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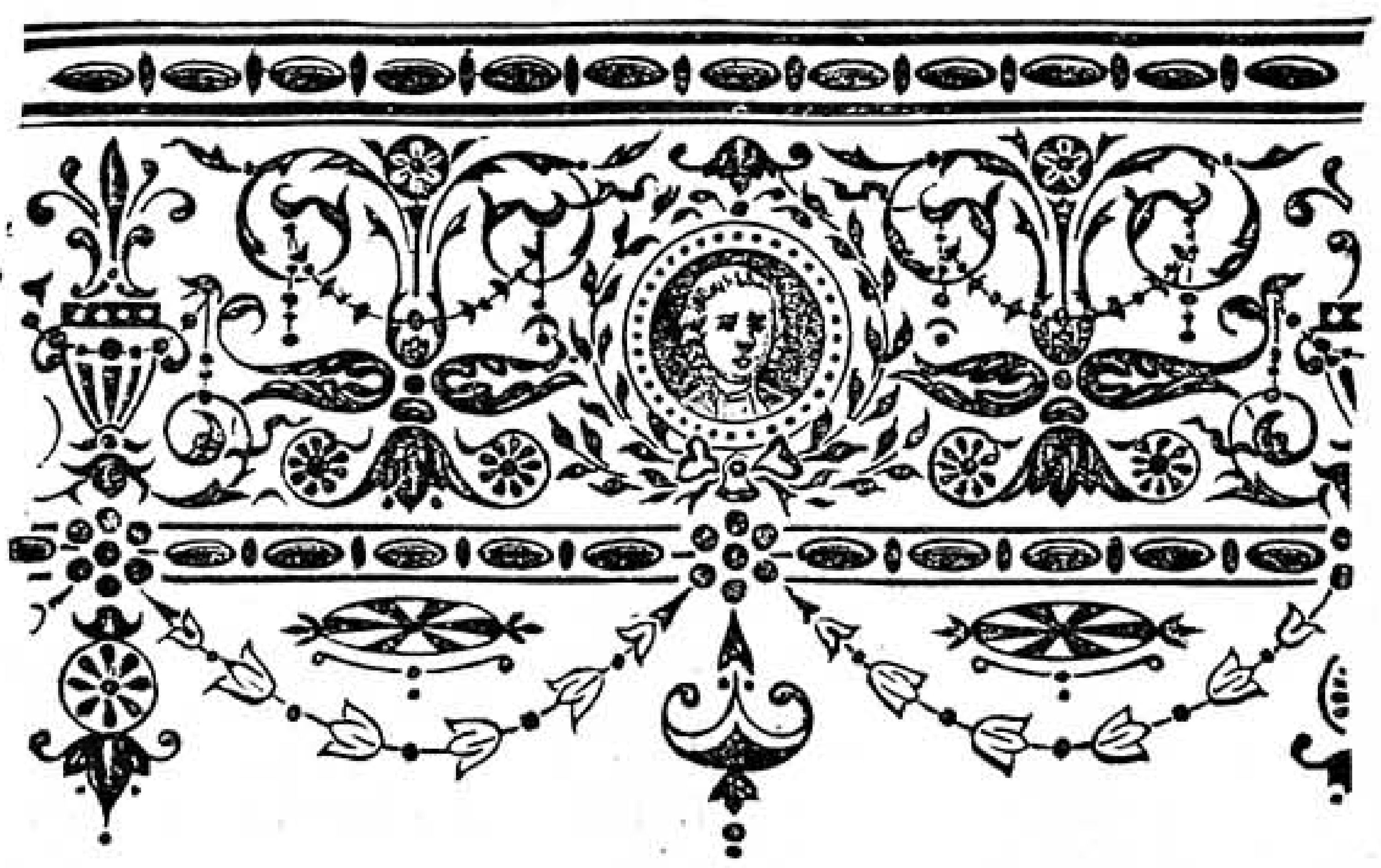


Fig. 2.

