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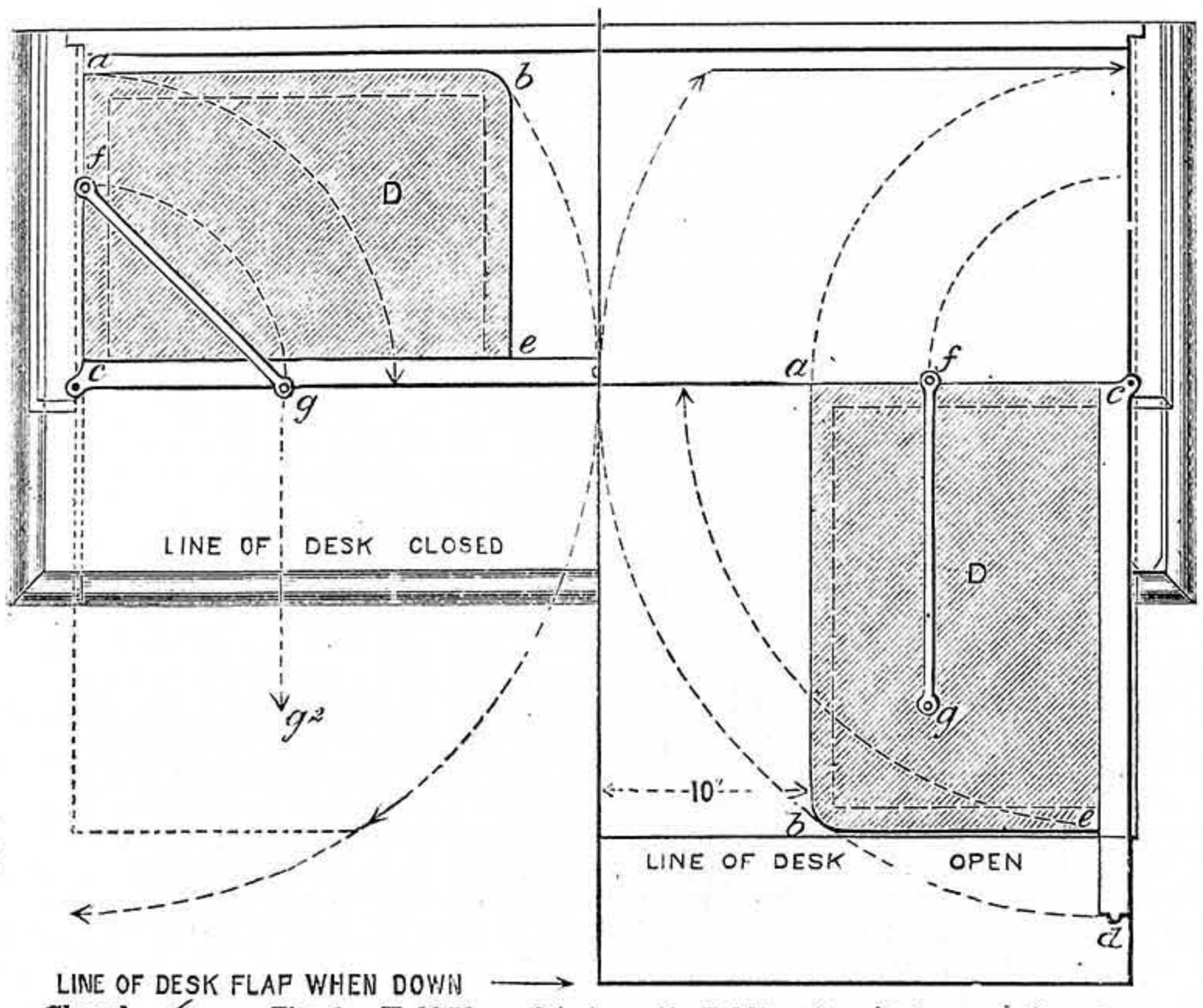


Closed. ← Fig. 1.—Half Plan of Automatic Folding Secrétaire. → Open.

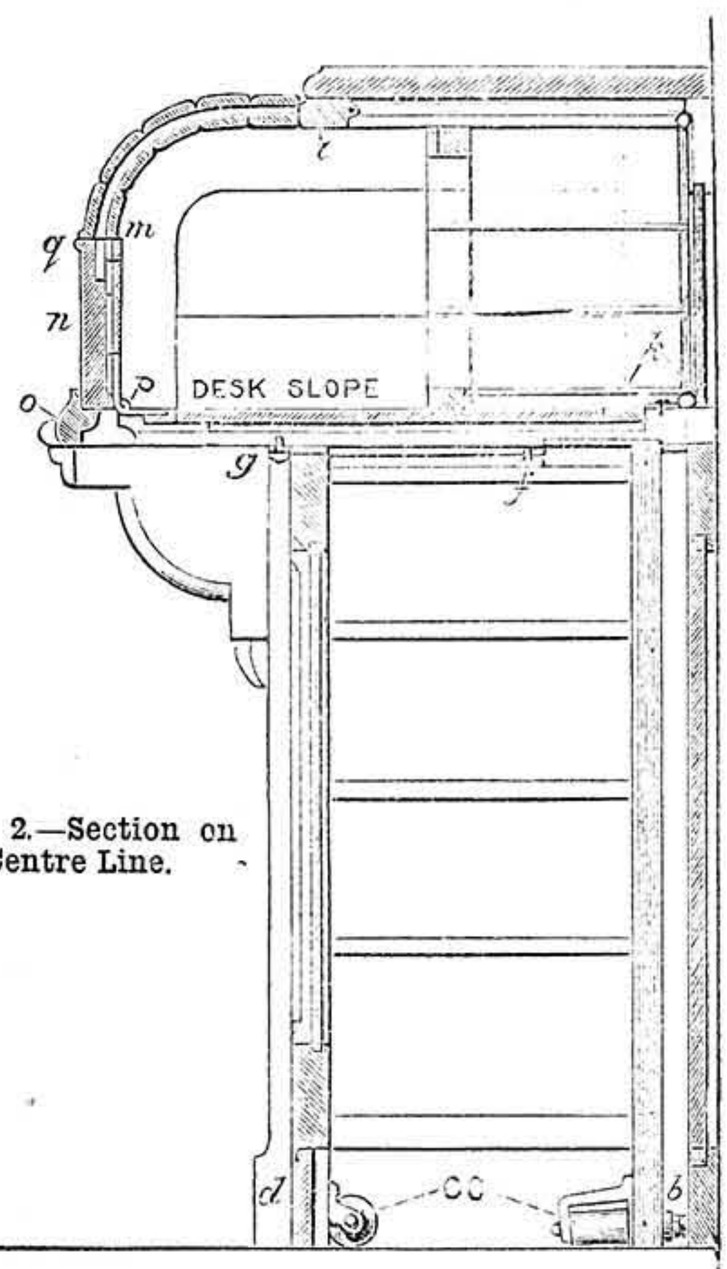
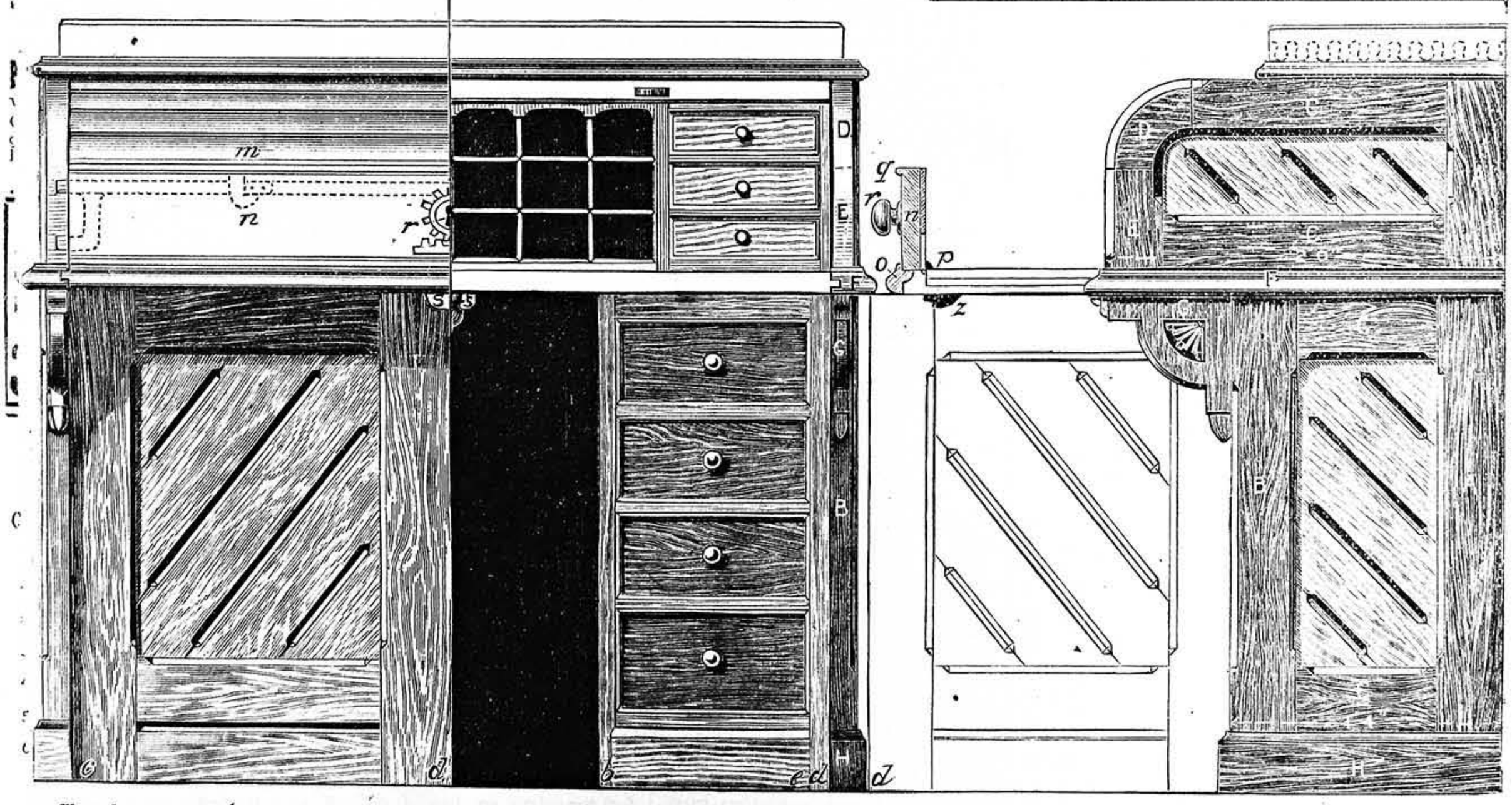


Fig. 2.—Section on Centre Line.



Closed. ← Fig. 3.—Half Elevation. → Open.

Open. ← Fig. 4.—End View. → Closed.

AUTOMATIC FOLDING SECRÉTAIRE FOR HOME OR OFFICE.

BY J. WHITFIELD HARLAND.

ECONOMISING SPACE AND TIME, AND ATTRACTIVE APPEARANCE—HOW TO SCHEME IMPROVEMENTS—METHODS OF ASSISTING THE FACULTIES—OCCUPATION OF SPACE BY MOVEMENT OF PARTS OTHERWISE WASTED—ACTUATING SEVERAL MOVEMENTS BY THE SAME MOTION AND FORCE—CONICAL CASTERS—LOCKING UP VARIOUS PARTS BY A SINGLE MOTION OF ONE KNOB—STYLE OF DESIGN—THE MAIN CONSTRUCTION—END FRAMES—BACK FRAME—TOP—BOOKCASE ABOVE, IF PREFERRED—FITTINGS IN CARCASE, THE MOVABLE DESK-TABLE AND SLOPE, THE PIGEON-HOLES AND DRAWERS—FRAME OF DRAWERS TO ACT AS STRUT TO STIFFEN THE CARCASE—FRONT HINGED DESK-FLAP AND LOCKING APPARATUS—THE DESK-SHUTTER—UNDER PORTION—DOORS AND DRAWER-NESTS—HOW TO FIX PIVOTS—CONNECTING-RODS—INNER PLATING WITH STEEL—CONVERTING SECRÉTAIRE INTO FIRE- AND BURGLAR-PROOF SAFE.

HAVING been consulted as to the best way of designing a secrétaire or writing-desk for office or home use, which should take up the least possible space consistent with utility, and at the same time form a decorative piece of furniture at a comparatively low price, and which should be capable of being instantly closed without disarrangement of papers, etc., I thought out and designed the automatic folding desk, of which the illustrations and the following constructive description may, I hope, be interesting to readers of WORK.

The desiderata are to economise (1) space and (2) time, with an exterior sufficiently attractive in appearance. As to space, the ordinary office desk, with pigeon-holes, drawers, etc., with semi-circular shutter and nest of drawers at each side underneath, takes up about 4 ft. in length by 3 ft. or more in width or depth—*i.e.*, about 12 superficial feet. As to time, there are eight or ten drawers to lock up separately, besides closing and locking the desk itself. It will be noted that a space necessary for the legs and feet of a person using the desk—namely, the hollow under centre of desk—is always wasted, or, at most, is a receptacle for the "W. P. B."

When the desk is in use, we cannot dispense with room for the legs—say, 20 in. wide. The space is then necessary, but when not in use this space is useless—that is, it is simply wasted—and by the conditions, should be utilised when not in use, and still be available when required. I prefer to jot down the train of reasoning, that others may get an insight into the practical process of designing (or inventing, if preferred) means to an end expressed in the conditions which, technically, might have a greater value than the mere design now under consideration. Thousands who will never carry out the subject of this paper may deduce from it the way to carry out similar problems in other directions. Analogy and individual taste and requirements run on the lines suggested may result in improvements unforeseen to me, from other data, from other exigencies, and for indefinitely other objects; hence I prefer to show the brain action wanted, not merely for the present purpose, but for all other parallel or similar cases. In a few words, it is this: First examine thoroughly existing models; next criticise their shortcomings, and try to devise methods of utilising waste space, and to see if time be wasted in their use or not, and if so, to obviate the need for such waste of time as may exist.

Parenthetically, I have never seen mentioned in any text-book, or seen in practice, a valuable use of the hinge of the every-day "two-foot rule." I have a habit, when thinking out the three dimensions (length, breadth, and thickness), of playing with my rule-hinge to aid my imagination, and convey to "my mind's eye" an idea of relative proportion, putting my thumbs at certain points on each limb, and setting the joint at right angles. It may be put down as a foolish trick, but it does at times help the mind in its conceptions on every point, especially of leverage, change of position, etc., and saves making *model drawings*—that is, drawings where portions are cut out and are movable, in order to see where, in their orbit, they will clear other points of probable contact without clashing with other movable points at certain parts of their passage when in motion.

Returning to the means of economising the above-mentioned space: Let us suppose the usual nest of drawers on each side, which ordinarily support the desk, and are about 10 in. wide by 16 in. deep, and imagine them fixed to a door on hinges so that they could revolve into the space under the desk lengthwise across, thus occupying, including casing, only about 12 in. deep by 18 in. long, and partly utilising the 20 in. space between the nests when open. A glance at the plan (Fig. 1), which is divided so as to show position of one half open and the other half shut, and the front elevation (Fig. 3), similarly drawn, will show the working of the two nests of drawers on the pivots, *c*, *c*. Here the flap or door forming the side of the drawer casing (*c d* in plan) is, of course, made to extend to the centre line in each case, so as to fully close the aperture, whilst the casing (*a*, *b*, *c*, *e*) when swung open leaves 10 in. clear space on each side of centre line for the legs and feet of the writer using the desk. When closed (see end view, Fig. 4), the case with drawers folded inside measures only 1 ft. 4 in., and the desk above it 2 ft., or when open, 3 ft. 5 in., from back to front. The only motion required to open the secrétaire is to draw forward the desk-table, after unlocking, 12 in., which actuates two connecting-rods fixed by pivots at one end to the top of each drawer-nest, and at the other to the underside of the desk-table (see *f*, *g*, g^2 in Fig. 1). These rods being drawn forward 12 in.—*i.e.*, from *g* to g^2—cause the nests of drawers to turn on their hinges or pivots until they are at right angles to their former position, and face outwards. The same motion of the desk-table forward draws a cord fixed at *l* (Fig. 2) over the pulleys, *k*, *j*, and attached to the desk-shutter, *m i*, at *i*, and draws it back from *i* to *j*, thus fully opening it. The desk-flap, *m n*, with its covering moulding, hinged at *p*, can now be let down flat, giving 18 in. instead of 12 in. extra depth of desk space. It should be noted that the sides of desk and the drawers and pigeon-holes forming its interior fittings do not move—merely the table. By using spiral springs, the desk-shutter will close automatically when the desk-table is pushed back, and the flap turned upright to meet it. Conical casters are fixed to support the weight of the drawer-nests whilst revolving, so as to take the strain off the hinge pivots, and render the opening and shutting very easy.

It will be seen from the foregoing that one operation is all that is required to open or close the whole thing, and that therefore one lock is all that is necessary to secure the whole of the eight drawers, the desk itself, and its contents; and (as will be now described) this is a spring lock. By merely shutting up the desk, everything is locked up instantly. On referring to Fig. 3, the dotted lines on the desk-flap show the bolts for locking by means of a quarter turn of the handle or knob shown in half elevation, and a toothed wheel attached to the knob working into racks on the bolts, which also carry snugs to fit into the gudgeons fixed to the front bar of the desk-shutter.

To prevent unlocking, it is only necessary to lock the handle or knob so that it cannot turn. This is effected by having a spring bolt in the neck of the knob, which fits a hole in the plate through which it passes. In front of this spring bolt, and in the knob itself, is a five-lever lock—very small, of course, but inaccessible: the proper key alone being capable of drawing back, lever by lever, the stops and the spring bolt. The keyhole is shown in the front of the knob at *r* (Fig. 3), whilst at *s* is shown a stop which prevents the nests of drawers or the doors underneath from being opened so long as the desk is locked. If desired to be made extra secure, a lock can, of course, be also fitted to the stiles of the doors, but this is, in my opinion, unnecessary. A sliding shutter made in the knob to cover the keyhole could also be fitted, thus fully concealing the means of opening the lock. As there is no bottom, the whole thing should be fixed firmly to the floor, inside, with snugs and coach screws.

In order still further to save space, and to give the secrétaire a handsome look as a pieces of furniture, a bookcase could be fitted to part of the top, or it could be finished, where a bookcase is not desired, by a small balustrade and cap-mould, as shown in Fig. 4 in dotted line.

