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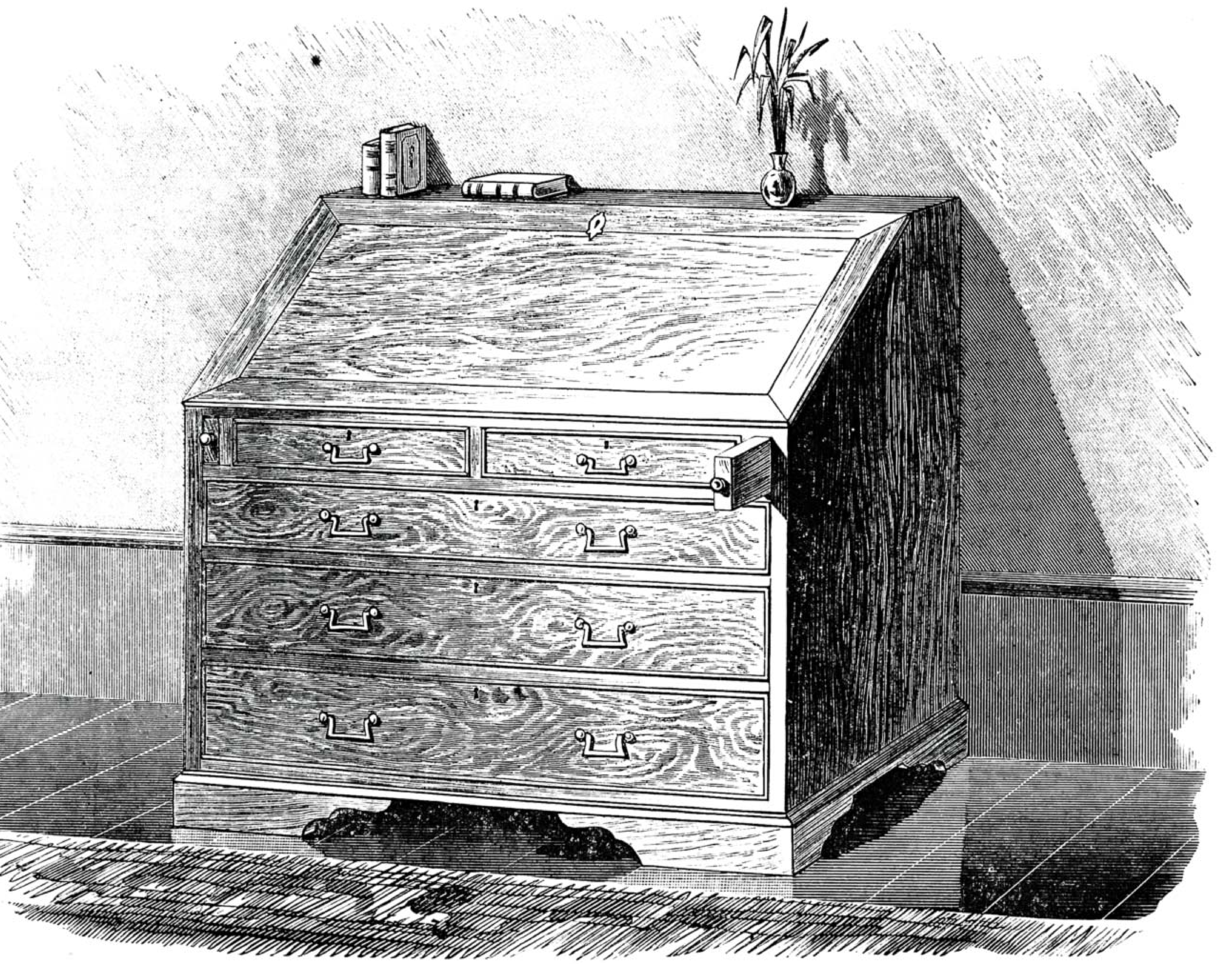


Old Form of the Bureau.

SOME LESSONS FROM AN OLD BUREAU.

BY DAVID ADAMSON.

I.—Modern Writing Appliances—Advantages of Bureau—Scamped Work in the Past—Space taken up by Bureau—Accommodation Afforded—Departures in Style—Comparative Cheapness of Bureau—Veneering—Materials—Working Drawings—Width and Thickness of Pieces—List of Pieces Required.

Possibly on seeing the above heading the reader may be inclined to wonder what occasion there can be to describe the construction of such an old-fashioned piece of furniture. We have now so many modern contrivances for the purpose—from the plain leg writing-table to the pedestal cylinder fall, the register, and a number of others, not forgetting several American "patents" of marvellous ingenuity and cumbersomeness (structures formed for the exemplification of the good old injunction to have a place for everything, even though the place may sometimes be forgotten)—that the bureau has somewhat fallen into disrepute, or, at any rate, neglect. It is now so seldom made that it may, perhaps, be supposed that its descendants fulfil its purpose better, or it would not have ceased to be an article of modern manufacture. The fact, however, must not be overlooked that many forms of furniture and useful varieties, in every respect equal to, and in many instances superior to, those looked on as the best, have come to be regarded as obsolete. They have, however, merely been forgotten and relegated to the shops of dealers in second-hand furniture, whence they will, no doubt, some day emerge from their temporary obscurity—in modified design, perhaps—as novelties. Let us see in what respects the old-fashioned bureau is deserving of recognition as a modern piece of furniture, and, if possible, do something to rescue it from untimely demise; for, slightly altering a well-known address to another article of domestic comfort, it may be said—

> "I love it—I love it, and who shall dare
> To chide me for loving that old 'secretaire'?"

No contention is made that the bureau

surpasses all other forms of writing-desk, for each has special advantages of its own in a greater or less degree; but that is far from saying that all of them are superior to it. Like its younger brethren, it has features peculiar to itself; and if any of these remarks may seem to imply that it is better than any of them, please bear in mind what was stated in the previous sentence. Now let us look at the bureau (Fig. 1), and, comparing it with other forms of desk or table, note what appear to be its chief characteristics, and the points wherein it may be considered superior to them. Perhaps the first that may occur to the amateur cabinet maker is its extreme simplicity; for though some of the old bureaus are complicated and elaborate, the one before us is as plain almost as it could well be. A plain honest piece of work—more agreeable to look on, perhaps, than if it were more pretentious—and it may well serve as our model. If nothing better is learned from it, at least it will show that plainly-made furniture is not necessarily ugly. Elaboration and ornamentation are pleasing only when judiciously employed. If over-done, the effect may be striking, but it soon palls, and the eye is wearied with its ostentation. To design a plain piece of furniture is not difficult, my amateur friends; but when you get ambitious and want to make a handsome thing, that's where the difficulty comes in. This old bureau, and many another old piece of woodwork, remind us that soundly-constructed furniture has a charm of its own, even when there is no pretence at ornamentation, and the finish is a little rough. It certainly is somewhat crude and rough—do not let any prejudices against modern things, as compared with those of an older date, blind us to this fact. In a few choice specimens of old furniture we may find evidences that the old workers were not a whit behind those of the present, either in artistic or technical skill; but candour compels us to admit that most of their work was not equal to the bulk of that which is now made. That much rubbish is made now, no one who knows anything about modern furniture will deny; but can anybody say that scamped work is a recent production? If there be one rash enough to make such an assertion, will he allow me just to remind him of the discoveries made during the restoration of, I think, Peterborough Cathedral, as to the plan adopted by its builders. That was a practical comment of a rather startling kind—one which should make those very enthusiastic belauders of everything that is old calm down in their affected admiration of it.

If they really appreciate good work, they will see more of it in any half-dozen first-class furniture shops than in an equal number of museums. Is it not blind, unreasoning veneration, the tribute to antiquity, which may be more or less influences us all, that calls forth so many remarks in favour of old furniture, rather than an intelligent acknowledgment of good qualities, wherever they may be found? I do not now refer to the old work stored in our treasure-houses of art, but to the every-day specimens one comes across, which is surely the fairest way of judging the class of work our forefathers made. Let any one carefully examine such things, and he cannot help acknowledging that they are mostly coarse and clumsy by comparison with modern work. The most that can be said in favour of them is that the makers made the best of their opportunities; for I fancy it is sometimes forgotten that many appliances and tools are only of recent origin. We have now better tools than ever, our workmen do not remain in one district, nor are they behindhand either in their endeavours to turn out honestly-made articles, or in intelligence. Those who delight to sneer at the British workman may not agree with these remarks, but they are nevertheless true; and the real cause of so much faulty work must be attributed, not alone nor principally to the tradesmen, but to those buyers who want to get things under their value. But what has all this to do with the bureau? Nothing directly with its construction, though indirectly we may learn to appreciate not only it but other things, and to regard them as objects for intelligent study. Hence I trust the few hints may not be amiss.

Briefly, let us imitate what is worthy of imitation in old workmanship, but do not let us fall into the error of supposing that want of finish is in itself meritorious. It cannot be anything but an indication either of carelessness or incompetence in modern work, though in the old it may have been unavoidable, and consequently is not to be found fault with. Well, having delivered my little lecture, we turn again to the bureau, and note some of its excellences. For one thing, it does not occupy much space—only 3 ft. 6 in. across by 1 ft. 8½ in. from back to front; and yet there is an available table-space of about 3 ft. 3 in. × 2 ft. 1 in. when the lid is opened. Now, suppose we compare this with any ordinary writing-desks. In these, with the exception of the cylinder fall, we find that they occupy as much space when not required for use as when being written at. The old bureau on this point clearly has the advantage. Again, look at the drawers. Where can one get such accommodation in any of the pedestal writing-desks of the ordinary "knee-hole" form? Then see how easily and quickly any writing that has to be suddenly left can be secured from prying eyes. It is only necessary to push back the papers, lift the lid, and turn the key—nothing can be simpler. What other desk is equally convenient in this respect? Inside are convenient receptacles for small documents, etc., in the form of pigeon-holes and drawers; which, however, are not singular to the bureau. In case the arrangement shown in Fig. 2 does not suit the fancy or requirements of all, those who prefer some other may be reminded, in the words of a cabinet maker (Heppelwhite), referring to the bureau (or, as he called it, simply a desk) nearly a century ago, that "the drawers and internal conveniences admit of much variation." By the way, it is not uninteresting to notice that Heppelwhite gives us the general sizes for bureaus as follows:—"Length 3 ft. 6 in., depth 22 in., height of desk (*i.e.*, overall) 3 ft. 2 in., including 10 in. for the inside of the desk." These measurements differ only slightly from those of the one under consideration. But more of some of the older cabinet makers' designs, etc., later on; for though this bureau is a very plain one, I hope to show how it may be altered in detail, or, rather, how ornamentation may be added to it to make it represent various styles—for example, Chippendale, Sheraton, etc. The general construction will, however, remain the same. But, some one may ask, has the bureau no disadvantages to counterbalance its good qualities? and the answer may fairly be in the negative, unless, indeed, some may be inclined to object to a level surface for writing on, instead of a slope. Those who think thus will have a plan suggested to them for making the desk to their liking—one which, I think, will be found practicable without seriously increasing the difficulties of construction. Perhaps the only particular in which it may be said that the bureau is not so convenient as the ordinary knee-hole pedestal table is in getting access to the drawers in the lower part when the writing-flap is down. To get anything out of them—especially out of the two top drawers—that may be wanted while writing, the flap must be raised. After all, however, one cannot have everything, and the inconvenience—if it can be called one—is so slight that it is almost unworthy of consideration. Perhaps as a set-off against this it may be said that, for the accommodation found in it, the bureau is the cheapest form of writing desk and table; though, if it is to be made properly, it will be found to cost a fair sum for materials, and I purpose giving, as nearly as possible, the specification of that from which the drawing (Fig. 1) is made. That it might be made at a less cost I do not deny, but it does not come either within the province of this journal, nor yet of my own inclination, to give instructions for the manufacture of shams. By this I do not wish to say that it must be of oak if it is to be genuine, for it may be equally well and soundly made in pine; only, if it is of pine, let it be either painted in plain colour—not grained—or simply stained and varnished. Nor would I go the length, as some do, of objecting to veneer, for experience shows that veneered work, when *properly* done on a suitable base, is not to be despised, although some critics, who know little or nothing about it, condemn it utterly. However, as veneering is hardly likely to engage the worker's attention while making the bureau, the various *pros* and *cons*, whether of a theoretical or practical kind, need not be considered here.

The only remark I will at present offer about veneering in connection with the bureau is that those who prefer making it in mahogany will be able to get finer figured wood in veneers than in the solid, and that therefore they may as well make it of some cheap mahogany—such as bay-wood or Honduras. This has very little figure, but it serves excellently as a foundation on which to lay the choicer and more beautifully-marked veneer. Those who can lay veneer need scarcely be reminded that they are not likely to get good figure in "knife-cut."

But let us suppose that we are to commence making a bureau, for which the one represented is to serve as a model. As it is of oak, it will, perhaps, simplify the instructions to assume that the one to be made is the same, and I shall, therefore, refer to oak only, whenever it is necessary to distinguish between the principal wood and the pine which enters into its construction. Those who prefer to make the thing in some other wood—say, mahogany, ash, etc.—have only to substitute it for oak whenever this is mentioned. It will be noticed that I have not mentioned that now popular wood, American or black walnut; and it may occur to some that this is an oversight. The fact is, I hardly know what to say about it for the purpose of this piece of furniture—so much depends on the maker. If his intention is to make a bureau which shall be a verisimilitude of the real old-fashioned thing, then American walnut will be decidedly wrong, for it is, comparatively speaking, only a very recent introduction, and was quite unknown, in this country at any rate, at the date when the bureau was still an every-day article. This, however, rather savours of inculcating the notion that the new bureau is to appear as if it had been made years ago—in other words, that it is to be a spurious antique. This, it is almost superfluous to say, is not a desirable ambition to be entertained ; but as there may be some who, without any desire to deceive, wish to avoid an anachronism and to be strictly correct from an antiquarian point of view, the suggestion is given. Apart from this, there is no reason why American walnut should not be used. While mentioning American woods, I may just put in a caution not to use the stuff known as satin walnut. The name is taking, and almost seems to imply that the wood is a superior kind of walnut. It is, however, nothing of the sort, being in reality a very inferior timber of little or no intrinsic value as a furniture wood, for which, however, it is now being used. Possibly some good qualities may be discovered in it later on, and there is no saying that it may not become popular, for it must not be forgotten that American walnut only a few years ago was a drug in the market ; but in the meantime I would strongly advise no amateur to make anything valuable in it. It is very unreliable.

Before actually beginning to make the bureau, or, indeed, any other piece of furniture, a full-sized working drawing or plan should be set out. It need not be a troublesome matter, even for those who are not draughtsmen, as all that is absolutely required is that it shall show distinctly the sizes of the various parts. When this is done, it greatly facilitates work, besides preventing mistakes in cutting up the wood. If the maker can show details and sections, well and good ; but if not, he can easily supply the needed reminders by a written word or two. All that is wanted is that the drawing shall be a serviceable guide to him when working ; and whether the explanation is given partly in words or altogether in lineal representation, is of little consequence. Theoretical working drawings and useful practical drawings for the workshop are by no means necessarily the same. In the present case, two drawings will suffice—one of them showing the shape of the end, and the other the plan of the front. This latter shows the arrangement of spaces for drawers, etc., and need only be drawn of one half of the bureau, as the other portion is exactly the same. Of course, in measuring from it, all horizontal lengths must be doubled and the other parts duplicated. In case the novice may be in any difficulty about this — for working drawings are too often regarded rather as a source of mystification than of elucidation — Figs. 3 and 4 are given to serve as a guide. On the former, which is a drawing of the end (without the plinth), the measurements are shown in inches. On the latter, to prevent confusion, they are omitted, but it will be understood that the full-sized drawing must show them in actual measurement. The width of the various pieces from back to front, such as the divisions between the drawers, may be stated on them. Thickness will show itself. One rather important matter may be mentioned here, viz., to show the thicknesses as they will be when the wood is planed and cleaned up, not as it nominally is. Thus the said rails are of 1 in. stuff, but as this will be, when finished up, only some ¾ in., or at the most ⅞ in. thick, it will easily be perceived that the working drawing would be misleading if the full nominal thickness were shown. The same principle applies generally to all wood, and it is important when mentioning thickness to understand whether the measurement is given of the finished or rough stuff. To prevent any confusion arising to the reader in the present instance, I may say that all *thicknesses* that will be given must be taken as indicating the nominal measurements of the rough stuff, so that due allowance must be made for waste and finishing. As this method may seem strange to the inexperienced wood worker, I may explain, for his benefit, how it comes about, and it will then be seen to be perfectly natural. A log of, say, 12 in. thick, has to be cut into twelve planks of 1 in. each. If these could be, so to say, sliced off, they would be actually 1 in. thick, but as they are cut with the saw, which forms a passage of its own thickness and removes a certain amount of material in the form of sawdust, it needs no great discernment to recognise the fact that the twelve (nominal) 1-in. boards will not be equal in bulk to the original log. Besides the saw-cut—or kerf, as it is technically called—a further deduction must be allowed for roughness to be removed by planing, etc., so that altogether a fair margin must be allowed for finishing. Sometimes, it is true, planks will be found which are fully up to their nominal thickness, but so seldom that it would be unsafe to rely on meeting with them just when they are wanted. Indeed, they may almost be said to come under a separate standard of measurement, though not exactly a recognised one, in which they are described as "full" ½ in. or "full" 1 in., or whatever the thickness may be.

When the working drawing is prepared, it will be found to be a very convenient plan to make out a list of all pieces required. Much time is thereby saved, and uncertainty avoided in fitting the parts, which, as they are got out, should be numbered to correspond with the list. So far as I know, this method is not adopted generally in either trade or amateur workshops, but its advantages will be manifest to, and not readily relinquished by, those who have tried it. It is well to have the list legibly made out and placed so that it can easily be referred to as the job progresses. The precise arrangement of the list, of course, does not matter very much—some preferring one, and some another, for reasons which, though, perhaps, important in a large factory, are scarcely likely to be of much importance in small shops or to the amateur. All things considered, the tabulation adopted in this case is probably, at least, as convenient as any other. In it some of the smaller pieces, such as drawer stops, are omitted, as they can be made from waste or short ends, and their enumeration would only encumber the list with needless details. It will be seen that the wood is classified according to thickness, not according to the position it is to occupy in the bureau, as some might prefer. This, if one may judge from some remarks that have lately appeared in an important technical contemporary, is a point on which opinions differ, as each plan has its own peculiar advantages, and it is one that cannot be fully discussed here. The choice must be left for each individual to decide for himself, and he may extend it, as some do, by specifying the small bits left out if he thinks it necessary. The annexed Table gives a list of the timber required to construct a bureau measuring 3 ft. 6 in. wide × 3 ft. 4½ in. high × 1 ft. 8½ in. back to front ; unless, indeed, any one wishes for special reasons to use other thicknesses, etc. Perhaps, instead of saying that they are required to be as stated, it will be better to understand them as reliable thicknesses, given as suggestions in case of doubt, though I would not advise any departure from them unless by an experienced worker.

In addition, there will be required about 7 ft. of moulding for plinth ; the material for the plinth itself; blocks,

LIST OF PIECES OF TIMBER REQUIRED IN CONSTRUCTION OF BUREAU.

