allow the user to attain the speed necessary for such work. The key writers hitherto produced are excellent machines, almost every one of them possessing some distinctive feature, but the cheapest costs ten guineas. A machine that would sell for two or, at most, three, while retaining a key action, would probably be the most profitable invention of its year.

ELECTRICAL PLANT GROWING.—Although the suggestion that the electric current would materially hasten the growth of plants has been here and there followed up, nothing like concerted action, under circumstances which would effectively preclude even unintentional deception, has yet been attempted. We might suggest to our readers that they might render good service, both to science and horticulture, if they arranged to try the experiment in concert at some large market garden establishment, where comparison of the electric and non-electric methods of cultivation could be publicly and accurately tested. If the assertions occasionally made are true, the former will, ere long, come into fashion, and will conduce to the material benefit of its users. An American journal gives as the result of recent experiments by a correspondent a saving of one week out of five in raising lettuce and similar plants. This would be worth securing if the expense were not too great, but upon this point no specific information is to hand. Meanwhile, experiments nearer home would be of interest.

AN EASILY MADE ÆOLIAN HARP.—One of the simplest and easiest ways of making an Æolian harp is to take a plain piece of common deal, about an inch shorter than the window in which the harp is to be fixed, and as wide as it may be desired to make it, dovetailing or mortising the ends into two channelled, round pieces of wood of the same width, so that the whole will loosely fit the window frame. Elastic bands, or pieces of india-rubber cord, of varying thicknesses should then be passed into the channels at the two ends, which will thus keep three, five, or as many elastic cords as may be desired, stretched close to, but not touching, the deal centre-board. This is placed in the window frame, and the window drawn down when the arrangement is complete.

The channels in the cords may be of any desired depth, provided they keep the strings clear of the centre-board and of the bottom of the sash. Square or half-round pieces may be used for the ends, but to those possessing a lathe it will be easier to make them circular, cutting the channels at the same time; or a piece so turned may be cut in half longitudinally and nailed or screwed to the centre-board ends. No very neat fitting is required, and the harp when completed furnishes much amusement to children. Of course, the sound is somewhat different to that given by a harp with metal strings, but it is not unmusical, and the elastic bands or cords are very sensitive to a current of air.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

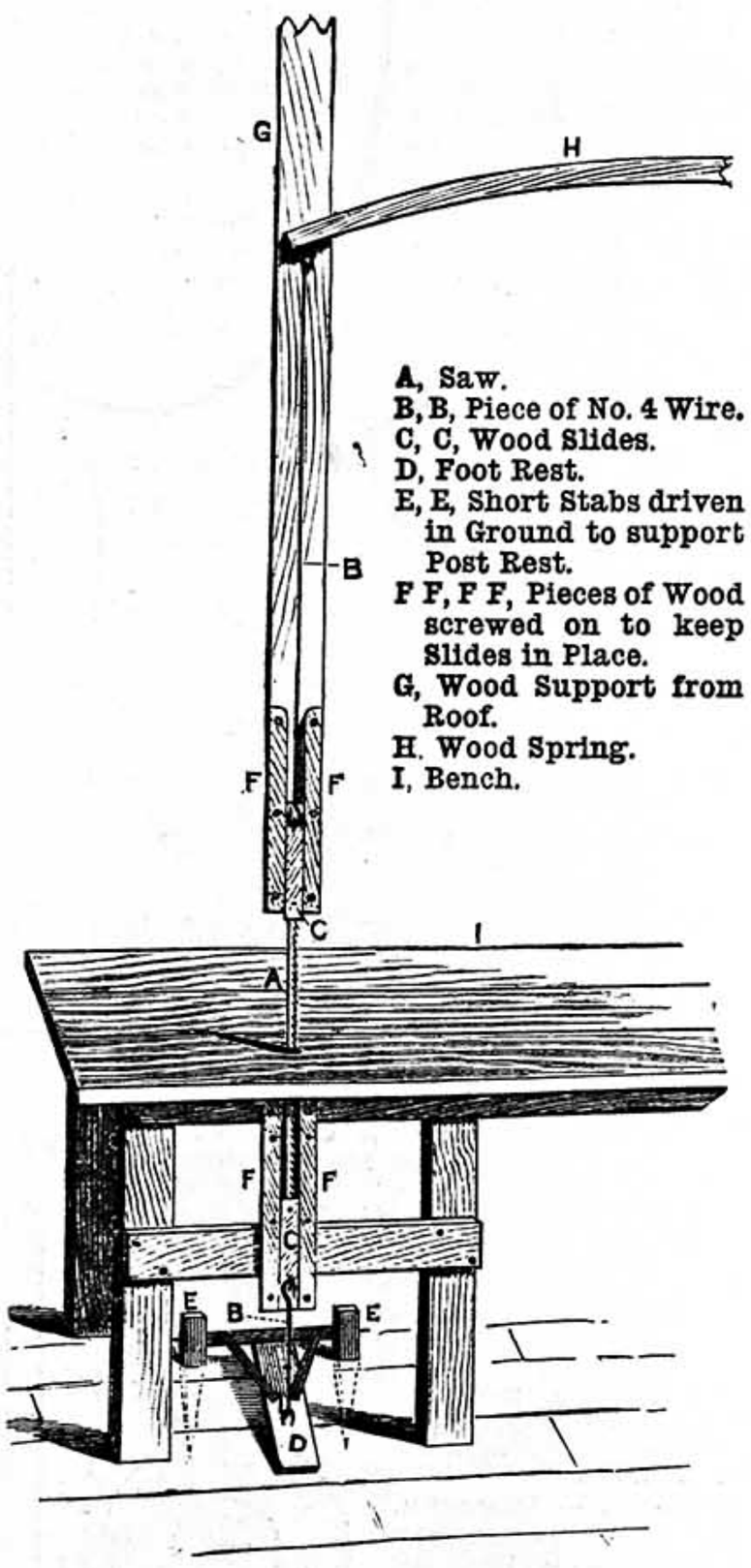
**** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

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.*

I.—LETTERS FROM CORRESPONDENTS.

Cotton Belting.—Erratum.—J. N. (*York*) writes:—"In the answer to S. A. & Co. (*Stockport*), page 254, Vol. III., '56 feet' should read 5,656 feet per minute as the running rate of the cotton rope referred to."