Having thus described the automatic working of the various parts, I will now give the main construction; but I do not give minute details, as it is unlikely that a tyro would undertake the making of so important a piece of furniture; whilst those amateurs who attempt it with any chance of success will have had the experience that will suggest these minor points. My design is semi-Gothic, but can be just as well carried out in Queen Anne or in Renaissance by modifying characteristics and mouldings. The construction in the main will be the same—viz., frame together the ends (see Fig. 4), consisting each of a long stile, A A, to finish 3 ft. 5 in. high, a short stile (front), B, to finish 2 ft. 4 in. high, two short and two longer rails, C, C, C, C, mortised and tenoned together, with a stile, E, and curved rail, D, to finish upper part. In drawing, the long stile, A, is cut narrower at upper part, to suit the narrower rails. The same width might be kept throughout to save trouble, if desired, but appearance is best consulted by reducing. The bottom stiles and rails are to finish 4 in. wide, the upper ones $3\frac{1}{2}$ in. wide; all are $1\frac{1}{4}$ in. stuff, panelled with $\frac{3}{4}$ in. diagonal, jointed, stop-chamfered boarding well fitted into $\frac{1}{2}$ in. grooves in framing, showing $\frac{3}{8}$ in. reveal to face side, the framing stop-chamfered $\frac{1}{4}$ in. where shown, and having to front a carved bracket, G, 1 in. thick, centred and screwed and glued thereto, and finished with a moulding, F, and a plinth, H, as shown. On inner face, just behind and in line with the mould, F, a groove should be cut for the desk-table to slide in, and under it runners should also be fixed; another groove on inner face, curved to same radius as D, and straight along C, should be cut for the desk-shutter ends to work in. The upper end of the stile B, it should be noted, will tenon into a mortise in lower rail of the upper portion, which

involves driving the long stile on last, after fitting in all the panelling.

All the rails should be tenoned and wedged right through the long stile, which should be also rebated ½ in. each way inside to receive back frame, upon which a good deal of the rigidity of the casing depends, as there is neither bottom nor rail, and the top itself does not go across the full width. For this reason, at the foot of each stile an iron bracket of L shape should be screwed, to give fixing for coach screws, to the floor, and during its making a piece of stuff should be screwed to these brackets—at any rate, at the front—to hold it rigid.

When all this has been done, the back frame should next be made, and in order to give the rigidity just spoken of, should consist of two rails (top and bottom), with a centre stile or mounting—or even two, if preferred—tenoned and mortised into them; and these should be tenoned into mortises cut in each end stile right through them. The stiles and mountings should be 3 in. or 3½ in. wide by 1 in. thick, at least, rebated ½ in. by ½ in. to receive ½ in. matched boarding for filling of panels, which should be fitted, glued, and nailed to rebates from inner side. The stiles should also be rebated to fit rebates in the long stiles of ends, and should, when fixed in place, be glued to them and skew-nailed from within, and screwed in two or three holes to them from behind, and also from the ends under the plinth and under the mouldings, which afterwards conceal the screws.

The top should be of 1 in. stuff, 13 in. wide, either veneered or solid, and screwed down firmly at each end to the upper rails of the ends, and finished, front and ends, by a mitred moulding at edges; and if the bookcase is not desired, should have a thin narrow piece or strip laid upon it as a finish along ends and front to conceal the screws, forming a sort of ledge to carry balusters.

The casing, or carcase, being thus completed, the desk-table and flap should be made and fitted to slide freely in grooves cut in the ends to receive it. It should be framed of 1¼ in. stuff, with four transverse and two longitudinal pieces 3 in. wide, 3 ft. 10 in. long, exclusive of runners, and 1 ft. 9 in. wide. The two end panels should be filled in with ½ in. stuff in ½ in. rebates in the framing made to receive them, and finish flush with upper side. They will be 7 in. wide each and 1 ft. 3 in. long, leaving the centre panel 20 in. by 1 ft. 3 in., which is to be a loose desk-flap hinged to under side at front edge to the framing, so that it can be sloped as required for writing upon. This desk-flap should be clamped at ends, and be fitted into ½ in. rebate in the framing, so that it can lie flat therein when not required as a slope. If preferable, it might be framed and flush-panelled, and may be covered with cloth, leather, velvet, etc., glued down to its face, and finished according to taste; a 4 in. flap hinged to its back edge underneath would afford means for propping it up behind, the rebate being cut deeper, to allow of the flap folding down, as seen (*a b*, Fig. 2), so that it may slide under the pigeon-holes. There is an alternative which would save time in rapidly closing the desk—viz., that of leaving a 4 in. space in the pigeon-hole compartment, so that the flap could slide underneath whilst up. In the slope, holes for ink-wells and hollow for penholders, etc., could be made at the back. By this means the desk could be pushed back and closed without moving anything; or a fixed desk, the slope forming a lid, could be fitted to the sliding desk-table of the dimensions given—perhaps the best plan. The drawers and pigeon-holes in the desk portion should now be made, modified according to the above intentions.

As it is an object to obtain rigidity, the front framing of this portion—which, be it remembered, is immovable—should be strongly made and fitted tightly into the carcase, and well screwed thereto from inside, thus forming an extra rail across, and preventing end frames being forced either in or out, and keeping the grooves therein, in which slide the desk-table runners, close to their work. As no rail can be found room for below, owing to the folding of the drawers underneath, it is very important that this frame should be utilised in this manner—stiffening everything.

The desk flap (*n*, Fig. 2), which must not be confused with the slope and flap mentioned above, forms the front of the secrétaire when closed, and contains inside it the locking bars or bolts, carrying the knob with lock inside, or, if preferred, a lock of the usual kind, throwing a bolt into the knob spindle; and the tooth wheel that, actuated by the knob, throws the bolts should be made as follows (see Fig. 5, lettered to correspond with other Figs.).

The face of it should consist of a solid piece of stuff 3 ft. 10¼ in. long by 6 in. wide, ¾ in. thick, planed perfectly true and flat, upon which, on inner face, set out and fix the bolts and other parts of the locking arrangement, filling in with ½ in. stuff all the intermediate portions, which are shaded over in Fig. 5. This shading also shows the direction in which the grain of the wood should lie; which is important. This being done, and the working of the parts being ascertained to be perfect, the plate for the knob being screwed in its place, hinges fitted, and lock, if separate, fixed and found to act, the lining may be glued on. It should be of ⅜ in. stuff to finish out the total thickness to 1¼ in.—*i.e.*, same as the sliding desk-table. On its outer upper edge a small bead, *q*, should be planted for finish where the desk-shutter, *i m*, Fig. 2, joins it. At its lower edge a moulding, *o*, of the section shown should be planted, when rebated, partly on the face and partly on lower edge, which, when down, acts as a stop to the flap, and whilst up conceals the joining of the flap itself to the desk-table.

The only portion of the upper part of the secrétaire left to describe is the shutter, which, made in either of two ways, will complete this portion. In either case it consists of seven—or more, if preferred—strips of wood, hinged together, and chamfered or rounded off at edges, to permit of its following the curve like the well-known shop shutters.

It can be made of 1 in. stuff glued on to canvas at the back, as is often done, or, as I prefer, mortised through centrally in three places for bands of spring steel, ¾ in. wide by $\frac{1}{32}$ in. thick, to pass through; one mortise being central, the other two, say, about 6 in. from each end. For an extra strong job five steels might be used. As they require no fixing beyond being tightly drawn through the mortises, and turned over at each end and screwed, they could not so easily be broken into as if gluing on to canvas is resorted to. Clarke's patent shutter hinges could also be made available as an alternative. To the back of the last rib or lath should be attached the cord at *i*, passing over the pulleys fixed in the carcase, *j* and *k*, and the other extremity made fast to the desk-table at *l* (Fig. 2), which pulls the shutter up out of the way when the secrétaire is opened. To the first or front rib should be attached the catches into which the locking bolts of the front flap throw snugs to hold it down when closed.

I now come to the underneath portion of the construction. The sides of the nests of drawers, which form virtually a pair of doors, should be framed up of 1¼ in. stuff 4 in. wide, and panelled with ¾ in. diagonal panelling, consisting of five 5 in. strips, all stop-chamfered ¼ in. as shown. These doors should be fitted exactly to close the aperture when shut—*i.e.*, each half of 3 ft. 10 in.—viz., 1 ft. 11 in. full. Into the hanging stiles of each (*c*, *c*) the back framing, *a*, *c*, of the drawer-nests should be dovetailed nearly through, and the front framing, *b*, *c*, should also be fixed to both top and bottom rails of these doors at 1 ft. 7 in. from back to front at *e*; the other side frames, *a*, *b*, being tenoned and mortised to the front and back frames. The drawers, runners, etc., can then be made and fitted. The doors, *c d*, *c d*, should not be hinged in the ordinary way, but hung on pivots at *c*, *c*, as shown, which consist of V fixings, like centre punches, working into plates having taper holes in them, so as to secure absolute accuracy of working as they move on their centres. A notch, *z*, must be cut for moulding, *o*, when flap is down. The exterior corners at *b*, *b*, can be rounded off so as not to remain sharp enough to bruise the knees or shins of the writer whilst seating himself or rising.

On the top edge of the back frames, *a c*, *a c*, at the points *f*, *f*, fix two pivots on which two connecting-rods, which may be of iron or brass, 13½ in. long, may work (see *f g*, *f g*), their centres being 12 in. apart. To ascertain the points *f* and *g*, you have only to lay the rod, *f g*, at an angle of 45°, and scribe on *f* the centre hole, and whilst the desk-table is closed, scribe on *g* the

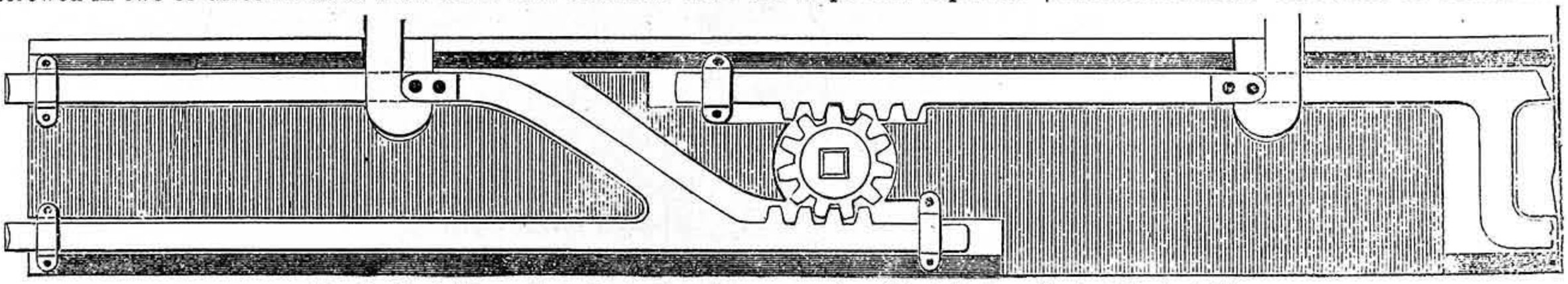


Fig. 5.—Desk-Flap enlarged, showing Arrangement and Lock Bolts. (Scale, 2 in. to 1 ft.)

centre hole, and when the pivots are in place and the desk is drawn out to its full extent, it will be found that the nest of drawers will swing exactly to its place square with the casing, and will allow the projecting part of each door beyond the drawer fronts (*c*, *d*) to act as a support for the desk front or flap to rest upon when down. To prevent the latter being scratched thereby, a piece of thin rubber may be nailed on the top of door at *d*. The doors should have a dumb plinth, as shown.

Should it be desirable to render this secrétaire more secure as a receptacle for valuable papers, etc., the whole of the inner surfaces of the carcase, doors, etc., may be lined with thin steel plates screwed to them, which would prevent their being cut through burglariously. It might also be made to act as a safe by being made of iron and steel throughout, intersected so as to break drills, etc., and made fireproof also. The exterior could be then enamelled to imitate wood of any preferred grain and colour to suit a library furniture—its instanter action rendering it valuable against sudden surprise when in use.

HOW TO MOUNT CANVAS FOR PAINTINGS.

BY A. CONWAY.

ADVANTAGES OF MAKING FOR OWN USE—STRETCHERS—MATERIALS AND DIMENSIONS—FITTING OF JOINTS—WEDGES—COVERING—CANVAS—SUBSTITUTES.

I IMAGINE there are few readers for whom this article will have any attractions who need to be told that oil paintings are usually done on prepared canvas, and that this has to be stretched over a wooden frame or "stretcher." Still, there may be a good many who would willingly make their own stretchers and mount the canvas if they knew how. The work is simple enough, and they only want a few practical directions what to do and how to do it. Artists of the ordinary stamp are not above commercial considerations as to the cost of their materials, and to many of them the saving to be effected by doing what is suggested will not be unwelcome any more than to others. But perhaps this may seem false economy to some readers, for they may assume that the artist's time could be more remuneratively employed in painting than in making stretchers. Well, if an artist could always employ all his time profitably in painting, no doubt this might be the case, and those who can do so will, no doubt, prefer to get the canvas all ready to their hands. After all, though, the great majority have plenty of leisure—too much sometimes—and perhaps some may be glad to fill up their time profitably. Youngsters just beginning to paint may find every penny of consequence to them, and I hope the hints about to be given may be of use to them as well as to others. True, in London and many other places canvas all ready to work on can be had at such low prices that one wonders how it can be sold; but in many country districts it is by no means easy to get what is needed locally, and even when it is met with, the price is comparatively high. However, whether the user elects to make his own stretchers and mount the canvas on them or not, must be left to his own tastes. I can but direct him how to do what is necessary.

The stretchers or frames on which the canvas is to be mounted may as well first engage attention. Nothing need be said about their size, except that they may be anything. The construction is practically the same in all, with a slight addition, which will be named later on, for the largest sizes. These, however, the maker is not advised to begin with, as they may be too unwieldy. The material may be any kind of wood, though pine is generally used for the purpose, because it does as well as any of the more expensive kinds. In thickness it should be about 1 in.—that is, it is nominally of that thickness when in the rough, and before it is planed smooth. When this is done, it will seldom be more than ¾ in. thick, which is quite enough for small pictures, say, up to 30 in. by 20 in., and even for much larger sizes. If preferred, thicker wood may be used for all, but there is generally no object in doing so, and, of course, the greater the quantity used unnecessarily, the greater the amount of material wasted. The width of each piece may be from about 1 in. to 2½ in. or 3 in., according to size. The narrowest named is, however, only suitable for very small stretchers and for ordinary cabinet pictures. About 2 in. may be named as generally about the width which will be best.

Four pieces will be necessary for each stretcher—viz., two for the ends and two for

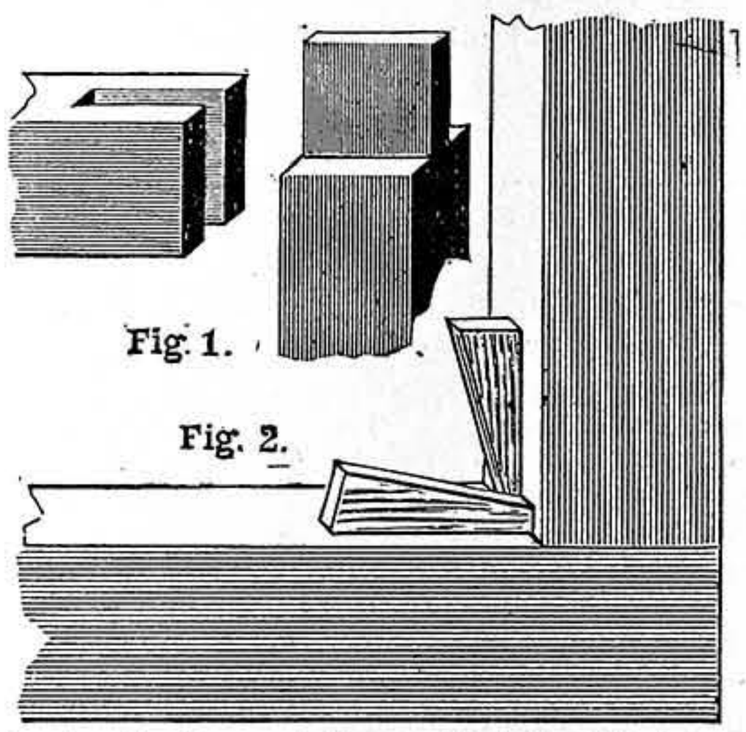


Fig. 1.—Mortise and Tenon Joint for Stretcher.
Fig. 2.—Cover of Stretcher with Wedges inserted.

the remainder. All must be cut of the full length required, and the ends be properly squared. They are fastened, or, rather, fitted together with a plain mortise and tenon joint, as shown in Fig. 1. Beyond saying that the tenon should be of about one-third the thickness of the stuff, it is unnecessary to make any remarks about this joint, as it is of the simplest kind. The parts should fit fairly well together, though the accuracy which would be expected in good cabinet work is not essential. In case of some workers not being quite so skilful as they might be, it may be desirable to remind them that the surfaces of the front—or that portion of the stretcher which is to be covered with canvas—must be level. The back is not so important, but if there is an inequality at the joints in front, it will make itself evident in the picture.

The stretcher might be covered with canvas now, but the wooden support would be rather a frame than a stretcher, for no provision has been made for "stretching" the canvas and taking up any slackness which may occur later on. The parts of the stretcher, it must be understood, are only put together dry—*i.e.*, without glue and without any fastenings in the way of nails or pegs—so they can be pulled apart at any time till bound over by the canvas. This being so, two wedges inserted in each corner, as in Fig. 2, afford a ready means of forcing the pieces of the frame somewhat apart, and in so doing, of course, tightening or stretching the canvas.

The wedges are usually of some hard wood about ⅛ in. thick, and for their reception spaces must be cut, one slightly prolonging the mortise, and the other alongside the tenon of the piece which fits to it.

The stretcher is, after the parts have been put together, ready for covering with the canvas. This should be cut at least sufficiently large to cover the edges of the stretcher, and if a little extra is allowed to lap over behind, so much the better. In doing this part of the work, a pair of the wide-jawed pincers as used by upholsterers will be found a convenience, but the ordinary kind may be used instead, or even they may be dispensed with, and the necessary pulling be done with the fingers. Whatever is used, care must be taken to get the canvas evenly stretched, so that puckers may be avoided. Evenness is even more essential at this stage than tightness, though this should be as great as convenient, otherwise, when the canvas becomes slack—as it probably will—there may be too much looseness to be taken up by the wedges. No specific directions need be given about the way to proceed in fastening the canvas, but probably the most satisfactory plan will be to fasten each edge down with one tack and then gradually work round. If this be carefully done, there is very slight risk of uneven stretching. The tacks are driven into the edge of the stretcher at intervals of, say, a couple of inches. The corners should be neatly folded over and each fastened with a tack. Any canvas projecting over the edge should either be neatly cut away or, better, be folded behind and tacked down there. The canvas should now be fairly tight—*i.e.*, presenting a flat surface sufficiently firm to be worked on. If it is not, or becomes slack, a tap or two on each wedge will make it as "tight as a drum," and nothing more is wanted. The whole of the work is much more easy, even to a novice, than it may seem to be from any description, and as "single-primed" canvas is purchasable at 4s. 6d. per yard 84 in. wide, it will be seen that the cost of canvases on stretchers need not be great when the amateur maker values his time—as he probably will—at *nil*. The addition referred to for large canvases is a cross-bar to keep the stretcher rigid, but will seldom be required.