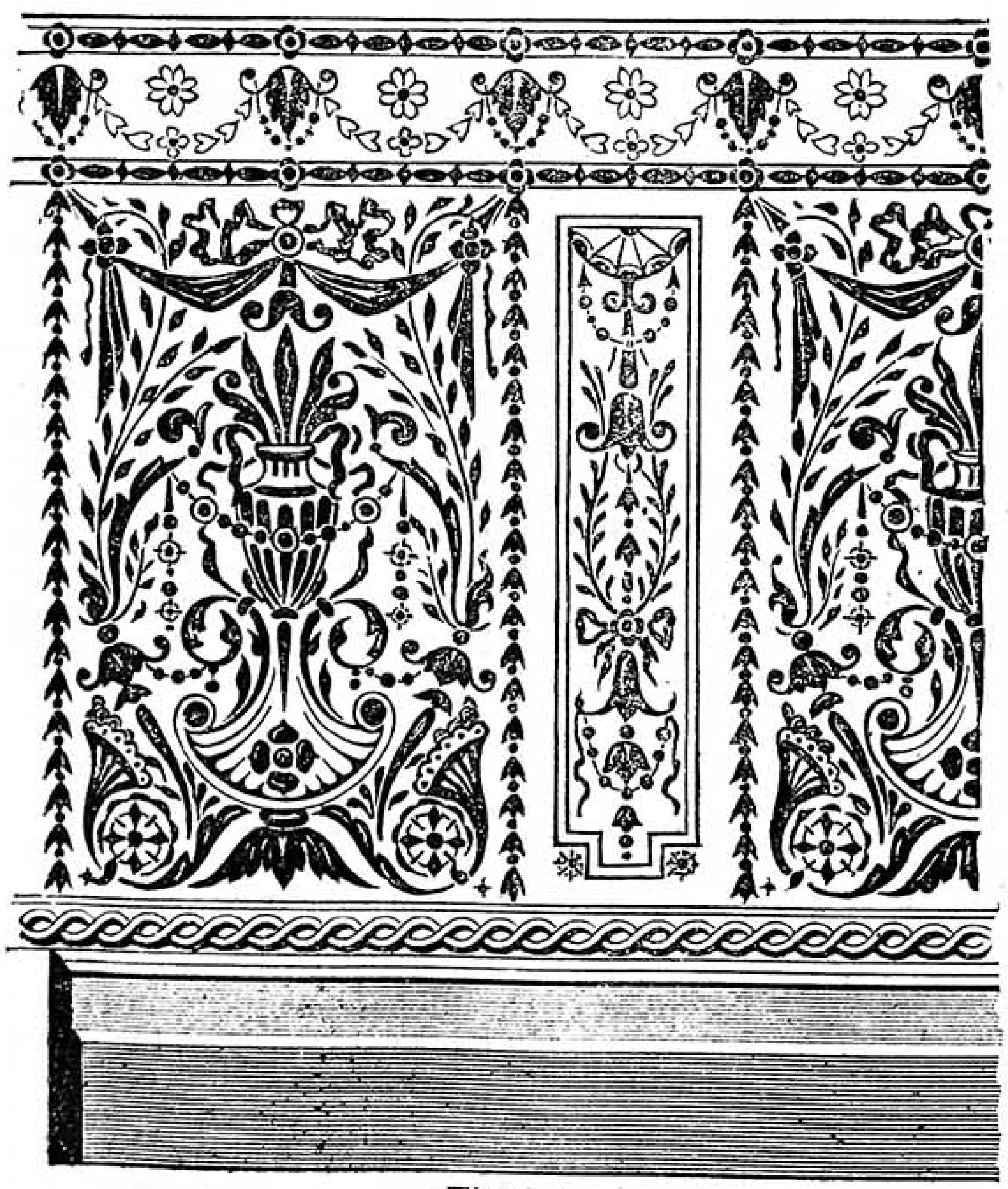
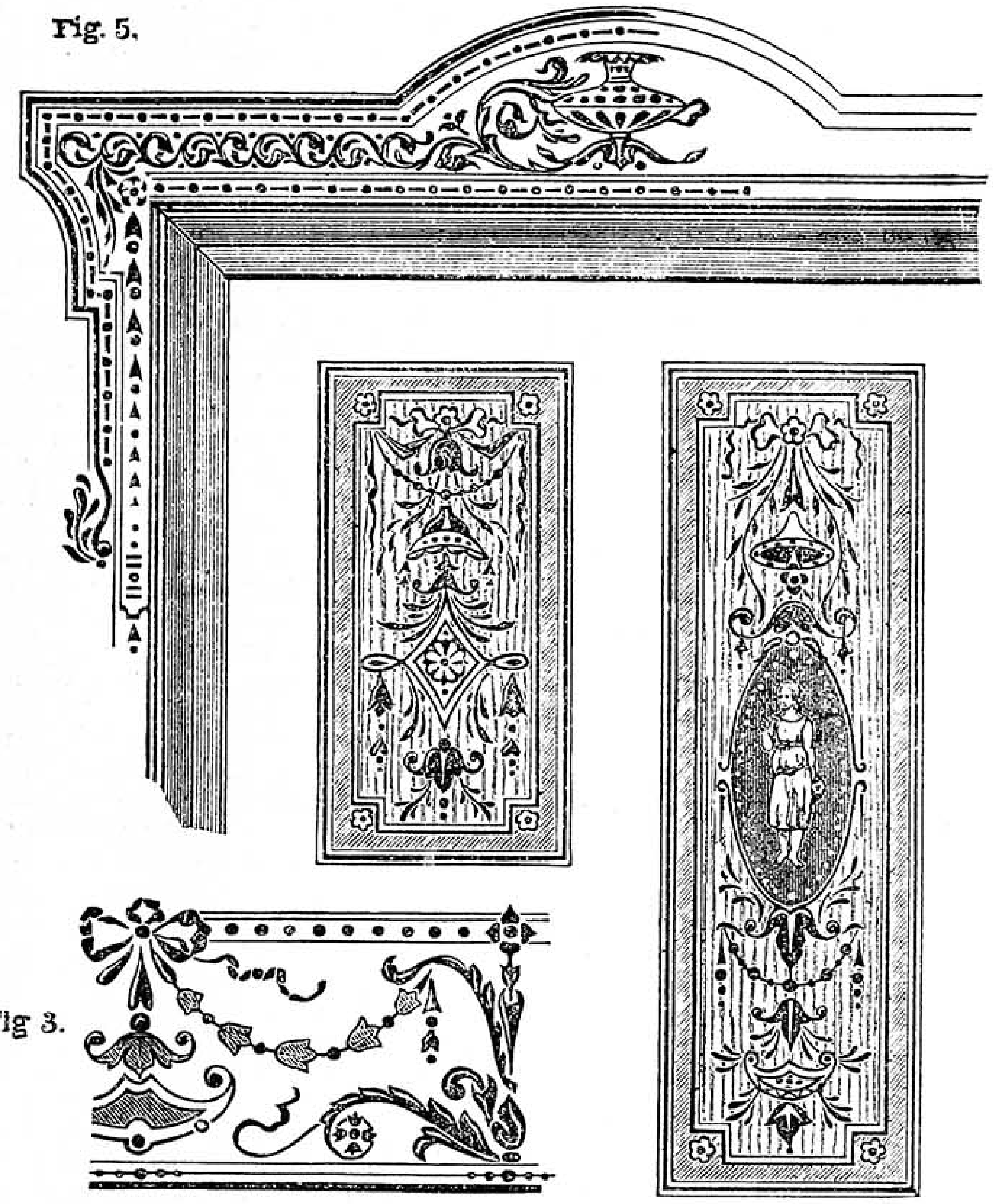


Fig. 1.

Fig. 5.