Saw.—W. W. (*Caverton*) writes:—"I send herewith a sketch of a saw I have just put up, which I find works delightfully. It cuts 1½ in. stuff just like



Saw.

cheese, and I think it is the simplest saw that could be made. If there is anything that is not quite clear, I shall be glad to answer any questions about it in 'Shop.' C, C are slides kept in their places as a dovetail, and there is a weight of about two stones on the foot-board."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Gas Engine Slide Valves.—JACK.—I don't think you can re-face the valve of your gas-engine unless you are an engine-fitter, and accustomed to the use of file and scraper. There must be four surfaces to get up, also the valve must be perfectly parallel. You would require a couple of files and a scraper, and a good surface-plate. It is not likely the valve would be cut deeply enough to require planing.—F. A. M.

Developer.—PHOTOGRAPHER.—The developer you refer to is Secretan's New White Developer for dry plates, lantern plates, Argentic bromide paper and opals, which can be used for either plates or paper without fear of fog or stain. For short exposures it is invaluable, and if diluted with an equal quantity of water, and more time given, will develop every detail without any tendency to hardness. For paper pictures the ordinary developer diluted with twice its bulk of water is most valuable. There is no fear of any stain, in fact, prints can be taken out of the developer and placed in hypo without washing, and no stain will occur; it is, however, advisable to wash in water before fixing. No acid water is needed. The ordinary developer gives great sparkle and delicacy in lantern slides and clear glass in shadows. In any case the developer can be used continuously for a number of exposures, thus avoiding the necessity of mixing fresh solution for each development.—D.

Writing on Glass.—J. S. (*Cardiff*).—For handbooks on this subject write for particulars and prices to The Decorative Art Journals Co., 15, St. Ann Street, Manchester, and to Messrs. Brodie and Middleton, Long Acre, London, W.C.—H. L. B.

Price for Lettering Signs.—SKIBO.—Find out what are the approximate charges that are ruling in your neighbourhood. Prices also depend upon the class of work required and the skill of the workman.—H. L. B.

WORK Numbers, etc.—E. G. (*Nottingham*).—There are fifty-two numbers in each yearly volume of WORK. Volume II. began with No. 53, and ended with No. 104. The price of back numbers is one penny. All the back numbers can be had of the publishers, Cassell & Co., Limited, Ludgate Hill, London, E.C.

WORK Volumes and Contents.—W. C. (*London, E.*).—The price of the volume of WORK is 7s. 6d. through any bookseller. The Indexes to Volumes I. and I. and II. are published at one penny each.

Chamfer Plane.—Y. R. (*Middlesboro'*).—I have not seen a plane like yours, and think it would not work well. The cutter, fixed as you show, would penetrate too deeply at first, and its fixing would give way. Better get a plane maker to get out a plane suitable for the purpose. The fault in yours is that there is no wood or other material fitting the curved surface, and limiting the penetration of the cutting edge.—B. A. B.

To Strop a Razor.—RAZOR.—The two articles mentioned by you were written by different people, so that the terms used by one would not necessarily be employed by the other. In the article "How to Strop a Razor," I make no mention of the term "lines of friction," but you are wrong when you say these cross one another in that article. Note the lines on razor in Fig. 5 in article "Setting a Razor":—"They are slightly inclined from the handle and back towards the point and cutting edge." These lines should have been rather more inclined to agree with the position of razor on the stone (Figs. 1 and 2); but as they are only to illustrate what the meaning of open and crossed lines are, they answer the purpose very well. If you will now turn to the article "How to Strop a Razor" (see No. 105, page 7), and note the position of razor, A, Fig. 1, and imagine the path it takes while descending to D, Fig. 2, the lines of friction *on the razor* will take the same direction as those recommended in article "Setting a Razor" (see No. 100, page 782): that is, inclined from the handle and back towards the point and cutting edge. On reversal, B, Fig. 1, is drawn upwards till it assumes position C, Fig. 2; again, the lines of friction are from the handle and back towards the point and cutting edge. The only crossings of the line of friction I can see is that, on the upward stroke of the razor, it crosses at an angle on the strop the path which the razor formed on the downward stroke. This is the only case in which the lines do cross. If in "Setting a Razor" (Figs. 1 and 2) the tool were held at right angles to the stone and pushed forward, and at the same at an angle across it, and always worked in the same angle, the same effect would be obtained as by holding it at an angle and pushing it straight forward, as advised. I, in stropping a razor, proceed by the former of these methods: that is, hold the razor almost square across the strop while drawing it upwards and sideways, or reversed. I hope you will be able to follow these few notes.—P. B. H.

Improved Bottle.—LONG VALLEY.—So far as we can gather from the particulars sent us, we fail to see any novelty in the plan proposed, inasmuch as we used just such an arrangement over thirty-five years ago, and found it very convenient, as it possessed all the benefits and advantages proposed in the description. The words suggested as a title for a trade mark would not be registered, as they would be held to be "descriptive" not "distinctive," which the law and ruling of the courts hold no valid trade mark may be. If a trade mark is obtained as a separate property from the patent, the right conferred thereby becomes the property of the public directly the patent right expires. An inventor may, of course, prepare his own title, specification and claims, and put them in himself, and in many cases will do better by this than in seeking the aid of an "agent," who, in too many cases, is incapable of affording an inventor any useful aid in obtaining a sound and valid patent, as far too many are merely copying clerks, law writers, amateur dabblers, and otherwise unqualified and unable to afford what is essential for obtaining of a sound patent, or, otherwise, a legal property; in either case he would not secure what he seeks, and is supposed to desire, when he decides on applying for the grant of a patent. An inventor under such circumstances is in the position of the captain of a

ship, with no chart on board, seeking to enter a strange port on a dark night without the aid of a properly skilled pilot to take him in, and about as likely to succeed. There is no difficulty in any one getting a patent granted in response to his application, but then, if it is not a valid one, capable of securing the support of the law to sustain it, what good is it? There is not a day that passes that at least half a dozen useless, imperfect, and invalid patents are not applied for, and if put in, in accordance with the rules as to the size of the paper, etc., are granted to the applicants, but until they have passed the ordeal of the law courts are not a decided property.—C.E.

Water-proof Cloth.—A.M.—(*Conndon*).—We have never heard of the material named being applied to the purpose mentioned. What we have always seen used in the interior has been pitch, which, so far as we know, fully answers the purpose required. We have inquired of various persons who are engaged in the business here in London, but they, none of them, ever heard of it being so used. There is a cheap material employed for covering the exterior which may be had of Messrs. Dottridge Brothers, Dorset Works, East Road, London, N., who supply all that is necessary and required in the business, and if A. M. will send his trade card and inquiries, we have no doubt they will furnish him with all particulars, prices. etc.—C. E.