No.	Pieces.	Length.	Width.	Thick.	For	Remarks.
1	2	3 ft. 1½ in.	1 ft. 7¼ in.	1 in.	Ends.	Full width made up by facing slips.
2	1	3 ft. 4½ in.	9¼ in.	"	Top.	
3	1	3 ft. 3¼ in.	1 ft. 7 in.	"	Table top (or lid).	Or pine under pigeon-holes.
4	4	3 ft. 3¼ in.	2 in.	"	Drawer bearers.	Ditto, or pine faced up.
5	3	4 in.	2 in.	"	" "	
6	2	1 ft. 5¼ in.	3½ in.	"	Drawer fronts.	
7	1	3 ft. 3 in.	4½ in.	"	" "	
8	1	3 ft. 3 in.	5½ in.	"	" "	
9	1	3 ft. 3 in.	6½ in.	"	" "	
10	2	1 ft. 4 in.	3 in.	"	Lid.	
11	1	3 ft. 4 in.	3 in.	"	"	
12	1	2 ft. 10 in.	1 ft. 1 in.	"	"	
13	10	6 in.	—	¾ in.	Top side drawer fronts.	In pairs, width increasing from 1½ in.
14	2	5 in.	3 in.	"	} Fronts of drawers under pigeon-holes.	
15	1	1 ft. 4½ in.	3 in.	"		
16	1	3 ft. 3 in.	9 in.	½ in.	} Bottom and ends of pigeon-holes and under bottom row of drawers.	
17	1	2 ft. 3 in.	"	"		
18	2	11½ in.	"	"		
19	8	6½ in.	"	"	Between side drawers.	
20	6	8½ in.	"	"	Pigeon-hole partitions.	
21	2	3½ in.	"	"	Between drawers. Below "	
22	20	8½ in.	—	"	Small drawer sides.	In fours, same width as corresponding fronts.
23	10	6 in.	—	"	" " backs.	In pairs, width ½ in. less than corresponding fronts.
24	10	5⅝ in.	8½ in.	"	" " bottoms.	
25	6	8½ in.	3 in.	"	Sides of Nos. 14 & 15.	
26	2	5 in.	2½ in.	"	Backs " "	
27	2	4⅝ in.	8½ in.	"	Bottoms of No. 14.	
28	1	1 ft. 4¼ in.	8½ in.	"	Bottom " 15.	
29	1	1 ft. 4½ in.	2½ in.	"	Back " 15.	
30	2	1 ft. 3½ in.	3½ in.	1 in.	Lid bearers.	
31	8	1 ft. 6 in.	2 in.	"	Drawer slides.	
32	1	3 ft. 4½ in.	1 ft. 8 in.	"	Bottom.	
33	10	1 ft. 7 in.	—	½ in.	Drawer sides.	In pairs, same widths as Nos. 6 to 9.
34	2	1 ft. 5 in.	1 ft. 7 in.	"	" bottoms.	For No. 6.
35	2	1 ft. 5½ in.	3 in.	"	" backs.	Ditto, ½ in. narrower.
36	3	3 ft. 3 in.	—	"	" "	For corresponding fronts, Nos. 7, 8 to 9, ½ in. narrower.
37	3	3 ft. 2¼ in.	1 ft. 7 in.	"	" bottoms.	For Nos. 7, 8 & 9.
38	3	2 ft. 10½ in.	1 ft. 6 in.	"	Dustboards.	

The exact measurements will, of course, be taken from the maker's working drawing, and, if necessary, be altered accordingly.

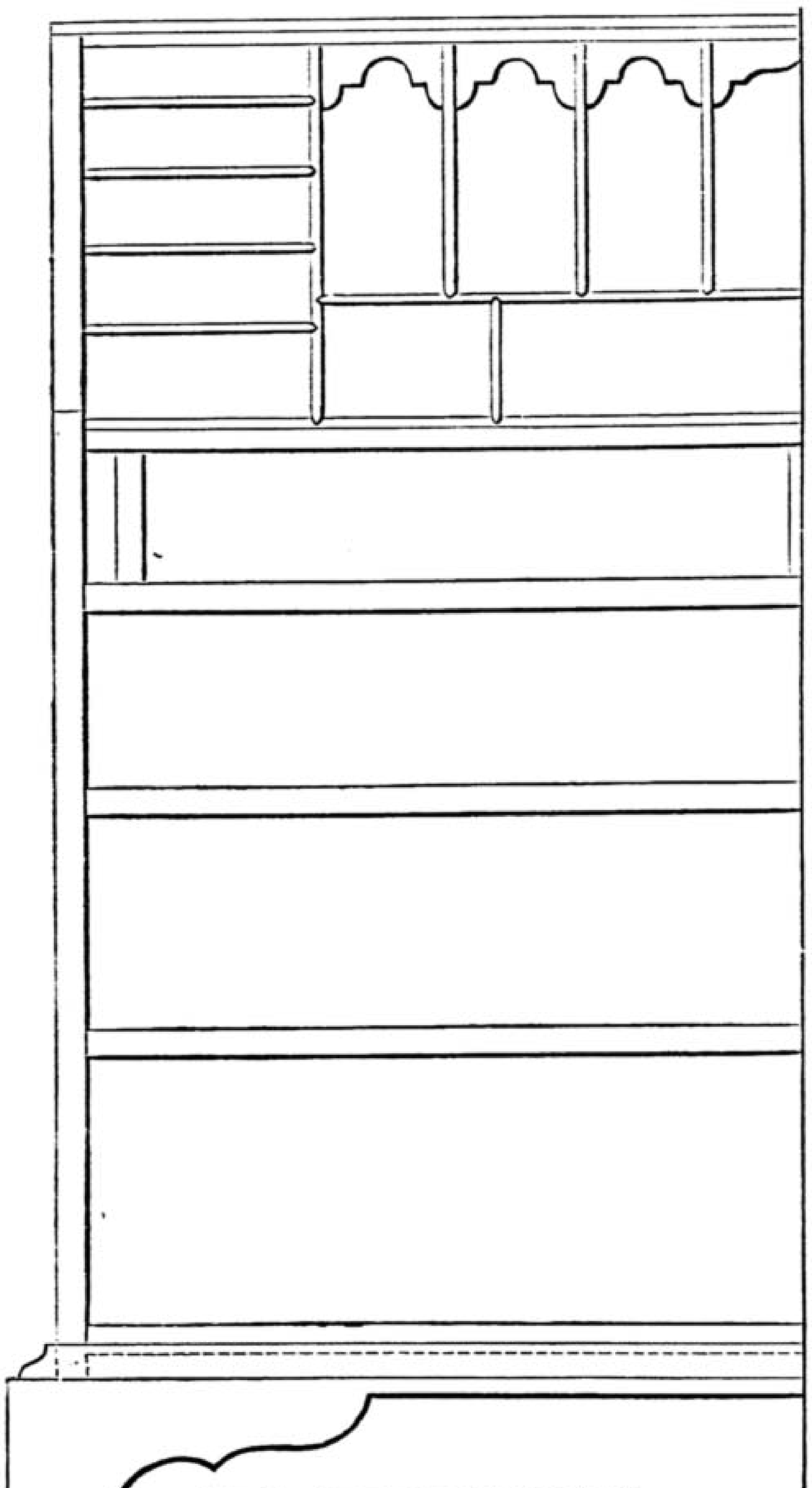


Fig. 4.—Front Elevation (Half).

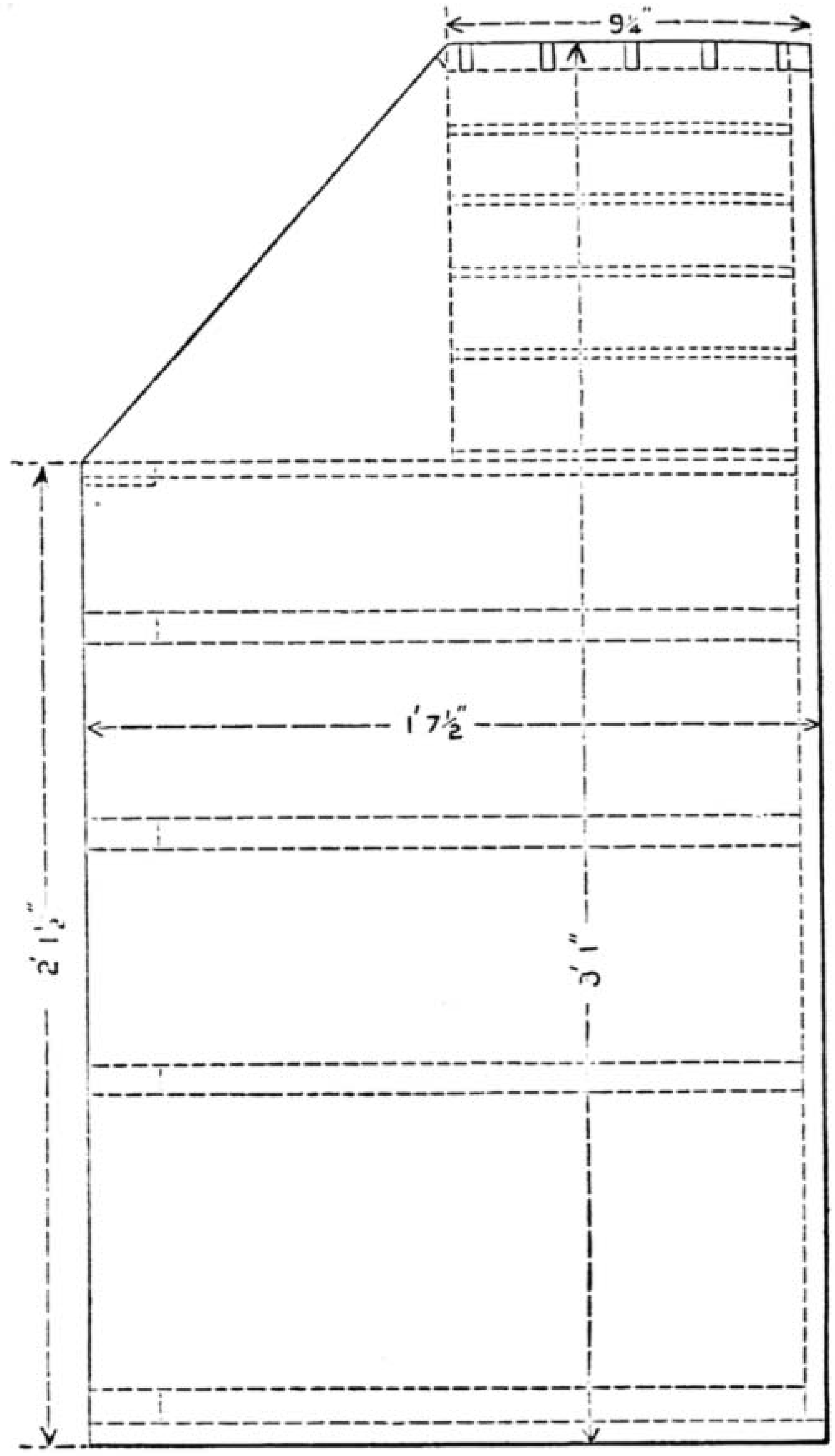


Fig. 3.—End of Old Bureau.

drawer-stops, and beads, which will be dealt with later on, as well as the back of the bureau, when referring to the parts with which they are connected. The sizes given are taken as nearly as possible, but they do not all include small fractions of an inch. They give approximately the measurements to which the material may be cut in the rough without incurring, on the one hand, needless waste, and, on the other, allowing sufficient for trimming and fitting. If there is any doubt, it is better to cut the pieces rather over than under the sizes, for these can always be reduced by a shaving or two being removed. It will be noticed that in one or two instances ⅛th of an inch is given, and this may seem to imply that absolute exactness has been studied in such cases. It has to a certain extent, but the principal reason they are given is to show the approximate proportions these pieces bear to the corresponding parts to which they are to be attached, but they must not be taken as exact when finished. It is in making them fit each other accurately and correctly that the skill of the maker shows itself. Measurements are all very well in their way, and indeed necessary, but no measurement will overcome the need of fitting and adjusting the various parts to each other. The list may seem a somewhat formidable one, and its preparation is not accomplished without an expenditure of time; an expenditure which is more than repaid by the increased speed and facility of working. Before going any further, it may be stated that all the parts to No. 29 inclusive are of oak. The remainder may be pine, or any wood that may be preferred to it. Pine is named, as those portions of the bureau from which this description is given are of it, and they do very well. The only alteration that I would suggest with regard to them, were I asked to improve on the material, is that the insides of the lower drawers, *i.e.*, the large ones in the body or "carcase" of the bureau, would be better in something else.

But here I must stop, trusting I have given every reader who may make up his mind to construct a bureau something to do in getting out the timber required.

(*To be continued.*)

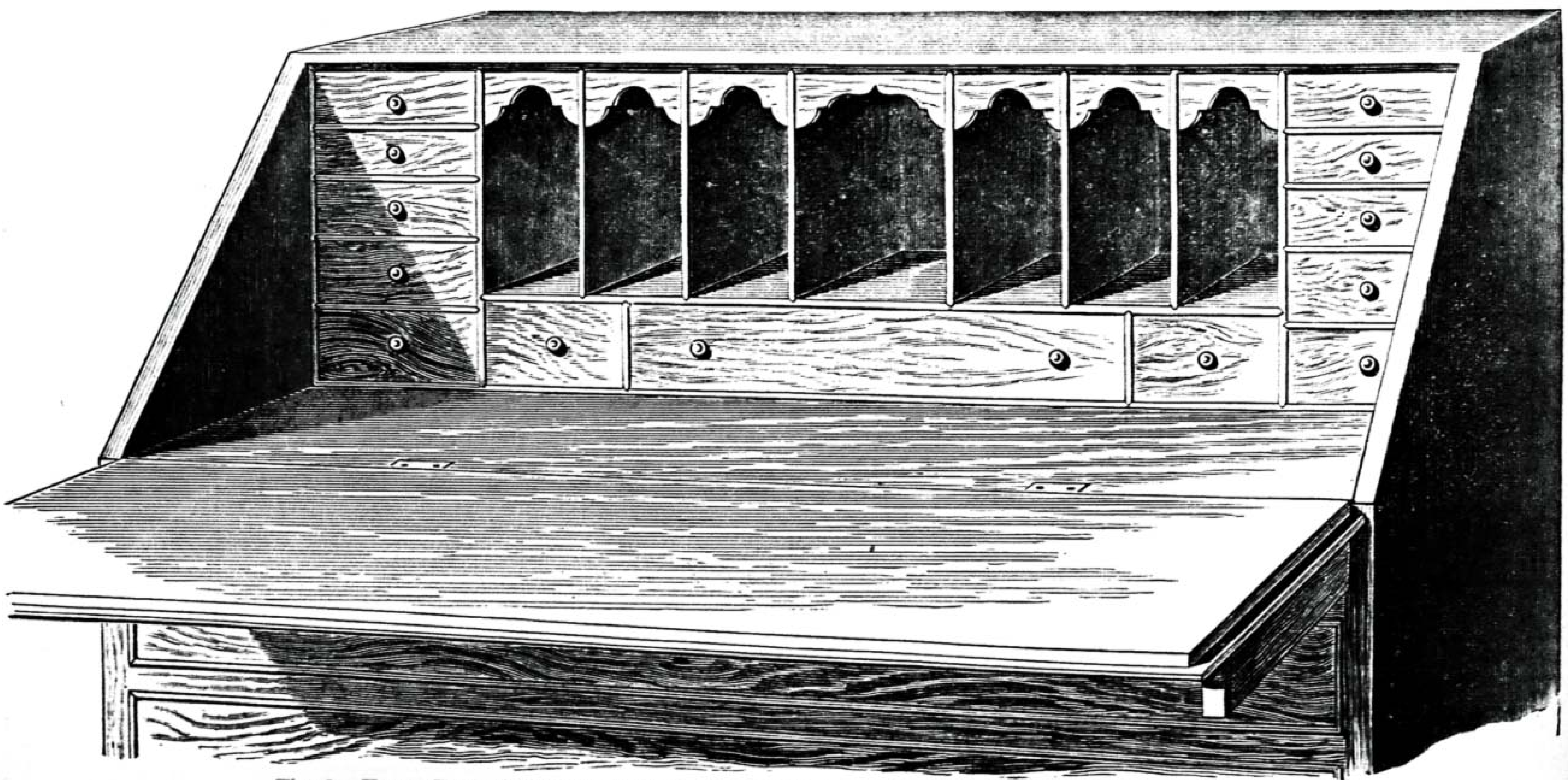


Fig. 2.—Upper Part of Old Bureau or Secretaire, Open and Exhibiting Arrangement of Interior.

WROUGHT IRON AND STEEL GIRDER WORK.

BY FRANCIS CAMPIN, C.E.

I.—Iron Lists—Templates—Marking.

In the present article I purpose dealing with the construction of girder work in the iron yard, starting from the completion of the general drawings, and when, therefore, all the purely theoretical calculations have been made and the manufacturing or practical stage is reached.

It sometimes happens in preparing the designs for works of novel or intricate character that points affecting the manufacture of the work are overlooked, and it is, therefore, incumbent on the leading hands in the shops to examine the drawings very carefully in the first instance, in order to avoid subsequent hitches during the progress of construction.

The mechanical processes commence with the rolling of the iron or steel plates, bars, and other sections required for the job, and the preparation of templates for marking the positions of the rivet holes.

All flat pieces over 12 in. wide must be rolled as *plates*, and this will involve some unevenness of the edges, the plates being rolled between plain cylinders, and their edges subsequently sheared to the sizes ordered; this shearing cannot be effected with the accuracy necessary for neat work. The narrower *bars* being rolled in grooved cylinders will have their edges as well as their surfaces smooth; but all the parts on leaving the rolling mill require some amount of straightening before being built up into the structures of which they are destined to form parts.

If two or more thicknesses of plates are to be riveted together, it is evident that they should be of exactly equal widths, and have truly-formed edges; and in such cases, even when they are less than 12 in. wide, they should be rolled as plates and planed to the required dimensions.

On the iron lists sent to the rolling-mills, the dimensions marked must be sufficient to allow for the reduction by planing. On the amount of allowance to be made on this account there exist differences of opinion, and it will be affected by the accuracy observed in the particular mill to which the order may be sent; but the practice I have found most satisfactory is to allow a quarter-inch on all edges and ends of plates for working. This allowance is, of course, so much waste; and some small firms, after tendering at very low prices, have kept it down to as little as one-eighth of an inch; but this is very risky, and I have known cases of whole plates having to be thrown aside through the insufficiency of the margin to cover the irregularities of the edges.

While the iron is being rolled, the templates for marking the rivet holes may be proceeded with. These will be made of strips of wood formed into frames to suit the shapes of the plates and bars, and perforated with holes corresponding to the intended positions of the rivets.

It is necessary before proceeding further to make some observations upon the different methods of making the rivet holes, as upon that adopted the arrangement of the templates will depend in some measure. There are three ways in which the holes may be made: by punching simply, by drilling out of the solid, and by punching small holes and drilling or rymering them out to the required size. Formerly punching was universal, or almost so, but in recent years, with the advent of improved machinery, drilling has been gradually superseding it for large and important works, the magnitude of which justifies the construction of special machines for their execution. In the old style, punches with flat ends and a good deal of taper were commonly used, and the holes made by them were not of equal diameter throughout. To mark the plates, stumps dipped in white paint were used. The perforated templates were clamped on to the plates and bars, and the stump passed through the perforations, and their positions thus marked by white rings upon the material to be punched, which, the templates having been removed, was then ready for the puncher. The marked work being passed under the punch by hand, it is evident that the quality of the result is dependent upon the accuracy of eye and steadiness of hand of the workman attending the machine; hence it is almost impossible that the punched holes can be exactly in the position marked; and in work done by an inferior hand, their eccentricity may become very appreciable; then when the plates are laid together to be riveted up, the holes will not coincide, and either the rivet will be distorted in closing, or the holes must be broached out to a larger diameter to make them concentric, and thus the plates are weakened by losing more of their substance than would be necessary with more exact work.