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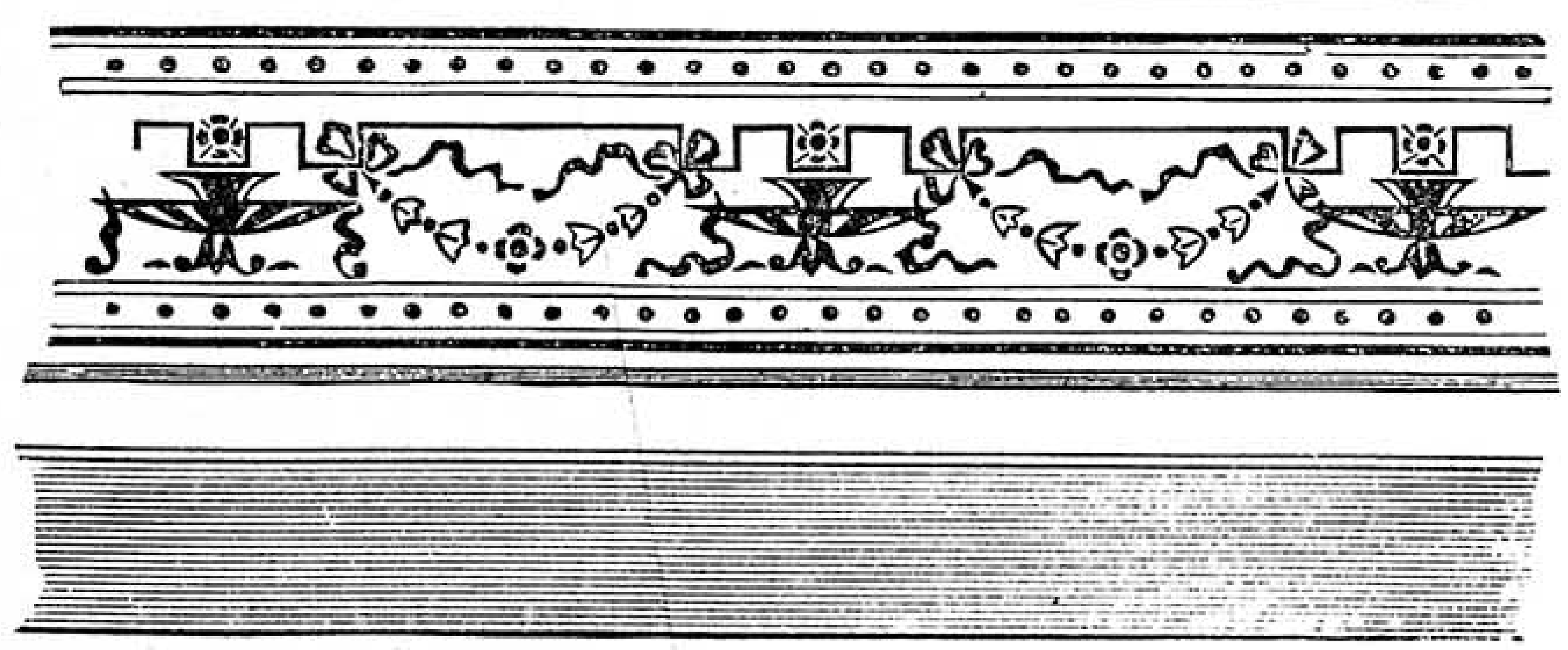


Fig. 4.

Stencil Designs for the Decoration of a Drawing-Room. Fig. 1.—Dado above Skirting in Borders and Panels. Fig. 2.—Frieze below Cornice. Figs. 3 and 4.—Designs for Borders. Fig. 5.—Treatment of Upper (A) and Lower (B) Panels of Door and Ornamental Work above Docr.

STENCILLED DECORATIONS FOR A DRAWING-ROOM.

BY A LONDON DECORATOR.

THE ornamental designs accompanying this paper are intended for use in conjunction with the stencilled ceiling which appeared in Vol. II., page 133 (No. 61) of WORK. As a serviceable introduction to this article, I must therefore strongly advise readers who may take a practical interest in the present effort to carefully peruse the above. In common with the ceiling design, an attempt has herein been made to meet the different circumstances of the worker's ability and requirements.

Contemporaneously with the ordinary householder's "spring cleaning" comes the house-painter's and decorator's "spring season" of work. The present is therefore a very *à propos* time to invite attention upon home embellishment; and whilst I think the work now suggested to be within the capabilities of many amateur decorators, an effort has also been made to proffer useful hints for the professional painter and decorator—both with regard to material used and resultant effects.

In the article upon ceiling design of the "Adams" type, besides explaining the useful adaptability of such disconnective ornament for our purpose, it was advised that the work be carried out in two or three simple tints. For use with many wall-papers, a blue tint of ceiling design upon a soft cream ground was given as being very effective; whilst further mention was made of executing it in other monotone tints of terra-cotta, etc., where the cream and blue would be unsuitable. "Adams" ornament—so named after the celebrated architects, the Brothers Adams, who introduced it—is at the present time in much use for high-class and costly drawing-room ceilings. In such cases it is usually made in fibrous plaster, and then affixed to the surface. In trying, therefore, to reproduce in flat tints the effect of a delicately modelled ornament in low relief, the relative amount of contrast between the ground and design is a very important factor in the success of the work. On the one hand, we must avoid that extreme which gives a sensation of Pompeian harshness and fussiness —such as we get in simple black and white; whilst, on the other hand, the design must be sufficiently plain for the eye to follow it under all fair conditions of lighting, without the least strain to the sight. "Taste"—that highly convenient jargon in matters of individual selection—can very often be taken as an attribute of common sense; and in the above respect it will be found that decoration which is based upon the latter will generally be conceded to express the best, or "correct taste."