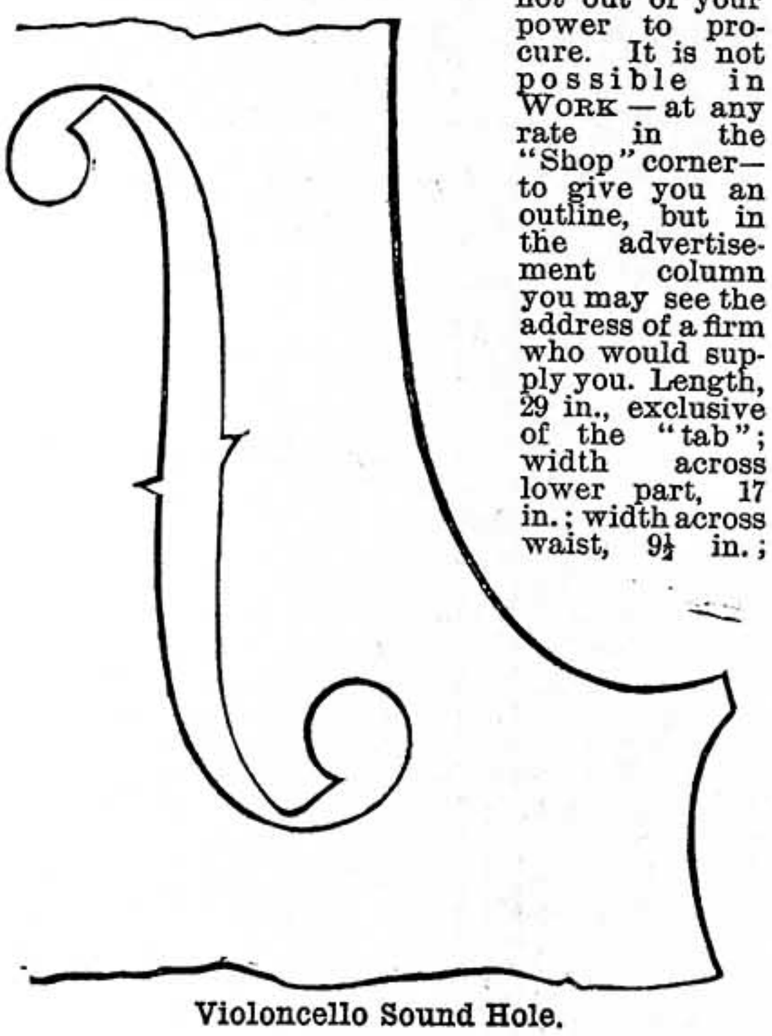
Trade Marks.—LONG VALLEY will, doubtless, have seen that his former letter has been answered in due course, before this can appear.—C. C. C.

Engine Cover.—W. (*Hough, near Grantham*).—Sailcloth makers produce a special material for this purpose called "tarpaulin canvas," which is well suited for the object in view, and moderate in price, being very strong. To make it, measure the length of the engine with the funnel lowered, over all down to the lowest point it is desired to cover, and do the same over the breadth of the engine. This will give the area of the cover, *i.e.*, length by breadth. This canvas is, we believe, woven in breadths of twenty inches wide; therefore, to ascertain how much will be required, turn the number of feet into inches and divide them by twenty, the result will be the number of breadths needed to give the width, and the length in feet multiplied by the number of breadths, and, divided by three, will give the number of yards required. The canvas must then be sewed together with a "sailmaker's seam," using untarred sail twine, and the edges may be doubled in and stitched so as to form a broadish hem, or be roped round after sewing on a rope or line of the size selected. Now spread the cover out on a boarded floor, and tack it down at the four corners to keep it steady and even. If it be desired to make it a "tarpaulin" cover, get some Stockholm or vegetable tar—taking care *not* to use coal or gas tar—make it boiling hot, taking great care that it *does not boil over*, or there may be a job for the nearest fire brigade, and when it has got thoroughly heated it is then fit for use. Whilst this is being done, under the charge of someone to keep it stirred and lift it off when it seems likely to boil over, you should, with a whitewash brush and a bucket of water, brush the canvas all over—taking care to do it evenly—letting it absorb a good dose of water, and then with a long-handled tar brush apply the hot tar evenly and liberally all over it, and it will be found that as the water evaporates, the tar will dry into the canvas and be absorbed into its very substance. In a couple of days' time, if the weather is dry and hot, you may give it a second dressing of hot tar—this time omitting the water—and, when dry, it is fit for use, unless it be preferred to give it a third coat before using, which will be beneficial. In case the tar may be objected to the cover may be waterproofed in the following manner. Take 1lb. soft soap, 1 gallon boiling water, 3 lbs. mixed paint of any desired colour, mix them well together and coat the canvas evenly all over with it. When dry it may be finished off with one or two coats of oil paint of the colour it is desired to remain. We have used both these plans and found them satisfactory. Of course, a greater quantity of this waterproofing may be made at a time by increasing the quantity of the materials named, but keeping to the proportions specified.—C. E.

Photography.—A. W. (*Paisley*).—You slightly misconceive the purpose and intention of these columns, which are for the express purpose of giving short and concise replies to correspondents. A. W.'s case is not at all uncommon. We should advise that *working* models be made of each instrument, and then, *if* they bear out the expectations of the maker, he should then obtain the provisional protection of the Patent Office, and afterwards submit them for approval to any good manufacturing firm and make his own terms with them. We may remark that rough sketches, such as those sent, give very little idea of the *real working* capabilities of the completed instrument, and we must decline to offer an opinion as to the practical value of the inventions. Plans and diagrams are all very well as suggestions in working out a design, but utterly differ from those carefully made from the completed work. Very few will be found not to require considerable modification before they realise the intentions of the designer.—D.

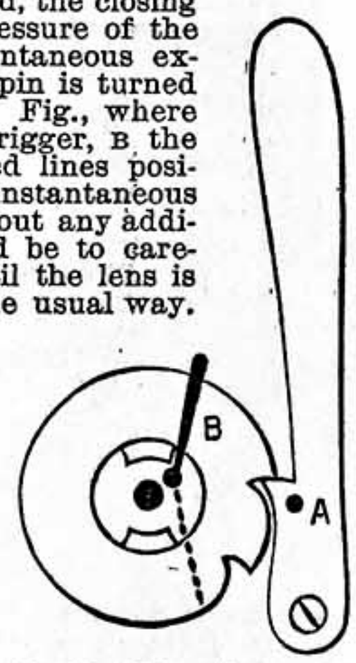
Effective Pressure Rivet.—BILSTON.—The mean effective pressure of the steam is best obtained by taking indicator cards from both ends of the engine cylinder, drawing a series of equidistant *breadths* of the diagram perpendicular to the atmospheric or line of pressure, adding them together, and dividing the total by the number of the divisions. This will give the effective mean pressure per square inch through the stroke, or rather, one revolution. The effective energy exerted by the steam on the piston during each double stroke or revolution, is the product of the mean effective pressure, the area of the piston, and the length of the stroke, or (p.m-p.m.) A.S., and if N be the number of double strokes in a minute, the I.H.P. in foot pounds per minute is (p.m.-p. m.) A.N.S., from which the indicated horse power is found by dividing by 33,000. The net or effective horse power is obtained by the use of the formula:—$\left\{\frac{P}{r}\left(1+\log\frac{r}{2}\right)\text{-p b}\right\}=\text{A.L.N.}\frac{\quad}{33{,}000.}$—C.E.