Perhaps it may be well to say that canvas is to be had in various widths, and that unless some discretion is used in cutting it up, there may be more waste than is desirable or necessary. The prepared canvas is sold by the yard, and is obtainable at any good artists' colour shop. It may also be suggested that, in the absence of the real thing, various fabrics of similar substance may be used—coarse calico, holland, or anything of that kind. Something suitable can always be found in any country draper's shop, so that the would-be painter need never be at a loss in this respect. If he does not care to paint on the unprepared surface, he can easily prime it with some white paint thinned down with turps.

To show any painter-reader of WORK what apparently unpromising material can be used, I may say that I have an excellent picture by one of the ablest of the North Wales artists now living, painted on the back of a piece of glazed table baize. I may fittingly conclude the present paper by suggesting that this fact shows that it is the work, "layin' on the paint," and not the canvas, which makes a picture. Still, it

is not everyone who has the skill of the painter referred to, even among artists, and the beginner may as well use ordinary artists' canvas instead of some substitute for it. This brings to my recollection the saying that a "bad workman always finds fault with his tools," and the converse of this is equally true—namely, that a good workman will make a good job of whatever he takes in hand, even with poor appliances and unpromising material. That this is true is amply illustrated by the fact I have recorded above, in which a master of his art pressed into his service and made available for good work a piece of stuff which, in the hands of a less skilful artist, would have led to failure.

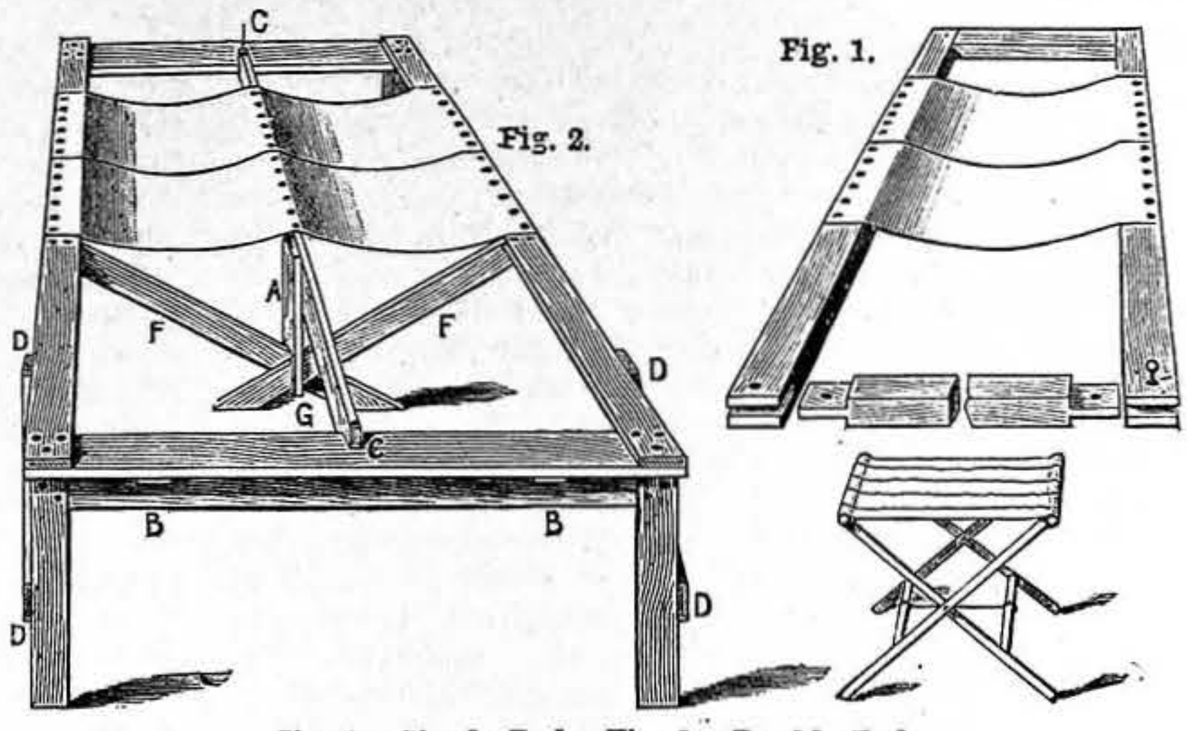


Fig. 2.

Fig. 1.

Fig. 1.—Single Bed. Fig. 2.—Double Bed.

BEDSTEADS FOR EMERGENCIES AND FOLD-UP BATH.

BY JOHN CHARLES KING.

THE handy man who made the Hat-rack described in No. 137 of WORK, at the request of his friends at their stay in Paris during the Exhibition, 1889, was asked to knock up a bedstead or two for three friends who came in unexpectedly. Here we at once see the wide difference between an amateur who makes to conventional forms and fittings, and the man making one without having seen, heard, or thought of a ready knock-off bedstead, who on the instant evolves a new plan to meet means and requirements, using a chair for a bench, a camp-stool for a trestle, and some tools borrowed from a workman who was good enough to spare them for the novice.

Perhaps it was because he was not a bedstead maker or carpenter that his notions of work were untrammelled. "Bedsteads for three in an hour," was the laughing order of the young lady—his sister—though she little expected to see the order so promptly executed. They were done within two hours, and are still in use, as firm as when they were made.

The first one consisted of a square piece of deal, 2 in. by 2½ in., made up into a long frame, as shown by Fig. 1 (cheap and common deal). The open mortises were made by boring four holes 2½ in. from each end of the two long pieces; two saw-cuts into these holes made the mortises in very little more time than it takes to write about it.

The tenons on the two cross-pieces, forming the head and foot of the bedstead, were cut to suit the mortise notches. These tenons were about ⅞ in. thick, to stand the strain on them. Stout canvas was nailed on the top of the frame with large clout-headed nails. The canvas lapped over an inch at joints, held in the middle by a strong safety-pin. Two of these pieces are shown nailed on, to indicate the method. Screws secured the tenons in their mortises, which, when removed and the stiles taken out, allowed the canvas to be rolled round the long pieces for stowing away when not wanted.

A large camp-stool at head and foot served to support it, instead of legs. A mattress was not wanted; the canvas was sufficiently yielding. A little over half an hour was the time taken to make this single bed. The wood, canvas, screws, and nails cost 3s. 4d.

A double bedstead, on legs of some sort, was requested.

Lighter material was brought in for this one. Common deal, as for the single one, but only ⅝ in. thick board, served the purpose for all the parts—top, legs, and stays, or brace-pieces.

Fig. 2 is a double bedstead, made so as to take apart easily, so as to be carried on the arm in moving from the lodging.

The board was cut to the uniform width of 4 in.—the sides and mid-rib were 6 ft. 6 in. long; the head- and foot-boards 5 ft. long; the braces or side-pieces to support the legs 4 ft. long; the legs 2 ft. 3 in. long; the middle diagonal braces 6 ft. 6 in. long. An upright middle leg supported the mid-rib of the frame, and was fixed to the diagonal braces by their passing through a long notch in it. For the convenience of fixing the vertical toe- and head-boards to the horizontal ones, four sliding butts were used. These are marked at B B. This angle form of frame stiffened head and foot of bedstead. The mid-rib, A, was notched so as to clip the flat toe- and head-boards, and was secured by long screws at C, C. The legs were screwed to the vertical head- and toe-boards, and to the long sides of frame. The diagonal leg-braces were fixed to legs and sides of frame by screws, as marked at D, D, making them unyielding.

To prevent the canvas when weighted drawing in the sides of the frame, and bending down the mid-rib, the diagonal braces, F, F, were halved up under the side frames, with a shoulder to the edge of each, and screwed there as shown. These braces were screwed together at G, and notched through the lower part of the middle leg of the bedstead, and screwed to it. Canvas served for a mattress, as in the single bed, the joints overlapping, and held by safety-pins.

It was easily taken apart, and occupied but little space when rolled up in the canvas. It is still in use in Paris, and likely to be for many years as an extra makeshift bedstead for two. The wood, canvas, screws, butts, and nails cost only 6s. 8d., and the time to complete it—an hour and a half.

The sanitary necessity called for a bath, and it was as quickly made up, though there was less of the makeshift and contrivance about it than the bedsteads, but the same aim was in view—economy of time and cost in making, and portability and packability, so as to occupy little space when folded-up—an essential thing in the rooms of a Parisian dwelling.

Some good yellow deal board, ⅝ in. thick, was bought and ripped into 3½ in. stuff, 740 ft. run. This was enough for the frame of a bath—50 in. long, 30 in. wide, and 30 in. deep.

It is made up in four parts—the sides and the ends separate, as shown by A and B, Fig. 3. The top and bottom of sides were screwed on to the uprights without lapping the joints. The ends had uprights screwed on to the top and bottom pieces, as shown in the sketch. These ends had cross-braces, shown at C C, screwed at the joints to the uprights.

This stuff had to be planed smooth, and all the edges well rounded off on the outsides and top inside edges, where the canvas was drawn over the edges or came in contact with them. For fixing the ends on to the sides to make a bath parallelogram shape, eight 2 in. brass sliding butts were used, one of which is shown at Fig. 4, and are shown fixed at J J J J, Fig. 3. These lock the ends to the sides immovably, yet are lifted apart and put together so easily.

The canvas was the stout sort used for fire-buckets. The dotted line shows the two ends and the bottom in one piece of canvas, into which the sides had to be sewn with a double-handed stitch of waxed threads, a thin ribbon of gutta-percha, ½ in. wide, laid between making a thoroughly water-tight joint, even for indifferent sewing, which was candidly admitted by the needleman. The top edges of the canvas had twenty-four button-holes worked in the canvas folded double. These took hold of twenty-four extra stout brass round-headed screws fixed in the upper part of the bath frame, as shown.

The canvas of the bath rested on the floor, so that to soften the resting-places for bathers a roll of carpet or wrappers laid down adds to the bather's comfort.

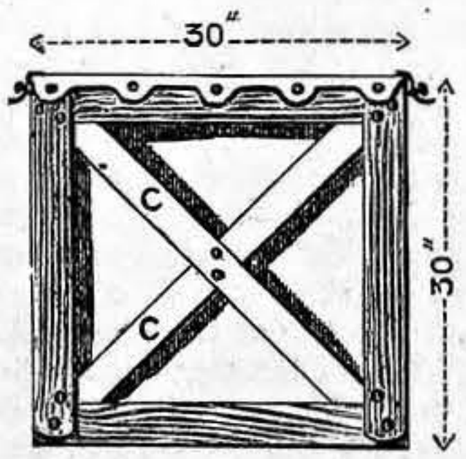


Fig. 3A


Fig. 5.


Fig. 4

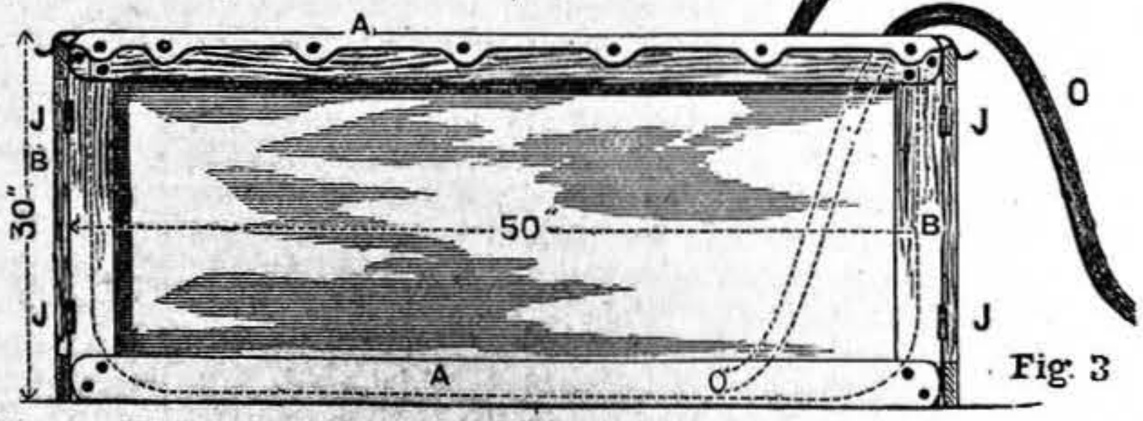


Fig. 3

Fig. 3.—Folding Bath: Side Elevation. Fig. 3 A.—Ditto: End Elevation.
Fig. 4.—Butt Hinge Connection. Fig. 5.—Bath Complete: Folded.

Paris houses are mostly well supplied with water-taps, for supply by hose, if necessary; and for emptying the bath a flexible hose, with a low outfall, would act as a syphon, as it did with this bath. These are shown in the drawing of the bath.

To keep the bath sweet and clean, it must be wiped out well, and be dried before it is folded up and put away in an airy cupboard, or any odd corner of the room.

Instead of plain canvas, indiarubber dressed canvas might be used, and would be quickly cleaned and dried—the edges of lap-joints being cemented instead of being sewn together. The bath-frame is shown folded up in Fig. 5.

In the absence of fire-bucket canvas, closely woven canvas, dressed well with hot boiled linseed oil, and dried before making up, makes it waterproof, and answers the purpose.

What was serviceable in an emergency in Paris might be usefully so in England, in dwellings where room-space is contracted. The contrivances to supply the place of the real articles are certainly ingenious, and show considerable readiness of inventive power. There are not many, probably, who would have exhibited the same aptness in dealing with difficulties, and met so quickly and promptly the imperative call for beds and bath.

HOW TO MAKE A QUARTER HORSE-POWER STEAM ENGINE.

BY F. A. M.

The Feed-Pump and Governor.

An Injector—Considerations Affecting Capacity of Pump—Making the Pump Eccentric, Plunger, and Rod—Chucking and Boring Pump Body—Making and Grinding in Valves.

We have now completed the most important parts of the engine, and we might stop here, simply connecting the steam-pipe with the boiler, and conducting the exhaust steam away by another pipe. Our engine would, however, be deficient in two respects: it would have to be regulated as to its speed by hand, and it would possess no pump for supplying to its boiler the feed-water necessary to make up for what is boiled away. Of course, if steam is obtainable from the boiler of another engine, or if it be preferred to employ an injector to supply the boiler with water, no feed-pump would be necessary. I will tell my readers where they can obtain a small and very simple injector, suitable for supplying our engine boiler, in case they should prefer it, and will then describe the force-pump designed for this engine. A small injector can be obtained from Mr. E. Powell, of 12, Grove Hill Road, Tunbridge Wells. No. 1 size will supply a one or two horse-power boiler; it is quite a little thing, and very simple, having no adjustment, but only requiring the steam and water turned on: it costs £1 1s. I have seen one of them at work, and believe that though so small they are quite reliable.

As to the capacity required for our pump, if we relied on theory alone we might turn to a table showing the comparative volumes of water and steam at 40 lbs. pressure per square inch, when we should find that one cubic inch of water would give about 500 cubic inches of steam at 37 lbs. pressure above the atmosphere, and we might proceed to argue from this that, as the pump, being single acting, throws one barrel full to every two cylinders full of steam, therefore the pump would require to have a capacity of $\frac{1}{250}$ part of the cylinder. Suppose the steam cut off at $\frac{3}{4}$ of the stroke, then we have a length of 6 in. of the cylinder filled with steam for the double stroke, or one complete revolution; add another inch for leakage and call it 7 in.: now, the area of 2 in. being 3·14 square in., 7 in. by 3·14 in. gives 22 cubic in. of steam expended for each revolution. Our pump has a diameter of $\frac{1}{2}$ in. and a stroke of $\frac{3}{4}$ in., its area being ·2 square in.; ·2 in. by ·75 in. gives for the cubic in. of water thrown per revolution ·15. No pump will throw its full capacity, so we will only reckon on $\frac{2}{3}$ of this, and call the quantity of water delivered by the feed-pump per revolution ·1, or $\frac{1}{10}$ of a cubic in.: $\frac{1}{220}$ of the capacity of the cylinder; the actual amount thrown by the feed-pump, therefore, should be greater than what is theoretically required by as much as $\frac{1}{220}$ is greater than $\frac{1}{250}$.

This will perhaps be the place to explain that it is convenient to be able to regulate the amount of water thrown by the pump so as to balance as nearly as possible the quantity extracted from the boiler by evaporation. This is done in a very simple way by means of a "return cock," which is either fitted as a branch on to the delivery-pipe, or else is screwed into that part of the valve-box of the pump from which the delivery-pipe springs. By looking at the back view (Fig. 6, page 328), such a cock will be seen; it serves a double purpose; acting as a pet-cock, it will release any air that may have accumulated, and, by gradually adjusting it, it can be made to let out and allow to return to the supply tank any quantity of water forced by the pump and not required by the boiler. It is also convenient to have a pump of a little more than the size absolutely needed, because, when about to stop work—at dinner-time, for instance—we can, by filling up the boiler, both ensure its safety from burning while we are away, and also lower the pressure by the introduction of a considerable quantity of feed-water. These practical considerations make it desirable to have a pump of more than the theoretical capacity. Some, too, prefer to have both the pump and the injector, as they are sure then to have one available; also the injector can be used when the engine is standing still, provided only there is steam in the boiler, so that it could be used to fill up the boiler during the stoppage for meals.

Having now taken a little rest from the details of construction, let me direct my readers' attention to Figs. 4, 5 (page 260), where the pump appears in section and plan; also to Fig. 6 for end view, and to Figs. 20, 21, 22 (page 328) for the eccentric, plunger, and rod. A second pair of straps will be required exactly the same as those before described; when these are finished, the eccentric (Fig. 20) would be undertaken; the two holes for the screws may be bored first of all, and through these holes wood screws may be passed into C, Fig. 56 (page 581), which can then be adjusted upon B, so as to bring true first the hole to be bored, so as to fit upon the boss of the main eccentric; and then the outer rim to fit the strap; also, if the screw-holes are countersunk and the heads of the two screws do not project, the face of the eccentric can be turned; if not, a narrow band only can be turned round the edge, and the remainder might be finished by the file: then the other side would be either turned up flat or filed. Notice, however, that the eccentricity is in this case only $\frac{3}{8}$ in., and not $\frac{1}{2}$ in., as in the valve eccentric. We now pass on to the plunger and rod, about which there is little to say, except that the small end of the rod containing the hole for the pin should be case-hardened, and the pin itself must be of hard steel, and driven firmly into the eye of the brass plunger. The plunger itself is made in two pieces, for which castings are supplied, and the two parts are to be soldered together when the joint has been fitted, and cannot then be separated without unsoldering again; this, however, will most likely never be required.