Turning now to the practical aspect of this decorative treatment, we will consider Fig. 1 of the illustration. Judging by the paper-stainers' new designs for the present year, we may safely state that dados for the decoration of drawing-rooms are rapidly "going out" of demand, and that deep frieze decorations are in stronger call. For the drawing-room—"with-drawing" room—pure and simple, where the apartment is but seldom used, and then only for special social purposes, a dado is certainly a superfluous feature. The notion that dados were merely the outcome of a wall chair rail, and not purely a decorative feature, is still as prevalent as it is erroneous; and the intimation that their source can be explored in the ruins of ancient Pompeii comes equally as a matter of surprise to many. Judging again, however, from the common-sense basis, we decide upon these grounds: whether the amount of elaborate work would be sufficiently displayed according to the arrangement of our furniture; whether, if we simply carry the plain treatment down to the skirting, we shall probably have any objectionable dents and finger-marks to catch and worry the eye; whether the height of wall is adapted for a dado; and so forth. This vexed question being perhaps settled in the general affirmative, I give a few instructions for its execution. With regard to these designs, it may be thought that a worker who can draw them large enough to use would probably be able to produce his own design, and *vice versâ*. Such does not, by any means, always apply. The main feature of "Adams" work is a repetition of simple forms in graceful lines; therefore, given this feature, the exact proportion of a reproduction of my illustrations is not a necessity. All wall stencil-work, if it be above the level of ornamental doggrel, must be drawn with direct regard to the size and disposition of the room, hence it follows that, with the exception of ceiling ornaments and simple borders, sets of ready-cut stencils can seldom be applied to an apartment without much re-arrangement and often mutilation of the designs. The dado given is drawn to 1 in. scale, having alternating panels 18 in. and 9 in. wide. The height above skirting to top of border is shown as 36 in.

In applying panelled dado-stencils to a room, we must look chiefly to the dado breaks, such as door frame and mantelpiece make. At these positions the panels must appear intact, and not simply starting at one angle, and finding ourselves with half a panel to put in against the door, where every eye will catch sight of it. The best plan is to measure our wall lengths, and see what size "repeat" will then come in with least trouble. The half of each panel design must be first sketched in on paper with charcoal, and then carefully drawn with all detail—remembering that we are preparing *stencilled* ornaments. In all intersections and connective parts not less than ¼ in. of space must be interposed as natural "ties"; when stencilled, these will but nicely separate the parts, without any appearance of ugly breaks. If we make the tie spaces much less the stencil will not stand the wear.

Both the dado border—a "repeat" 6 in. by 9 in.—and the bottom simple "twist" pattern must be put in after the dado. If we wish to decrease the height of the latter, the base ornament can be substituted by a couple of lines. The "fuchsia" upright margins to panels will best be put in separately, whilst the narrow panel can be easily adapted in width, as necessity may arise, by "humouring" the plain surrounding margin. All main dividing lines should be struck out with chalk line, etc., and the lines put in, lastly, with lining fitch and straight-edge. Two "repeats" of the stencil border will be sufficient to cut, and most convenient for one person to use.

The deep frieze combination of Fig. 2 can either be used as drawn or in parts. If it is wished to have a wooden frieze-picture rail, the same should be placed beneath the bottom straight line of design. If desired, the festoons can be then stencilled immediately beneath the rail, suspending the ornamental lines upon small "nail" ornaments. The main design of frieze has to be repeated on the right hand until the "vase" returns, each medallion being therefore 36 in. apart. If the cameo heads are used, the wall length of frieze must be carefully spaced out, and the medallions properly centred. Instead of the heads, simple circular pateras may be used for these positions, or relief plaques of "Lincrusta" or "Anaglyta" fixed therein. One repeat of the stencil, as shown, will be quite sufficient if we carefully set the wall-space out, stencil in all our left-hand halves, reverse and clean the stencil-pattern, and then complete the alternative sections.

Fig. 3 is a border design, to be drawn 9 in. in height, of a simple but effective design. This may be used as a border above a dado of plain colour, due allowance being made for the extra width. To produce the stencils, we must first draw the half of pattern, as illustration, on paper twice the length; then double the paper, pin it to a table, and mark over the outline with a wooden point and fair pressure. When opened, the impression of the second half will be discernible, and can then be transferred to the stencil-paper. The latter is best attained by rubbing the under side of drawing-paper over with a little dry colour before we outline the impression, and then pinning this inner side down on the cartridge-paper for a transfer of red outline by pressure as before. Fig. 4 is another border of decided horizontal lines, and is suggested for use, nine inches wide, above the wooden skirting in cases where the dado is not used.

The remaining items of our illustration in Fig. 5 refer directly to the door. The panels are proportionately those of the common four-panel door, and are placed in such a position to enable the effect of an "over-door" ornament to be fully appreciated. Where the deep frieze is used, the height of wall must be considerable to permit also of over-door ornament, and not less than, say, a foot of clear filling space should show between the nearest portions of each.

Now, a few notes respecting colours and material. In No. 53, Vol. II. of WORK, an interesting illustrated paper appeared, disclosing the claims and merits of a new *tempera* paint, Church's "House Decorator"—or wall decorator, rather. The writer having, like many others, in a varied professional career, paid the purchase-money of some practical experience in connection with "patent distempers" and silicate paints, the contents of the above notice were individually taken with due caution—*cum grano salis*.* During the last few months it has been my privilege to make a pleasing working acquaintance with this new commercial product, now rapidly becoming known as "Alabastine," which is made and supplied by The Church Manufacturing Company, 127, Pomeroy Street, Hatcham, London, S.E.

To the new "Alabastine" tint circular we may now profitably give a little attention in the execution of this decorative work. A very chaste and decorative colour scheme may be carried out in this material upon the ornamental lines of my paper. For the ceiling ground, No. 7 tint may be used. Upon this admirable cream ground let the ceiling design be stencilled with No. 23, or flat paint made to that tint. The cornice may be treated in the same creams and blue. The wall may be coated right down to skirting with either Nos. 16 or 23, which will give an excellent "background" tint for drawing-room wall ornaments, the latter tint being lightened up, if necessary, for a badly-lighted apartment. The stencil dado and frieze must be executed in flat paint-stain (see article in No. 61), made with Prussian blue and raw umber to a sufficiently deep shade of soft blue, toned rather to dulness than brightness in colour. If a darker plain dado be wished, then a thin coat of flat paint of the desired colour, painted over the "Alabastine," would be the best job, and the dado border stencilled with the same colour, a darker line still intervening. For a warm treatment to a room of cold aspect, the Alabastine circular shows equally soft and pleasing tints. The frieze medallions, if painted, should be done in cream monochrome against blue background, the latter outlined with a fine line of gilding or darker blue. Where the ceiling and frieze designs may both be used, the circular panels of the former should be substituted by suggestions of the four "seasons," since the cameo heads of musical celebrities, poets, etc., must be