Violoncello.—J. D. (*Glasgow*).—Herewith you have a good pattern for sound-hole. I have previously replied to your query (*re* Bass Bar). The following dimensions may perhaps assist you, but you ought to have a good outline. This is surely not out of your power to procure. It is not possible in WORK—at any rate in the "Shop" corner—to give you an outline, but in the advertisement column you may see the address of a firm who would supply you. Length, 29 in., exclusive of the "tab"; width across lower part, 17 in.; width across waist, 9½ in.; width across upper part, 13½ in. The instructions in violin making apply, the dimensions of course excepted, to violas, 'cellos, and double basses; the rules are the same for all these instruments.—B.



Violoncello Sound Hole.

Blind Shutter.—NERO.—To fit a time arrangement to the blind shutter described in No. 98 of WORK, solder a small brass pin upright on the trigger; rivet another pin to the bottom of winged nut, so that when it is turned one way it will engage with the pin on the trigger and keep the lens open as long as wished, the closing being done by a second pressure of the trigger. When only instantaneous exposures are required the pin is turned out of the way. See the Fig., where A represents the pin on trigger, B the pin on nut, and the dotted lines position when turned for instantaneous work. Another plan, without any additions to the shutter, would be to carefully wind the shutter until the lens is fully open, then close in the usual way. Hope I have made it plain; but if any further difficulty, write again.—W. E. D., JR.



Shutter Time Arrangement.

Brooms.—BRUSHER.—Numerous plans have been brought forward for the purpose named, and some have been patented, but whether they have been adopted or turned out useful we do not know. We should not advise any attempt at patenting before the novelty of the invention has been ascertained, as it would most probably turn out that the idea had been published or used before. If there is a free public library in the town, most probably copies of the specifications will be found there. If not, the Patent Office will present a set if application is made for the same in a proper manner. Failing this the best thing would be to spend a few hours in the Patent Office Library, Southampton Buildings, Chancery Lane, London, and consult the specifications bearing on the matter, when BRUSHER may quickly ascertain if there is any novelty in his plan.—C. E.

Xylonite.—G. A. B. (*Normanton*).—The address is:—The British Xylonite Company, Limited, 124, High Street, Homerton, E.

Spots on Sword-Scabbard, etc.—TROOPER.—The sword scabbard being of iron or soft steel tarnishes more readily than the sword blade, and requires protecting from rust. To remove rust stains, and preserve from recurrence of such to any of the iron or steel appointments, adopt the following plans. Sword scabbards are apt to get rusty inside as well as out, and communicate stains to a sword blade. Unscrew the small nut-screw that holds the lip edge in the top of the scabbard, take it out, also the thin pieces of wood or leather which line the scabbard; clean out any rust with long thin blade of iron on which is tied emery cloth: then rub in paraffin oil, replace the wood or leather casings the same way they were drawn out, and screw the lip in its place again. For outside spots or stains, rub them with fine emery powder and lard, using the end of a cork or soft piece of willow. When all the stain is got out, apply rotten-stone or tripoli and sweet oil on these parts—this is to smooth the dulness caused by the emery powder—then go over all the scabbard with this rotten-stone with a soft woollen rag; this will equalise the lustre all over. Finish off with a soft wash leather or a soft piece of old silk rag with whiting, or charcoal powder, free from oil; the blade to be brightened in the same way. If much rusted all over, adopt the following plan. First cleanse from grease—should any be on—with a hot solution of soda, and wipe dry. Then make up with 1 pint of hydrochloric (muriatic) acid, 1 quart of water. Let the articles to be cleaned soak twenty-four hours, scrub the rusty metal with a brush till the parts are bright, or nearly so, complete the brightening of the patchy places with fine emery and lard—after you have thoroughly washed off all the acid, which must not be allowed to remain on. The scabbard, sword or stirrups will have a dull, lustreless surface through the action of the acid, or "pickle," as it is termed by workmen. Now use emery and lard. After the emery brightening use the rotten-stone and oil, finishing as before described. Many things are used for surface protection, and are sold by cycle dealers. To make your own, any of the following serve. Have a box of dry slack lime, and keep bits, spurs, stirrups and chains in it; they will not rust there. A sword is best kept in a green baize bag, and rubbed up now and then. If kept in an armoury or hung up handy for use or display, cover with mercurial ointment, or equal parts of carbolic acid and sweet oil rubbed on with a rag, or one part of paraffin and two parts of mutton suet smeared over. Plumbago and oil are a good cover; a better is dry white lead and lard—this must be warmed to be removed. As a rule, troopers after their drill see to their appointments, and do not let water stains remain on them, but clean off at the first chance. Five minutes then save an hour's work or more that neglect will cause. The burnisher and burnishing chain are essential to get up lustre to steel or iron. For want of a burnisher, use a large new bradawl or any round bright steel tool. If mustered in the rain, a light rub of sweet oil hardly dims the lustre of steel, and preserves from rust.—J. C. K.

Bicycle "Hub Dish."—SELF-HELPER.—By "hub dish" your correspondent means the steel cup in the hub end where the balls run. A new cup would have to be sweated in by using a medium-sized blowpipe, which would not injure the plating. The new cup must be heated up sufficiently to temper hard by sudden cooling in water. Small quantities of steel castings can be had of St. George's Cycle Company, Upper Street, Islington, or Brown Bros., 7, Great Eastern Street, London. They will give castings for their own patterns of machines, or make castings from patterns sent.—A. S. P.