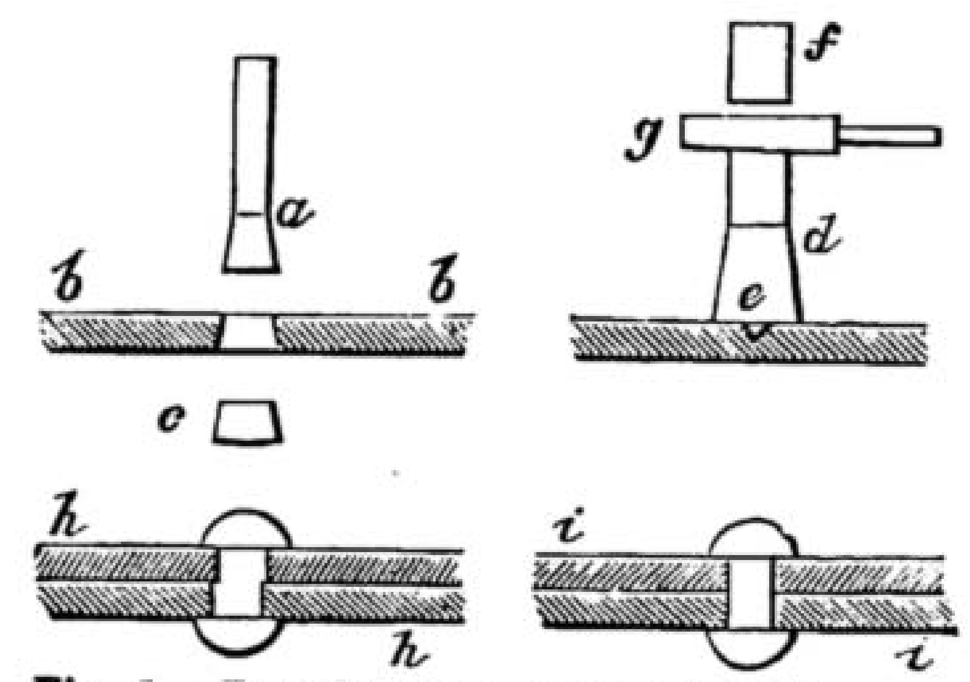


Fig. 1.—Punching and Riveting Plates.

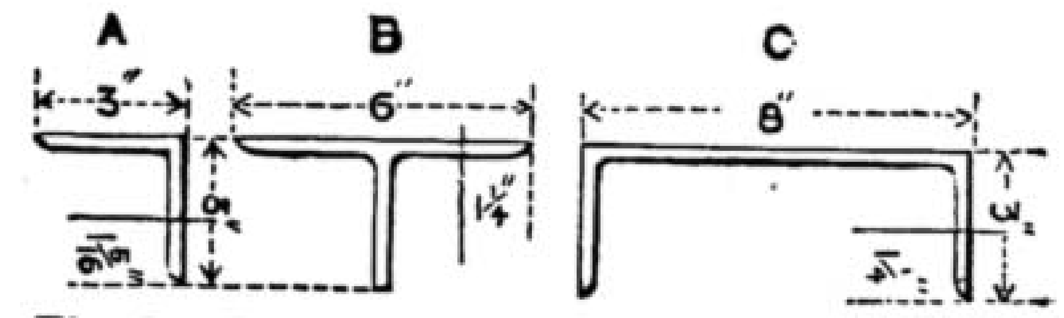


Fig. 2.—Position of Rivets in Angle Sections.

In ordinary punching, the material is partly cut and partly burst out of the solid, and therefore around the edges of the holes some injury must be caused, and the strength of the plate for some distance—probably about one-tenth of the diameter—deteriorated. This difficulty is, however, overcome by punching the holes smaller than the finished size, and drilling or rymering out the damaged part; thus for the finished diameter of $\frac{3}{4}$ in. the holes may be punched $\frac{5}{8}$ in. and then drilled out to $\frac{3}{4}$ in. Here also we are in the hands of the puncher as to accuracy of position; therefore, to ensure accuracy, recourse is had to the process of "nipple" punching, which is slightly more costly, but much more satisfactory. There is no difficulty whatever in correctly making the templates, as the centres of the rivet holes are set out by dividers, and the perforations made by an accurately formed centrebit; and lest there should be the slightest deviation from the vertical direction during the drilling of the wood, the template when used is turned over, and that face upon which the holes were set out placed in contact with the metallic surface to be marked.

If the work is to be "nipple" punched the plates are marked with a centre punch instead of a stump dipped in paint, and thus the centre of each intended hole is indicated by a conical depression, into which the "nipple" of the punch falls, thus securing the proper adjustment of the plate to the punch.

In the accompanying Fig. 1, *a* is the working end of an ordinary punch, and *b b*, is a section of a plate from which the distorted "burr," *c*, has been punched out. The more nearly cylindrical the punch, *a*, can be kept, the better will be the work executed by it. Great care is required in grinding these punches, in order that they may take their bearing fairly, otherwise constant breakages will result. At *d* is shown a "nipple" punch, of which *e* is the "nipple," and beneath this is shown a section of a plate with a countersink, into which the nipple falls. *f* is a rising and falling block, by which the punch is driven through the plate; between this block and the head of the punch is a wedge, *g*, so arranged that by drawing it back the block, *f*, can make its stroke without acting on the punch, thus allowing time for the plate to be fairly adjusted to the nipple, when the wedge, *g*, being pushed in the hole, is punched. This operation for each hole takes some time to describe, but in practice it is fairly rapid, and it is certainly a very great advance upon the older method. *h*, *h*, shows a section of two plates, in which the rivet is distorted through bad punching; and *i*, *i*, a section in which the rivet is properly formed.

Multiple punching machines have been made to punch a number of holes at one stroke, the plate being automatically moved forward after each stroke, and the punches acting at each stroke being determined by templates working on the principle of the Jacquard loom. These contrivances have, however, been found very costly to construct, and are very rarely used; hence I shall not occupy the space allotted to me with a description of them.

If holes are to be drilled under a single drill, the same marking as that used for the nipple punch will be suitable; but girder work is generally drilled in a multiple drilling machine, and in this case the centres of the holes do not require marking throughout, as the drills themselves are adjusted to the required "pitch" or distance from centre to centre of rivet holes, and templates only will be necessary for marking the positions at joints and connections of rivet holes which are out of the general run of the work, and such as have to be drilled by hand or small portable machines after the girder has been built up.

If every department fully and faithfully performs its duties, the *working* drawings when they reach the yard should have *every dimension* clearly marked upon them; but experience shows that this does not always happen. The reasons for this might be discussed, but they would not be edifying. It is therefore highly necessary that the template maker should know just what is required for the practical execution of the work, as any mistake which escapes him will appear in the work itself.

Some very awkward places often occur in making joints in bridge girders, especially where several members meet together; and here may be a temptation to overcrowd the rivets in order to avoid clumsy-looking joint plates, but it is important that this be not done to the detriment of structural strength; and the most carefully made general calculations will be frustrated if even the smallest details are improperly arranged.

The distances of rivets from each other, and especially from the edges and ends of plates and bars, is a matter of great importance, as if they are reduced below their proper limits there is danger of the material bursting out. Under no circumstances should the centre of a rivet be closer to the edge of a plate or bar than one and a half diameters, and that only when the strain on the rivet does not act towards the edge of the plate, but parallel to it; this would give 1⅛ in. for the distance of a ¾-in. diameter rivet; and although a great amount of work has been done to this proportion, it is, in my opinion, very little. Similarly three diameters will be the very least distance allowable between two rivet centres in girder work; this would be 2¼-in. for ¾-in. rivets. This close packing of rivets cannot but cut up the grain of the plate, especially when they are irregularly placed, as in some joint plates; and it must be remembered that the strength of a plate across the grain is less than that in its direction—in the ratio of about 6 to 7.

In joining angle and other sections together, the space allowed for the rivets is often very limited, in which case the rivets should be placed in the centre of the width. In Fig. 2 are shown three sections of iron or steel; A is angle; B is tee; and C is channel section. The distance of the rivet centre from the edge of any limb is found by deducting from its width the thickness of the adjoining limb and halving the remainder. Thus, if the angle iron is 3 in. by 3 in. by ⅜ in. thick, the distance of rivet centre from the edge should be 3—⅜ divided by 2 equals 2⅝ in. divided by 2 or $1\frac{5}{16}$ in. The 6 in. by 3 in. by ½-in. thick tee iron, and the 8 in. by 3 in. by ½-in. thick channel iron, will each have their rivet centres 1¼ in. from their edges.

When the strain on the rivet is towards the nearest edge, tending, therefore, to tear it out, it must be much further in, two diameters being the least to be allowed between the rivet centre and the edge of the plate or bar. Should distances less than those I have here given appear upon the drawings, they should certainly be referred back to the drawing office for verification before being worked to.

The templates having been properly prepared, and being ready for use, we have to take in hand the material supplied from the rolling mills. All this, as it is delivered to the girder yard, should be put under cover to protect it from rusting; then as soon as the inspecting engineers have made such tests as may be specified, and passed the iron or steel, work may be begun on it.

It will generally be found that the plates require more or less straightening, as in cooling they will take on some twist; this may be removed by hammering, but that method is very rough, and it is altogether better to straighten them in machines made for that purpose, consisting usually of three rollers.

(To be continued.)

"TIPS" FOR TYROS.

BY OPIFEX.

Moulded Corners for Picture Frames.

Picture-frame making is a very favourite amusement with many amateurs, and from its nature is likely to continue so always; yet there are few things more difficult to do well, notwithstanding the helps which have of late years been invented, such as mitre-cutting machines, corner clamps, etc.

Picture-frame moulding being covered with a white composition, it is hard to carry out the various operations of sawing or even cutting with mitre machines, "shooting" or planing the surface of the mitres, gluing, and nailing, without chipping off some of this composition; and besides this difficulty, there is oftener the other, and greater one, of cutting exact angles, so that, from some of these causes, the result too often is that we make a "mess of the job." Now although we strongly recommend the reader to overcome these difficulties by patient painstaking and practice, yet before this desirable end is attained many amateurs become tired of trying, and we therefore suggest a remedy for spoiled corners which will not only hide the evil, but if well done will be an improvement to almost any ordinary picture frame.

Procure a small piece of good basil leather, say about 5 or 6 in. square, and soak it in lukewarm water in which some glue has been melted—about a wine-glassful of melted glue to half a pint of water. Next select a leaf, which is about the length of the joint at your mitres; the kind of leaf is of course a matter of taste, but a narrow, pointed leaf will suit best for a beginner. Now, having rubbed your leather as free from water as possible, wiping it on both sides with a cloth, flatten it out smooth, and lay the leaf upon it, mark the shape exactly, including a short stalk, and then cut out cleanly with a very sharp penknife. Now with a blunt, smooth, pointed instrument—*e.g.*, a small paper knife—mark out clearly the veins as upon the natural leaf, and otherwise model it as faithfully as possible. Repeat the operation for the number required, and lay aside to dry thoroughly in the sun, or other warm place; when dry, give each leaf a coat of gold size, and when it is dry give another. When this second coat is almost dry apply gold leaf, gilding the leather leaves all over on right side and edges. Glue these securely to the corners of your frame, being careful to place them exactly at the proper angle, and most picture frames of ordinary moulding will be improved by this addition.

Gold Leaf: How to Use It.

Gold leaf is a thing which is impossible to manage unless one knows how, and yet we often have occasion to repair gilt articles of various kinds, or "touch up" a picture frame, etc. The usual practice is to apply some of the many gold paints, and the invariable result is a nasty patch, which, to a critical eye, is worse than the original flaw.

But besides patching and mending, gold leaf is highly effective in combination with black for the ornamentation of various articles of furniture which amateurs often construct for themselves. A book of "gold leaf" which is quite good enough for such uses may now be bought for sixpence; indeed, this German gold is quite as good for inside work as the "real thing."

Having procured a book, lay it flat upon a table, and carefully open the first leaf, when the metal foil will lie before you; with a pair of sharp scissors cut off the paper leaf you have just raised; lay it flat upon your open hand, and rub it on your hair; whether you use pomatum or not, there will be quite sufficient grease to answer the end in view. Now lay the paper upon the foil in its original position and press firmly with the hand; lift carefully, and the gold will be found adhering; this paper leaf with foil attached will now bear to be carried about, and may be cut up with scissors to size and shape required. The same process may next be carried out for as many leaves as we need for the job in hand.

Having said so much about gold leaf, we add a hint as to the method of laying it on, in case the reader does not know.

Paint the part you wish to gild with gold size, and be very accurate, as the leaf will stick to every spot touched; this size will dry rapidly, and when it is just *not dry*, or "tacky," *i.e.*, sticky, cut a piece of your leaf a little larger every way than your design, etc., press it firmly, and then lift the paper; do not touch it again till quite dry, when you may remove the surplus foil with a large, soft, camel's-hair brush, or "dabber."

For illuminations, etc., gum arabic may be used instead of gold size, and may be allowed to dry, breathing upon it for a few seconds when you wish to apply the gold.

LATHES AND TURNING APPLIANCES.

BY F. A. M.

IV.—The Overhead Motion (*continued*).

Another Arrangement of Overhead—Its Defects—High Speed for Drills and Cutters—Construction—Crossway or Fourway—Horizontal Bar—Ball—Castings and Forgings—Guide Pulleys and Sliders—Assistance Rendered by Overhead—New Overhead of London Lathe and Tool Company.

We come now to an entirely different arrangement, which is simpler than any yet described. It is also very fairly efficient. It has its advantages and disadvantages which will be stated, and then detailed drawings will be given so as to enable those who wish to make it for themselves. At Fig. 8 will be seen the general arrangement of the overhead. Here there is but one long band which is quickly adjusted for use, and, when not required, is not removed, but simply slipped off the large wheel to the right with the left hand, while with the right hand the slack loop is pulled so as to draw up the lower end which embraced the large wheel close up to the crank shaft; then the slack loop can be turned back and wound round the horizontal bar out of the way, leaving the fly wheel free for the ordinary band. Since the bands for the mandrel and for the drillers and cutters have to be frequently changed, it is a matter of some importance to be able to do this quickly.

We will now confess the defects of the arrangement. One is that since there is only one band, no variations in speed can be made but those due to the different diameters of the grooves of the fly wheel and those upon the pulleys of the various instruments employed. The greatest speed then will be determined by the ratio between the largest groove on the fly wheel and the smallest on the pulleys. Now these latter cannot be less than ⅞ in. in diameter, because, if so, the hooks of the ⅓-in. band, used for overhead motions, could not go round them without too severe a jerk; the utmost speed will therefore depend upon the size of the largest groove on the fly wheel. If the lathe is provided with a 24-in. wheel, the speed will be sufficient, but if the lathe be a small one, having a fly wheel of 20 in. or thereabouts, it would be better to adopt the plan shown at Fig. 4, or some other, which enables more speed to be obtained.

Here it may be well to draw attention to the great advantage of a high speed for the small cutters and drills: they *must* run fast if they are to work well. When they run at a proper speed and are kept sharp, it is astonishing how much hard wood they will remove, and how smooth a surface they will leave. A ratio, then, of 24 to ¾ will do very well; that makes the cutters revolve 32 times as fast as the foot wheel. Now the speed of the foot wheel may vary from 30 to 160 revolutions per minute, but we may consider 100 revolutions per minute of the fly wheel as pretty fast treadling to keep up continuously; let us, therefore, take 3,000 revolutions per minute as about the correct speed for the drilling spindle and small cutting frames for ornamental turning. A band ⅛ in. in diameter is quite strong enough, and much better than a thicker one, since it must bend easily round the small ¾-in. pulleys. If it be of catgut it may be joined with the usual hooks and eyes, sold at the tool shops; or it might be of Binn's endless blind cord, if a piece could be obtained of a suitable length; if not, it might be of whipcord or string, long spliced. It is a great advantage to avoid the jerk caused by the hook and eye as they pass over the small pulleys; this is sure to leave a slight mark on the work.

Proceeding now with our description of the overhead illustrated in Fig. 8, it will be seen to consist of a piece of iron gaspipe, 1¼ in. bore and 1⅝ in. external diameter, extending from floor to ceiling, and fixed so as not to touch the lathe at all. If, however, the ceiling cannot be utilised there must be a bracket as at B, and the upright pipe would end about 6 in. above the cross bar. There is, however, a considerable advantage in the first plan, since, when the overhead motion is fixed to the lathe, a slight amount of tremor is communicated to it, which interferes with the perfection of the work. Let it be understood, then, that the bracket, B, would not be used except when the upper end of the standard could not be supported from ceiling or wall. The top and bottom of the upright pipe are screwed into 1¼-in. flange plates. The lower of these is screwed to the floor, and the upper one to a board about ¾ in. thick, which board is fixed by long screws passing through the plaster of the ceiling into the joists above. This arrangement fixes the pipe firmly in a vertical position, yet allows of its turning on its own axis in the two flange plates, so that the horizontal bar may swing partly round in a horizontal plane. About 6 ft. high up the pipe from the ground is what gasfitters call a "cross" or "fourway," shown quarter size in Fig. 10. This cross is not screwed to the pipe in the usual way, but is bored out so as to remove the thread in such a way that it can slide up and down, the pipe from flange to flange being in one piece, and the cross slipped upon it and secured by the screw, A. This screw is obtainable from the gasfitter like the rest of the fittings. It is called a plug, and it serves here to fix the cross upon the pipe at the height most convenient for the band, a piece of wood being fitted into the arm of the cross to enable the screw to press upon the pipe.

We come now to the horizontal bar shown at Figs. 8, 9, and 11. This may also be of gaspipe of about ¾ in. bore, and it will require to be from 4 to 5 feet long. Its length should be such that a perpendicular dropped from its right-hand extremity would fall from 15 to 18 in. in front of the headstock. This bar should be smooth, because at one end there slides on it a heavy ball, and at the other two small sockets carrying a pair of pulleys each. To make a good job it should be turned up (though gaspipe is not nice to turn), and probably it would be better to employ for this purpose a piece of smooth steel tube of about ⅞ in. external diameter and ⅛ in. thick. We have now to connect the horizontal bar with the vertical so that it may swing or rock, like a see-saw, or like the beam of a steam engine, in a vertical plane: this we can do by means of the remaining arm of the cross. At B, B, Figs. 10 and 11, is shown a diminished T piece, one branch being the same size as the branches of the cross—*i.e.*, that for 1¼-in. pipe—and the other two branches being suitable for ¾-in. pipe. A rymer would be put through those two arms to remove the thread so as to make a thoroughfare hole to fit the turned gaspipe or the steel tube chosen to suit it, which would then be driven through half its length. At C, Fig. 10, is shown another way of fixing the bar. Here a piece of solid bar iron is screwed with the proper thread to suit the cross, and bored across with a hole of about 1 in. diameter to fit the bar, which is then driven in, and, if necessary, may be held by a pinching screw. Both these plans, while holding the bar, allow of the required see-saw motion. The second is the best, as it brings the bars a little closer together. Also it may be difficult to meet with the requisite T for the other plan. The ball is 5 in. diameter of solid iron; it may be obtained finished, with screw fitted, for about eight shillings. On the end of the bar, at D, is seen a stop screw tapped into the pipe, intended to prevent any possibility of the slipping off of the ball.