* Yes, our "London Decorator" objected very much to "Alabastine" when it was first noticed in WORK, and I rather think he mentally placed me among the majority of the people of the United Kingdom, according to Carlyle's classification, for daring to predict a future—and a good future, too—for this new decorative material. It has taken only a twelvemonth to show that I was justified in advocating the claims of "Alabastine" to public favour. For the benefit of the readers of WORK I may be permitted to say that the "Church Manufacturing Company," whose address will be found above, will readily send to any applicant their prospectus, with specimens of the various tints in which the material is supplied, including the newest additions to which allusion is made in this paper.—ED.

the main feature of *one* portion only. The best treatment of woodwork would be enamelled-cream skirting, frame and stiles; panels in light-blue tint, flatted and lightly stippled, with ornament stencilled thereon in deep blue, and outlined with either fine gilded line or a deeper shade of blue. In the panel treatment of illustration the margin to panel would be painted a few shades darker than the remainder, and the marginal lines and corner *rose*, with also a bead on panel-mouldings, should be gilded. If something beyond the ordinary is desired for the panels, the worker may obtain a pair of the figure cameo panels made in "Lincrusta," and combine his handicraft therewith by using Alabastine in relief. To this end, cover the panels carefully with a stout white lining paper; paint these, when dry, with one coat of thin oil paint. Upon this mark the position of the panel, then coat in the panel ground with Alabastine, stippled as the flatting. Paint and finish the Lincrusta centre panel, and then work the other ornament on the lines of Gesso work, and according to the directions given with the new circular and the valuable product itself.

ARTISTIC LITHOGRAPHY.

BY A. J. ABRAHAM.

PRINTING SURFACES.

DERIVATION OF TERM—WHAT LITHOGRAPHY IS—LITHOGRAPHIC LIMESTONE—COLOUR OF STONE—VARIETIES OF LIMESTONE—GRAINING AND POLISHING—TESTING GRAIN—SELECTION OF STONES—RE-GRAINING, ETC.—OTHER PRINTING SURFACES—ZINC—TRANSFER PAPER.

Derivation of Term.—The word lithography is derived from the two Greek words, "lith'os," a stone, and "graph'o," I write. Chromo-lithography is a further extension of the word from "chro'-me," colour.

What Lithography is.—Lithography is the art of drawing on a stone or other substance that is capable of retaining both grease and water, with a fatty or greasy matter, with the pen, brush, etc., in such a manner that when the stone, after being subjected to a treatment of acid, is damped with water and passed over by an inking roller, the drawing has protected the stone from the action of the acid, and has thus preserved its natural properties, which is the quality of receiving printing ink, whereas all the rest of the stone rejects the ink through the interposition of the water, which is antagonistic to grease; so, when an absorbent paper is pressed on the stone, copies can be obtained.

Lithographic Limestone. — There are several kinds of substances that can be used for this purpose, such as zinc, wood, etc., but up to the present time nothing has been found possessing the qualities required in greater perfection than limestone. This is found in quarries in several countries; but the best, both in quality and quantity, comes from Solenhofen, in Bavaria.

Colour of Stone.—These few hints being more for the use of the artist who draws on the stone, it will not be necessary to enter into the details of its chemical qualities, which really are of more use to the printer than the lithographer; but what it *is* necessary that he should know is that the stone is of different shades of colour, varying from a pale yellowish-white to a dark blue or greenish-grey. Those lighter in tone, being softer in composition, are only suitable for drawing with the pen or brush, but the darker ones being harder in substance, are more suitable for chalk, engraving, and the better class of work.

Varieties of Limestone.—Limestone is found varying from a line to several inches in thickness, when it can be easily cut from the surrounding earth. This is generally done in sizes suitable for commercial purposes at the quarries. As a rule, the printer will supply the artist with stones, the charge being by weight, so much per lb. according to the size of the stone, larger ones commanding a bigger price than smaller ones, stones darker in colour more than the lighter-toned ones; and those with a surface on both sides suitable for printing from are very expensive, on account of the difficulty in obtaining a stone that is of an even composition all the way through. These are termed double-faced stones.

Graining and Polishing.—When a stone is required for pen or brush work, it is ground level and then polished with pumice or snake-stone, and when required for chalk work, an artificial grain is given to it with ground glass or fine sand passed through sieves having holes of various sizes, according to the texture of the grain required; but as grinding the stone belongs to the printing department, all that the student need tell the printer is the size of the drawing for which the stone is required, and whether it be for ink or chalk work. It is also necessary to know whether a grain with a fine or coarse texture is required, according to the nature of the work, writings and small drawings requiring a finer grain than a larger, bolder style of work; but as the size of the sieves varies so much, and no two men grind the sand in quite the same manner, it would be impossible to state a regular size for any particular class of work; this the student can only obtain by practice and experience. A good plan would be, on trying several grains, and finding one suitable for the work in hand, to ask the printer the number used in graining that special stone, and if for any future work a coarser texture is required, subtract from it, and if for a finer grain add accordingly. This should in every case be done when the artist works with a different printer or grinder to whom he has been accustomed.

Testing Grain.—Before beginning his subject the student should test the grain, by making one or two marks with the chalk in different parts of the stone, when, if not found suitable, it can be easily re-grained. If made lightly, these patches do not affect the work, as they can be darkened if a deeper tint is wanted in that place, or taken away altogether if not required.

Selection of Stones.—In choosing stones for chalk work, see that the surface is free from veins (in appearance like a pencil-line drawn irregularly across the stone) and chalky spots (in appearance patchy or speckled in colour), as either veins or spots are apt to show when printed; but for pen work it is not of so much consequence, as the stone, being polished, does not exaggerate any imperfections such as veins, which is the case when an artificial grain is given to it.