Turning now to the pump itself, the casting for the body has on it a foot, or flange, best seen in Fig. 6, by which we may chuck it on the angle-plate on the face-plate chuck. This foot must first be brought flat and vertical, so as to be parallel with the centre line in Fig. 6, in such a way that, when standing on its flange upon the face-plate, the scriber point will come to the centre of the four holes—namely, the suction, the delivery, the top of the valve-box, and the barrel. To ascertain these centres, plug them up temporarily with wood, file off the wood level, and find the centre with the dividers. There should have been a facing on the bed against which the pump flange would have bolted, but none was made because some might not wish to have the pump at all, and the flange can be well enough fitted to the casting by rubbing the place where it is to go with red marking to try the flange upon it. First, however, we must have the flange upright, and not slanting, as it appears in Fig. 6; also it must be brought into a plane parallel with that in which the centre lines of the pump lie, as before described; when this is done, it can be clamped upon the angle-plate, and each of the three centre lines can be brought true with the centre of revolution one after the other. Let us begin with the longest part—the valve-box. Set this carefully true in the lathe by adjusting the flange upon the angle-plate, and clamp it firmly; then bore out the inside to $\frac{13}{16}$ in., $\frac{1}{2}$ in., and $\frac{5}{16}$ in., taking care to bring the valve-seats perfectly true and smooth; cut the thread for the cap that closes the top, and turn the mouth of the hole true; we might, if we wished, turn the outside as far as the delivery branch, but that would involve getting up the whole of the outside bright, and it may as well be painted. Now take off the face-plate chuck without disturbing the setting of the pump body, and turn the two small conical valves. These valves are made from two little castings. Taking the large one first, centre it, and bore the little hole up the wings, which receives the reduced spindle of the lower valve; countersink this hole slightly, put the carrier on the small end, and put the little casting between the centres; or it might be grasped at the small end by a universal chuck, and supported at the other by the back centre point in the drilled hole; turn it up, bringing the three flat wings to fit into the bored part of the valve-box, and bringing the part that fits the seating to exactly the same cone, rubbing red marking on the turned seat, and trying the valve in till it fits; then see that the largest part of the valve does not exceed $\frac{5}{8}$ in. diameter, so that there may be room for the water to pass. The smaller valve is to be turned in a similar way; the top of its spindle is to go into the hole in the upper valve to steady it, but it should not fit that hole closely. The small valve should be capable of lifting $\frac{1}{16}$ in., an amount which can be regulated by holding down the upper valve and lifting the lower one with a bit of wire; put up the suction, and file off the top of the spindle till the lift is correct.

Having turned the valves, put on the face-plate chuck with the pump body upon it; make a handle for the valves by boring a hole in the end of a bit of wood, into which you can drive the small end of the spindle; then, while the pump is going round and back in the lathe (for you must not let the lathe wheel go continuously), you proceed to grind the valves to their seats. Do not try to do this with emery—never try to grind brass with emery; you can do it with some of the grit from the grindstone trough, or, better still, with a little bit of oilstone crushed up with the hammer on any hard surface, because then you get it pure. The great danger to be guarded against in grinding in valves, or plugs, is lest you get the surfaces which ought to be water-tight scored in rings and rough. This may arise through not keeping the grinding material distributed; it won't do to use force or to keep grinding on; press very lightly and withdraw constantly, to pass the finger over the surface and re-distribute the powder, and continue till you see that smooth, dull look that appears on the plug of a gas-tap if you take it out. Water will do well enough to mix with the grinding powder; you and I, reader, will not imitate those who use the product of the salivary glands, though it may be so conveniently near at hand.

The two valves being ground to their seats so that air cannot be sucked through, we may turn the pump body round on the angle-plate and set the barrel true to bore it out to fit the plunger, and cut the thread for the gland; then turn it round again, and screw and face up the delivery branch. The pump is to be strongly bolted to the bed, and the studs should fit well into the holes in the flange, that it may not move. An india-rubber pipe is to be stretched over the bottom of the valve-box for the suction. The delivery-pipe has a small ring brazed to it after the union-nut is put over it; the nut holds the pipe by this ring, and clasps it up to the face of the delivery branch. Between the two faces would be interposed a ring of indiarubber to make the joint good. The return-cock already referred to, as seen in Fig. 6, is supposed to be screwed into the valve-box, but it need not be placed there: it might be fixed as a branch downwards from the delivery-pipe.

SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

Setting Out, involving the Use of the Square and Gauges.

We made the acquaintance of the mortise gauge in our last lesson, marking by its aid the position of the mortise and the position and thickness of the tenon. The square is needed to mark the shoulders and set out the mortise. It is important to remember that the square should always be used from the same edge and side, *unless* the wood has been prepared perfectly parallel in width and thickness, in which case it is immaterial to which side it is applied. It is for this reason, among others, that workmen always mark the prepared side and edge of all work requiring setting out. Whenever setting out anything in pairs, be sure to keep each pair face to face, or mistakes will occur. It is frequently a great advantage to fix, with a hand-screw, all the stiles—mortised members—of a job together, when the setting out can be done on the edges of each, transferring the marks as necessary to the other edge with square; in doing so, care is needed to have all the inner edges together, as well as all pairs face to face.

The gauging must also be done from the same surfaces throughout the job—that is, the marked surface of each piece—in order that the work may be "flush," or even, when put together.

If you have to buy a square be sure to look at several, and make sure of getting a good one by getting one that agrees with two that mutually agree. Formerly, buying a square was more uncertain than now, but sometimes squares (so called) belie their name. I found no difficulty, however, in getting several for a class, some time ago, all alike and correct.

If a square is, or has become, incorrect it will give different indications when reversed, but do not venture to alter a square unless you are certain that the edge by which you are testing it is accurately straight, and not then unless you have had much experience.

Supposing the work is dovetailed the setting out is different, inasmuch as the *ends* of the wood are more important, and are usually gauged from. As the lines cross the fibre of the wood a cutting gauge is preferable to a marking gauge. It is to be set, for plain dovetails, fully the thickness of the wood, so that the pins will just project a shaving when the work is finished.

This gauging pre-supposes that the ends of the work are planed accurately; this of itself constitutes a difficult lesson to be mastered, though one in which my writing without your perseverance will be of no assistance. If the work is of equal thickness, then one setting of the gauge will suffice; if not, it is better to have two separate gauges than to risk mistakes.

Opinions differ as to the best procedure in dovetailing. This is as it should be, for do not circumstances alter cases? In the great majority of instances the dovetails may be cut first, because then they can be cut in pairs, which if the pins were cut first could not be the case, though there are sometimes circumstances which make it almost imperative to depart from the usual mode of procedure.

There are, of course, several other methods of joining, the setting out of some of which shall be described in the next paper.

MEANS, MODES, AND METHODS.

What to do with Empty Tins.

Nowadays that so many different articles are packed in tins, it is a puzzle to many people to know what to do with them when their contents have been used, and in consequence many useful tins find their way to the ashpit.

I make it a maxim to never throw away an empty tin. Cocoa and mustard tins, if in good order and with the covers, I reserve for holding nails, screws, etc.; it is much more convenient to keep them assorted in tins than knocking about in a box. All my dry paints, plaster of Paris, and such like, I keep in square tins, and by this plan none of my colours ever get spoiled by damp, besides being to hand whenever I want them.

Large fruit tins, empty tea canisters, and all large tins, if a little battered, I hold over a hot fire—not with the fingers, mind, but with a pair of tongs—until the solder melts and the sheets of tin fall asunder. When cool, I hammer out flat with a mallet on a block of wood and put by for future use. These are but a few of the ways in which old tins may be utilised, but to an inventive mind no doubt many other means of utilising them will crop up, and what was formerly regarded as waste become useful, if not ornamental.

How to Mend a Broken Violin Bow.

A musical friend of mine came to me one day some time ago in great tribulation. He had broken his violin bow across the middle—the result of a fall—and not being able to tackle it himself, he begged me to try my hand at it. At first I was afraid it was

Fig. 1

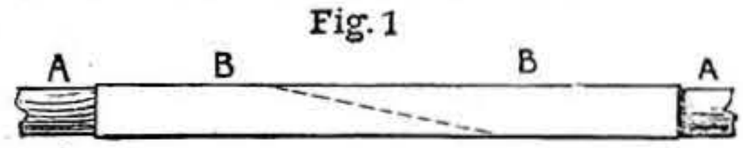


Fig. 2.

Fig. 1.—How to cut Broken Ends to form Splice.
Fig. 2.—Join Complete—A, Wood; B, Tubing.

done for, but after a little cogitation I hit on a plan which was very successful. The break was not straight across, but a little slanting, and with a sharp penknife I cut both ends so as to form a half-lap joint like Fig. 1. Then I got a nice piece of nickel-plated tubing—part of a pocket pencil, in fact—about four inches long, and which fitted tightly on the bow. I glued both bevels, and, about two inches above each, slipped the tubing over one half and then slipped in the other end, pressed well together, and left to dry. Fig. 2 shows join complete. It was a very good job, and stood well, the bow being in use still, and giving every satisfaction; the only fault being that it is a little heavy on account of the piece of tubing, which should be as light as possible.

A Good Temporary Bench-Stop.

Many carpenters, when in want of a stop for temporary use—as, for instance, when working away from home—simply drive a few nails into the bench end, leaving the

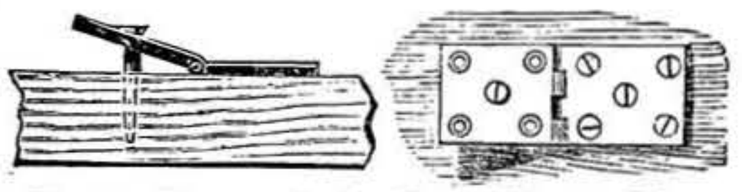


Fig. 1.—Stop ready for Use. Fig. 2.—Plan.

heads projecting enough to hold the wood. This is a bad plan, and a much better substitute can be made out of an ordinary butt hinge, one end of which should be filed into teeth so as to hold the wood better. This end should be left loose, and the other side screwed down tightly to the bench end. A long, light screw through the middle hole in the loose side will afford sufficient adjustment for thin or thick stuff. Figs. 1 and 2 will explain what I mean; it is much better than nails, and can be taken up when done with, and put away.

E. A. P.

*** This department of Work is open to the contributions of all who may be able to suggest some mode of procedure in working that he has tried himself and which may be useful to others. Considering the thousands of readers into whose hands Work goes weekly, there should be at least a column weekly, if not more, of such suggestions, etc.—Ed.

AN AMATEUR'S READING-STAND, OR BOOK-REST.

BY F. B.

BEING a tradesman, my time is broken up and into very much, and frequently when reading I am called away, and have to put my book down hurriedly. On coming back, I generally have a difficulty in finding the place.

However, I happened to have some disused brass gas-arms lying in a cupboard, and seeing these one day by mere chance, I thought of a way to make a book-rest out of them. What I thought of is shown by the drawings that accompany this paper.

It will be seen by Fig. 1 that it is well suited for reading, as it is adjustable to any height, by simply sliding arm up or down the standard. It also swings either way: which is very convenient, saving the trouble of lifting the whole concern when one wishes to get up from the chair.

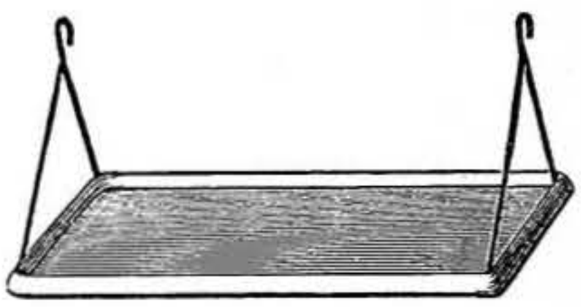


Fig. 4.—Small Tray for Invalids.

I have sketched it from the back, because the different parts are seen better in that position. The parts lettered A, B, C, Fig. 1, and their accompanying joints, simply screw into each other; D was a socket which received a tapering joint. This I had to file to fit B. I next sawed 1½ in. off a 1 in. pipe, and then divided it again lengthwise, as seen in Fig. 3 at E, E. I then purchased a 1¼ in. brass hinge, D, which I soldered inside.

When I had got thus far, I thought I might as well make the book-rest so that it would take off and on—so that, if I wished to read at the table, I could do so (see Fig. 2). I cut two parallel cuts with an old tenon saw, to receive the ends of slot (A, Fig. 3), which I bent up out of a strip of brass, and fixed with solder from inside. I next took an old binding-screw from an electric battery, sawed the ends off, and drilled one so that the screw would not bite, leaving the other thread intact. These I fixed one on each half of tube, as shown at B, Fig. 3. I then cut two pieces of rubber sheeting, and fixed inside with glue. I also cut furrows lengthways, so that it would grip arm better (see C, Fig. 3). When this little contrivance is put on to the arm (C, Fig. 1), and screwed up tight, it may be raised or lowered to any angle required, without fear of slipping or altering its position, not even with a heavy book resting upon the book-rest.

I purchased next a plain band of brass, 3 in. wide by 2 ft. 3 in. long, and $\frac{1}{16}$ in. thick. This I cut into strips, ¾ in. wide, with a pair of snips. This gave me four lengths. I cut three of these again into shorter lengths, of 13 in. and 11½ in. full, so as to allow for working up into shape (see Fig. 2). I hammered them as flat as I could, and then filed them with a very fine flat file, finishing with two or three different sizes of emery-cloth.

My next difficulty was to drill the holes true, so that I could rivet them together, as shown in Fig. 2. I hit upon the plan of folding a piece of stout zinc round the end of one of these bands, so that it would slide off with a little pressure. I then drilled a small hole through both zinc and brass, and by this means I was able to measure accurately all the end holes; then, with a very little trouble, I was able to drill the others. I made my rivets out of brass wire. I next purchased a ½ in. hinge, for the back support, as shown at A, Fig. 2.

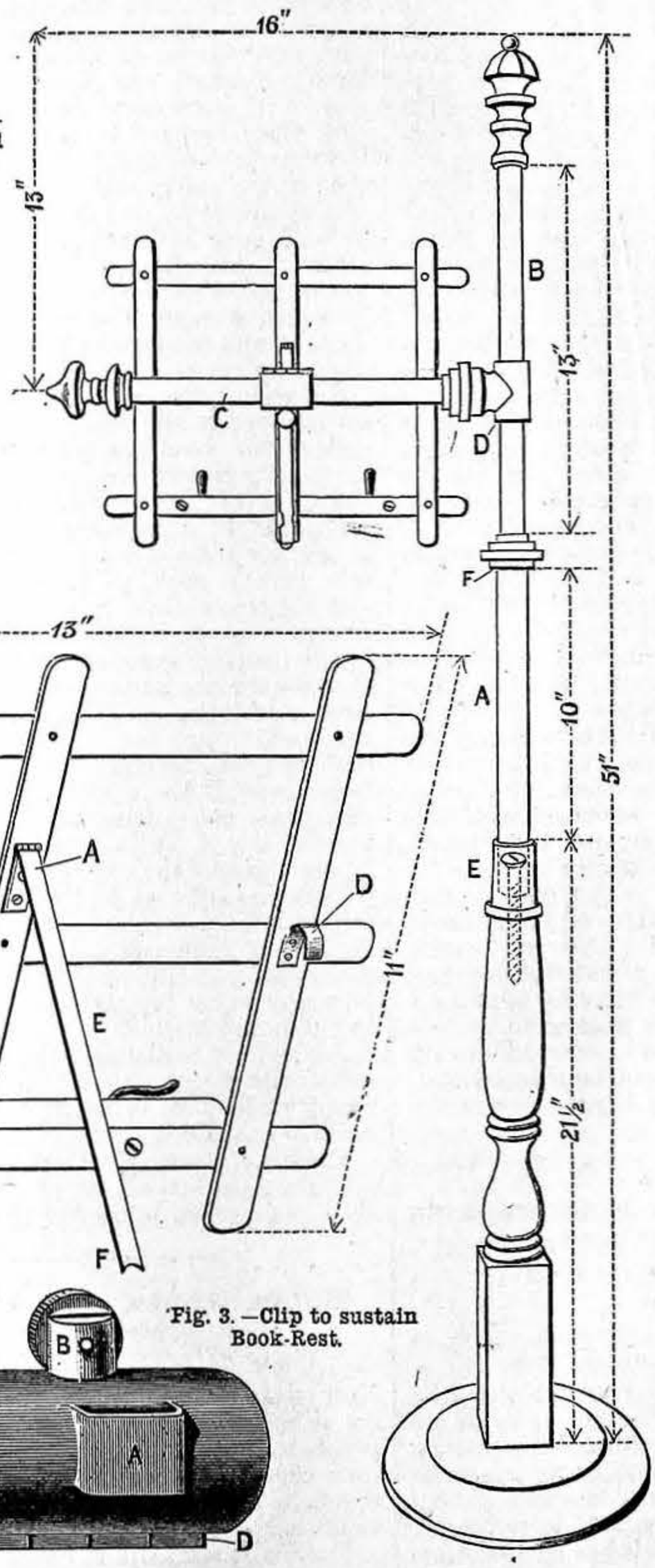


Fig. 1.—Reading-Stand Complete.

Fig. 2.—Book-Rest.

Fig. 3.—Clip to sustain Book-Rest.

My next job was to cut a piece of mahogany, to form a shelf to rest book on, 1¼ in. wide, 11½ in. long, and ⅜ in. thick. This was already polished. I fixed this on from back with screws, as shown at B, Fig. 2. I purchased hooks, for keeping the leaves of book down, at a piano maker's; but he charged so much, that if I had occasion to make another book-rest I should try my hand at making them out of an ordinary wood screw and a flat piece of brass filed into shape. I also found it necessary to make a small clip (see C, Fig. 2). This I made out of a thin strip of brass, and soldered it to centre-band, as shown. This tended to keep book-rest steady when fixed into its place. I also fixed two flat hooks, as shown at D, D, Fig. 2. This also I found an improvement in the same direction. The back support (E, Fig. 2) I made from strip of brass, ½ in. wide, and 7½ in. long, the end being filed with round file, to prevent it slipping when standing on the table (see F, Fig. 2).

Now we come to the lower portions. I had made up my mind that I should have to turn up a pedestal in lathe; but finding the leg of a common toilet table, I enlisted it into my service. The first thing was to turn it upside down, and bore a hole with centre-bit (see E, Fig. 1) 2½ in. deep, and just slightly larger than tubing, A, which it was to receive. I then took a 4 in. wood screw, and drove it in about half its length in centre of hole E: for what purpose I will explain presently.