All this work the amateur is advised to order from the foundry; it requires tools which he has not got, and whatever overhead he undertakes he must of necessity spend something in castings and forgings. The main standard, being of 1¼-in. gas "barrel," can be bought in 14-ft. lengths at sixpence per foot. Let the height of the workroom be measured, and give that measure to the workman after subtracting ¾ in. for the thickness of the board for the ceiling. Order the two flange plates fitted so that they can be turned round by the hand; they cost 9d. each. Order the cross (at 1s. 9d.) bored out so that it will slide upon the pipe; the screw plug costs 4½d. Then comes the ¾-in. pipe: that costs 3½d. per foot; the T and stop screw about 1s. 3d. Allowing 3s. for boring the cross, 3s. for turning the ¾-in. pipe, and 8s. for the ball, we come to about 27s. Fix the standard yourself, using a plumb line, then you will not be charged for journeys, fetching tools, etc.

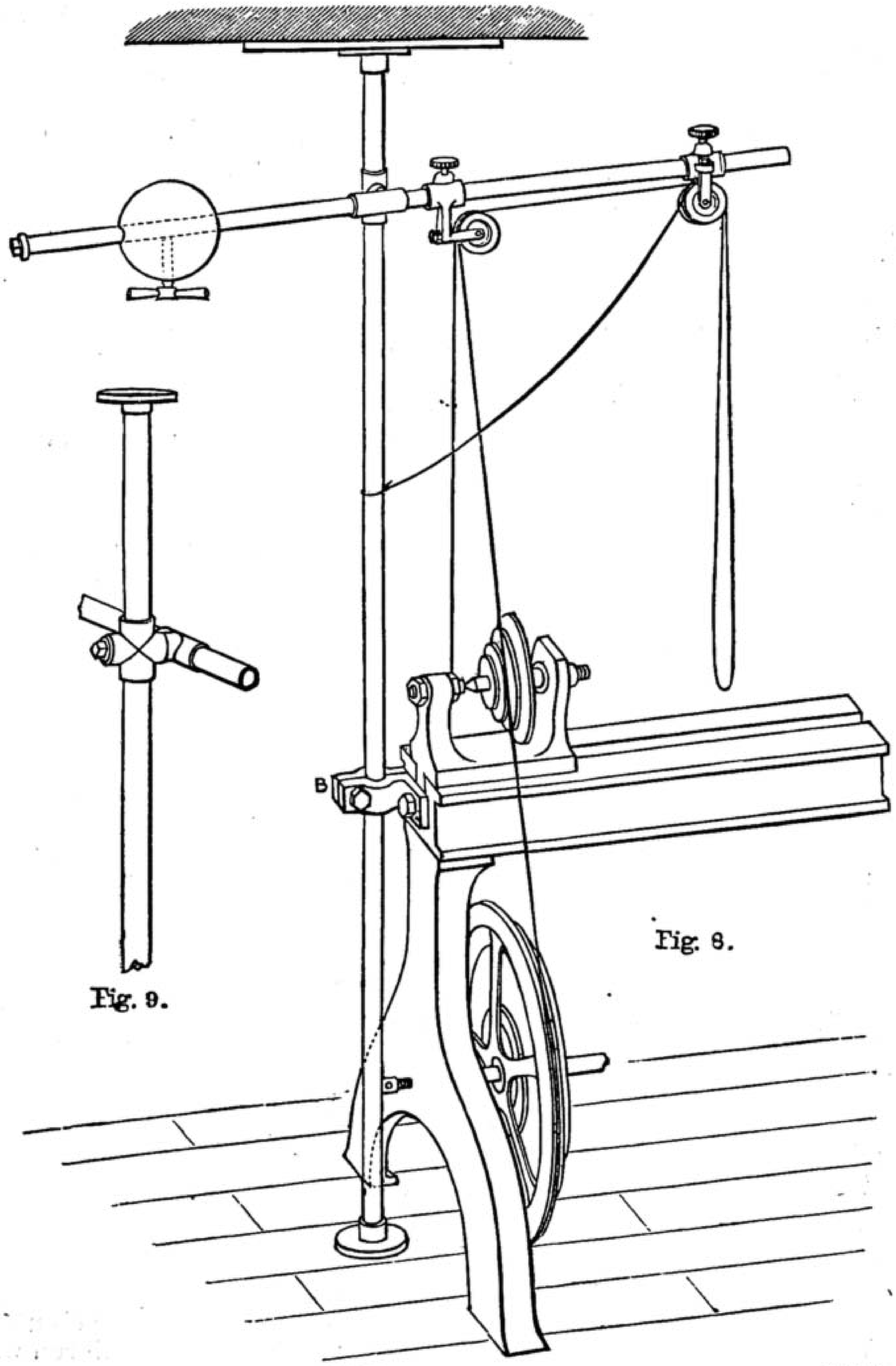
We come now to the four guide pulleys and their sliders, which the amateur is to make himself; a very nice little job, which should be well within the powers of any amateur turner in metal. In Fig. 11 the bar is seen in plan looking down upon the sliders, to which are attached the stirrups of the pulleys; Figs. 12 and 12 A show the side elevation; Fig. 13 the end view of the left-hand slider and pulleys, and Fig. 14 the end view of the right-hand slider with its pulleys. The stirrups are to prevent the possibility of the bands flying off the pulleys. The shape of the left-hand slider is clearly seen in Figs. 11, 12, and 13. It is made in that way to enable the workman to incline the pulleys, as seen in Fig. 13, to suit the slant of the band as it descends to the different speeds on the fly wheel. The right-hand slider need not be made in that way, but as Fig. 14; however, it might be made like the other to save a second pattern. At Fig. 14 is seen between the stirrups an eye-hole cast in one with the slider. This is intended for the attachment of a small cord or chain, best seen in Fig. 8, which is looped round the upright, so that if the band were to come off the pulleys or wheel, the weight would be checked before it could fall far; the loop would be slid up or down to suit the position of the right-hand slider upon the bar. As to the construction of these sliders, they are made from castings of brass or gun metal; patterns must be made, or one pattern will do if preferred. When received, the castings would be chucked and bored out to fit and slide upon the bar, and the flat wings filed flat and drilled to receive the stirrups; these stirrups may also be of gun metal together with the pulleys. The pulleys are shown 3 in. in diameter, and they should not be less. They should be chucked and bored first, and bushed with hard steel, driven firmly in, and then driven on to a mandrel and turned true with the hole. The pins on which they run must also be of hard steel, as if not, owing to the great speed at which they run, they will soon wear loose and make a disagreeable noise. Here we have then four guide pulleys, each with its centre requiring oil and liable to sprinkle that oil on the work; also the friction of our apparatus will about equal that of Fig. 5 and Fig. 6. To prevent the dispersion of the oil and diminish the friction we may, however, adopt the form of stirrup shown at Fig 15, which is but little more trouble to make. Instead of a steel bush inserted in the pulley we have a small steel spindle with both ends hardened, running on two small pointed screws, also hardened; these screws have heads which are screwed hard up to the sides of the stirrup, but wear can easily be taken up by lightly tapping with a hammer upon the bow of the stirrup so as to condense the metal and close slightly the arch upon the little spindle within. These little pulleys, so mounted, will not disperse the oil unless too much is applied, and they will run without noise or rattle. The little centres of the spindles should be carefully coned, and then a small hole drilled up for ¼ in. to contain oil, then when properly hardened they will wear very well.

Made as above described the overhead represented at Fig. 8 will be very cheap, will run lightly, will not disperse the oil, will be quickly and easily adjusted for work, and will therefore, in spite of its simplicity, bear comparison with any of the foregoing examples. To shorten the band it is only necessary to unfix the screw at the hinder arm of the cross and to raise and fix it a little higher on the upright; to lengthen the band so as to reach further from the mandrel the cross is lowered in a similar way.

To complete the subject it should perhaps be stated that it is possible not only to drive revolving cutters, etc., from an overhead, but also to give a regular feed to the slide-rest screw by connecting it with the mandrel, so that whilst one part of the overhead is driving a cutter or drill, another part is feeding along the cutting instrument to produce a screw or spiral. Fixed tools, both for wood and metal, have been guided in this way, and screws have been cut even in steel as coarse as 8 threads to the inch, and fairly accurate in pitch for 3 or 4 in. in length, by Mr. Haydon, the inventor of the system, which system would prove very useful to those who possess neither slide lathe nor spiral apparatus. Special precautions, however, have to be taken against slip of the band.

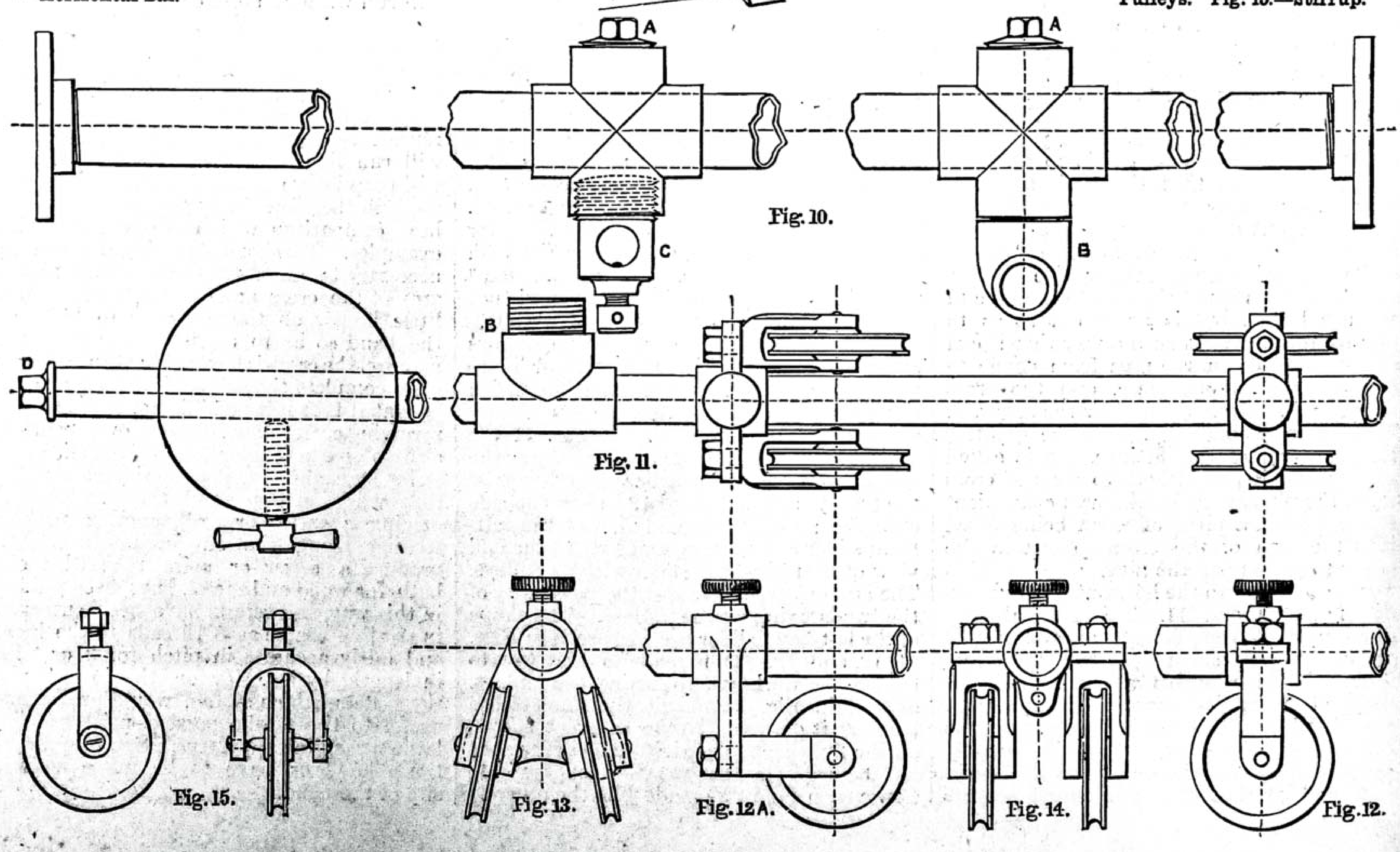
Since the above was written, yet another form of overhead has been brought out by The London Lathe and Tool Company, of 37, Pomeroy Street, London, S.E. It is a very good one, and of an interesting description. In this, as in some other forms, there is a long horizontal shaft, raised above the lathe bed, which runs in bearings and is supported by tubular stays. This shaft is driven from the fly wheel as usual, and upon it are two large and light pulleys, one of which is fitted with a key which slides in a long groove, or key way, cut in the shaft; so that though it may be pushed along by the hand to any part of the shaft, yet it must turn with it; this is the driving pulley. The second, or companion pulley, also slides freely along the shaft, but it is not keyed in any way, but acts merely as a guide pulley. The overhead band passes round a pulley which forms part of a weight, then over the two pulleys on the horizontal shaft and down to the driller, cutter, or grinder, or whatever it be required to drive, fixed in the slide rest; thus the tension of the band will remain constant, and yet its length may vary as the driller, etc., is moved by the slide rest. The guide pulley revolves in the opposite direction to the drive pulley, whilst the shaft which carries it is turning within it in a contrary direction. The size of these pulleys will diminish friction by allowing of a slower motion of the overhead shaft. The weight hangs just above the lathe board, so that in case of accident it would not have far to fall. The pulley in the weight can be taken out to put the band round it, and therefore the band may be without any hook and eye to jerk the spindle of the cutters, and injure the perfection of the work. The whole arrangement appears to be very convenient, and capable of giving a high speed, so important for ornamental turning. If there is an objection, it is that the pulleys would require to be pushed along the shaft by the hand if the length of the flute or cut exceeded 4 or 5 inches. The guide pulley being loose would follow of itself, but the driving pulley will not follow so easily, owing to the extra friction caused by the key. [The lathe to which the overhead just described is fitted, namely, the "Five-inch Geometric Lathe," of the London Lathe and Tool Company, will be noticed, and an engraving of it given in an early number.—ED.]

(*To be continued.*)



The Overhead Motion. Fig. 8.—Simple Form of Overhead. Fig. 9.—Upright Bar and Cross Piece. Fig. 10.—Cross or "Four-Way" (quarter size). Fig. 11.—Horizontal Bar.

Figs. 12, 12A, 13, 14.—Side Elevation of Horizontal Bar. Fig. 13.—End View of Left-Hand Slides and Pulleys. Fig. 14.—End View of Right-Hand Slide and Pulleys. Fig. 15.—Stirrup.



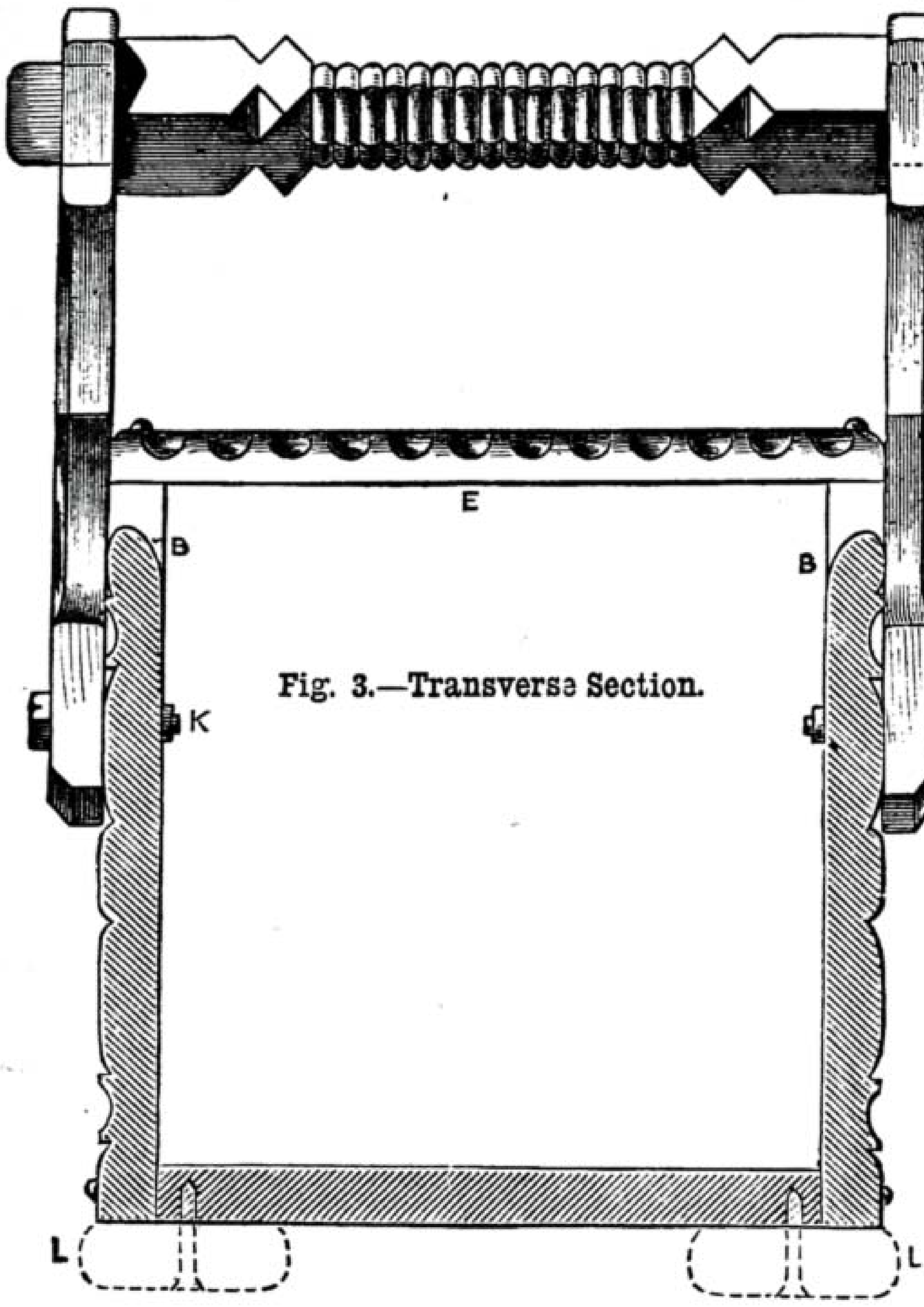


Fig. 3.—Transverse Section.