Conservatory.—BOTANY.—The construction of a small conservatory of the dimensions you give—viz., 17 ft. by 5 ft. wide—is a very simple matter, and the work may be readily undertaken by an amateur of ordinary ability. You would do well to set out the dimensions on paper to a scale, say, half an inch to the foot; then with a pair of compasses and a rule you can ensure the centreing of every piece of timber the required size before putting together. Having regard to the possibility of the glass-house being required to be removed, it would be better to leave out the brick-work, and construct the house of wood and glass only. I should make a ground frame of wood, 5 in. wide by 1½ in. deep, the ends of which may be plain overlapping joints; to the corners of this frame should be neatly fitted the four uprights, of 4 in. square each, which should be kept in a vertical position by means of struts, eight in number; then four lengths of the 4 in. square stuff should be fitted crosswise to the uprights to form the top frame. Prepare a ridge-board, 1 in. thick by 6 in. wide, to which the rafters must be fitted and connected to the top frame. These rafters, or sash-bars, may be purchased ready-cut to the required shape in every town almost. Of course, some of the same material must be used for the side lights, and the space below may be conveniently covered inside and out with match-boarding; the space being filled up with sawdust, which is a bad conductor of heat. The most suitable kind of wood for the framework is dry soft deal, as free from knots as possible; and, unless you are a good amateur wood-worker, it will be best to buy the door or doors ready-made; certainly it will be cheaper. For artificial heat hot water is the best, and the system most reliable in a small way is to have jacket-boiler and stove combined, costing from about £2 10s. upwards. This will hold a good supply of coke, and will require very little attention. If further details are required, write again.—C. M. W.

Magnetic or Galvanic Belts. — J. McA. (*Glasgow*).—The belts and appliances for the cure of rheumatism and paralysis, made and sold by Mr. Cole, 248, Caledonian Road, London, N., are made up of permanent magnets. Similar appliances may be made of 3 in. lengths of hard crinoline steel permanently magnetised, coated with silk, and sewn in between two pieces of fine flannel. If made up in the form of a belt, quilt the pieces of magnetised steel at distances of two inches apart, vertically, in two rows throughout the length of the belt. The two ends of the belt may be fastened with leather straps and buckles, or with straps made of webbing. There need be no difficulty about making the belts. Mr. Cole's success is due to his knowledge of how to apply the magnets, for, if wrongly applied, they will, he claims, do more harm than good. Lumbago is a rheumatic affection of the lumbar muscles. A magnetic belt worn around the loins should give relief, and aid other measures (hygienic and dietetic) in effecting a cure.—G. E. B.

Manganese.—OBLONG.—Manganese is a metal of a reddish-white colour, obtained from ores found in Cornwall, Devonshire, North Wales, Somerset, Warwickshire, Aberdeenshire, Wicklow, Germany, Spain, Austria, Italy, France, Sweden, Canada, and the United States of America. The ores vary in composition, but that found in most abundance is a peroxide of manganese, composed of one part manganese and two parts oxygen, represented by the chemical formula MnO_2. This is the ore employed, when broken to the size of peas, to charge the porous cells of a Leclanchè battery. When used in this way it will last just as long as it has any free oxygen to part with, the time being governed by the quantity of the ore placed in the cell and the quantity of electricity drawn from it in that time. If a Leclanchè battery is frequently used for long runs of more than ten minutes at a time, or if the battery is connected to work having a low resistance, or short-circuited by connecting the two terminals with a short thick wire, all the oxygen available from the manganese will soon be used, and the cell will be soon exhausted.—G. E. B.

Electric Light for Necktie.—LONG READER.—Unless you are a working jeweller, knowing something about electric appliances, I should not advise you to attempt making an electric light scarf-pin for the necktie. The tiny pea-lamp used in making these pins cannot be made outside a suitable workshop, fitted with costly machinery. This class of jewellery can be obtained from Messrs. J. E. Hartley & Co., 13, St. Paul's Square, Birmingham, or from Messrs. Cathcart & Peto, 57B, Hatton Garden, London, W.C., who also supply the small ebonite batteries for furnishing current to the lamps. One of these batteries, containing two cells, will go easily into the inside breast pocket of a coat and light up a 4-volt lamp.—G. E. B.

Ship Stoker Engineer. — SAHAB. — If your correspondent will refer to the Merchant Shipping Act Amendment Act, 1862, he will find it is *specially* provided that "service in the capacity of fireman, stoker, donkeyman, greaser, winchman, labourer, engineer's steward, or any other capacity than that of engineer taking watch on engines and boilers for propelling, will not be accepted." The object of this Act is to provide that only properly qualified men should have charge of the machinery on board ship, which is now of such a powerful and complicated character, and requires men of competence and ability to have charge of it. The services of mere "drivers" and "cock turners" are of no utility in the present day, as the circumstances and conditions of steam-ship machinery have so utterly changed. It is a most wholesome and necessary provision, in the interests of the public who have to travel in them, that the machinery of such ships should be in charge of only properly qualified and competent men, as life and property are so eminently dependent on their skill, ability, and attention. Unless our correspondent has served his time at making and repairing engines, "he must prove that for not less than three years he has been employed as a journeyman mechanic in some factory or workshop on the making or repairing of engines. In either case he must also have served one year at sea in the engine-room as an engineer on regular watch in the foreign, home, or coasting trade, or he must have served at least four years at sea in the engine-room as an engineer on regular watch in the foreign, home, or coasting trade." Having done all this, he may offer himself for examination, and on the results of this examination will depend whether he can obtain a certificate entitling him to be employed as a capable man in the engine-room of a steam-ship. For each grade of engineer, the candidate must prove by examination that he is a fit and proper person to be entrusted with the care of engines and boilers on regular watch at sea; and if he cannot do this, he will not be certified as fit and proper to fulfil the duties required, and, consequently, must be content with what he can obtain as fireman, donkeyman, greaser, etc., as provided by the Act.—C. E.

Bicycle Papers. — ONE ANXIOUS. — The appearance of my article rests entirely with the editor of WORK, who has the full series of papers on Safety Bicycle Construction in his hands.—A. S. P.

Cleaning Oil Paintings. — No better man can be recommended than Edwin W. Izod, 220, Great Portland Street, W.—F. B.

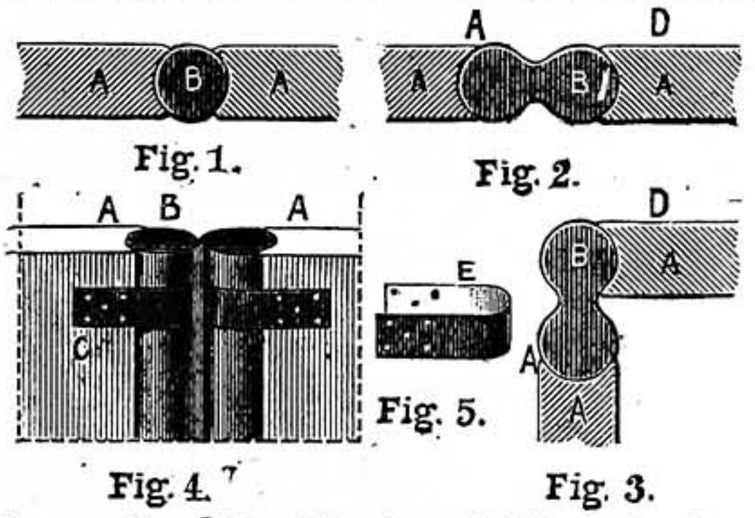
Framing Oil Paintings, etc. — A very good and reasonable man is Wm. Hayward, 18, Giltspur Street, E.C.—F. B.