My next difficulty was to get a base that would stand firm, and not be much in the way. This troubled me not a little, until I happened to see an old rusty tin plate, which suggested to me the plan I will now describe.

I put the plate on the fire with all the scraps of old lead pipe I could find, but I could not find enough to fill it so I pressed a horseshoe, a few old iron hooks, and a ½ lb. weight into my service. I was careful to put these near the edge of plate, so as to leave centre of it filled wth lead. The plate measured 9 in. over all. I next proceeded to fix my plate (bottom upwards, of course) on the square end of the pedestal, taking care to have it in centre. I used a 5 in. wood screw and a washer for this purpose, and one or two nails to keep pedestal from twisting. I next cut a circular piece of wood the same size as plate. This I screwed to the bottom, after having first completed filling the plate with plaster of Paris.

There only remained to make the joint good between brass tubing, A, and the wooden pedestal at E. This I did by simply unscrewing tubing at F, Fig. 1, and placing A in position, taking great care to have it

upright. I then poured melted resin into the tube A, which flowed all round the wood screw, and filled up the space between wood and brass, making a clean and rigid joint with a very little trouble.

And that is how I made my book-rest, or music-stand. We use it also for a fire-screen, which is easily and effectively done by hanging a fancy worked banneret from the projecting arm. It is also very useful in a sick room, as the arm can be put to its full height, and a small tray suspended in front of patient (see Fig. 4). I ought to say I ebonised the wood and base, which makes a very good finish, and contrasts well with the brass-work.

MAKING THE BEST OF A BAD HOUSE.

BY MARK MALLETT.

THE STUDY: THE WALLS—THE DADO—THE FRIEZE—ORNAMENTATION OF THE FLOOR—THE DOORS—SOME PRACTICAL SUGGESTIONS.

The Study: the Walls.—It will be remembered that I found the walls of my study covered with bare whitewash only from floor to ceiling; they were wholly innocent of cornice or skirting-board, and had, moreover, anything but an even surface. I scraped and cleaned away the whitewash, and then fell to considering how I might best render them more pleasing to the eye.

The Dado.—In the first place, as old wainscotting was abundant, I resolved on a dado of dark carved oak; this would be the very thing to harmonise with the woodwork of the fireplace. A few carved panels like those in the chimney corners were still remaining. I had also plenty of plain ones, so nearly of the same size that, with judicious placing, the difference would never be noticed, and these last I proposed to carve to match. Fig. 13 is one of the old panels. The ornament is a common one of the "Restoration" period, and one which requires no great skill or any long time to carve.

My panels were but some 15 in. high, and the whole strip of wainscot only about 21 in., so I had to bring my dado to a proper height by placing next the floor a skirting-board of ebonised wood, and of this I could slightly vary the width so as to bring my odd lots of wainscot to one uniform level. Along the top of the wainscot I nailed another strip of ebonised pine having a moulding on its projecting edge. This finished the dado off neatly. As I have before remarked, old dark oak and ebonised wood go exceedingly well together.

I may mention here that preparing the old oak cost some little trouble—more, indeed, than the actual carving of it. Old oak generally comes into the hands of the collector in a bad state—choked up sometimes with whitewash, beeswax, or dirt, or very frequently with paint. About the middle of last century the fashion appears to have been to paint the oaken wainscot of old rooms *white*. Some of the ancient wainscot that has come to my hands had received not less than half a dozen coats of paint. Whitewash, dirt, etc., yield to hot water, soda, and a scrubbing-brush, but successive strata of paint, which have had a century and a half in which to harden, require more serious treatment. The plan which I have found most successful is to make a strong solution of American potash, to mix it with sawdust, and to lay the poultice thus formed over the paint for a few hours; if cold water and a sponge will not remove the incrustation at a first treatment, they generally will complete the cleansing at a second. After either soda or potash the old oak loses its rich colour and looks pale and poor; but rubbing over with boiled oil, and a subsequent polishing with beeswax and turpentine, will restore it to its original tone.

In nailing the dado to the plugs which I had driven into the walls, I made use of a simple dodge for boring and nailing at exactly the right spot, which may prove a "wrinkle" to those not acquainted with it. Taking a plummet, I tied a knot in the line at a somewhat greater distance from the lead than the plug was from the top of the dado; then, adjusting the plummet so as to bring the bottom of the lead exactly to the middle of the plug, I marked a cross on the wall opposite to the knot. When my wainscot was arranged in place, I had, it will be seen, merely to hold the knot opposite to the cross on the wall and the lead would show with certainty the spot at which to drive the nail.

The Frieze.—The wall space above the line of my dado I well sized, and papered with newspapers to bring it to a more level surface. I got some steam-struck moulding of two sizes, one 1¼ in. and the other ¾ in. in width (they cost respectively 5s. 6d. and 3s. 6d. per 100 ft. run). These I ebonised, and fixed up the larger against the ceiling by way of cornice, whilst the smaller I nailed below at a distance from it of 1 ft. to form the bottom line of a frieze.

I had proposed to fill this frieze with an embossed paper about one-third gold and two-thirds maroon, but, as we all know, it is easy to imagine a paper just to one's taste, but not so easy to find it in the maker's pattern-book. I could meet with nothing to my purpose, but in the end made by no means a bad shift by using a plain maroon paper, and along its middle running a 5 in. strip of Japanese leather paper, all gold lacquer. As this paper is of extraordinary width (36 in.), three yards, at 2s. per yard, sufficed for the room.

The space between dado and frieze I papered with a plain and rather dark sage green, which went well with the other fittings, and forms an admirable background for pictures, whether in gold frames or black.

Ornamentation of the Floor.—The floor has been spoken of as the one good thing in this otherwise uninviting room. It was of fine heart of oak, and the century's wear which it had undergone had served only to season it. Had a floor polished throughout been the thing required, no one could have desired better material on which to operate. But, however pleasant to look upon, a slippery floor is practically objectionable. However enjoyable sliding may be upon the ice, it is not a satisfactory form of exercise for one's own sanctum. As I had no intention of laying down a carpet, I wished to preserve a firm foothold where the floor had to be walked upon. I contented myself, therefore, with oiling and polishing a width of about 2 ft. round the outsides. This strip took a rich colour and made a good ground on which to arrange my carved chests and chairs.

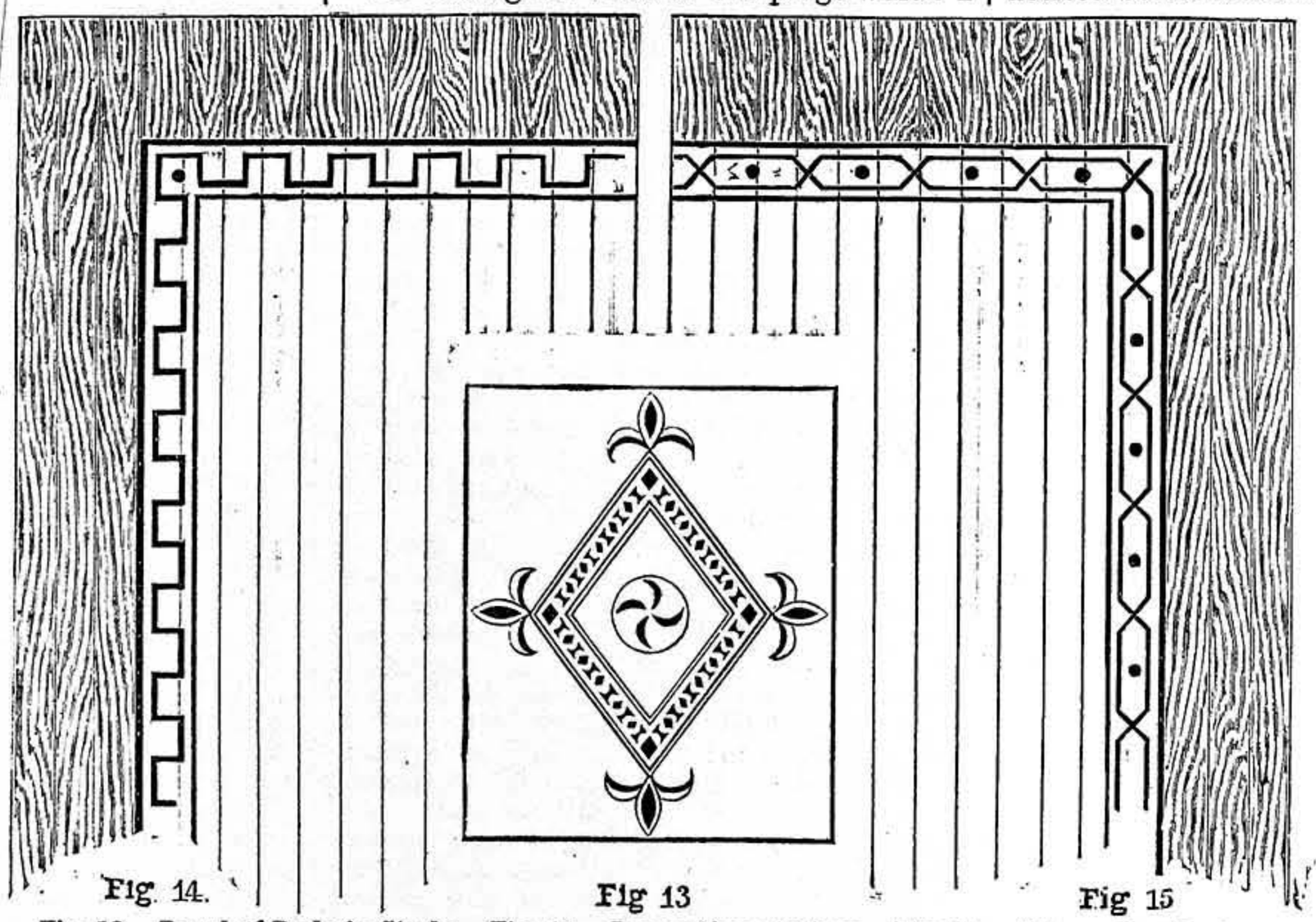


Fig. 14. Fig 13 Fig 15

Fig. 13.—Panel of Dado in Study. Fig. 14.—Decoration of Floor. Fig. 15.—Alternative Design.

But the break between it and the unpolished part was too abrupt; so, to correct this, I added a line of ornament about 1 ft. in width, as seen in Fig. 14. Having drawn out the pattern on the floor I went over it with a solution of iron, the effect of which was to turn the oak wherever it was touched almost black. Iron turns new oak to a purplish black, but old oak to a very deep rich brown. The solution of iron was made by putting old nails, etc., in vinegar, and it was laid on with a small brush. If applied too freely, there is danger of the stain running along the grain of the wood, and thus in cross lines giving a blurred outline; with, however, a piece of blotting-paper kept beside the worker, superfluous moisture may be readily removed.

When dry, the stained parts should have a couple of coats of varnish; the ornament will then stand wear and tear and the scrubbing-brush for many years. This simple mode of floor decoration gives something of the effect, without the cost, of parquetry. It is one in which a simple pattern may be carried out with no great outlay of trouble, and will be sure to look well. As its inventor I may claim this for it. For an intricate design it is unsuited Fig. 15 is an alternative pattern.

The Doors.—To bring the doors in keeping with the old oak and ebonised woodwork, they were painted black; but as one of them led to the open air, it was desirable, for winter comfort, that arrangements should be made for covering them with curtains. Now, the brass and tapestry in vogue for that purpose would scarcely have been in keeping with the home-made fittings of my den, and, what was still more to the point, they were too costly for me. I contented myself with curtains of common green baize, but near the bottom of each I had sewn a double width of old-gold braid 1½ in. wide, and a trifle higher a single width of the same. This made handsome curtains.

For the means of hanging them I had recourse to the dismantled "four-poster" above-mentioned. Its side-rods were of the right length for my purpose, and each of them had at one end a socket, into which the foot-rod screwed. With the fret saw I cut from a bit of hard panel an ornamental javelin head of *fleur de lis* shape, gilded it, and screwed and puttied it into the socket of the rod; the rod itself I enamelled vermilion. Both my doors were in corners, so that one end of the rod in each case fitted into a socket fixed to the wall; the other, the ornamental end, had a hole punched through it and was hung on a hook. Thus arranged, my door-curtains were by no means a costly luxury.

Some Practical Suggestions.—In effecting the above improvements in "my den," it must be admitted that in some respects I had advantages which others who may wish to undertake similar work may not have. For instance, one does not find a good oak floor in every room. Yet I would observe that an ordinary deal floor is susceptible of decoration by the same method, only in that case, instead of the solution of iron, one of the usual wood stains must be used.

Nor may everyone have a stock of old oak panelling at his disposal. But, failing this, new match-boarding is always to be got, and is not costly. If the reader will refer to the excellent designs for ornamental arrangements of it in Vol. II., p. 627, No. 91, he will find abundant suggestions for such artistic new woodwork as might well take the place of my old wainscot, and which might be stained to any desired tone.

On the other hand, the rooms in ordinary and more modern houses will have advantages which mine had not; in the matter of windows this will probably be the case. These windows will most likely be larger, and, unlike mine, of greater height than width. Had I such a window space to deal with I should, before filling it with leaded lights, fit in a transom as well as a mullion. Say that its dimensions were 4 ft. 9 in. high by 3 ft. 3 in. wide, and that my mullion and transom each occupied a width of 3 in., I should then divide the space into two upper lights, 18 in. square, and two lower lights, 36 in. by 18 in. The lower lights I should fill entirely with white glass (plain pattern glazing), but in each of the upper ones I should introduce a coloured medallion or cartouche. I should thus get a more effective Elizabethan window than that shown in my last article.

I proceeded, however, just as I have told my readers, in the self-imposed task of turning my house, or parts of it, which at the first glance had appeared so devoid of promise, into one which, to say the least of it, was satisfactory to the eye. I have other portions yet to speak of, but the description of these I am compelled, through want of space, to reserve for future papers.

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.*

96.—"A First Book of Mechanics.

Among the various educational works that have been published of late years by Messrs. Cassell and Company, Limited, there are few that have as good a claim to favourable consideration from schoolmasters and teachers, and acceptance and permanent adoption as a text-book, as "A First Book of Mechanics for Young Beginners," written by the Rev. J. G. Easton, M.A., late Scholar of St. John's College, Cambridge, and formerly Head Master of the Grammar School, Great Yarmouth. The value of the work itself as a text-book is much increased by the numerous examples that are appended to each chapter; but, as the book is intended for the use of schools, it is a question whether it would not have been better to have given the answers to the examples in a separate form, and, for the better assistance of pupil-teachers, to have incorporated with the answers the working of some of the more difficult problems. It is claimed on the title page that the book is "very fully illustrated," and so it is from one point of view, for it contains many explanatory diagrams in elucidation of the text; and it would have been well to have added the words "with explanatory diagrams" to those already quoted, for the popular notion of a fully illustrated work is that it contains plenty of pictures, and no publishing firm or company, perhaps, has done more to create and confirm this popular notion than Messrs. Cassell & Company, Limited. The *raison d'être* of the book itself is best gathered from the preface, in which the author explains that it has been developed from notes compiled by himself, "during a considerable scholastic experience, for the use of pupils preparing chiefly for the London Matriculation, the Preliminary Medical Examination, and the additional subjects of the Previous Examination at Cambridge. In its present form it is intended to supply the want, which has probably been often felt, of a text-book on mechanics treated with mathematical strictness and suitable for beginners whose mathematical knowledge is limited to Euclid's Geometry and to Algebra as far as Quadratic Equations." To anyone who has been brought up according to the old lines of mathematical teaching, it will naturally seem at first sight that the cart has been placed before the horse in taking Dynamics before Statics, but Mr. Easton very ably and, what is more to the point, convincingly shows that this mode of procedure is more reasonable than the old arrangement of Statics first and Dynamics afterwards, and explains that "at the present time there is a tendency to establish the science (of Mechanics) on the foundation of the Three Laws of Motion. In this course of procedure the elementary notions of velocity and acceleration are first dealt with, and next the measurement of mass and force, as involved in Newton's Second Law, is considered. The Parallelogram of Forces is shown to follow at once from the doctrine of the 'physical independence of forces' taught by that Law, taken in conjunction with the geometrical theorem of the composition of simultaneous velocities." In accordance with this, Mr. Easton divides the first part of his book—namely, Dynamics—into two sections: Kinematics, dealing with (1) velocity and acceleration, (2) linear acceleration, and (3) the composition of velocities; and Kinetics, treating on (1) force and mass, (2) Newton's Laws of Motion, with examples, (3) collision or impact, and (4) work and energy. Of these, Kinematics involves the geometry of motion, or motion considered irrespective of its causes, and Kinetics, motion, together with the causes producing it. Then follow Statics, in which the state of rest of bodies is dealt with. That Mr. Easton's book is in every way important and well conceived as a text-book is proved by the *primâ facie* evidence of its arrangement, and the clearness of the matter contained in its pages. There is but one thing that I can venture to suggest by way of improvement, and that is, a short glossary giving the meaning and derivation of scientific and mathematical terms employed in its pages. Such words as dynamics, kinematics, kinetics, velocity, acceleration, statics, etc., present no meaning that the mind can fairly grasp at first sight to those who are unacquainted with their derivation, and thus miss the force of signification that is contained in them; and it is not every teacher who can explain them to his class so as to endow them, as it were, with the life of meaning, and thus to render them better capable of retention in the mind and in the memory.

97.—"Condensed Mechanics."

In marked contrast to the volume just noticed, which deals with theory rather than practice, or which, in other words, is theoretical rather than practical, is "Condensed Mechanics," a selection of formulæ, rules, tables, and data for the use of engineering students, science classes, etc., in accordance with the requirements of the Science and Art Department, by Mr. W. G. Crawford Hughes, A.M.I.C.E., First Class Honour Man in Technology, City and Guilds of London Institute, etc. etc., and published by Messrs. Crosby Lockwood & Son. This book is practical rather than theoretical, although it deals, in the first part, as briefly as possible with what the author himself describes as "Condensed Theoretical Mechanics," and in the second with practical work and tables, "it having been the endeavour of the author," as he himself says, to gradually lead up in this manner to problems actually occurring in practice. The tables have been given chiefly as a reference for the student, to aid him in solving the problems presented. The tables deal with data and formulæ on various matters connected with engineering.

98.—"Light."