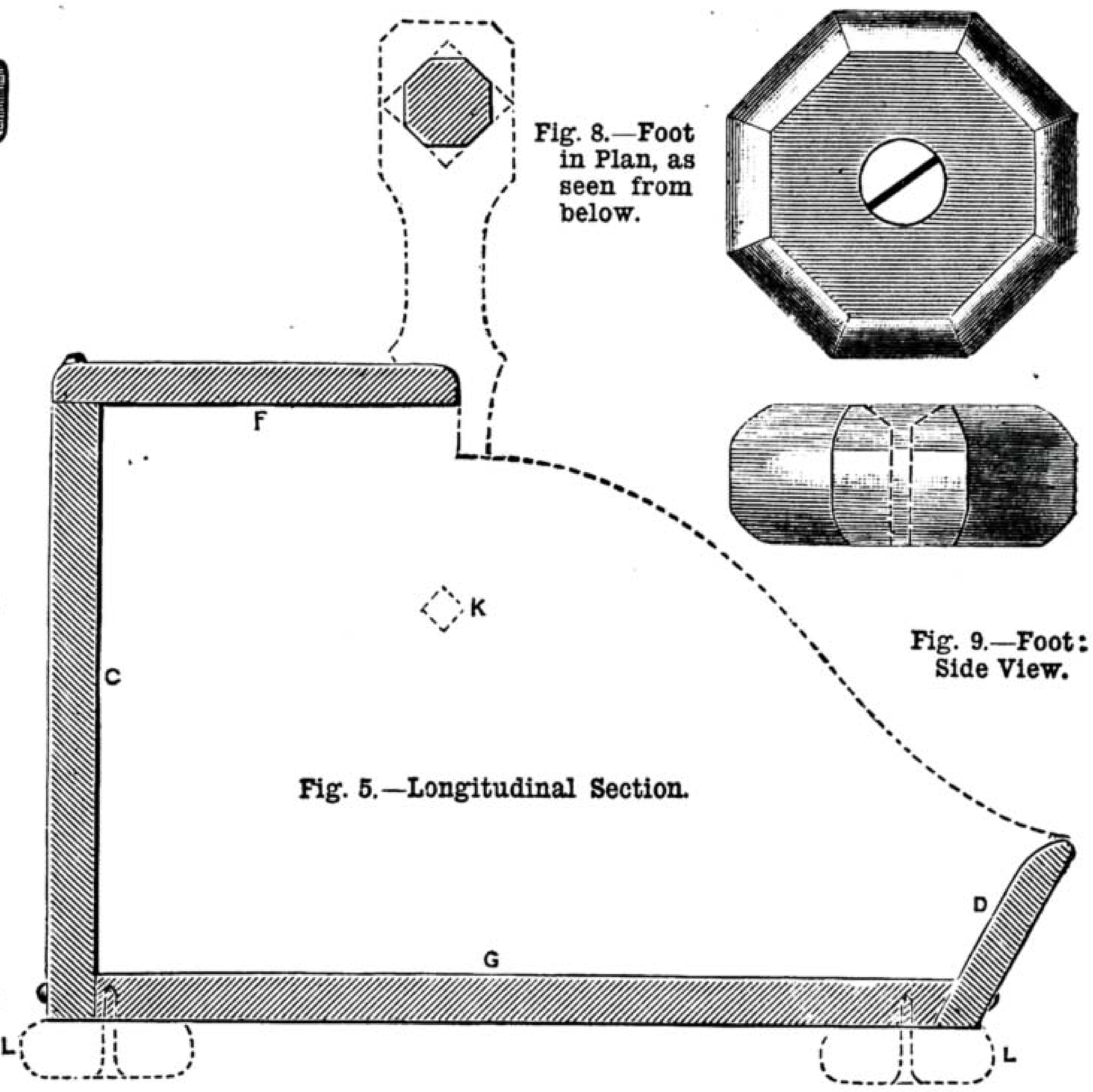


Fig. 5.—Longitudinal Section.

Fig. 8.—Foot in Plan, as seen from below.

Fig. 9.—Foot: Side View.

A COAL BOX IN CARVED OAK.

BY HIRAM PRICE.

Carving—Materials—Scale and Dimensions—Joints—Sides—Back—Top—Handle—Supports—Feet—Imitation of Old Oak.

In designing any household article in carved oak, and more especially if the article is intended to be in keeping with real old carved oak furniture, the designer naturally looks to the remains of the seventeenth century for guidance. But when that article happens to be a coal box—a matter not less necessary in oak-furnished rooms than nobler things—there is, so far as the writer is aware, no authority to which reference can be made. Our ancestors of the early Stuart Period burned logs, and had no need for coal scuttles. The consequence has been that, in devising such a convenience (originally for his own particular sanctum), the writer has had little to guide him, beyond his own sense of the fitness of things. As, however, he has succeeded in making a scuttle which, whilst serviceable, harmonises well with its genuinely old surroundings, he has pleasure in offering its design to others.

It will be observed that the carving on the sides and top, though original in its arrangement, is in a style frequently met

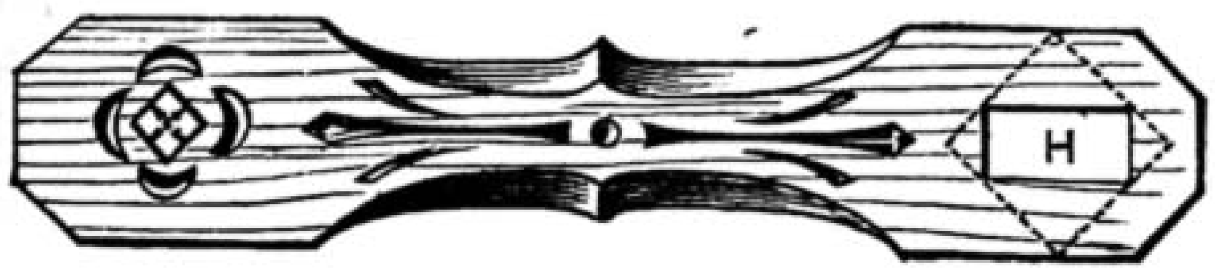


Fig. 7.—Support of Handle.

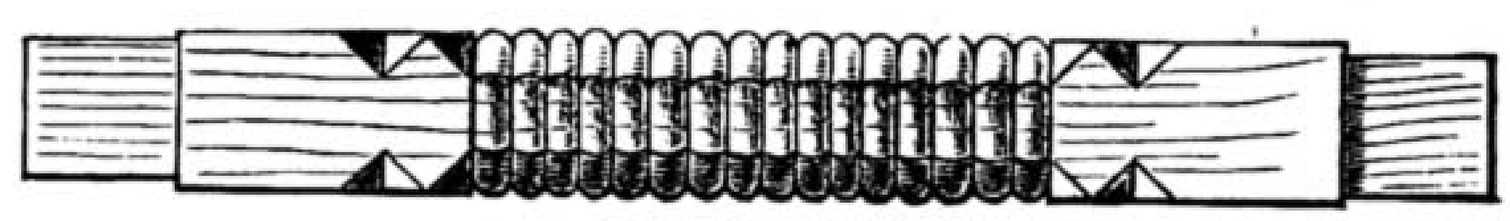


Fig. 6.—Handle.

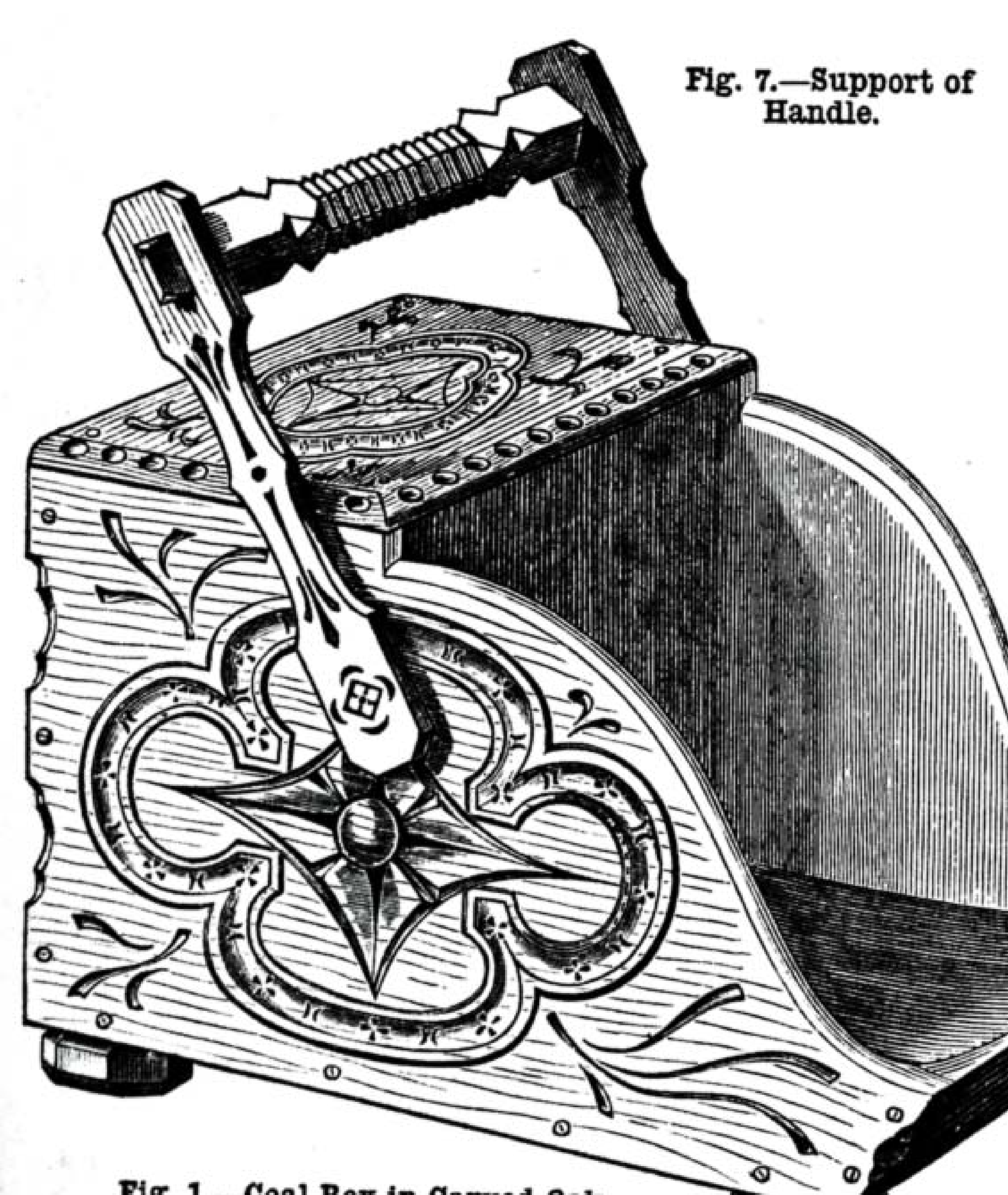


Fig. 1.—Coal Box in Carved Oak.

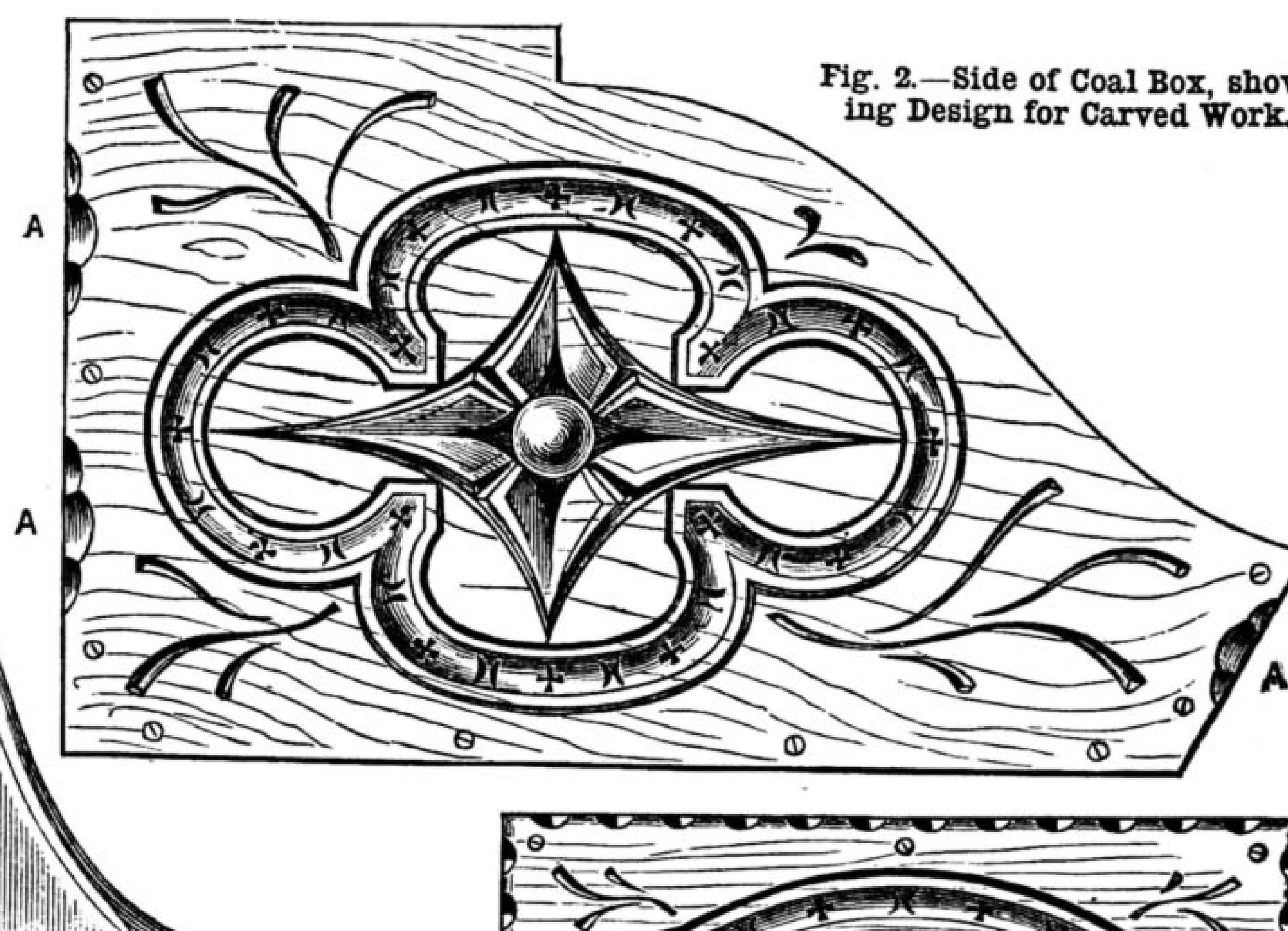


Fig. 2.—Side of Coal Box, showing Design for Carved Work.

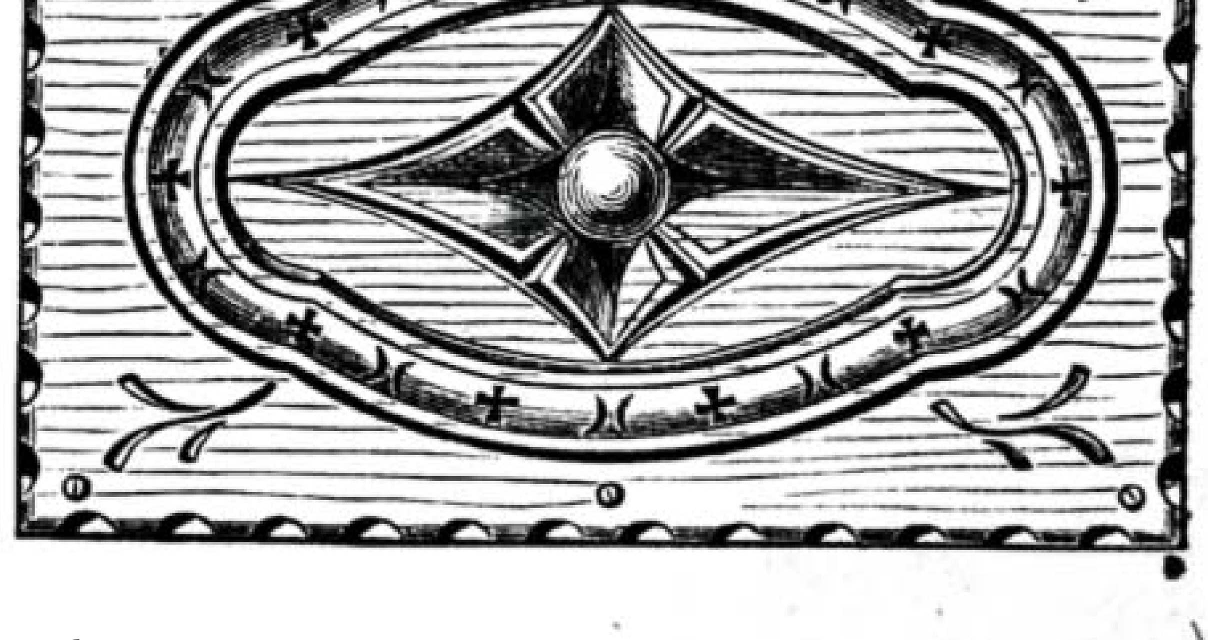


Fig. 4.—Top of Coal Box, showing Design for Carved Work.

with on seventeenth century panels; and it is one which, with a very moderate amount of labour, produces a rich and artistic effect. Whilst sufficiently deep to give a pleasing play of light and shadow, it is not of a kind liable to weaken the wood work of an article in which strength is a first essential.

The sides, top, front, and supports of handle, are in oak of about $\frac{5}{8}$ in. thick, after planing down. The back also is of oak, and is, for obvious reasons, somewhat stouter, about $\frac{3}{4}$ in. The bottom is of similar thickness, but in this place elm is preferable, as being more tough, and better fitted to withstand the rough usage to which it must be subjected. It can readily be stained to match the colour of the oak, though this will matter little, since a few days' use will make it black enough for anything.

It will be seen from the illustrations that the joints are not dovetailed, but merely screwed together, the position of the screws being, in most instances, indicated. Dovetailing would interfere much with the effect of the carving, whereas the black, round-headed screws employed are rather ornamental than otherwise; and with sound oak of the thickness specified, and $1\frac{1}{4}$-in. screws, there will be abundant strength; whilst to many home workers, the simpler mode of construction will be an advantage. If glue is not used in putting together—and there will be no necessity for using it—a mere streak of soft putty along the middle of each joint before screwing will effectually prevent any possibility of coal-dust working its way through.

Fig. 1 gives a rough sketch of the scuttle as a whole in perspective; this is not to scale. The remaining illustrations, 8 and 9 only excepted, are on a $\frac{1}{4}$ scale. The box has an internal measurement of about 14 in. by $8\frac{3}{4}$ in., and $8\frac{1}{2}$ in. high.

Fig. 2 shows one of the sides—dimensions, $15\frac{1}{4}$ in. by 9 in. A reference to the transverse section (Fig. 3) will give some additional idea as to the character and depth of the carving which ornaments it. Even in the deepest cuts — the veins, namely, which meet round the central boss—the wood is only penetrated about $\frac{1}{4}$ in. In those bands which form the quatrefoil the middle will be seen to be hollowed out by a single draft of the gouge, and this hollow bears an enrichment which may be given entirely with grounding punches (it often is so, as we see these bands in old work), but in the illustration, double nicks with a gouge are shown alternating with punched crosses. The back and front edges at A, A, A (Fig. 2), are seen to be scooped out with triple drafts of the gouge between the screws; this gives a little diversity to the straight lines, and does not weaken the joints. The manner in which the exposed lip is rounded off, somewhat more on the inner than the outer edge, is shown at B, B, Fig. 3. This piece is screwed to the bottom, back, and front.