Scroll for Iron Kitchen Stand.—T. H. (*Newcastle, Staffs.*).—Had you sent a sketch, however rough, of your stand, it would have given me a better idea of its style; as it is, I have done my best, bearing in mind the materials to be used, and trust it may suit you. I have added the "T. H." to fill up the centre space. You will remove all the

Scroll for Kitchen Fender.

white shown in the design, and if you prefer plain Roman letters, you may substitute them for those given. One word of caution: the centres of the two O's will require small stays being left, or they will drop out.—WORKER BEE.

Screen to Fold without Exhibiting Crevice. —H. C. (*Lee, S.E.*).—The method you illustrate (which you observed in a farm-house) of constructing a screen in such a manner that it shall show no crevice between the frames is a very good one; but it was some time before I clearly understood all your sketches, and was in doubt as to what use the clamps were. However, it is overcome, and I reproduce your drawings, shaded, and with necessary additions. First, however, I must tell readers that, constructed as in Fig. 1, it will not fold flat, which you explain; but that, as in Fig. 2, all will be well as regards the folding. I cannot really see the advantages gained, as the amount of extra labour necessary, besides the appearance of the clamps, will hardly be compensated for. An ordinary screen, with towel-horse joint, and covered completely with fabric, pleated where it contacts with the union of the frames, should not be objectionable. If a screen of the sort with joints (Fig. 2) were covered completely with fabric, the latter would, as in ordinary cases, have to be pleated, for the distance from A to D (when partly



Screen to fold without exhibiting Crevices. Fig. 1.—Plan of Screen (which will not fold flat). Fig. 2.—Plan of Screen to fold quite flat. Fig. 3.—Ditto with Frames at Right Angles to each other. Fig. 4. Perspective View of Fig. 3. Fig. 5.—Clamps to retain Frames to Rod.

folded) would be in excess of that from A to D (open). At any rate, I will explain your letter. B (Fig. 1) is a rod extending the whole height of the screen, to which fits the grooved edges of the frames, A, A. Two or more clamps (C) are screwed to each frame in such a way that they show on both sides of the screen, while the bend (E) passes around the rod B, which should be slightly shallowed to receive them at those parts, thus retaining the frames. With screen, Fig. 1, they must be fixed one above the other, while with Fig. 2 both on a level; in the latter case the bends passing through slots. The upright rod of Fig. 2 must consist of a shaped solid piece, or of two rods screwed together. Had you shown a *perspective* sketch, however roughly, of clamps, I should the more readily have understood.—J. S.

Wood Sample.—T. A. (*St. Helens*).—The sample of wood sent is American white wood, and can be purchased at any yard in Liverpool. The price would be about 3d. per foot super.—A. J. H.

Drill Chuck Slipping.—BERTIE.—I think it will comfort you to know that the slipping of your drill chuck has probably saved the life of some of your drills, which would otherwise have been broken off; so it is not an entirely bad feature. You don't say what sort of chuck you have, so I will suppose it is one of those you clasp on the drill by turning it with the hand. I have an old one of this sort which takes drills up to ½ in., and have frequently found it slip when holding the larger sizes, and have had to stop and close it harder, when it would generally hold unless the drill caught, as it does sometimes when just getting through a hole; that is, when drills are most often broken, unless the chuck slips. But suppose the chuck slips when you are simply boring, then you should consider how you can reduce the strain on it. Does the drill want sharpening? of course it will take double the power to drive if it is blunt. Are you, perhaps, trying to bore too large a hole out of the solid? Say you want to bore a ½ in. hole, you should use about three drills in succession, say $\frac{7}{16}$ in., $\frac{3}{8}$ in., ½ in., if you are boring in iron. If it is brass you are boring, another difficulty arises from the twist drill being too greedy for that metal, so that if the centre of the hole is cleared out it is apt to dig in. I should use a ¼ in. drill first, and then, in following with the ½ in. one, be very careful to hold the work *back* against the back centre, so that it cannot feed in too fast, as it is apt to do. The straight-flute drills are better for brass than twist drills.—F. A. M.

Stain for Red Ivory Balls.—W. C. R. (*Glasgow*).—Make your red dye as follows:—¼ lb. of new scarlet cloth cuttings; rub in well ½ lb. of soft soap. Put in an earthen vessel, pour in two quarts of water. Boil for a considerable time, stirring occasionally, till the colour is extracted from the cloth. Take out the cloth, wringing it to get the whole of the dye out. Now dip your ivory balls into aquafortis, and then into cold water. Have the dye liquor just at the boil, then put in your balls without keeping up the boiling. The stain will strike in in a short time. Avoid any metal, as iron or copper, touching the balls, or it may make a dark stain on them. When taken out of the liquor, cover with a cloth so as not to dry too quickly. Another plan for red stain is to make up nitrate of tin thus:—Dissolve in rather strong nitric acid thin strips of metallic tin. Great care is necessary to add only very small portions of the tin to the acid gradually. This must be done in an earthenware bowl. Boil the balls in this liquor for a brief time, and then in cochineal dye, into which put some of the nitrate of tin. Let the balls boil till they assume the proper colour. You may buy the nitrate "bowl liquor," as it is termed, of a dyer who makes it. It may be as well to try the operation first on any old bit of ivory before trying on your balls. Let the balls be covered up with a cloth in drying, or they may crack on the surface.—J. C. K.

Greenhouse.—A NEW READER.—You will find a thorough description of what you want in Nos. 12, 14 and 15, Vol. I., under the heading of "The Tenant's Greenhouse," where the subject is gone into far more fully than would be possible in the already over-crowded columns of "Shop."—E.D.

Address Wanted.—J. M. K. (*Glasgow*).—You have omitted to send your full name and address for A. S. P.

Die Sinking.—I. W. A. W. (*Wroxesbury*).—I may say that I am unacquainted with the process of Die Sinking and using, except that I know that making stampings for cycles is done with ponderous machinery, the steam hammer holding a prominent place. The dies are costly things to make, and, when made, unless many thousands of the parts are stamped from the dies, they will not pay the original cost. If I. W. A. W. wishes to become acquainted with this kind of work, he should get into a factory where such work is done, for there only can any useful experience be obtained.—A. S. P.