The book which bears a title well calculated to excite the interest and raise a spirit of inquiry in all those who are desirous of learning all they can respecting the wonderful phenomena of Nature, is one of a series of handbooks on scientific subjects published under the general title of "Whittaker's Library of Popular Science," by Messrs. Whittaker & Co. Briefly described, it is an elementary treatise on the subject by Sir Henry Trueman Wood, M.A., Secretary of the Society of Arts. It has been written, as its author tells us, "with the view of providing such information as an intelligent student, unfamiliar with natural science, would require;" and although it has been sought to give the information contained therein in a sufficiently simple form, no attempt has been made to go down to the level of language and style which would be looked for, and, indeed, would be used naturally enough in a book specially intended for young people. A synopsis of the chief contents of the volume may be given as follows: The modern theory of light is first set forth, and it is shown how all phenomena which are matters of common observation may be explained on that theory. The nature of colour is then described, and the mode of its production, and this is followed by an acount of the construction and principles of action of the more important optical instrument. Further, an explanation is given of the chemical effects of light and its influence in producing those alterations which are so noticeable in every sun-picture or light-picture produced by photography. Lastly, a brief description is furnished of the phenomena produced by polrised light and fluorescence. In the Appendix, the names of kindred works are given which the student may read with advantage on his subject, after having made himself master of the book now under consideration.

THE EDITOR.

SHOP:

A Corner for Those who Want to Talk It.

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

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

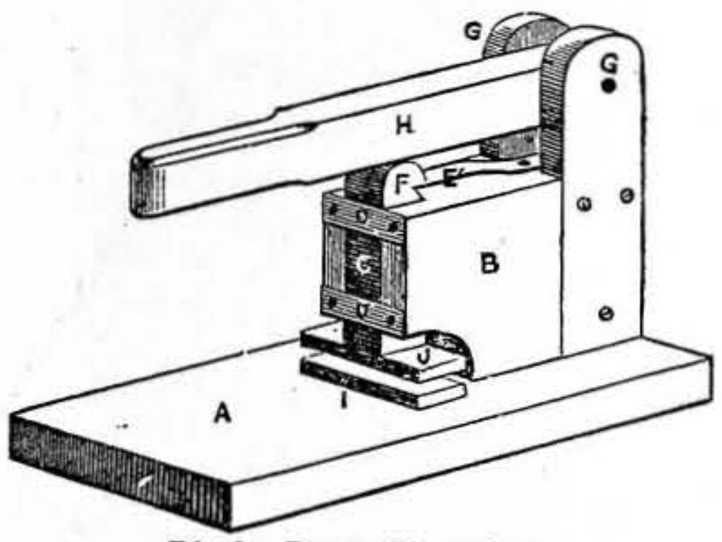
II.—Questions Answered by Editor and Staff.

Lady's Ring.—Novice.—You say you have bought a lady's gold ring, set with pearls, that has gone white like silver after a few hours' wear; and it also made a green mark on the finger. This ring appears, from the foregoing extract from your letter, to be a swindle—almost without a doubt. Now, to settle the matter one way or another, I should, if I were in your place, take it to another jeweller to test; or, if you have no other near but the one you bought it of, then take it to a chemist. Either will be able to give a decision almost instantly by this simple test: namely, scraping a small part of it quite clean, say one of the sides, so as not to damage it, and then applying aquafortis. If it is 15 ct. gold, there will be very little alteration in colour; but if it is 9 ct., he will find that a dark stain will come over the place that the acid is applied to. If, however, it is base metal, such as German silver, brass, aluminium gold, etc., then it will bubble up and turn pale green, and give off fumes, the acid being in a complete turmoil until its energy is expended. A better way still is by comparing it with known qualities by means of a touchstone, or a piece of Wedgwood pottery will do as well. To carry out this method, a small streak—say about ¼ in. long by ⅛ in. wide—should be rubbed off the ring on to the stone. Then get two or three other known qualities of gold, and make similar streaks with them at the side of the one you wish to test. Finally, apply the aquafortis by means of a pointed piece of glass, right across the whole row. Then, after a few minutes wipe the acid off; one or the other will be sure to be acted on in the same way as the rubbing from the ring is, that one being, of course, of about the same quality as the one you wish to find out about. If it is base metal, then the whole line will disappear—but so it does with 9 ct. gold; so if you find the rubbing from the ring leaves no mark where the acid has been, then try the other method; but do not flood the work with acid. Now, there is a way that a gold ring can be changed to white in a very little time, and that is by becoming covered with mercury or quicksilver. Be quite sure no such contact has been made before you go further in the matter. The former condition can be restored at a cost of about 1s., I should say. If the ring is a hollow one, and has been water-gilt, it might account for this, for very often the mercury oozes out when any has been left inside, and will completely cover the article. The next thing is with regard to the Government stamp: if that is false, I shall be able to put you in possession of facts that will enable you to bring great pressure to bear on the man that sold you the ring. For that purpose, if it is necessary, you must send me a description of the four or five marks you will find inside the ring. First, the two letters or more that are together; then, is there a leopard's head, or an anchor, or a lion, or what? thirdly, what is the single letter, enclosed in a shield? fourthly, is there a crown, and the figure 15? I want to know this, so that I can find the particular town-mark that has been counterfeited. I do not think I can give you more information or advice, with only your letter before me; and you will clearly understand that nothing but an actual test, carried out by a practical man, can be relied on; so, before demanding your money back, be sure to have one made as I advise. You ought to get a light 15 ct. lady's ring, set with small pearls, for the amount mentioned. I know of no "acid" from a person's body that would cause gold to go white, and I do not believe there is any.—H. S. G.

Mastic Cement.—F. A. M. (*Liverpool*) does not mention the purpose, or the kind of material, for which he requires a mastic cement; which makes it difficult to give him a satisfactory answer. We believe that for such substances as will bear heat (glass, china, etc.), the gum mastic, used alone, is sufficient. When jewellers wish to unite two stones, or to mend a broken one, they are said to heat both pieces, apply a little gum mastic to the two faces, and press the two pieces tightly together, keeping them so till cold. This, if well done (with the minimum of gum), makes a strong and scarcely perceptible joint. Gum mastic, merely dissolved in alcohol, is also used as a cement for hard materials. Some cements have been called "mastic," which have no connection with that gum except its name.—M. M.

Polishing Marble Slab.—Marble.—The slab being already slightly polished, no preliminary work will be necessary. The perfect polish will be given with "putty powder" (calcined tin). This is applied, with water, on a thick felt stretched over a block of wood, which, by means of a handle, has to be kept moving over the face of the slab till the polish is obtained. Putty powder can be got at the colourman's, and if any difficulty is found in getting the proper felt at the same place, it can be had from a marble yard. It is sold by the pound. Perhaps, with the exception of sawing marble, there are few finer exercises for the virtue of patience than polishing.—M. M.

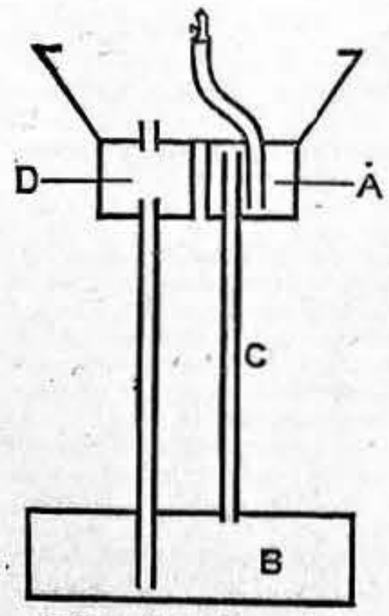
Die.—W. H. (*St. Leonard's-on-Sea*).—The die in question can readily be used for *plain* stamping on paper, if mounted in a wooden press made after the style indicated by the accompanying sketch, in which A is a baseboard of 1 in. wood, 12 in. long by 6 in. wide; and B a block of wood 2 in. thick, 6 in. long, and 4½ in. high, into which a plunger, C, 1 in. square and 4½ in. long, is fitted as shown, being retained in its position by two brass strips, D, D, screwed to the front edge of B, and supported by a flat spring, E, screwed to the top edge of B, as shown, and engaging in a notch, F, in the plunger. G, G, are two standards, ⅛ in. thick, 2 in. wide, and 7½ in. high, glued and screwed to B. These standards support one end of a lever, H, which rests upon the plunger, C, to which it transmits pressure, applied to the free end of the lever. The plunger should be



Die for Paper Stamping.

well fitted to B, so as to travel freely with the least possible play; and the spring, E, should be strong enough to lift the plunger and lever, H. The die, I, is fitted to the baseboard centrally, under the plunger, by any convenient means which will admit of its rapid removal and replacement. A counter-plate, J, is formed of a piece of stout sheet brass, rather larger than the die, affixed at right angles to the lower end of the plunger; the counter-die itself being formed of a piece of sheet gutta-percha, softened by heat, cemented to the under-side of the counter-plate, and strongly pressed on the die whilst still soft, the pressure being continued until the gutta-percha becomes cold and hard. If the lettering of the die is sunk, the press so arranged may be used for either plain or colour stamping. If the latter process be decided on, the die must be removed from the press and carefully inked in the letters by means of the ink sold for the purpose (and which, no doubt, the makers of the die can supply), applied with a brush, the surplus ink being removed from the face of the die by rubbing on a flat pad of soft paper. The die is then replaced in the press. The ink left in the sunk letters will be transferred to the paper when placed in position, and the lever depressed with some force. The removal, inking, and replacement of die has to be performed for each sheet of paper stamped. Should plain stamping alone be aimed at, the relative positions of die and counter may be reversed with advantage.—Qui Vive.

Self-acting Fountain.—Amerckel.—The sketch of fountain sent (of which you say you have made four, and none of which will play for more than two or three minutes) is an illustration of how a simple contrivance like the "Hero" fountain may be mangled and complicated so as to be useless. The reason your fountains do not play is that you get but a very little water at all into your vessel, A; and, if the jet is anything just discernible, is quickly exhausted. This vessel, A, should be about the same size as the bottom one, and the time the fountain will play through a given jet depends entirely upon the capacity of the vessels, A and B. Your vessel, D, is useless and quite superfluous. There is a fully descriptive article in No. 69 of Work upon this subject. Try a fountain upon those lines to any dimensions and you will succeed.—C. M. W.



Self-acting Fountain Part.

Design for Alabaster Panel.—Nemo.—With every wish to be of service to Nemo, I fear the want of particulars in his letter will forbid my being so to any great extent. He should have said whether his practice in carving makes an elaborate or only a simple design desirable. He should have said whether he wants a figure subject or mere ornament, and if the latter, what style he desires—whether Classical, Gothic, Renaissance, Naturalistic, or what not. If I know *what* he wants, I will gladly (with the Editor's permission) try to draw it for him. If (as he hints) he is in a hurry, I would advise him to try some of the designs already given in Work. Most people like the Naturalistic style; let him refer to No. 13 (Vol. I., pp. 200-1), and he will there find some good panels of natural fruit and foliage—plum, hip, and blackberry—which he can readily adapt to his dimensions. Though designed with a view to wood carving, they are not less suited to alabaster, or any fine white stone.—M. M.

Index.—A. W. (*Stoke-on-Trent*).—You are a little behind date in your kind suggestion. The "good thing" you require in the shape of an index has been published for Vols. I. and II. of Work, and a third one is in preparation for Vol. III. The price of the Index is one penny.

Lathe Speed.—R. T. (*Paisley*).—You wish to turn 8 in. cast-iron wheels on a lathe which gives a speed of one revolution to four treads, and you ask whether this is slow enough. Yes, certainly; it is just about right, and you should be able to turn 10 in. diameters. I cannot tell whether your lathe is strong enough, but think it is sure to be.—F. A. M.

Spring Roller Blind.—First Time of Asking.—It is quite impossible for an amateur to make a spring roller for a shop blind; but as First Time of Asking wants to get an idea of the kind of spring used, and of the method of fixing, we reply that the roller is made by special appliances for rolling tin in cylindrical lengths, of the length of the sheet of tin. These lengths, with a lining between each, are soldered together—"sweated," as it is termed. The ends are turned beech blocks; the spindle, an iron rod, from ⅜ to ¾ in. diameter, according to the size of roller. The spring is of wire, specially drawn for the purpose, known as "charcoal spring" wire. This is wound on a revolving mandrel by the roller-maker. The mandrels vary from ½ in. to 1½ in., according to diameter of roller. One end of the cylindrical coil of wire thus made is fixed to one end block, the other to the iron spindle; care being taken to wind the cloth, so that the coil is made tighter when the blind is drawn down. First Time of Asking can get a roller through a blind-maker.—B. A. B.

Boot and Shoe Repairing.—G. H. (*Kings Langley*).—Articles have appeared in the following numbers of Work: 112, 117, 122, 126, 130, and 137.

Air Pumps.—Air Pump says:—"I do not altogether understand the drawing (see Work, No. 136, p. 497) of the silk valve, Fig. 2; but I understand its action from your description. I enclose sketch of my idea of the silk valve. Is not the end of your drawing screwed so as to screw into pump barrel?" In reply, I would say that the fear of an unduly long article, together with the thought that this part of the instrument is of easy understanding, kept me from going into details. Fig. 2 represents the valve end of the horizontal tube at the bottom of the barrel in Fig. 1, where the engraver has shown, as clearly as it is possible, the valve, a short tube being soldered to the barrel, into which Fig. 2 is screwed. In the sketch sent Air Pump seems to think that the white parts marked C in Fig. 2 are wooden plugs. How he has this idea I do not know. Let me try to make the matter a little plainer. In the tube A a short piece of smaller tubing, B, is soldered, to take the thread; on the end of this is soldered a thick disc, C, which is undercut as shown. On the two opposite sides the undercut is filed off. Across this is placed the silk, as shown by the dark lines. This is carefully tied on, and the undercut prevents its being forced off by the pressure of the air. What Air Pump has evidently taken for wooden plugs is the disc projecting on each side beyond the silk. If Air Pump could let me know his whereabouts I should be very pleased to send the part in question for his inspection, but I think the foregoing ought to be clear enough. Air Pump asks which I would recommend him to make, Fig. 3 or Fig. 6. Well, what does he want it for? If great rarefaction is needed, I should say Fig. 6; but I have given, I think, the advantages of each, and it would be idle to repeat. "Please give thickness of barrel, depth of piston, and mode of packing." I use thin mandrel drawn tubing, such as is used in optical instruments. No thicker is needed. The piston may be 1 in. or 1¼ in., and packed with worsted or cotton. For lubrication do not use grease or oil, but a little vaseline, as I believe there is no acid to corrode the brass as there is in oils. "Please say if the drawing of aspirator is full size." No. Messrs. M. & S.'s in glass is about 8 in. The only fault in the engraving is that the thickness of the metal is shown disproportionately heavy, and that the taper tube, F, should come to a very fine point, the opening simply being a pin-hole.—O. B.

Tips.—F. S. (*London, N.W.*).—The inquirer is Mr. Jupp, Wardour Street, London, W.

Violin Making.—T. H. C. (*Stroud*).—Articles have appeared in the following numbers of Work: 105, 110, 114, and 118.

Graining.—Solder Pot.—Articles appeared in the following numbers of Work: 55, 58, 62, 65, 69, 72, 76, 79, 84, 93, 95, 98, 100, 103.

Æolian Harp.—J. H. (*Newchurch*).—An article on this subject appeared in No. 55 of Work.

Printing on Bindings.—CÆSAR.—For printing the title on the backs of books in gold, brass letters are generally used. These have long wooden handles. The letters are sold in boxes or sets containing the alphabet and figures, etc. The process has indeed been given many times in WORK, and very fully in the articles upon bookbinding in Vol. II. You should really look these up, as you will get full instructions of the process, more than I could possibly give here. However, a general idea may be given in a few words. Wash the books with paste water, and after they have become perfectly dry give the title, and other parts where you want the gold to appear, two coats of glaire, allowing the first to dry before applying the second. After both are dry, lay on the gold leaf, using lard or olive oil to make it adhere while working. Lay out the letters to be used and heat them in a gas flame, or otherwise; lift them one by one and press them on the cover upon the top of the gold; the heat of the tool will make the gold to adhere. After the whole title is finished, rub off the superfluous gold with an oily rag. This may help you, but see the articles on the subject already mentioned.—G. C.

Leather Desk.—LEARNED.—You want to know how to ornament desks which you have covered with leather and American cloth. There is no book upon the subject that I know of. If you read the articles upon bookbinding in Vol. II. you will get all you require, for the method of treatment in the case of books is the same as you want for your desks. You will require a number of rolls, corners, sprigs, etc., as we call these tools. They are made of brass with wooden handles. When working with them they must be heated. I would advise you not to put gold upon the American cloth, as only those who are well up in this class of work can do it; besides, it is seldom done, as the cloth is used for cheapness. Look up the articles mentioned, and if you require any other instructions write again.—G. C.

Four-Jaw Chuck.—R. C. (*Glasgow*).—You may obtain all the information you require in No. 1324 of the *English Mechanic*, with drawing—far more than the Editor would like to put into the "Shop" columns. I will only say, then, that the proportions of the dog as you have them are correct, but that you should certainly have them *forged* and case-hardened after fitting.—F. A. M.

Picture Framing.—A WOULD-BE PICTURE-FRAMER.—Articles on Picture Framing appeared in Nos. 5, 8, 70, 106, 109, and 121 of WORK. Your bookseller or the publishers, Messrs. Cassell & Co., London, E.C., will supply them at one penny each, or by post three halfpence.

Cracked Ball Cups, etc.—A. T. (*Canonbury*).—The frame must be twisted, or the cups are not put in true. To bell out tube for lap joints: The tube is slit down on opposite angles with a saw as far as you think sufficient. The belling is done by beating and working out on the nose of an anvil if the tubes are large; if tubes are small, a pointed mandrel screwed in the vice is used, or a tinman's stake will do. It is a somewhat difficult job to do satisfactorily, and requires some experience. Bending handle bars: This also requires some experience, as they are usually bent by heating, without filing. To ensure against the tube flattening, ram the part to be bent with dry sand, driving a wad of paper into each end to hold the sand in place; heat the whole of the part to be bent equally, and bend round a curved surface, such as an iron post, or the nose of an anvil, otherwise grip the heated part gently in a vice and bend upwards by putting a rod in each end of the tube to use as levers. When a tube shows oval after being bent, it is brought by heating to a red hue and hammering carefully on the round surface used in bending. Wheel making: Full instructions on wheel making are given in the papers, "The Practical Construction of the Safety Bicycle." Tricycle drawings: The type or style of tricycle would have to be indicated before a drawing could be given.—A. S. P.

Tandem Tricycle.—J. B. (*Clapham*).—A tandem tricycle with 24 in. wheels is something out of the common, unless for children. The width should not be less than 33 in. over all. With 30 in. wheels it should not be less than 36 in. wide. To bend a tube, if only a slight bend, heat it to a bright red—that is, the part to be bent. When hot, place a smaller tube in each end and bend gently over a round surface, such as the nose of an anvil. The tube will *oval* slightly at the bend, but that does not impair it in strength.—A. S. P.