Re-graining, etc. — The stone must be properly grained or polished before starting any drawing, or else old work which has been on the stone sometime may show through any new work that the artist may do. Although this does not come under the artist's supervision, still it is advisable that he should know what the result would be were the stone not properly prepared. It is sometimes necessary to reduce the thickness of the stone ⅛ of an inch in cases where work has been standing for any length of time, as the ink adheres so strongly to it that it is impossible to remove it; and, of course, the longer it remains on the deeper it sinks, and unfortunately not being perceptible to the eye, it does not show, or, to use a trade expression, "work up," until it is in the printing machine. It is always better to have the stone rather larger than the paper required, in order that in printing the paper does not overlap the stone, else its edge is likely to leave a mark on the paper from the pressure of the machine.

The above subject has been perhaps enlarged rather more extensively than necessary, but as stone plays such a very important part in lithography, it cannot be impressed too strongly upon the student how particular he should be in selecting his stones, and seeing that they are properly prepared by the printer.

Other Printing Surfaces.—It is only necessary to touch lightly upon other printing surfaces, as the student having once mastered the art of drawing on stone, will find no difficulty in working upon foreign substances.

Zinc. — In reference to other materials suitable for printing purposes, zinc gains the advantage over stone in being lighter in weight, and therefore more easily moved and lifted about. It is not so expensive, and can be printed at the same time with letterpress, which is impossible with stone on account of its size. Being of a dark slate colour, however, it is very trying to the eyes, and unless the artist is sure of his work and able to judge of the different effects whilst it is in progress, he is likely to forget that the colour of the material has to correspond with white paper, and that a tint will only look half the strength on paper to what it does on the zinc, the grey shade of the surface giving an extra tone to the work, thereby softening the whole subject, which will look much harder and cruder on paper. This refers in a certain degree to stone, but not quite to the same extent, it being so much lighter in colour. The general tone of the work is not so much affected. Zinc cannot be used for lithographic purposes to quite the same extent as stone, as it does not possess those natural properties peculiar to limestone, which have been mentioned.

Transfer Paper.—This is a paper specially prepared with a grained surface for chalk work, and a smooth one for working with the pen, or brush, but when it is used the drawing has always to be transferred to stone before any printed impressions can be obtained. It is preferable to stone for some purposes, insomuch that whilst all drawings on the latter *must* be drawn the reverse way to the original sketch, any drawings on the above paper can be copied the same way, as they must be transferred to stone for printing purposes. This method is generally adapted for writings, legal circulars, billheads, plans, maps, architectural drawings, etc., but all artistic lithography, such as chromos, etc., should be drawn on the stone.

Having mentioned the above out of several different substances for drawing on, it will only be now necessary to deal with limestone as forming the foundation of all good lithographic printing. I will, therefore, proceed in my next paper to speak about the materials and tools necessary to the lithographic artist.

I may add that the art of lithography is one that admits of high artistic excellence, and that as it can be practised with success, and is in itself remunerative, it is well worth the attention of women, as a vocation from which a good living may be made.

EAR-RINGS AND OTHER ORNAMENTS FOR THE EAR.

PRINCIPALLY WITH REFERENCE TO THEIR MODES OF ATTACHMENT.

BY H. S. GOLDSMITH.

INTRODUCTION—MODES OF ATTACHMENT TO EAR—ANCIENT EAR-RINGS—TYPES OF FASTENINGS—FASTENINGS IN INDIAN WORK—EAR-RINGS HANGING TO FRONT.

Introduction. — The above limitation is necessary in order to keep this paper within reasonable space. It will deal with a few of the things an apprentice will soon be concerned with. These are the mechanical and technical portions, for at first the artistic merits of the ornament he has to do with will be out of his province.

If he is told to attach the hooks, etc., to the other parts that make up an ear-ring, and he has had a little previous consideration of the matter, it should follow that he will be able to turn out his work in a better form than would otherwise be the case. These reasons lead me to deal with the principles upon which the hooks and other fastenings should be made: first, in order to obtain the necessary security for the ornament; secondly, *in order to show the ornament to the best advantage* — or, in other words, to get them to hang or set properly when worn.

Modes of Attachment to Ear. — This kind of ornament attached by means of a hole pierced through the lobe of the ear, we shall find, gives us several classes of attachment, which we will at first divide into two—namely, those in the form of hooks or rings: that is to say, those usually understood by the name of ear-rings; secondly, those called ear-studs. The latter rest *on* the ear, while the former hang below it.

Here in England the ornaments are attached to the lobe only, but in some parts of India the ear is pierced in the upper part as well, in order to wear several pairs of ear-rings at one time; and in addition to that, the ear is sometimes slit and lengthened by wearing heavy solid ear-rings. On the outside of the slit, when the ear has become lengthened, there will be a piece of cartilage nearly as thick as a lead pencil, and this they use to clasp an ornament round, much the same that you would clasp a bracelet round an arm. These ornaments are about three-quarters of an inch long.

One can easily understand that the ladies over there do not mind large holes being made in their ears, as our ladies do, for it is a mere pin-hole in the ear that has to serve us for attaching the ornament, while there the happy jeweller can have a hole in the ear of any size, and in any part of the ear too. Seemingly this is a privilege we have lost, for in our museums there are plenty of so-called ear-rings which would require a slit half an inch in length before they could let the end of the ear-ring pass.

The other division will consist of ear-rings for unpierced ears, and there will be a little to say about them and their modes of attachment.

Ancient Ear-Rings.—The great number of modern ear-rings in which joints play a part is in complete contrast to those of the ancients in the British Museum, for there we find Egyptians, Greeks, and Romans taking full advantage of the natural ductility of fine gold, by bending or untwisting part of the ear-ring each time they wished to remove or attach the ornament.

A strong reason why we use joints so much is this:—The gold now worked is of a lower quality—generally very much lower—and all, or nearly all, of its ductility is gone, and in its place we have elasticity, so we cannot, even if we would, twist and untwist an ear-ring hook each time of wearing; for even if the gold would stand it without breaking, still it is not "kind," like fine gold, and would require pliers to turn the ends in with.