Bicycle Castings.—J. B. (*Glasgow*).—This correspondent can have my address of our Editor. I have the wood patterns of the parts referred to by him, which I can either lend or sell him; or I could get castings from them, but not in less time than one month. I get my malleable castings from Forsyth & Millar, Broad Street, Bridgeton, Glasgow.—A. S. P.

Bicycle Tyres.—ARTIST NOVICE.—Make a clean cut slanting, say, two inches long on both ends of the tyre with a sharp knife dipped in water; smear the cuts with Snell and Brown's "Tyre Splicing Solution"—of any cycle depot, 1s. bottles; let stand before joining an hour or so; then join the ends evenly and press together, the tyre may then be put on the wheel at once.—A. S. P.

Cyclometer. — OBLONG. — Unless your correspondent is an optician, or perhaps a practical clock or watch maker, he could not construct a reliable cyclometer. Even then he would have to get a good one and dissect it, in order to see the construction; then he might make a copy. For any one unacquainted with that kind of work to attempt one would be simply out of the question. They can be bought very cheap, from 15s. to 30s.—A. S. P.

Magic Lantern.—H. E. (*West Bromwich*).—Before much assistance can be rendered to you, you must quote the article, number and page of WORK to which your letter refers, and state specifically what you wish to know about.

Cast Steel Wheels.—VULCAN.—Do you mean the common wheels for pitch chains? If so, I should say the teeth should not be less than ⅜ in. broad by $\frac{3}{16}$ in. thick.—I.

Sand Blast Machines.—TOXTETHIAN.—Except that the sand is driven against the files by a steam pressure of from sixty to a hundred pounds per square inch, I know nothing of the process. Still, if you hunt up the number of the patent specification, which you can do in the Liverpool Library; you can get a copy of it for a few pence of H. Reader Lack, Patent Office, Southampton Buildings, London, W.C.—I.

Protractor.—W. E. H.—I presume you allude to the instrument called the "protractor," which you can get of any mathematical instrument maker. What kind of "metal goods" do you want? Unless you say what class of goods you want, of course I cannot tell you where to go.—I.

Model Engine.—LEMUR.—Without seeing your model I cannot tell you what is at fault, but should think, from your description, that some portions of the mechanism are not sufficiently sensitive. Try the effect of easing some of the joints of the fittings.—I.

White Enamel.—F. L. (*West Cowes*).—The best job for a counter top would be to give it a solid coating of best white lead paint, say four coats. Use the colour finely strained, avoid streakiness of brushwork, and use fine glass paper between each coat. Finish with two or three coats of white hard bath varnish, or one coat of any good maker's enamel. There are many other methods, but the above is usually the most practicable. Don't attempt to make either varnish or enamel.—F. P.

Repainting Wooden Boxes.—J. T. B. (*Warrington*).—First get a little weak soda water, and cleanse and rub down the surfaces with pumice stone, well rinsing with water at the finish. The inside and outside can now have a coat of thin cream paint, made with more turps than oil. Then stop all holes, etc., with putty. Now paint insides only a good oily coat of light buff, and then, next day, a coat of flatting paint a few tints lighter than before. Next, "ground" the outsides with buff paint, then comb them with graining colour, and varnish with "church oak." For graining, see No. 58, page 86; and No. 62, page 152, or the whole "Art of Graining," contained in Vol. II.—F. P.

Damp-proof Paper.—C. G. M. SOUTHARD.—I know of no arbitrary reason why either tar-paper—or the more modern and superior waterproof paper, made by Stather & Sons, of Hull—should be fixed to the wall by either the coated or clean side. I see many pieces fixed in a twelvemonth, and the bulk of it has the coated side outwards. So far as experience and practice go, either side will affix itself by stout paste to a wall in fair condition. In numberless cases I have had ocular demonstration of this fact, and, furthermore, I know of no *theory* for or against on either side. Sometimes, when covering it with a light and delicately tinted wall-paper, it is *advisable* to put the darkest side next the wall to prevent the blackness interfering with the solidity of the flank of wall. If you use much of this article, send to Stather's for their patent paper, it is greatly superior to the old thing.—F. P.

Articles on Plain Painting.—G. M., JUNR. (*Portland*).—These articles, which appeared in Vol. I., consist of "Introduction," No. 27, page 418; "White, Yellow and Red Pigments," No. 29, page 450; "Blue and Black Pigments," No. 35, page 550; "The Three Simple Divisions of Colour—Secondary and Tertiary Pigments," No. 36, page 566; "Oils, Varnishes, and other Vehicles; Solid and Liquid Driers," No. 42, page 659, and continued in No. 43. "Mixing Oil Paints, and Compounding Tints and Shades of Colours for Practical Use," No. 44, page 698. In No. 46, page 723, the same subject is continued, and the second and third coating is explained. The final coating and flatting processes are explained on page 739, No. 47. These three papers last mentioned contain a practical lesson on the actual manipulation, as well as much invaluable matter respecting technique and theories. No. 50 contains an exhaustive paper on *tempera* work—"distempers." The concluding chapter is an illustrated one, on "House-painters' Brushes, Knives, etc." The best advice I can give you is to get the complete volume and have it bound up.—LONDON DECORATOR.

Lime-Washing Walls.—E. W. (*Chingford*).—The painter's apprentice usually does the liming work, and he also gets in a "fearful mess." The rougher the wall, of course the more it splashes. A very common brush also makes matters worse, as the cheap fibre will not hold the lime-wash like bristles, but the latter are expensive. I can only say get a decent brush, and practice for a week or two to gain expertness! Use it fresh slacked, or it will not bind.—F. P.

Material for Gilding On.—REDCLIFFE.—Your query is scarcely explicit enough, but assuming you want a recipe for preparing the picture-frame makers' *composition*, with which the ornament is moulded, see reply to AMATEUR, page 683, No. 94, Vol. II.—F. P.

Concertina Reeds.—G. D. O. (*No Address*).—All these are made of brass, steel, and German silver. The strips of metal of the proper gauge and temper to produce approximately the sound required, may be obtained from Messrs. Dawkins, Charterhouse Street, London, E.C.; but they must be tuned by filing in order to make them quite true as to pitch.—G.

Photo Lithography.—HALF-TONE.—Please accept my apologies in the delay in replying to your query, regarding the transfer of photos in half tone to stone, but I have been ill with the influenza and unable to write. There are several methods of doing this, one of which is to wash the transfer paper with the medium first, then photo on to this, and transfer to stone in the ordinary way; but, with the Editor's kind permission, I will write more fully upon the subject as soon as ever I am well enough. Will W. G. BLACKBURN and LITHO (*Birmingham*) kindly accept the same apologies for delaying their replies.—A. J. A.