The back (seen at C in the longitudinal section, Fig. 5) is nearly square, being $8\frac{1}{2}$ in. by $8\frac{1}{4}$ in. As before mentioned, it should, if practicable, be a trifle stouter than the sides, etc. The front, marked D in the same figure, measures $8\frac{1}{2}$ in. by 3 in. Except at the ends, where against the joints the edge is left square (as seen in Fig. 1), its lip is rounded off as shown in section, in Fig. 5. The bottom, G, Fig. 5, is 13 in. by $8\frac{1}{2}$ in.

The top, of which the dimensions are $9\frac{3}{4}$ in. by 6 in., appears in Fig. 4; its front is also seen at E, Fig. 3, and its shorter section at F, Fig. 5. It is like the sides, carved, but its smaller size renders a somewhat smaller and simpler design desirable, the character of the carving being, of course, precisely the same. The upper edge is taken off all round, and relieved with hollows made by single strokes of the gouge, as shown. This piece is screwed down to the back and sides.

The handle and one of its supports are shown in Figs. 6 and 7; in Fig. 3 also, which should properly be a section merely, a front elevation of handle and supports mortised together has been introduced for economy of space. In Fig. 1, the handle appears turned back at an angle of about 55°, as it generally will be when the coal box is standing at rest; but in Fig. 3, that it may explain its construction more clearly, it is directly upright. The supports, Fig. 7, are of similar board to the sides, etc., and are 10 in. by 2 in. Through the upper end of each is a mortise, H, cut to receive the tenon of the handle. The handle itself (Fig. 6), and of which the centre appears in section in Fig. 5, is $12\frac{1}{2}$ in. long by $1\frac{1}{4}$ in. square. How its central part is brought to an octagon, and made better for grasping firmly, as well as more ornamental by incised bands, may be seen in Figs. 1, 3, and 6. A dotted line surrounding H, Fig. 7, indicates how it is mortised diagonally into the supports, beyond which its tenons project some half inch, and are then rounded off. A small screw through the *back* edge of each support secures the tenon. The supports are fixed to the sides of the box by a small screw bolt and nut, as shown at K, Figs. 3 and 5. If an ornamental bolt is not to be bought, any one can, with a hand-saw file, in a few minutes alter an ordinary bolt-head to the form seen in Fig. 7.

The appearance of this handle and its supports in Fig. 3 may possibly raise a doubt as to whether it is not somewhat heavy for the box, but no such question is suggested by the actual thing. In Fig. 3 we get but a mere skeleton of the lower parts, and thus the handle, the whole of which is seen, looks unduly large. Its bolt-upright position also causes it to appear full high, but it is not felt to be too high when pushed a little back, as in Fig. 1.

In Figs. 8 and 9 is shown one of the octagonal feet, which are only indicated by dotted lines at L, L, in Figs. 3 and 5. These are merely sawn from inch board and the edges rounded off; if preferred, there is no reason why they should not, instead, be turned round; they could be made more quickly in the lathe than by hand. They are $2\frac{1}{2}$ in. in diameter, and are fastened to the bottom, as shown, by stout screws. These last two diagrams, 8 and 9, are drawn to $\frac{1}{2}$ scale.

In carrying out these plans in a scuttle for his own use, the writer has employed *old* oak, and this, when it is desired to make one's work have the appearance of real old carved work, is much to be preferred. No process of colouring with which the writer is familiar will give to altogether new wood the rich and mellow tone of ancient oak; and though in course of working-up much of the colour of old wood is apparently destroyed, it is easily restored by treatment, and the surface will become undistinguishable from one which has weathered a couple of centuries. To restore old oak after working up, nothing more is necessary than to make a solution of iron, by putting old nails, etc., in a bottle with vinegar; and this for use must be weakened with water, or it may make the wood too dark. Except when very thin, as in panel, the old wood will always show comparatively light where deeply cut into, and such light places it is safer to go over two or three times with a hot weak solution, and so gradually bring all to one uniform tone: then rub with boiled oil, and polish with beeswax and turpentine.

HOW TO DRY NEGATIVES QUICKLY.

BY L. IVOR POOLE.

THERE is an old saying "Curiosity is woman's curse, but in a man 'tis ten times worse." Surely when it originated photography was unknown, or an exception would have been made in favour of the man who happens to be a photographer, for most of us are anxious to see how the print will look without unnecessary delay. Of course, heat can only be used to a very limited extent in drying a negative, so, in the long and tedious interval after the washing, till the negative is ready for printing from, there is nothing for it but to sit down and wait, or get on with something else in the meantime. Any way, we must exercise our patience, for drying in the ordinary way cannot be hastened. Sometimes, however, there are other reasons besides curiosity for wanting a print as soon as possible after exposure, and then the necessity for quick drying of the negative is important. It can be managed so rapidly, that more than once I have had a negative in the printing frame within a quarter of an hour from the exposure of the plate. True, when treated so hurriedly as this, the hypo. has not been thoroughly washed out, but this can be done afterwards, without any harm apparently to the negative. After fixing it, just rinse under the tap for a minute or two, after which it is dipped in methylated spirits, where it is allowed to remain for a few minutes. Before placing it in the spirits, however, much of the water on the surface should be removed from the film either by "dabbing" the film with a soft silk handkerchief, or with a piece of blotting paper. The glass side of the negative may be rubbed, but, of course, to do so on the gelatine side would simply be to destroy it. By taking care, a soft handkerchief may be used with impunity. Blotting paper sometimes leaves a fluff adhering to the film. After the negative has soaked a sufficient time, say from three to five minutes in the spirit, it is taken out, and the spirit allowed to drain from it or mopped up with the handkerchief. If the negative is then placed in a strong current of air it will be ready for printing from on the ordinary albuminised paper. A sufficient draught of air may be got by blowing with the mouth, or a pair of bellows may be substituted for the human blower. As often as not, I simply flog the film with my handkerchief loosely spread, and though it is the roughest way, I think it is as good as any.

The drying may be still further hastened by immersing the plate, after it has been in the spirit, in ordinary sulphuric ether, but as this is so very volatile, its use is somewhat expensive, and the time gained is hardly commensurate.

The action of the spirit is no doubt this: it unites with the water, of which there is only a very small quantity in the film, and disperses it. The spirit which soaks into the film quickly evaporates, and leaves the negative free from moisture. Ether evaporates more quickly still, so may be used as a final dryer if necessary. As the spirit every time it is used takes up some water, it loses its quick-drying powers, hence the reason for removing as much of the moisture as possible before putting it in the spirit. I find it more economical to use a small quantity of spirit at a time, renewing it frequently, than to have a large quantity constantly going. Though methylated spirit has been mentioned, it does not follow that it and no other alcoholic preparation would do, for anything that will mix readily with water and evaporate quickly will answer the purpose. For instance, two table-spoonfuls of any kind of spirit from gin upwards would be ample for an ordinary quarter plate, with the advantage that it—the preparation—could still be used —medicinally—afterwards.

NOTES FOR ELECTRO-PLATERS.

BY GEORGE EDWINSON BONNEY.

IV.—ANALYSIS—ANION—ANODE—GOLD ANODES.

Analysis.—A correct quantitative and qualitative analysis of all the substances and solutions used by electro-platers can only be made by a chemist trained in this special work, and with the aid of apparatus only found in a well-appointed laboratory. But it is most desirable that operators in this art should be well acquainted with the nature and quality of the materials used by them in the make-up of solutions; be able to detect impurities and adulterations; and determine in a short time by a mode of rough analysis the identification of a salt or a solution. Some substances can be easily recognised by some characteristic colour, form of crystal, odour, flavour, or general appearance, and thus adulterants may be easily detected. With others it would not be safe to use the senses of smell and taste in their detection; in fact, those senses should always be warily employed in the detection of any chemical, and the practice of smelling indiscriminately at bottles, and tasting of salts, cannot be too strongly deprecated. Nearly all substances and solutions give characteristic results when treated with certain other substances or solutions, or when heated over a gas-stove, or in the blow-pipe flame. For instance, the presence of silver in a solution may be indicated by adding to the solution some hydrochloric acid, or some chloride of sodium, or any other soluble chloride, when the silver present will combine with the chlorine of the added chloride, and fall down as a white curdy precipitate. This precipitate is insoluble in hot water and in nitric acid. The only precipitate nearly like it is chloride of lead; but this is *soluble* in hot water, and so can be detected and separated from chloride of silver. Compounds of sodium can be detected by the yellow colour of the flame in which they are burnt, potassium, by a violet tint, and copper, by a green tint. The presence of copper in an acid solution of this metal can be shown by immersing therein a piece of bright iron, when some of the iron will be dissolved by the acid, and copper be deposited on the iron to take the place of the dissolved iron. In a similar manner a piece of bright zinc will reveal the presence of gold; and a piece of bright copper, that of silver or mercury. The analysis of gilding and plating solutions, to determine the quantity of metal contained in them, and also the quantity of free solvent present, should be understood by every electro-plater. The apparatus is not very costly, nor is the task a difficult one when the method of doing it is understood. The same may be said of the analysis of potassium cyanide. Full directions will be given for the analysis of each in the article or note under their respective headings. See *Gilding Solutions, Analysis of; Silver-plating Solutions, Cyanide of Potassium, Free Cyanide*, etc.

Anion.—This term was invented by Dr. Faraday to indicate the radical of an acid, or the portion of a salt set free at the anode during electrolysis. It is defined by Mr. J. T. Sprague as "the electro-negative, or chlorous radical of the acid or salt decomposed." For instance, suppose we are using a solution of the double cyanide of silver and potassium in the work of electro-plating. The salt of silver in this solution is combined with a salt of potassium, and three distinct substances are present, apart from the water which holds them all in solution; these are—silver, potassium, and cyanogen. When the electric current is passing through the solution in the process of plating, silver and potassium are set free at the goods being plated, and cyanogen is set free at the silver anode. The salt is thus broken up or decomposed, and cyanogen is the anion of this salt. The following is a list

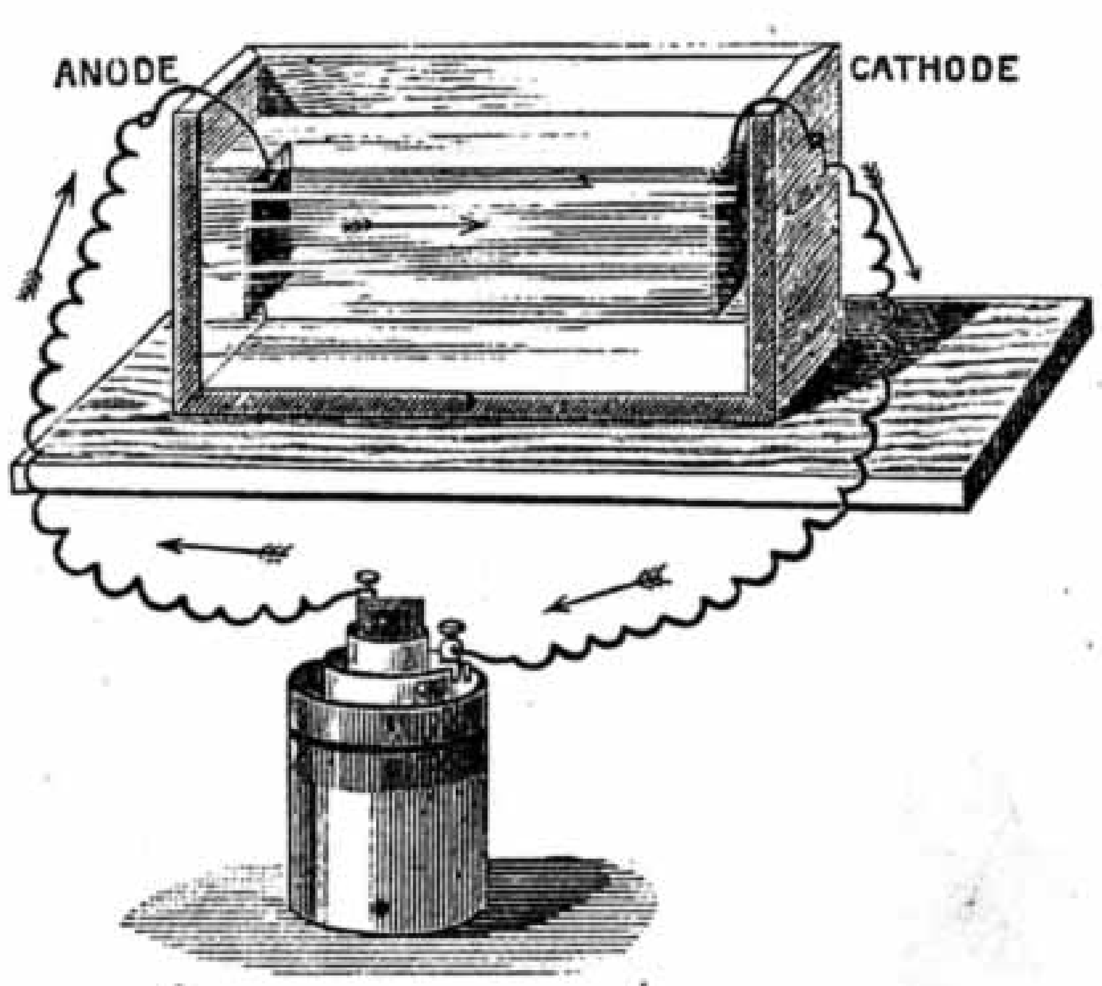


Fig. 1.—Diagram showing position of Anode and Cathode.

of anions given by Mr. Gore:—"Oxygen, fluorine, chlorine, bromine, iodine, and cyanogen; probably, also, sulpho-cyanogen, and also the various mineral acids. See also, *Anode, Cathode, Cations*, etc.

Anode.—A name given by Dr. Faraday to the positive plate or wire in a solution undergoing electrolysis. It is derived from two Greek words: *ana*, meaning "upwards;" and *odos*, "a way"—the way in which the sun rises. This term, applied to the action of the electric current, as used in electrolysis, signifies the way by which the current rises from the battery to enter the bath, or vat containing the solution to be electrolysed. This way is *from* the negative element of the battery *to* the positive element in the solution to be electrolysed. To make matters still plainer, let me say that the negative element of a battery is that part which receives the electric current and transmits it to the anode; this element is, therefore, the positive pole, and, by virtue of its connection to the anode by a wire, makes this also the positive pole or element in the solution. By way of illustration: the carbon element in a Bunsen battery is the negative element, because it receives the electric current generated by the positive, or zinc, element of the battery; but it is also the positive *pole*, because, through it and its metal connections, the current is transmitted to work outside the battery. The accompanying illustration will show this to the eye of the reader at a glance. See, also, notes under heads *Positive, Negative, Battery, Cathode, Current*, etc. Anodes may be soluble or insoluble in an electrolyte, as may be required to suit the nature of the work in hand. Insoluble anodes are used when we wish to decompose an electrolyte, and break it up into its several component parts without adding another element to it; as when acidulated water is decomposed by the electric current to form oxygen and hydrogen—in which case a platinum anode is used, because platinum is not soluble in the acidulated solution. Insoluble anodes are also used when we wish to extract all the metal from its solution, and deposit it in a pure condition on the cathode. Anodes are said to be insoluble when they are made of elements which are neither soluble in the solution to be electrolysed, nor can be made soluble therein under the influence of the electric current. Some solutions of the acids and alkalis will act very feebly, or not at all, on an element, even when heated to boiling point, but will dissolve it freely when a current of electricity is passed from it through the intractable solutions. For instance, gold is only feebly soluble in a strong solution of potassium cyanide when exposed to air, even when the solution is heated; but it is freely soluble in the same solution when only a feeble current of electricity is passed from it through the solution. Insoluble anodes are generally made of platinum or carbon. Soluble anodes are used when we wish to maintain an electrolyte at its original strength—that is, to contain the same quantity of metal in the solution after it has been worked as it had when first made up. To do this, the anode must be only soluble in the solution whilst the current is passing, and must then be dissolved therein to an extent equal with the rate of metal deposited. Unless an equivalent of metal is dissolved from the anode for each equivalent of metal deposited at the cathode, the original composition of the solution cannot be maintained during the process of electrolysis.

Gold Anodes should be made of pure gold plate or ribbon, not less than $\frac{1}{16}$ in. in thickness. Thin gold leaf or sheet is apt to become ragged at the edges as the anode gets worn; these ragged edges drop tiny pieces of gold to the bottom of the bath, and thus the solution, or the gilded goods, gets credited with an undue portion of the wasted anode. Plates of pure gold $\frac{1}{16}$ in. in thickness can be easily bent over a platinum wire, and this forms the best support for the anode, since it is not acted upon at all by the gilding solution or the fumes arising therefrom. Copper, silver, or brass wires dissolve and contaminate the solution with an alloy. Alloyed gold may be used as anodes, but the deposited metal will soon become an alloy of gold instead of pure gold; and the alloy is as likely to be as variable in composition as most deposited alloys are, and thus give trouble to the gilder. If gold anodes have been hardened by hammering, they should be annealed before being used. As a rule, the surface of anode presented to the solution should be slightly in excess of the surface to be coated with gold. As anodes are more quickly worn away at the surface of the solution, because of the action of the air on them, they should be lifted out when not in work, and their position frequently changed.

(*To be continued.*)

OUR GUIDE TO GOOD THINGS.

33.—Winn's New Patent Water Director.

The New Patent Water Director is, as its name implies, an appliance for throwing water, so to speak, in the form either of a jet or spray, on anything on which it may be desirable to cause water to impinge. It is not a syringe, in which water is first drawn in by the withdrawal of the piston within from nozzle to top, and then driven out by pushing the piston back again from top to nozzle; but it is simply a contrivance to take the place of the ordinary nozzle or tube, which is usually fitted to the end of the flexible tube that is attached to all garden engines and pumps, as a means, with the nozzle, for the direction of the water which is ejected from such machines by the operation of pumping. This, at all events, is the inference to be drawn from the annexed illustrations of the New Patent Water Director to be found in this page. Illustrations of this kind are most helpful to the comprehension of the description of any article; but it is by no means an easy matter to give a really good and intelligible description of anything, especially if it be a machine of any kind, from an engraving. To help me, therefore, in writing such descriptions, I shall always take it as a personal favour if manufacturers, patentees, and dealers will send me a specimen of the appliance to be described, that I may be enabled to thoroughly understand its construction myself before I attempt to describe it for others. I shall be glad, also, if they will name retail prices, for I have always held it to be neither of advantage to the reader, nor helpful to the maker, to say nothing about price; for many a man who will readily buy an article if the price suits his pocket, will take no trouble to make even inquiries about the thing if he be kept in the dark on this most important of all points. Apparently the Water Director under consideration is a useful and desirable contrivance for the purpose for which it is intended, more especially as the jet of water may be turned to spray, or the water entirely shut off by simply sliding the upper part or outer case upon the inner pipe or stalk, which terminates in a piece of metal twisted into a spiral form. There is no cock of any kind, and the movement is effected easily and smoothly, without concussion. That it is made and supplied by Messrs. Charles Winn, brassfounders, St. Thomas's Works, Granville Street, Birmingham, is, I think, a sufficient guarantee for its goodness, as far as make is concerned, and its utility. Messrs. Winn and Company state it to be "the simplest and most effective thing yet offered for the purpose." It is sold in three sizes—namely, ½ in., ⅝ in., and ¾ in., which, I presume, is the diameter of the inner pipe; but whether externally or internally, I am unable to say, for the reason stated above. The prices are 35s., 45s., and 60s. per dozen, respectively, according to size; or 45s., 60s., and 75s. if supplied with union.