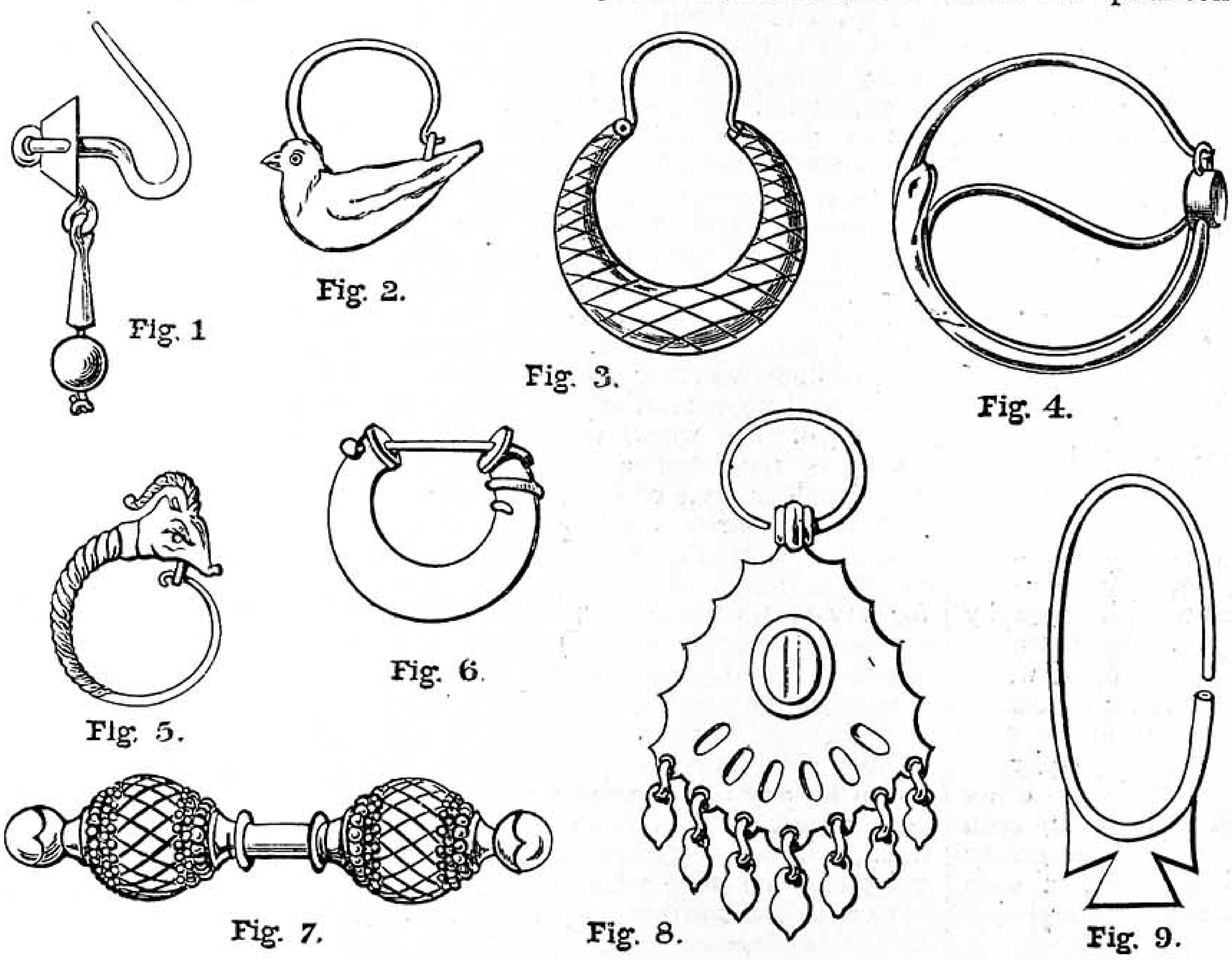


Fig. 1.—Ancient Roman Ear-Ring, with Wire the shape of the now-called German Hook. Fig. 2.—Greek Ear-Ring in the form of a Bird, the Fastening being the same as now used in Modern Jewellery. Fig. 3.—Modern English, with same class of Fastening. Fig. 4.—Modern Continental Form of same class of Fastening. Fig. 5.—Greek with Spring Fastening, the Tail acting as Spring. Fig. 6.—Greek, fastened in the Ear by threading through and coiling Spring round. Fig. 7.—Indian Ear-Stud: on Centre Piece is a Screw, to allow of separation of the End for Insertion. Fig. 8.—Russian Ear-Ring: Wire is attached the reverse way to show Edge and Back too much when worn. Fig. 9.—Sardinian, Ancient: also hangs contrary to the generally approved way.

It would not be to our advantage to go back to fine gold for ordinary work, and the foregoing is written simply to draw attention to one of the cases in which a property or merit of the metal is used to its full advantage. In what follows we shall find that the elasticity of our present qualities is just as profitably employed as was the softness of fine gold in the old time.

Types of Fastenings.—With but few exceptions, most of the simple types of fastenings now in use are to be found at the British Museum, even to that which we now call the German hook; and so that there should be no mistake about the apparently topsy-turvy way this is worn, the Roman has kindly attached a pendant to it, and in so doing he has removed any doubts that we might have about it, as you can see for yourself in Fig. 1.

There are also a few specimens of a bird-shaped ear-ring (Fig. 2), in which the wire is fastened like the common facetted ear-ring (Fig. 3) which we all know.

In South Kensington are some like Fig. 4. This form seems to be made with but slight variation in Normandy, Germany (Bremen), Italy, and Spain, and its fastening is just the same as the Greek bird (Fig. 2).

Fig. 5, however, does not seem to be much followed. It is, as you see, in the form of a monster's head, with a tail formed by a coil of tapering rings. In many of them the spiral coil acts as some sort of a spring, and as a joint as well. This gives a fairly secure and practical fastening, and is used in India even at the present time. My rough sketch is taken from one as arranged in the cases at the Museum, but it would not hang in the ear like that, of course.