Canvas Cycle Tires.—RETRENCHMENT.—I am quite unacquainted with the manufacture as well as with the materials of pneumatic tires. Sailcloth is certainly not one of the materials. It is not at all likely that repairers of cycles will give information regarding the mending of pneumatic tires, for the reason that very few of them possess it, and those who do have paid for their learning, and are not likely to give it away to all and sundry. The repairing of these tires is, I understand, a very ticklish job, and it is useless for your correspondent to try it unless he gets initiated into it by those in the secret, and learns what the proper materials are from them. Altogether, I regard these as a passing fad, that will be a thing of the past in a year or so hence.—A. S. P.

Wood for Zither.—B. W. R. (*Liverpool*).—I should think you would be able to obtain what you require in Liverpool at J. Byrom's, 3, Deane Street. He is a violin maker, and most probably would have exactly the kind of stuff to suit you. Failing him, try the organ builders, whose addresses you will find in the directory.—R. F.

Corner Bookcase.—J. T. W. (*No Address*).—You do not state whether you require a hanging corner bookcase, or one to stand upon the floor. If the present design suits you, my advice is to construct it in some light, strong wood, the choice of which must be left to your judgment. You will see that my arrangement is somewhat fresh; and by adopting it you will have more space for the disposal of your volumes than would be the case were you to place your books straight across the corner. For instance, one storey in the article shown will afford 30 in. accommodation; whereas, if intended to be *across* the corner, the accommodation would be but a little over 24 in.—unless you made the outside dimensions of the job excessive. A plan is shown in Fig. 2 of the upper carcase. The square space in the corner will be useless, but it is unavoidable; and

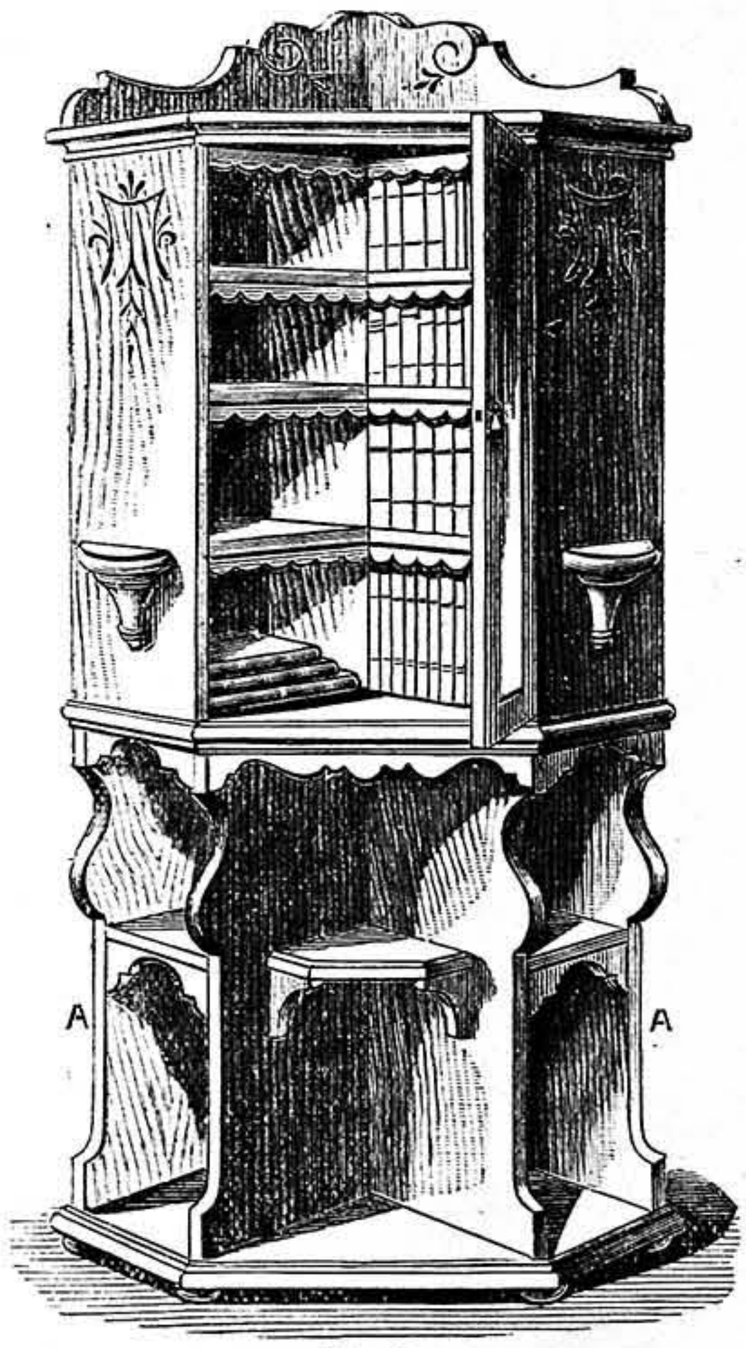


Fig. 1.

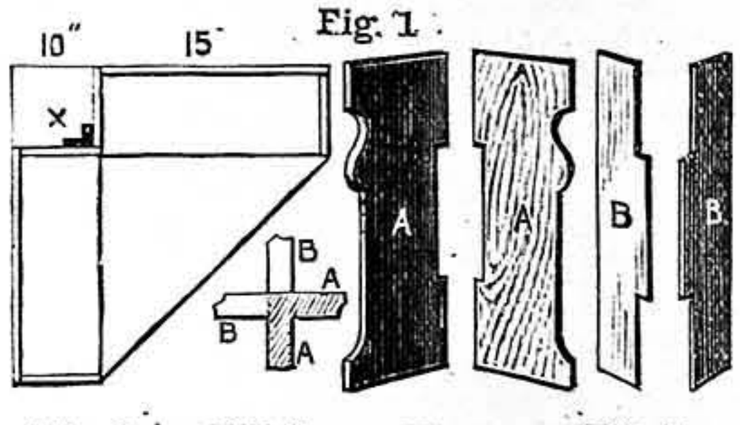


Fig. 2 Fig. 3 Fig. 4 Fig. 5

Fig. 1.—Corner Bookcase. Fig. 2.—Plan of Upper Carcase. Fig. 3.—Plan of United Corners of Boards, A, B, Lower Carcase. Figs. 4 and 5.—How to Shape Boards A and B (in addition to Dovetailing them) to secure the Unison shown in Plan, Fig. 3.

a larger space would be the result of the other arrangement. About the best way to construct the under carcase will be to shape boards, A (Figs. 1 and 3), as shown in Fig. 4, and boards, B, as in Fig. 5, previous to cutting the dovetails. When each pair is then joined together, there will be a corner projection formed by the angle of boards, B, which will fit into a space provided for it by the angle of boards A; and, in like manner, the external angles of A will fit the two spaces in boards B, and appear as in plan (at the corner which unites) in Fig. 3. To secure them thus, it will be necessary to screw stout uprights in the back corner (× in Fig. 2) the whole length behind, to both the portions of A and B which are there exposed to them. Of the upper carcase, two upright boards, 10 in. wide each, will provide the back angular portion; and two 15 in. back boards (to which are united the extreme front boards), joined to them, will complete the carcase, with the exception of all horizontal boards. There should be four corner boards, shaped as in Fig. 2 (the top one only, necessarily extending completely to the corner of the room)—viz., two as bottom and top boards for upper carcase, and two for the same purpose in the lower one. Screw the two carcases together. If other details are not comprehended, refer to back numbers for suitable particulars. You will find a very good design of corner bookcase (hanging) in No. 36, Vol. I.—J. S.

Bookcases.—A READER OF WORK.—Designs and particulars of these have been given in WORK, Nos. 15, 36, 44, 48, 52, etc.

Back Numbers of WORK.—E. M. (*Blackheath*).—You should address the publishers of WORK, Messrs. Cassell & Co., London, E.C., and not the Editor, for back numbers; and when applying for same, forward stamps for the cost of the numbers and postage.

Concertina Keys.—MUSIC.—All English concertinas have the keys about the same distance apart, of whatever make they may be. In the German concertina each key gives two tones; in the English instrument only *one*. English concertinas are not made to be held in the same way as the German instrument. The keys in the instruments made by Jeffreys are the same distance apart as in those by Lachenal.—G.

Musical Box Comb.—WHITEFIELD.—The steel comb of a musical box can be repaired, but no estimate of the cost could be given without examining the damage. Messrs. Nicole Frères, 21, Ely Place, London, are makers of Swiss musical boxes, and would doubtless inform Whitefield as to exact cost of repair if he will send his musical box up to them for examination.—G.

Cornet Valves.—U. H. (*Sunderland*).—The castings required can be obtained from Messrs. Gautros, 90, Rue d'Angoulême, Paris.—G.

Watch.—J. P. (*Liverpool*).—Did the watch keep good time before you had it cleaned, or had it always gone so uncertain as this makes all the difference; also, have you anything to do with any electric apparatus, or wear an electric belt, or ever go near a dynamo? Your letter is so vague that I am afraid I cannot help in the time-keeping part without further information. Are the hands perfectly tight, or does the minute hand drop occasionally? Did the hour hand always get out, or only since it was cleaned? If so, I should say a tooth has been either bent down or broken off, and this will cause it on the other; if it has always gone wrong, it is possible that the hour wheel has not the right number of teeth in it. I have found this fault more than once; and, on the other hand, I have myself broken or bent a tooth in the hour wheel in trying to move a hour hand which fitted too tight. I am sorry I cannot assist you in the timing of it without further particulars or examining it. I had a difficult case a little while ago, in the timing of a very expensive lever; with me and others it kept excellent time, but two days after delivering it to the owner, he would bring it back ten minutes slow; and quite by chance we found he wore an electric appliance, which, of course, accounted for the mischief.—A. B. C.

Graining Tooler.—D. O'S. (*Kerry*).—For any paint brushes, apply to Messrs. Brodie & Middleton, Long Acre, W.C.

Bookbinding.—G. W. L. (*Salford*).—The articles on bookbinding appeared in Nos. 6, 9, 57, 61, 65, 69, 72, 75, 80, 85, which can be had of any bookseller, price 1d. each.

Electric Bell.—J. H. J. (*Birmingham*).—Instructions how to fit an electric bell appeared in Nos. 12, 18, and 20 of WORK, which can be had of any bookseller, price 1d. each.

Talking Magpie.—M. L. C. *Leicester*).—Your question scarcely comes within the scope of WORK, although you have no doubt been well exercised in endeavouring to make your bird talk. Your proposal to cut its tongue would scarcely tend—would it?—to give the magpie a coloquial turn; but write to the Editor of *Cassell's Saturday Journal*, London, E.C.

Engine and Boiler Management.—J. P. (*Darlington*).—These articles appeared in the following numbers of WORK: 119, 123, 127.

Collie Dog Kennel.—J. H. M. (*Manchester*).—Consult WORK, No. 90, p. 617, and modify the sizes there indicated to suit your large dog.

Xylonite.—E. W. (*Cupar, Fife*).—A full description of this composition appeared in WORK, No. 101, p. 787.

Puffs of a Locomotive.—J. D. (*Bradford*).—The answer to your question in my hands is, with its illustrations, too long to appear in "Shop." You must be patient therefore until space can be found for it in the body of WORK, where it will probably appear under some such title as "Compound Engines."—ED.

Patent Saw Set.—WOODCUT.—This saw set can be obtained of Messrs. Churchill & Co., Cross Street, Finsbury, E.C., I think, for 6s. 6d.—M. P. B.

Density of Negatives.—AMATUR.—The density of a negative depends on both *exposure* and *development*. A much *over*-exposed negative is nearly always thin unless the development has been suited to the increased expsure. In your case most probably over-exposure is the cause. Try less, and use a well-restrained developer: one with a very small quantity of alkali and a large quantity of pyro. The fault may also proceed from light getting to the plate otherwise than through the lens, and so causing a fog effect. Examine your camera and ascertain if it is light-tight. If your plates are good

and your apparatus in good order, the following developer will give plenty of density—with a proper exposure. If you have any difficulty in the matter, the fault lies with yourself. Take for developer: 2 grs. pyrogallic acid, 2½ grs. of ammonium bromide, and 4 grs. of liquor ammonia, with 1 oz. of water. If you get weak images with this and a proper exposure, there is something wrong in your working; but in all probability it is over-exposure.—D.

White Wood.—SHOPITE.—For white wood try Cobbett, of Hackney Triangle, E., who can supply it at 2½d. per foot, 1 in. thick; or Latham, 124, Curtain Road, E.C. Be careful to get it dry, as it will be useless for your purpose without.—A. J. H.

Thermometer.—AMATEUR.—If you heat the glass tube sufficiently at the point at which you desire to close it, bend it at right angles, and twist off, I do not see how you can fail to close the hole. You say, "I can only succeed in closing it up every time I get it hot enough and then blow down." I confess I do not understand what you mean. If you succeed in closing it up *once* that is all you want. As to where you can "procure ¼ lb. of tubes at 6d." I cannot answer, but imagine you should have no difficulty in getting what you require in Liverpool if you look about and inquire.—OPIFEX.

Wooden Mole Traps.—R. G. S. & Co. (*Wellington*).—You should advertise your address and goods in the "Sale and Exchange" column of WORK.

Bent Iron.—B. H. (*Budleigh Salterton*).—An article on "A Hall Lantern in Bent Iron" appeared in No. 125 of WORK.

Astronomy.—ASTRO.—Your question does not come within the scope of WORK. Send the query to one of the educational papers, or to *Cassell's Saturday Journal*.

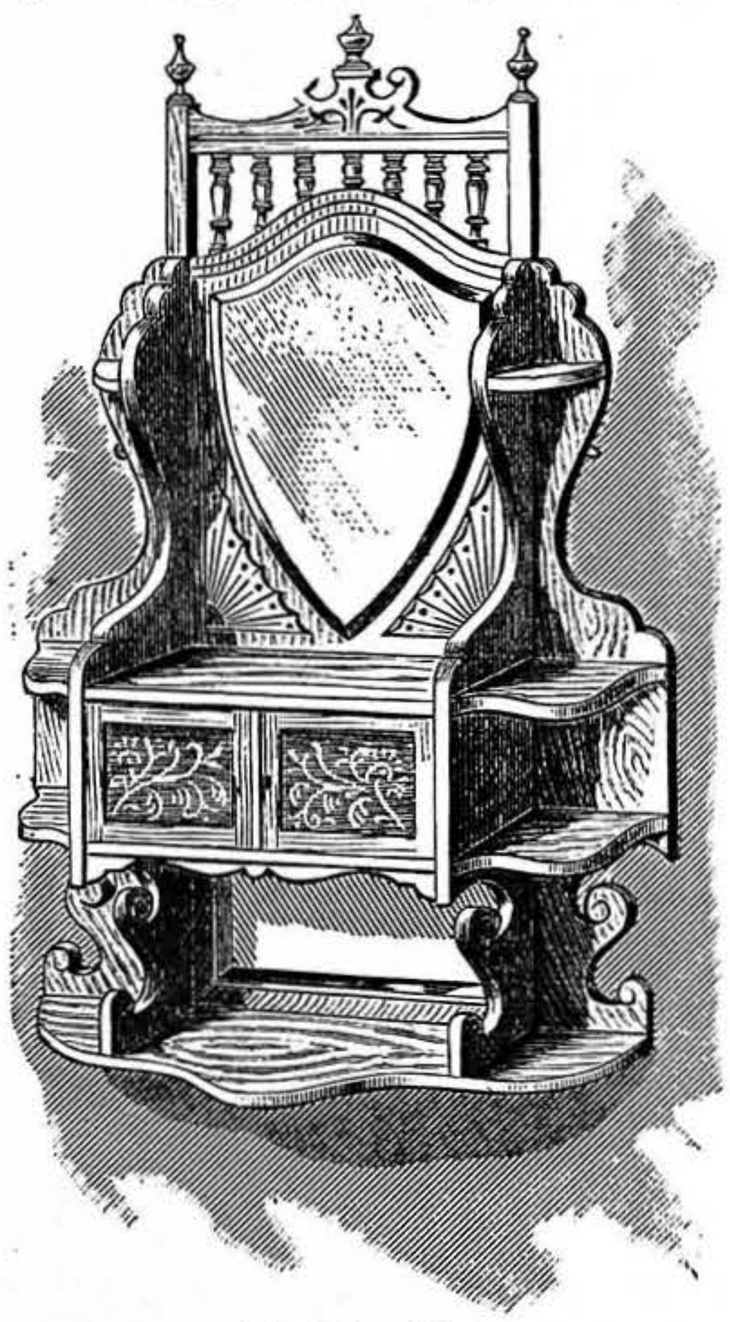
Spot Lens.—TOM.—A spot lens is used when it is desired to examine structural details, which might be invisible by direct light. If you take an ordinary condenser and block out the centre rays with a circular patch of paper or varnish, you have a rough-and-ready spot lens. The patch should be fixed on the flat side of the plano-convex lens, and this side should be turned towards the object when the lens is attached to the under-stage of the microscope. By the use of the spot lens with semi-transparent objects, dark ground illumination is secured. The object is viewed only by the aid of the light rays refracted from the marginal zone of the lens, and these rays are so bent by refraction that they fall on the object without entering the objective. In the best instruments a parabolic illuminator takes the place of this lens.—E. A. F.

Polishing Fretwork.—N. R. (*Yeovil*).—Fretwork polished by inexperienced hands is seldom satisfactory; it requires much previous practice on plain surfaces. The difficulty is rendered doubly so by trying to do it with new rubbers; the uneven surface of these will give fat edges, and will oft-times catch in and tear out delicate parts of the fret. A plan sometimes adopted, and one which has much to recommend it, is to well "body up" the plain surface previous to cutting the fretwork; the surface may then be made to look fairly respectable by carefully applying with a camel-hair brush a coat of spirit varnish. I know of no book on French polishing that I can so strongly recommend as the series of articles on the subject by Mr. Denning, the first of which—"How to French Polish"—appeared in WORK, No. 105, March 21st; and "The Rubber in French Polishing," No. 108, April 11th; followed at intervals by others which, if followed up by steady practice, will put you on the right track.—LIFEBOAT.