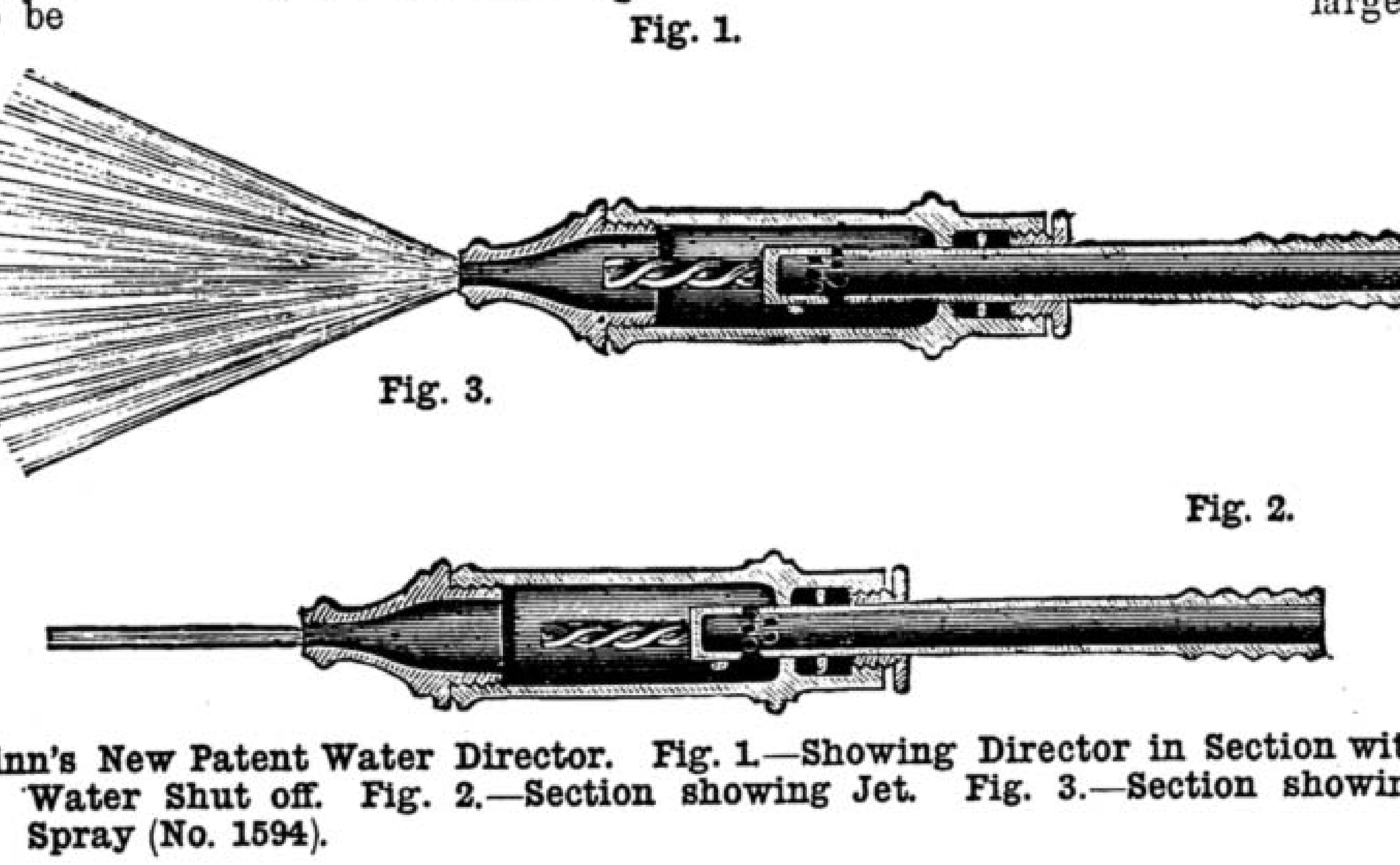
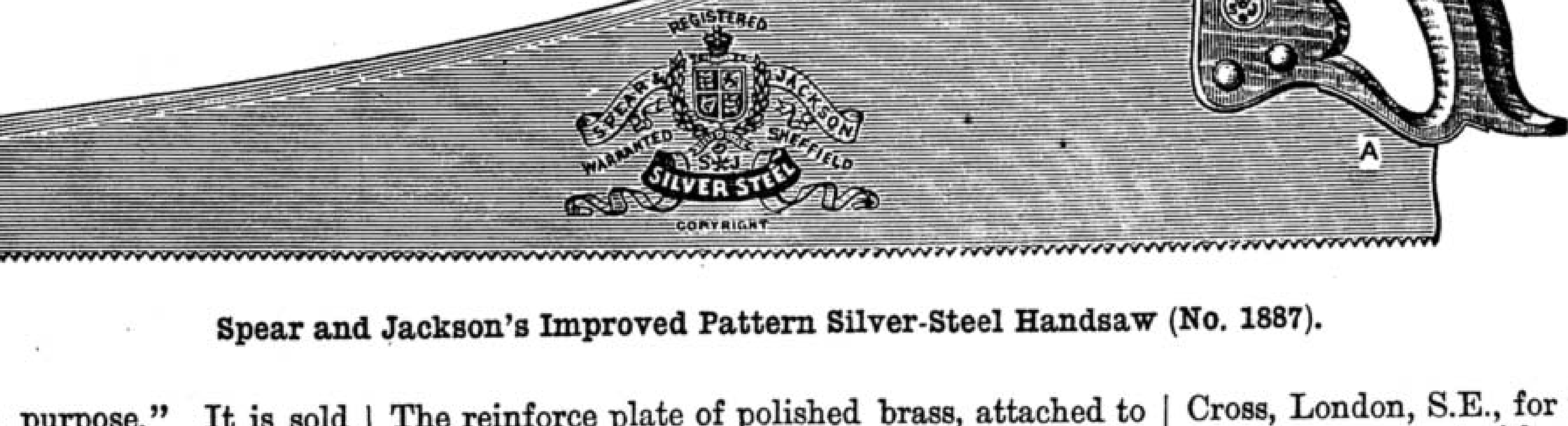


Fig. 1. Fig. 3. Fig. 2.

Winn's New Patent Water Director. Fig. 1.—Showing Director in Section with Water Shut off. Fig. 2.—Section showing Jet. Fig. 3.—Section showing Spray (No. 1594).

34.—Spear and Jackson's Improved Pattern Silver-Steel Handsaw.

This excellent saw, described in Messrs. Spear and Jackson's price list as No. 1887—a number which, perhaps, it will be well to quote in giving orders—is in every respect a nice tool to look at, and a capital tool to handle and work with. An old professional to whom I showed it, one of the best handrailers in the United Kingdom, fairly smiled with pleasure as he took the specimen saw sent to me into his hands, and examined it from handle to point with the utmost interest. "Yes, that's something like a saw," he said, as he handed it back to me with a lingering touch, and then asked the price, as though he would have liked to have made it his own. I could not tell him then, as I can tell my readers now, that this particular saw of silver-steel, full polished, with apple-wood handle, fitted with registered brass heel supporting and protecting plate, raised brass screws, and highly-finished blade, costs 120s. per dozen 26 in. long, and 130s. per dozen 28 in. long. And his approval was in no way diminished when, taking the saw in both hands, I brought point and handle together in pretty close proximity, and, letting go the point, allowed the blade to spring back smartly and sharply to its original position. The appearance of the blade is very good, being well-nigh as bright as silver; all the dirt, if I may so call it, being taken out of the metal—probably, by the Bessemer process and hammering combined. This saw, as well as all other best saws manufactured by Messrs. Spear and Jackson, Ætna Works, Sheffield, is tempered and ground by patented machinery, and is accurately tapered from the tooth to the back, and from the heel to the point, the teeth remaining the same thickness throughout, so that the saws work clean and sweet, with the least possible set.



Spear and Jackson's Improved Pattern Silver-Steel Handsaw (No. 1887).

The reinforce plate of polished brass, attached to the outer edge of the handle at A in the accompanying illustration, and extending on both sides of the blade the entire width of the handle, not only supports and stiffens the heel of the blade, but protects and strengthens the handle at its weakest place. The handle, moreover, being carried well forward on the blade, as shown by the illustration, the weight of the saw is brought nearer the wrist of the operator, who has thus greater control over it, and the feeling of weight at the point is avoided. The blade also is materially stiffened by this arrangement, and may therefore be thinner than is usual in saws of the ordinary pattern, and still, at the same time, as rigid. I do not think that any workman, whether professional or amateur, would regret becoming the possessor of one of these saws. It may appear to be somewhat expensive when the price is contrasted with the cost of other saws of the same size. Its form is similar to that of the handsaws made by Henry Disston, an American manufacturer; more especially in the curved line of the back, which will only be regretted by those who are in the habit of using the back of the saw sometimes as a straightedge.

35.—How to Select Wood-Working Machinery.

This is a handy little volume, forming No. 3 of the "Timber Trade Handbooks," published by Messrs. William Rider and Son, *Timber Trades' Journal* Office, 14, Bartholomew Close, E.C., and written by Mr. J. Stafford Ransome, Associated Member of the Institution of Civil Engineers. It is devoted to a consideration more especially of the larger machines used in felling and preparing timber for the various purposes to which it is applied; reviewing in order the machines themselves, as regards power, construction, and purpose, and the various motive powers in use for actuating them. There is much to be learnt from its pages on the points already stated, as well as on purchasing machines. Some chapters are devoted to tree felling, the handling of logs after felling, and handling and cross cutting logs in the yard.

36.—Practical Iron-founding.

This useful and well-illustrated work is from the pen of "A Foreman Pattern-maker," one of the contributors to Work, as its readers will recognise. It is published by Messrs. Whitaker and Company, 2, White Hart Street, Paternoster Square, E.C. It is, to use the author's own words, "an attempt to give a condensed account of the principles and practice of iron-founding"—an attempt in which the writer has been entirely successful. It further contains the most recent practice with regard to machine moulding and the working of iron. It may be said to be replete with information on sands; on moulding both in green and dry sand, loam-work, etc.; and on the mode of going to work in moulding, and the tools that are used. The book is well illustrated with various diagrams and engravings, most of which are apparently from the pencil of the writer of the work.

37.—Barry's Patent Model Apparatus for Teaching Applied Mechanics.

This is the title of a small pamphlet in which an account is given of an apparatus devised and constructed by Mr. E. Barry, 75, St. Donatt's Road, New Cross, London, S.E., for the purpose of "making youths conversant with mechanics and with what are called the mechanical powers, and induce in them habits of scientific reasoning." In the apparatus the whole of the mechanical powers and their action are clearly exhibited, and practical illustrations are afforded of simple machines used in raising weights, moving heavy bodies, horizontally, vertically, and on inclines, and overcoming resistances by the aid of the working models. It contains, in fact, thirty-six distinct machines with accessories, with which endless experiments and combinations can be made. Its cost, complete in case, is £5 5s., no great sum when its practical value as a means of teaching mechanics by ocular demonstration is considered.

The Editor.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Plans, etc., for Building.—A SUBSCRIBER WHO WANTS TO BUILD writes:—"Having entered my name as a subscriber from the time I first received your circular giving a description of your new publication entitled WORK, I have, with pleasure, perused its pages, and derived therefrom much valuable and useful information. I venture to suggest and ask you from time to time to favour us with a sketch and specification for building neat two-storied dwelling-houses at a moderate price. I am sure it would add additional interest and instruction to numbers of your subscribers. I know a few who would be delighted to receive such valuable information, and would myself gladly embrace the favourable opportunity of turning to good account the plans and information which, I am sure (judging from other suggestions and plans), would be worthy of carrying into effect. I hope ere long to be favoured with such when time and space permit."—[I insert your letter with pleasure as a means of ascertaining the views of readers on this subject. The difficulty would be to please all who may want to build, and to meet their wants in every particular. To my mind, the better way would be to begin with pairs of cottages of four or five rooms, giving types of two kinds—one suitable for towns, and the other for the country—and then to proceed onwards and upwards to what are usually known as villa residences. This mode of treatment would give an opportunity of describing new materials, modes, and appliances used in building; and readers who required any departure from the types given could be told how they might best effect their purpose in "Shop." I shall be glad to have a full expression of general opinion on this subject.—ED.]

Our "Cabinet in Fretwork."—SAMUEL COSGROVE (*Macclesfield*) writes:—"I beg to say that I have prepared, and am exhibiting at the Town Hall, Macclesfield (April 9), a cabinet from your drawing issued with No. 1 of WORK."—[I am obliged to you for the programme of the Exhibition sent with your letter. I am glad to find you have cut and made up the design, and trust that you may be successful in securing the first prize. Let me hear the result.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Plumbing, Joint Wiping, etc.—PLUMBER.—You will, I hope, soon see papers on these subjects.

Lithography in all its Branches.—W. R. S. (*Croydon*).—Lithography will be taken up in due season.

Etching on Steel.—EXCELSIOR wishes to know the composition of a powder used for etching on steel. The powder is strewed over the tracing made in soap, and moistened with water, then allowed to penetrate the steel. I have bought such a powder in the streets of London, but do not know its composition. I have tried a mixture of common salt and saltpetre crushed to a fine powder and spread over the tracing, then moistened with water. This bit into the steel, but it had not made much progress in two hours. When moistened with a drop of nitric acid its action is more rapid. Common salt spread on the tracing, and then moistened with very dilute nitric acid, has a rapid action on steel. Perhaps a brother etcher will oblige by sending a few hints for publication in "Shop."—G. E. B.

Batteries for Electric Lighting.—F. T. (*Bristol*).—I have not tried the Lalande battery for electric lighting; but others not connected with their manufacture and sale have done so, and have printed their experience. This is what one says:—"I had two years' practical work at lighting by the Lalande-Chaperon oxide of copper battery. The batteries used comprised large cells 1¼ ft. deep, 2 ft. long, and 1 ft. broad; these were very heavy, as each cell, when complete and charged, weighed 384 lb. We used 10 c. p. lamps of 20 volts, and as the electro-motive force of each cell was ·6, we required about 35 of these cells to obtain the necessary voltage." Finding the labour and cost of maintaining such a battery so great as to render their use impracticable, he next used only six cells during the day to charge 10 accumulators, using the current from these at night. He then gives results. "The quantity of current from each cell being large, it was possible to light ten 10 c. p. lamps of 20 volts for thirty hours, or six days of five hours; but not being able to regenerate the potash of battery and recover the zinc, this became impracticable on account of cost." Place these practical remarks side by side with the glowing account of the battery in the newspaper cutting sent, and draw your own conclusions. During the last ten years many of these so-called regenerative batteries have been invented and placed on the market. They are will-o'-the-wisps among batteries, for they only beguile persons from the right path by their flashy claim to inexpensiveness. A few moments thought will serve to convince any unbiassed mind of the hollowness of the claim. The electric current required to regenerate them costs as much, or more, to produce than the current obtained from a charged battery. The principle can be applied to the Daniell battery, but not economically. You cannot get any of these batteries to retrace their action and work backward. I propose writing a short paper on the Daniell battery at some future time. The subject of electrotyping will also be taken up at some time by myself or one of my colleagues. Stereotyping will also receive attention from one of us. To sum up: all that is of interest to workmen in their work will be treated of in the pages of WORK. The remaining suggestions in your kind and interesting letter have been handed on to the publishers, whose business it is to arrange the advertisements.—G. E. B.

Electro-gilding.—NEMO (*Norwich*).—Work your gilding solution with current from one quart Daniell cell, or one Bunsen weakly charged. The solution must be worked hot (160° Fahr.), and may be heated in an enamelled saucepan. Iron or any other metal vessel will not do for the purpose. Use an anode of pure gold attached to the wire leading from the copper or carbon of the battery. If the solution does not work freely, add a small piece of cyanide of potassium to it. If you want any further advice, please write again, and I will gladly help you. Look out for my forthcoming articles on "Notes for Electro-platers."—G. E. B.

Brass Casting.—BRASSWORKER writes:—"Will you say how antimony acts upon usual pig brass, and how much should be added to pot of metal of, say, 40 lbs., and if any beneficial result is obtained from using same in brass? Others advise a little lead to soften brass. Will this do, and, if so, how much should be added to pot of metal of, say, 40 lbs? Should the softening be correct, does it at the same time become more breakable or 'short,' as metal is called that breaks readily?"—To the above the reply is:—Antimony acts by facilitating the combination of the mixture called "pot metal" (copper and lead). 1 of antimony to 7 of lead and 16 of copper, mix well, and give a harder alloy than the lead and copper alone. There is a red brass composed of copper, 160 lbs.; zinc, 50 lbs.; lead, 10 lbs.; antimony, 44 oz. The metal is not short, but soft. The effect of lead upon common yellow brass (copper and zinc), when added to the extent of ¼ oz. or ½ oz. to the pound, is to render it more malleable, and to make it cast more sharply. The lead must be added last, and stirred just before pouring. If excess of lead is put in, it will ooze out, and partially separate in cooling.—J. H.

Building Model Locomotive.—AMATEUR writes:—"I intend building a model locomotive 3 ft. long. Now, what I want to know is—(1) Can I get a casting of the bed-plate in iron 35 in. × 9 in. and ½ in. thick? My impression is that I cannot. I would prefer a casting, as it is such a lot of trouble cutting out the various dimensions. (2) Where can I get the boiler tubes brazed in? There does not seem to be a brazier about here (*i.e.*, Wimbledon). Can you recommend me one in London?"—To these queries the following replies are given:—(1) It is quite possible to make a casting of a "bed-plate" (frame-plate) for a model locomotive in iron, measuring 35 in. × 9 in. × ½ in., but then it would be of no use when done. Wrought iron or steel plate is the proper material. (2) Any of the model-makers would braze your boiler tubes. Bateman & Lee, High Holborn, do plenty of this kind of work.—J. H.

Scrolls and Designs for Monumental Work.—J. C. (*Aberdeen*).—No branch of manual work will be neglected in WORK, but as I have already said, to touch on every trade at once is not possible. I can only say that papers on the art of the stone mason will be given as soon as it is practicable with designs for the special work to which you allude. Meanwhile, you will not fail to find in every number of the Magazine some hint, suggestion, or piece of information that will be well worth its price to you for home adoption and use.

Pit Frame for Wheel Making.—E. J. E. (*Abingdon*).—Your inquiry for the method of "making a good frame for wheel making" requires a longer reply than can be given conveniently in "Shop." I have much pleasure, therefore, in saying that provision shall be made to meet your requirement in the form of a paper with illustrative diagrams, which, I hope, you will find helpful to you.

Plasterers' Work.—C. L. (*Uxbridge*).—This subject, in common with the work of other trades, will receive mention at any and every opportunity.

Violin Scroll.—T. D. N.—The instructions for making violin scroll would require much more space than could be devoted here, but articles on violin making are in progress, when the subject will be fully dealt with.—B.

Violin Cramps.—E. P. W.—Please accept latter part of answer to T. D. N. on "Violin Scroll" in reply to your queries on violin making. A joiner would not be likely to have wood screwing tackle small enough (¾ or ½ in.) for making violin cramps. These can be bought from either Lafleur & Son, Green Street, Leicester Square, London, or J. Scheerer, Covered Market, Leeds.—B.