Phonograph.—T. H. (*Bradford*).—I am sorry I cannot give instructions for making these wax cylinders, for reasons that have been already given in this column.—W. D.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Gum.—STICKY writes:—"Will any reader tell me through 'Shop how to make and put on gum such as is on the backs of stamps and adhesive labels?"

Soap.—G. A. (*Fulham*) writes:—"Can any reader inform me how to make soap similar to the '*Sunlight*,' and whether it can be subjected to any special treatment so as to strip and cut about an hour after it is put in the frames, even while it is still warm?"

Colouring New Ivory.—R. P. C. (*Sunderland*) writes:—"I would like to know the best way to colour new ivory for piano-keys to match the old ones, which are of a yellow cast."

Split Cane.—J. T. (*Shadwell, E.*) writes:—"Will any reader kindly inform me as to the price, etc., and where I can obtain cane ready split similar to that used in caning chairs?"

Wood Pulp.—C. H. C. (*Hornsey*) would be glad if anyone could tell him where pulp (wood preferred) is to be obtained.

Pair-Oared Boat.—H. C. (*Lancaster*) writes:—"Will some reader of WORK kindly give me a few instructions as to how to make a pair-oared boat, to hold about three or four persons? What kind of wood, etc., will be required?"

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Fret Clock Design.—M. (*Bishop Auckland*) writes in reply to H. O. H. (*Bristol*) (see page 222, Vol. III.):—"Try Booth Brothers, Upper Stephen Street, Dublin; Harger Brothers, Settle, Yorks; J. H. Skinner and Co., East Dereham, Norfolk, or H. Zilles & Co., Wilson Street, Finsbury, London."

Crystoleum Painting.—M. (*Bishop Auckland*) writes in reply to PAINT BRUSH (see page 238, Vol. III.);—"I have found starch a very suitable medium for this purpose. You must use the best quality of starch."

Artists' Easel.—M. (*Bishop Auckland*) writes, in reply to S. A. W. (*Wallasey*) (see page 158, Vol. III.):—"I send sketch of one I made, which I think will suit you. Fig. 1 is the front view of the top joint, and Fig. 2 a side view. It is made in two pieces, the back one being 2 in. longer than the front. The front is hollowed to receive the ends of legs, which are fixed with countersunk-headed screws. A notch is cut in the back for the back leg, which is fixed with a strong wire. The legs are jointed in the middle, as shown in Figs. 3 and 4, and turn upwards when folded. They are jointed with screws, and fixed open by a pin, as shown at A. The legs are 1½ in. wide and ¾ in. thick. A piece of brass, about the size of a foot-rule, is fixed

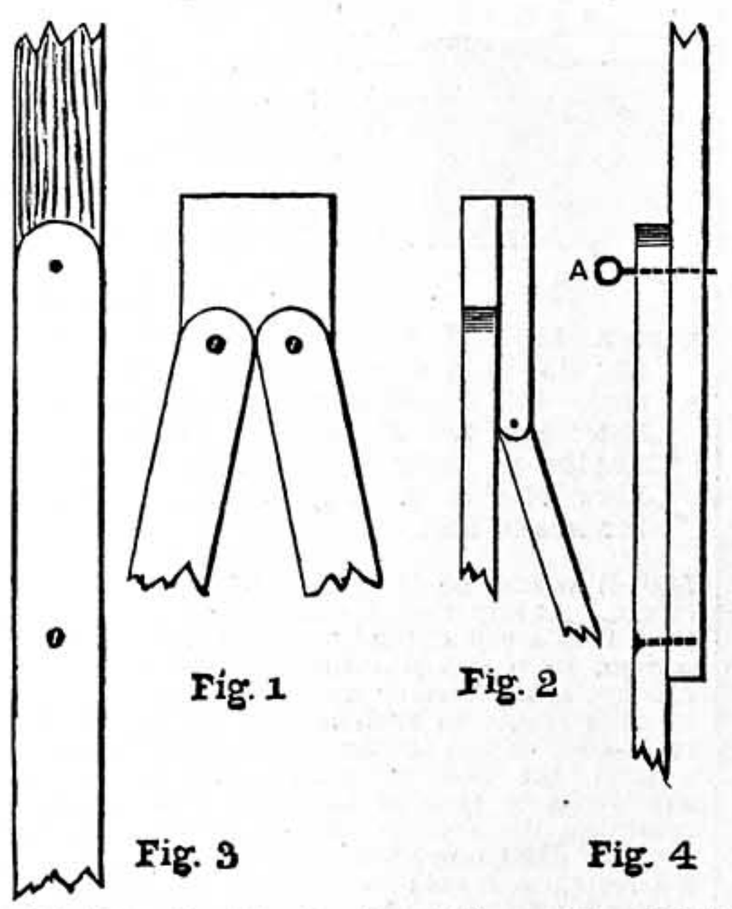


Fig. 1 Fig. 2

Fig. 3 Fig. 4

Artists' Easel. Fig. 1.—Front View of Top Joint. Fig. 2.—Side View. Fig. 3.—Joint of Legs, Front View. Fig. 4.—Side View.

between the front legs to stiffen them, and which folds with the legs. Two pieces of brass rod are fixed to the back leg, and are turned down at the ends, and fixed into two eyes in the front legs to keep all firm when set up. It folds up, and is fixed by a leather strap, and is very portable."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. J. (*Norwich*); W. C. (*Shrewsbury*); J. M. (*Paynell*); GOLFER; GLAZER; C. & M. (*London*); W. P. (*Southampton*); J. W. (*Morley*); H. Z. & CO. (*London*); ERIMUS; A. W. (*Paisley*); W. J. S. (*London, W.C.*); F. L. (*West Cowes*); H. W. (*Bristol*); PLAQUE ARTIST; E. G. P. (*Kingsland*); S. L. (*Haslemere*); J. G. (*Bloomsbury*); A BURNER; C C. (*Clapham*); R. N. (*Grays*); C. T. (*Edinburgh*); AN OLD SUBSCRIBER; OLD FURNITURE; "HAMMEROHREWER"; J. H. (*Liverpool*); E. F. (*Warrington*); G. B. (*East Dulwich*); H. T. (*West Bromwich*); T. R. *Stoke Newington*); ARROW SHOOTER; YORKSHIRE LADDIE; LATHE-STRUCK; G. P. (*Elgin*); J. P. (*St. Helens*); J. S. G. P. (*Portsea*); READER FROM VOL. II.; A. E. (*Hanger Hill*); A. N. (*Willenhall*); J. A. R. (*Wandsworth Common*); INQUIRING SUBSCRIBER; LAMPS (*Wigan*); J. A. (*Walsall*); A. R. (*Birmingham*); MAKE BY THE GROSS; A READER OF "WORK."

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