Estimating.—GRANT.—I think you would find "The Student's Guide to the Practice of Measuring and Valuing Artificer's Work" would be of great assistance to you. I have a great many questions on this subject, and it really seems to me that the inquirer appears to think that there is some royal road to estimating; but I can assure you there is not, and you will never succeed in finding a book that will give you exactly what you want unless it is a four-panel door or a common sash and frame; and even such simple things as these give a lot of trouble to the beginner, if he has no other knowledge to fall back upon except what he can get from a price-book. There must be some experience beforehand, but a little thinking will help a great deal; for instance, let us suppose you have a shop front to estimate for, of a general thickness of 2½ in.: now, what can you buy 2½ in. stuff for? What will they charge at the mill to cut it out to the sizes required? (You will find they charge this at so much the dozen feet.) Next, what do they quote in Laxton for planing-up stuff at per foot run? How long should a man, in your estimation, take to make such a frat when he has the stuff brought to him? Now look in your price-book and see what they give as the price for 2½ in. sashes or shop fronts, and compare their price with your estimate and draw your own conclusions. You must feel your way, as it were—no tradesman or estimating clerk trusts blindly to price-books; there are some things he finds by practice he can do cheaper than at the price given; and, on the other hand, he knows that if he takes the work out at the price quoted for some class of work, he must lose money. I have just made a shop front out of 4½ in. mahogany, 10 ft. high, 12 ft. wide, with a return end 13 ft. high by 6 ft. wide, with horizontal and two upright bars cut of 2½ in. by 4½ in., with a 2 in. door and fan over door, all heavily moulded, partly polished, ready for fixing; and this cost £23. Perhaps this may help you, but I doubt if you could find this in any price-book.—E. D.

Razor Strop.—G. W. B. (*Cockermouth*).—Make the body of the strop 12 in. long and 2 in. thick in the middle, tapering as shown in the cut (Fig. 2, p. 390, No. 129). You can make the handle any length you like—say, 4 in. This strop will suit admirably for hollow ground razors; better still, perhaps, if of greater convexity than suggested above.—OPIFEX.

Hanging Mirror.—D. B. (*Perth*).—I appreciate mechanical talent, and I feel certain that you would grant me the permission to view the result of your skill and labour if I asked; but the fact of your dwelling at so great a distance from me precludes all intention on my part of beseeching this permission. As it is, I believe many a reader would be glad to know how you have devised the brackets and feet of your article to spring out automatically when the flap is opened. Why not send sketches and particulars through the first columns of "Shop?" Now, don't say you cannot draw—that's all nonsense; for, judging by your sketches handed to me, I should say that you could manage it near enough. I give you here what you ask for—a design for a hanging mirror, with drawer or cabinet. I think it is somewhat fresh, and I hope it will meet with your approval. I will not state any dimensions, but



A Hanging Mirror.

merely say that it is advisable for any intending maker, if unable to decide as to size, to rough-sketch an elevation of it on a large sheet of paper, until satisfied as to proportions. If the shaping of the top glass will be too costly, have a square one. I must refer you and other makers, if ignorant upon any point in the joining, to back numbers. I may say, however, that it is preferable to have a post running the entire length at each side. Each shaped piece, too, would be best if made in an entire length. Those at the back, and those projecting, should be the same exactly. Two serpentine-fronted shelves, and a small quadrant shelf at each side, will be effective. I should say, let the bottom board terminate the job, as you will not want to hang the article high enough to show anything underneath it. This board could be in one piece, and screwed from underneath. As a change, I have shown different-sized spindles at the top. Of course, I am aware that spindles are turned, with a view to their being dowelled into *straight* rails, but you will have little difficulty in fitting them as shown. If this doesn't please you—well, alter it.—J. S.

Cog-Wheels.—T. J. W. (*Ystalyfera*).—You cannot do better than write to Messrs. Grimshaw and Baxter, Goswell Road, E.C., who are the most likely people to supply your wants. If they cannot, you should write to some model maker, whose address you will get from advertisements in WORK.—P. B. H.

Saw Maker.—R. M. B. (*Glasgow*).—You will get good band saws from Messrs. Eadon & Sons, President Works, Sheffield, or from Messrs. Aublet & Co., Curtain Road, London, E.C. I have for some years worked Aublet & Co.'s saws, and, as a rule, they give satisfaction; but I have not had any from Messrs. Eadon since they have had improved machinery for making band saws; although I hear they are now turning out really good band saws. I can highly recommend their circular saws. In reference to the usual pace of band saws, the speed when running over wheels from 36 in. upwards in diameter is from 4,000 to 6,000 ft. per minute. But as your wheels are very small, I would advise you not to run your saws much above 2,500 ft. per minute. The turn being quick, the saws would break quickly if driven at any much greater speed. The gauge of your saws should be about the 22nd gauge—at any rate, not stouter than 21st gauge. If stouter than these gauges, the saw will break after a very little working on such small wheels; and saws at the above gauge cannot be expected to do the amount of work they would do if worked on larger wheels before they break.—A. R.

Casks.—J. S. (*Longsight*).—The price for putting a new stave in above would be about 2s. 6d.; for a new hoop, 9d; and a new piece in head, 1s. But surely you have some friend who could make inquiries at a neighbouring cooper's as to what he charges, and compare his prices with those given above, and act accordingly.—E. D.

Polishing and Staining.—J. M. (*Manchester*).—The light bay wood can be made to match the darker by wiping over with a weak solution of bichromate of potash dissolved in hot water (½ oz. to 1 pint of water); it may be used cold, and be applied with a piece of rag or sponge, but it is well to try its effects on odd pieces of wood first till you meet with the required strength; or a rather strong solution of common soda-water may be used. If, when dry, the whole is afterwards wiped over with red oil and allowed to stand over-night, it will have a richer appearance. Red oil is made by soaking 2 oz. of alkanet root in 1 pint of clean linseed oil. Use rose-pink as the colouring medium for the "filling in;" it should also be used in the filling for the teak wood, which, by the way, if it requires matching, will be found a more difficult task than the bay wood; it would have to be done by the aid of dyed polishes. If required darker, vandyke brown or black would be needed; or, perchance, a tinge of black and red; if required a red shade, a red polish would be used, but this requires tact that can only be gained by practice. The present Vol. of WORK abounds in information on this subject. Articles have appeared in Nos. 105, 108, 115, 117, 119, 122, 123, 126, and 130, and the answers given in "Shop" touch upon points and difficulties such as you may meet with, and which in writing articles on the subject it is impossible to foresee and explain without rendering the subject unintelligible to the average reader. You will do well to obtain through your newsagent all the back numbers, weekly or monthly.—LIFEBOAT.

Oil-Coloured Photographs.—H. W. (*Stockport*).—The photographs are sized with gelatine before applying oil colours. In the pictures alluded to, aniline colours have been probably used, in which case the photograph would show through, which is not the case in oil painting, for in it the colours being opaque hide nearly all the photographic basis. Aniline colours are merely put on as flat washes of different degrees of strength, but are more adapted to drapery than flesh painting. At one time there was a large sale of aniline colours mixed with albumen of various tints, expressly designed for colouring photographs, and would most likely produce the effects you have seen. Try some of Judson's dyes with a little albumen.—D.

Grinding Skates.—H. F. (*Ramsbury*).—I regret to inform you that I have been quite unable to trace any book on the subject of skate grinding, and do not think there is one published.—T. W.

Throw of Slide-Valve.—J. W. (*Gateshead*).—If you want to know how to proportion the slide-valve, you should read the papers on that subject in No. 110 of WORK. The whole action must be properly understood to make one aright; the stroke will depend upon the width of the port and the amount of expansion adopted. For instance: suppose your ports are 1 in. wide, if you wish to cut off steam at ¾ of the stroke you will require 1 in. of lap, then the throw of the valve will be twice the port and lap added together—that is, 4 in.—and the eccentricity of the eccentric will be 2 in.—F. A. M.

Mail Cart.—W. T. T. (*Houghton-le-Spring*).—An article on this subject appeared in No. 30.

Overmantels.—R. B. (*Eltham*).—You will find full particulars of these in WORK, Nos, 2, 3, 5, 22.

Picture Framing.—R. B. (*Eltham*).—The following numbers of WORK contain much information upon picture framing: 5, 8, 10, 70, 106, 109.

Wood-Turning Class.—WOOD TURNER.—Instruction in wood turning will be included in the subjects of the Finsbury and City of London Guilds and Technical Institute, Finsbury, E.C. Write to the Secretary.

Electro-Plating Apparatus.—J. C. (*Heywood*).—You will require a vessel to hold the plating solution. This may be of stoneware, porcelain, or glass, holding from 1 quart to 10 gallons, as required. From this size up to vats holding several hundred gallons, you may get vessels of enamelled iron, wood-lined iron, or lead-lined and match-lined wood. You will also require metal rods placed across the vessels to hold the anodes and the articles to be plated. These may be of copper, brass, brass tube, or brassed iron. From these you must have wires or cables of sufficient size to carry the current from the generator of electricity to the plating solution. The generator of electricity may

be a Wollaston, Smee, Daniell, or Bunsen battery, or a dynamo machine. The battery cells must be large. You will also require such appliances as hair-brushes, scratch-brushes, polishing bobs, and burnishers. Stoneware vessels, containing various acids and alkaline solutions for cleaning the articles, will also be required. The solutions for plating should be those of double cyanide of silver and potassium, and double sulphate of nickel and ammonia. As you are quite ignorant of the art, I should advise you to first read a good text-book on the subject and the articles appearing in WORK.—G. E. B.

Electrical Shock.—J. S. H. (*Kirkcaldy*).—"Medical electric shocks" are given by means of an apparatus named a "shocking coil," worked with current from a strong galvanic battery. Illustrated papers on the construction of such coils will be given when space can be spared for their publication. As there is scarcely a back number of WORK in which there is not something about "electrical apparatus," I should advise you to get the whole.—G. E. B.

Blue Prints.—A. B. (*Bow*) uses the solutions too concentrated. Use instead 70 grs. of the potash salt and 100 grs. of the iron salt, and only mix the two solutions just before use; they will not keep mixed. Apply evenly, and dry in the dark.—D.

Half-Plate Camera.—G. L. (*Halifax*).—If G. L. will refer to the first volume of WORK, he will find instructions for making a whole-plate camera. He must bear in mind that a half-plate, so called, is rather larger than the half of a whole-plate, measuring 6½ in. by 4¾ in. In making the camera, the substance of the wood may be nearly as great as for the whole plate. The length of the bellows need not exceed 12 in. The only important differences are in the size of the dark slides and frame of camera and focussing screen, which must be made to suit 6½ in. by 4¾ in. plates. The baseboard, being so much less, need not be made so strongly as that recommended for the larger size. Of course, this applies to the whole apparatus. In examining the diagrams given, it will be seen that so long as the *principle* of the apparatus is not violated, many little alterations may be made in the construction to save labour, but not interfere with its working.—D.

Refracting Telescope (Huyghen's Achromatic Eye-piece—Magnifying Powers).—J. T. S. (*New Brompton*).—Your letter has interested me very much because of its genuineness. Persevere with your experiment. If, as you say, your object lens is 48 in. in focus, and you use for eye-piece your ½ in. plano-convex lens, then the magnifying power must be: $\frac{48}{\frac{1}{2}} = 96$; it cannot be anything else. If you use the ¼ in. for eye-piece, then the power is $\frac{48}{\frac{1}{4}} = 192$. But in either case you will not get a satisfactory result; for your object glass, being common, is non-achromatic—*i.e.*, uncorrected; and the using a single lens for eye-piece increases the error. I presume that you do not see your way clear to buy an achromatic object glass in place of your common one. An ordinary achromatic object lens, 2½ in. in diameter and 36 in. in focus, costs, at a good London house, 18s.; and, therefore, the best thing that you can do is to make for yourself a proper eye-piece. To do this, proceed as follows:—Procure two plano-convex lenses, having their respective focal lengths in the proportion of 1 to 3, thus: ¼ in. and ¾ in., or ½ in. and 1½ in. Place these at a distance apart equal to one-half their joint focal lengths, $\frac{\frac{1}{4} + \frac{3}{4}}{2} = \frac{1}{2}$ in. in the first case; $\frac{\frac{1}{2} + 1\frac{1}{2}}{2} = 1$ in. in the second case. The plane sides should be towards the eye, to which, of course, the smaller lens should be the nearer. Between the two lenses, and in the focus of the first, should be placed a stop. The central hole, which defines the field of view, will need to be slightly smaller in diameter than the smaller of the two lenses used. The magnifying power of this combination will be about twice as great as the power which the larger of the lenses, used alone, would have. Thus, you may calculate easily what lenses will give you a fixed power. For example: with lenses ¼ in. and ¾ in., placed ½ in. apart, the power would be, with your 48 in. focus object glass: $\frac{48}{\frac{3}{4}} \times 2 = \frac{48 \times 4}{3} \times 2 = 64 \times 2 = 128$. This is quite high enough for you to attempt to use. The better plan, indeed, would be for you to get a plano-convex 1½ in., and with this and the ½ in. that you have, to make an eye-piece of power—

$$\frac{48}{1\frac{1}{2}} \times 2 = \frac{48 \times 2}{3} \times 2 = 32 \times 2 = 64.$$

This power would show you the belts and moons of Jupiter, and even the rings of Saturn. Your idea that the power you have so far obtained is only 10 is perhaps due to over-strained expectation. A telescope is always disappointing to a beginner. Get used to it, and learn all its faults, and then you will be able to see a great deal more. As for Venus, it is the most trying object of them all. Many a good telescope shows faults when it is turned on to Venus: she is so bright and so dazzling. When you would observe her, first stop your object glass down to about 1 in., and then you will see her phases. Do not aim at high magnifying power. As a young student, lay this to heart: that more pleasure and profit can be obtained with a telescope *firmly mounted* (how important is this!), and armed with a low power, than with a loosely mounted instrument armed with a higher power. Experienced astronomers, as a rule, use low powers, except for very special work. I should not advise you to attempt to make an achromatic object glass for yourself; and if you were to attempt it, a lathe would have very little to do with it. Lenses are not made on lathes. But you might make a reflecting telescope; and when this 48 in. of yours is in working order, and satisfies you, if you write to the Editor again, he will send your letter to me, and I will tell you more about it.—E. A. F.

Wood-Carving Book.—F. G. P. (*Walsall*).—"Hints on Wood Carving," by E. Rowe, is the cheapest, best, and certainly the most practical manual on the subject I know. It can be obtained, post free, for 1s. 1d., from the School of Wood Carving, City and Guilds of London Technical Institute, Exhibition Road, South Kensington. It contains much useful information respecting tools, designs, etc. Fred Miller's book is published by Wyman, Little Queen Street. Its price is 5s., or 4s. 6d. It treats of wood carving from the historical standpoint rather than the practical. The number of tools required depends entirely on the character of the carving you intend to do; but very little can be done with less than eighteen, or twelve at the least. They cost from 10d. to 1s., depending on whether they are sharpened or not. They can be bought at the above-mentioned school ready for use, or from Buck, 242, Tottenham Court Road. Their sizes vary according to the work they have to do.—M. E. R.

Books on Electric Bells.—J. W. (*Homerton*).—"Electric Bells, and All About Them," by T. R. Bottone, and "Practical Electric Bell Fitting," by F. C. Allsop, are the only books on this subject. If you are in a fix, let me know the particulars, and I will try to help you out of it in the columns of WORK.—G. E. B.

Tool for Cutting Screws in Wood.—W. H. N. (*Oldham*).—You can purchase screw boxes and taps for cutting screws in wood, manufactured by Messrs. Peugeot Brothers, through any dealer in tools, of their agent, Mr. Alexander von Glehn, Idol Lane, London, E.C. The sizes range from ¼ in. to 3¼ in. You had better write to Mr. Von Glehn for a price-list.—ED.

Ground Glass Imitation.—R. M. (*Glasgow*).—I am sorry that you have failed to obtain satisfactory results when following my directions in No. 9, Vol. I. Perhaps you would succeed if you enclosed the lump of white-lead putty in a piece of rather coarse muslin. Your glass may have been damp or dirty, or your putty too wet or too dry. As you say, common salts (Epsom), dissolved in water, and applied to glass, produces a frosted appearance; or a saturated solution of alum produces the same effect; but, for this method the glass must be placed in an horizontal position until crystallisation takes place, when the frosting must be protected by the application of a coating of gum-water. This is, of course, a very temporary kind of work. You might try sugar of lead, rubbed up in boiled oil, and applied with the end of the bristles of an ordinary hog-hair brush, dabbing the surface of the pane lightly, until the whole is evenly muffed. When perfectly dry, a pattern may be made by drawing in the design with a fine brush dipped in a strong solution of caustic potash, and then wiping off with a soft cloth. This will last for a long time, and needs no protection.—OPIFEX.

III.—QUESTIONS SUBMITTED TO READERS.

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

Fretwork.—W. M. (*Brixton Hill*) writes:—"I have so far been using a hand fret saw, but wishing to work more expeditiously, thought of investing in a treadle machine. Can you or any reader tell me if there is any such machine capable of practical work, as I have been told all such machines are useless, being only made for selling to inexperienced amateurs."

Mangle Rollers.—LEARNER writes:—"I shall be glad if any reader would give me a description of the method of turning mangle rollers, and the different sizes of tools required (rest included); and if it is possible for me to turn them in a 5 in. centred lathe."—[LEARNER might have said whether he required wood rollers.—ED.]

Tailoring.—APPRENTICE will feel obliged to any reader who will tell him where he could get good books on cutting.

Alarum Clock.—A. S. (*Lavender Hill*) writes:—"Can any of my fellow readers tell me where I can obtain a continuous alarum clock?"

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. B. (*Kent*); S. L. (*London, N.W.*); C. F. C. (*Lincoln*); M. M. E. (*Openshaw*); ENGINEER; M. M. (*Roscrea*); J. T. H. (*South Shields*); E. M. (*Rainham*); CIRCULAR WINDMILL; WORKITE; NELSON; A. R. (*Scorrier*); W. E. D., JUNR. (*King's Lynn*); D. (*Kilmarnock*); E. J. (*Plumstead*); J. M. (*Glasgow*); A. V. S. (*Westbourne Park*); DUMMY; R. G. (*Settle*); J. W. W. (*Chesterfield*); J. W. H. (*Edinburgh*); F. C. (*Cardiff*); G. T. (*Liverpool*); F. C. S. (*Manchester*); A. R. T. (*Birmingham*); H. R. (*Chasewater*); A COUNTRY CABINET MAKER; NOVICE; F. J. (*Exeter*); T. M. (*Liverpool*); W. A.; N. M. (*Norwich*); J. T. (*Kensington Barracks*); J. W. (*Forebank*); C. F. W. M. (*Knfield Lock*); ERIC; G. R. D. (*Chatham*); W. C. A. (*Ware*); G. T. (*Hollinwood*); CUTTER; V. (*St. Helen's*); M. B. (*Brighton*); C. R. (*Birmingham*); J. H. (*Bury*); PATIENCE; T. P. (*Duckinfield*); J. G. (*Glasgow*); CANTAB; JOINER; E. J. A. H. (*Portslade-by-Sea*); A. R. R. (*Redcar*); ELECTRIC LAMP; J. P. (*Handsworth*); R. W. C. (*Oxford*); A. B. C. (*Arbroath*).

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