Treatment of Gold Rings after Soldering.—DEAN FOREST.—After soldering wedding rings and keepers, drop them into a mixture of sulphuric acid 1 part, water, 10 parts, and leave till the borax is dissolved. They must then either be gilt or polished; wedding rings would do scratch-brushed and burnished, but keepers would require to be gilt, and if required to look as new, also lapped.—AUROLECTRIC.

Model Beam Engine.—W. J. P. (*Fenny Stratford*).—I do not know of any book that will tell you how to make a model beam engine. It is a thing amateurs seldom think of attempting. But there is a very clear sectional view of a beam engine in "Stationary Engine Driving," by Michael Reynolds, p. 42. It is a folding plate, and can very well be worked from by scale. It is published by Crosby, Lockwood, & Co. Any information you may require as to the details of work of this kind can be had for the asking.—J. H.

Mounting Tracing Linen.—LARA asks:—(1) "How to mount drawings made on tracing linen. I have tried it a few times without success. It always becomes *baggy*, and loses its polish. (2) Can tracing linen being damped be restored its original gloss, and how?"—Your query is not sufficiently defined. I may assume, tracing cloth being in itself sufficiently durable, that it is not intended to mount on canvas. If for an ordinary picture strainer or board, the simplest way is to glue the outer edge of the strainer on one of its longest sides, turn the tracing cloth down, say, ⅜ths of an inch, and fix. Allow time for this to set. Next glue opposite edge of strainer, and pull the tracing tightly down, pressing firmly to the glued edge, repeating the process for the other two sides; cut out the corners of the cloth to prevent creases. On most tracings you will find one or more selvage edges; these should be cut off before mounting, otherwise the cloth will give when tightened more in other parts than on these edges. If objection is taken to the cloth showing on outer edges, glue ⅜ths of an inch on flat surface of strainer, and proceed as above. Use Le Page's glue or transparent cement, cold; hot glue will affect surface; indeed, any glue or cement used is sure to show through even if the surface is otherwise unaffected. If the tracing is for show, put a strip of coloured paper over the part affected by the glue, and so form a border. A sheet of white paper under the tracing shows it up to advantage. Above all things avoid damping or wetting. Tracing cloth wet is practically spoilt, and I believe any solution you might try to regain the lost gloss would only add to the mischief. The Aladdin remedy, new lamps for old, is about the only way to effect a satisfactory issue.—JOACHIM MILLER.

Bunsen Batteries.—H. D. (*Haverfordwest*).—(1) Porous cells for quart Bunsens, 6d. each. (2) Zinc cylinders, amalgamated, 1s. 3d. per lb. Both procurable of any dealers in electric sundries. Here in London, of Messrs. H. Dale & Co., 26, Ludgate Hill, E.C. (3) One cell for electro-plating and gilding on a small scale, or working a small shocking coil, or small magneto-motor. Two cells in series for working larger coils, magnets, or motors. Three cells in series for electro-coppering and nickelling and lighting a small lamp. Four cells in series will light two small incandescent lamps. (4) Although I mentioned electric lighting as one of the kinds of work suitable to the Bunsen battery, I am not favourable to this system of lighting by means of a battery. There is too much trouble, and mess, and expense attached to it, to make it pleasant. See reply to H. S. on this subject. (5) The cost of a Bunsen battery will be about 3s. per quart cell, complete. Acids will be extra cost, of course. That is about the cost here in London.—G. E. B.

Internal Resistance of Battery.—G. W. (*Liverpool*).—All conductors of electricity offer a resistance to the passage of this force. This differs with different conductors. Its nearest equivalent in mechanics is friction. The internal resistance of a battery is the total resistance of the conducting fluids and elements within the cells. This is ascertained by balancing against it the known resistance of certain coils of wire and instruments. The coils are known as resistance coils, and are equivalent to electric weights. The balance beam, so to speak, is named a "Wheatstone Bridge," and the indicating instrument is named a "Galvanometer." The resistance of wires is ascertained by the same method. Electrical measurements and measuring instruments will receive our attention, and be treated of in future numbers of WORK.—G. E. B.

Glazier's Diamond.—N. T. (*Leyton*).—Superior diamonds will cost about 30s.; from this price downwards for a good tool to 21s. You may get a fairly good one second-hand at a pawnbroker's shop for 10s. 6d.; but second-hand diamonds may be damaged or out of set. To use a diamond, place the sheet of glass on a cloth-covered level board, measure off the dimensions, lay a straightedge along the intended line to be cut, hold the tool in the right hand, with the steel holder close to the straightedge, find out by trial the cutting edge of the diamond, then draw the tool along in this position to the end of the line. You can feel and hear when the diamond is *cutting* the glass, then keep the tool in the cutting position all along the line to the edge of the glass, but not over it. The pressure on the tool should be only enough to keep it in cut, but must be uniform throughout. Of course the tool will wear out, but will last a lifetime with good care. If the diamond spark is injured or torn out of its setting, it must be reset. Tool vendors will get this done.—G. E. B.

Electric Lighting by Battery.—H. S. (*Bebington*).—Four quart Bunsen cells in series will light up two small incandescent electric lamps. These lamps are small glass globes fitted with platinum wires attached to a thin filament or string of carbon. The globes are exhausted of air, and sealed

One wire of the battery is hooked on to one of the platinum wires on the globe, and the other battery wire to the other bit of platinum, then the carbon filament gets white hot and glows, emitting a soft, white light. Proper holders for the lamps are supplied by those who sell the lamps. Having tried lighting by batteries on a small scale, and experienced the cost and trouble, I do not advise any other person to follow my example, save only as an experiment to see what can be done this way.—G. E. B.

Small Dynamo.—A Cottager.—Small dynamos are preferable to batteries for lighting up small electric lamps. I am trying to arrange for a few papers on dynamo building. Before you decide on electric lighting for your cottage, you must arrange for power to drive the dynamo. Have you a gas engine, steam engine, or water motor?—G. E. B.

Circular Saws.—A Reader.—You ask for a "simple rule to calculate the power, not nominal, it would take to drive a circular saw of any diameter up to 60 in. to cut, both soft and hard wood the depth it will reach."—For every square foot of hard wood with a 60-in. saw and ¼-in. kerf 2-horse power—actual, not nominal—is required to drive saw only. To this must be added, say, 1-horse power for shafting, etc., and the result doubled to provide for contingences. You would, therefore, require about 6-horse power actual. It is always best to provide a good margin of power, so that when the saw is working at its full capacity, the engine shall only exert at most about three-fourths of its full power.—Olla Podrida.

Power of Engine.—A Reader.—You ask what would be the real horse power of a "semiportable engine with two 11-in. cylinders, 24-in. stroke, and from 90 to 100 strokes per minute;" and "what pressure of steam should steam gauge indicate to get full power; and how to calculate the power of the above, or of an engine with one cylinder."—In finding the horse power of an engine, each cylinder—when there are more than one—is treated and calculated from separately. To do this in any case, the mean pressure of the steam in the cylinder during a revolution must be known. In practice this is ascertained from indicator diagrams. You do not give the boiler pressure, nor do you state the cut off of slide valve, both of which govern the power also. This information being absent, I cannot give much more than the method by which the horse power is worked, and in doing this will assume that the boiler pressure is 40 lbs. per square inch, and the slide valve cuts off at three-quarter stroke. This will give approximately and practically a mean pressure of 30 lbs. per square in. on the piston. The actual horse power of an engine is found by multiplying the area of the piston in square inches, the mean pressure in lbs. during the stroke, the length of stroke in feet, and the number of revolutions per minute together, and the result by two; which total, divided by 33,000, will give the horse power. Taking your case, for example, where the diameter of piston is 11 in., stroke 2 ft., and number of revolutions 100, the mean pressure being 30 lbs., we have as follows:—

$$\frac{(95 \times 30 \times 2 \times 100) \times 2}{33{,}000} = \overset{\text{Horse power.}}{17{\cdot}27}$$

for one cylinder, and 34·5 for the two cylinders. As to the pressure which steam gauge must indicate to get full power, I can give no information, not knowing what boiler and engine were designed to work at. If you do not know what pressure to work your boiler at, get it surveyed at once by a competent authority. If you neglect this, and go on working in the dark, as you evidently are, something serious may happen. If you will describe your boiler, giving its age, situation, method of seating, length, diameter, thickness of plates in each part, and general construction, I may be able to give you some idea of working pressure.—Olla Podrida.

Standard for Porous Pots.—Battery.—The question of the suitability of porous pots need not cause you any trouble. In practice, the eye alone guides one in the choice of pots. The only tests are those mentioned in my article on the Bunsen battery. These were given as aids to those who wished to put up a perfect series of cells, all having the same resistance. Any cell may be used, whether hard or soft; but the best are, of course, those of medium porosity.—G. E. B.

Organ and Harmonium Building.—H. B. (*Glasgow*).—In reply to your letter, arrangements for papers on the construction of the instrument known as the American organ are now in progress.

Circular Saw.—J. B. (*Poole*).—I do not see how I can well add to the description of the circular saw noticed in Work, No. 4 (page 61). You ask, "Can you give some idea of its capabilities? Will it saw inch boards lengthways and across? Is it properly finished, and will it saw mitres true? Has it 'continuity' of action?" As to capabilities, the amount of work that can be done by and with the saw is indicated by what was said of it in the description. It will certainly saw wood one inch thick both with the grain and across the grain. It is well finished, and will saw mitres true, provided you keep the edge of the wood you are cutting well against the fence, so that the saw may enter it at the right angle. As to "continuity of action," I can only say that the saw will keep going as long as motive power is applied to it. It is intended for small work; but with somebody to help you, and trestles whereon to support the board, you might rip up boards of any length. The fly-wheel is heavy enough for the saw. Rapidity of motion, of course, depends on the amount of power applied. You will find it a useful little saw for all ordinary purposes and light work; and by following the principle of construction and adding means of working the saw by hand power, and using an 8-in. saw instead of a 6-in. saw, you might easily construct a bench saw as an adjunct to your carpenter's bench, which would do heavier work than you can get out of the saw in question. You cannot expect a boy to do the work that a full-grown, able-bodied man will get through, and it is pretty much the same with large and small machines of the same class.

Casting in Plaster.—Moulder.—I know of no good work on casting in plaster; but I may say that in time the fullest and clearest instructions on this subject will be given in Work. Meanwhile, you shall have brief instructions for taking a plaster cast from the figures you have modelled in clay.

New Invention.—W. J. P.—The cost of obtaining provisional protection for nine months if you go to the Patent Office direct is only 30s. If you will send me a sketch of your invention, or, better still, a working model, I will submit it to a man in the trade to which your invention applies, on whom I can rely implicitly, and he will advise you as to its merits and value. That being settled, I will see what can be done towards helping you to secure the benefit of your invention, if you cannot help yourself to the extent first required. You see I have given no clue in my reply to the nature of your invention. I might have answered you direct by letter, but I have replied through "Shop," as you requested, on much the same principle that Admiral Byng was said to have been shot—namely, "to encourage the others"—the "others" in the present case being those who may happen to be in the same predicament as yourself. I hope and trust, by God's blessing, that Work will prove the means of bringing help to many a man who may have inventive and creative brain power, but lacking the means to turn the products of his thought to good account.

Wood and Machinery for Fret Sawing.—A. E. G. (*Ipswich*).—You ask me to tell you "the best firm for all kinds of wood for fretwork, saws, and designs, etc." To begin with: every firm of dealers in these articles consider themselves to constitute the "best firm." Suppose you were asked to declare whom you might think to be the prettiest and most charming of a dozen young ladies, and you were rash enough to do so. You would certainly offend eleven, and, perhaps, not make any decided advance in the good graces of the twelfth. Now, unwittingly, of course, you seek to place me in precisely the same predicament with the firms. I will tell you some *good* firms from whom you may get wood for fret sawing, and apologise to all who may be omitted, on the plea that I am either not acquainted with their names and addresses, or have forgotten them in a brief spell of temporary insanity, induced by your question. In London, wood may be bought of R. Melhuish and Sons, 85 and 87, Fetter Lane, E.C.; Henry Zilles, 23 and 24, Wilson Street, Finsbury; and Charles Churchill and Co., 21, Cross Street, Finsbury. In Liverpool, of G. Busschotts, Park Lane. In Bath, of Fritz Collins. In Settle, Yorkshire, of Harger Bros. In East Dereham, Norfolk (which is about the nearest to you, failing any dealer in Ipswich), of J. H. Skinner and Co. In Dublin, of Booth Bros. Of saws, there is a good German make with a thin rounded back and narrow blade to be had of Mr. H. Zilles; and there is an equally good kind of saw imported from Italy to be had of Mr. G. Busschotts. The Griffin saws, and the Star or Hibernia saws, are also good. Of fret machines, the best undoubtedly is the Britannia Company's No. 8 fret saw.

Advertisements in "Work."—An Amateur.—As I have said before, the appearance of advertisements in Work does not interfere with the utility of the magazine. You must try to persuade yourself that the value of the information you derive from Work outweighs considerably that which may possibly appear to yourself and others to be a detriment and disfigurement. At all events, your suggestion shall be taken to the proper quarter for its consideration.

III.—Questions submitted to Correspondents.

6. Steam Siren or Fog-Horn.—H. T. C. (*Leytonstone*) wishes to know "how to make a steam siren or fog-horn. Working drawings required."

7. Old Coloured Print.—W. H. (*Liverpool*) asks for "instructions how to remove old smoke-dried varnish from a coloured print, 'The Farm Yard,' by Bowles & Carver, 69, St. Paul's Churchyard, London." He adds:—"Can you give me an idea of the date, or tell me how I can get it? The size is 34 in. × 22 in., and it is printed on two pieces of paper joined down the centre."

IV.—Questions answered by Correspondents.

Cutting and Polishing Stones, etc. (See No. 2, p. 30).—J. H. writes:—"Mr. Bear will find a great deal of information on polishing processes in the third volume of Holtzapffel's 'Turning and Mechanical Manipulation.'"

Address Wanted.—Charles S. Whiting (*Dublin*) will oblige by sending his full address to the Editor of Work.

Trade Notes and Memoranda.

Some Topics of the Hour.—Conditions of Tendering.—District Surveyors' Fees.—The Condition of the National Portrait Gallery Pictures.—Compressed Air Systems.—Registration and Education of Architects and Surveyors.—Water Waste.—Improved Processes for Tanning.—Artificial Illumination.

The Westinghouse automatic brake is in future to be the standard brake upon the trunk lines of Switzerland.

An American writer recommends red ink in which gum arabic and washing soda have been dissolved, as a suitable solution for making legible alterations on blue prints. The action of the soda is to decompose the blue matter of the print, leaving the white paper exposed. The gum arabic is added as a thickening solution to prevent the ink from flowing too freely from the pen and spreading on the paper. Red ink is simply used as a colouring agent. If the soda alone is used, the lines show white. Caustic soda is recommended as being better than washing soda.

Timber in Guatemala is abundant. There are forests of mahogany and pine with a great variety of other woods which are capable of being used for manufacturing purposes. The balsam tree grows wild. There are forests of the indiarubber tree, beside the textile plants, such as the maguey, the saltwort, the soft rush, the soft aloe, all capable of becoming the bases for remunerative industry. Resins, gums, and balsams are met with, such as the liquid amber, the copal tree, the turpentine fir, vegetable wax, etc.

At the Central Institution of the City and Guilds of London Institute, Mr. T. Bolas is delivering a course of six lectures on photography, on Wednesday evenings, at 7.30. Lectures I. and II. will deal with the use of artificial light in photography; lectures III. and IV. with photo-mechanical printing methods; and lectures V. and VI. with direct contact printing methods.

WORK

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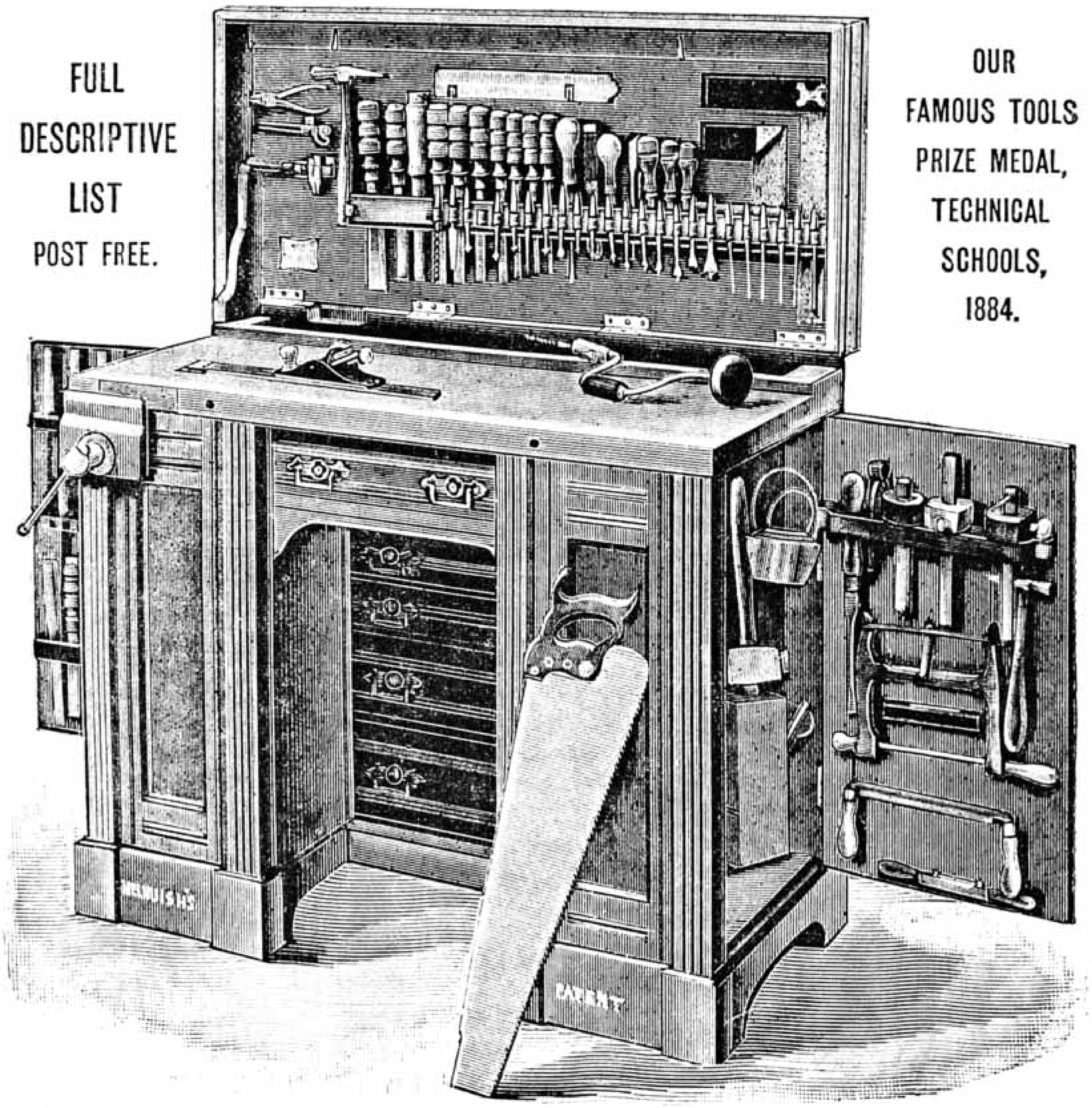

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