Fig. 6, you will note, is of a very strange form to us, although common enough in the East. This fastening possesses at least the merit of security: a state of affairs that can only be obtained this way with a fine gold pin, which, after passing through the pierced ear, is coiled round as shown in sketch.

Fastenings in Indian Work.—In Indian work the most general method of fastening an ear-ring, be it the shape of Fig. 6 or any other shape, or for ear-studs like Fig. 7 (this latter is drawn the actual size of many that are worn), is by means of a screw. These screws, of which the details will be shown when we come to bracelet fastenings—for they are too large for us to use for ear-rings—are obtained from double wire, coiled round a mandrel (piece of hard wire), one piece being soldered in a tube to form the female screw, the other being soldered on a peg to form the male screw.

The greater number of these screws run the other way to ours. Is this because the workman finds it comes more natural to him, just as we find a new hand will most likely chase his first screw in the lathe left-handed?

In India, also, is worn an ornament the size and shape of the ear, which is covered. The ornament is, however, perforated so that no serious impediment is offered to the wearer's hearing. Naturally the surface of such an ornament gives a good opportunity for display, and it is taken advantage of to the greatest degree.

They say comparisons are odious, and if we compare the size of ear-rings now worn to those of years ago, there seems to be a very decided tendency towards their gradual extinction. From a trade point of view it is to be hoped that this is not what it means; but as ladies do not in England wear rings in the nose, as some do in India, a mere decree of fashion will be enough to totally extinguish this class of ornament, and "the pearl in the Ethiop's ear" will be the only survival of a once flourishing part of our trade.

Ear-Rings hanging to Front.—Before entering on the particular sorts of modern fastenings, it will be as well for us to notice that although very much the greater proportion of ear-rings have their front to show to the front of the ear—that is, at right angles with the ear-ring hook—still there are just a few made to hang just the other way, and to show their edges, and possibly part of their backs, to anybody facing the wearer.

These exceptions are shown in Fig. 8 and Fig. 9, one Russian and the other ancient Sardinian—not but what plenty of others could be drawn, but these are sufficient to remind us that ear-rings are sometimes hung the other way; and to prove the rule which we seemed to learn at school is what exceptions were invented for.

As another curious fact about ear-rings, I may recall a statement made by a writer in a well-known magazine, "That at the time of the wars of Jugurtha it was the custom to wear one pearl ear-ring only, which afterwards became the sign of an acknowledged courtesan."

A JOINER'S CRAMP AND HOW TO MAKE IT.

BY DAVID DENNING.

No joiner, cabinet-maker, or other artificer in wood but requires the aid of cramps, or, as they are often called, clamps. Comparatively little in the way of framing up can be done without them, and they are useful in a variety of ways—so useful, indeed, as to be indispensable. The amateur is addicted to the use of the best of everything if he has the wherewithal needful for the purchase; if he has not, then he must do without, unless he can contrive or make some substitute. If he can do this, he is still apt to think that he would turn out things of much better workmanship if he only had something nicer to work with. He would prefer to have an iron cramp, such as he will see for sale in the better class tool-shops, instead of the wooden affair commonly used by professional artisans. Perhaps he does not even know of the existence of these; for why should the dealer in tools proclaim the virtues of an appliance which any worker can make for himself, instead of recommending "the very superior article" which he has for sale? As to cramps, these are made of iron, either entirely or principally, and it would never answer the amateur's purpose to make them, even if he could.

I am led to make these remarks as, in the catalogue of a leading dealer who lays himself out to supply the needs of amateurs, several improved forms of cramps are named, but there is no mention of the kind generally used by practical men, although it is as good as any of the newest improvements, so called. As the young and theoretically far advanced young artisan is not above a similar weakness for fancy improvements, I may be permitted to offer him a word of advice to the effect that many a thing of venerable antiquity is quite as useful as the latest novelty. In saying this, I by no means wish to inculcate the principle of "what was good enough for my father and his father before him is good enough for me," for if we were all to act on it there could be no progress. On the contrary, when any new thing is calculated to save time or to facilitate improved workmanship, by all means adopt it. Whether the iron cramp has sufficient advantages over the older-fashioned wooden one to induce us to discard this is a question I do not feel called on to discuss with the small minority who think so. One of them, by the way, has told us in a lately published work that iron cramps are indispensable. Well, let those who think so use them, while others who know better use the equally efficacious cramp about to be described. It is no makeshift, but a good practical cramp, such as, with perhaps trifling variations, will be found in general use throughout Great Britain. As there is no better cabinet work in the world than that of this country so far as construction is concerned, it may readily be supposed that the native artisan does not employ inferior tools. Among these must be reckoned the wooden cramp. It is not difficult to make, and labour and cost will be well repaid by the result.

The form and details given are from some cramps which were being made a few days ago by one of the most experienced and able cabinet-makers with whom I am acquainted, and I know a few of them. I cannot say that cramps are any novelty to me, but when I see a good man at work I always like to watch his methods and what he is doing. My friend Thompson is not one of those narrow-minded men who would keep all his information to himself or those of his trade, under the erroneous idea that it is a mistake to let the outside public know too much; so when I said to him that, while I had been seated on a vacant bench near his, watching and chatting, the idea had come into my mind that it would be a good thing for the readers of this Magazine to be told how to make a really good cramp, he just replied—"All right, Mr. Denning, you can't do better than tell them about these I've got here." The thanks of the reader, therefore, are due to Mr. Thompson; for it may be taken for granted that those he was making were the result of as much careful thought as if an elaborate piece of furniture had been in question—that is to say, that the cramps would not have been made as they are if his experience had taught him that some little alteration would have made them more convenient or better in use. That the model is original in its details I do not say, but it is probably as good a one as could be found.

Fig. 1 shows the cramp, or rather a portion of it, for the bar is shortened off in order not to occupy undue space. In actual construction it can be extended to any reasonable length. All that is really essential to assist in understanding the construction is shown. On examination, the cramp is seen to consist of a bar the lower edge of which is serrated to form a series of stops for the sliding-piece shown on the right, while on the left is a fixed head with a screw through it.

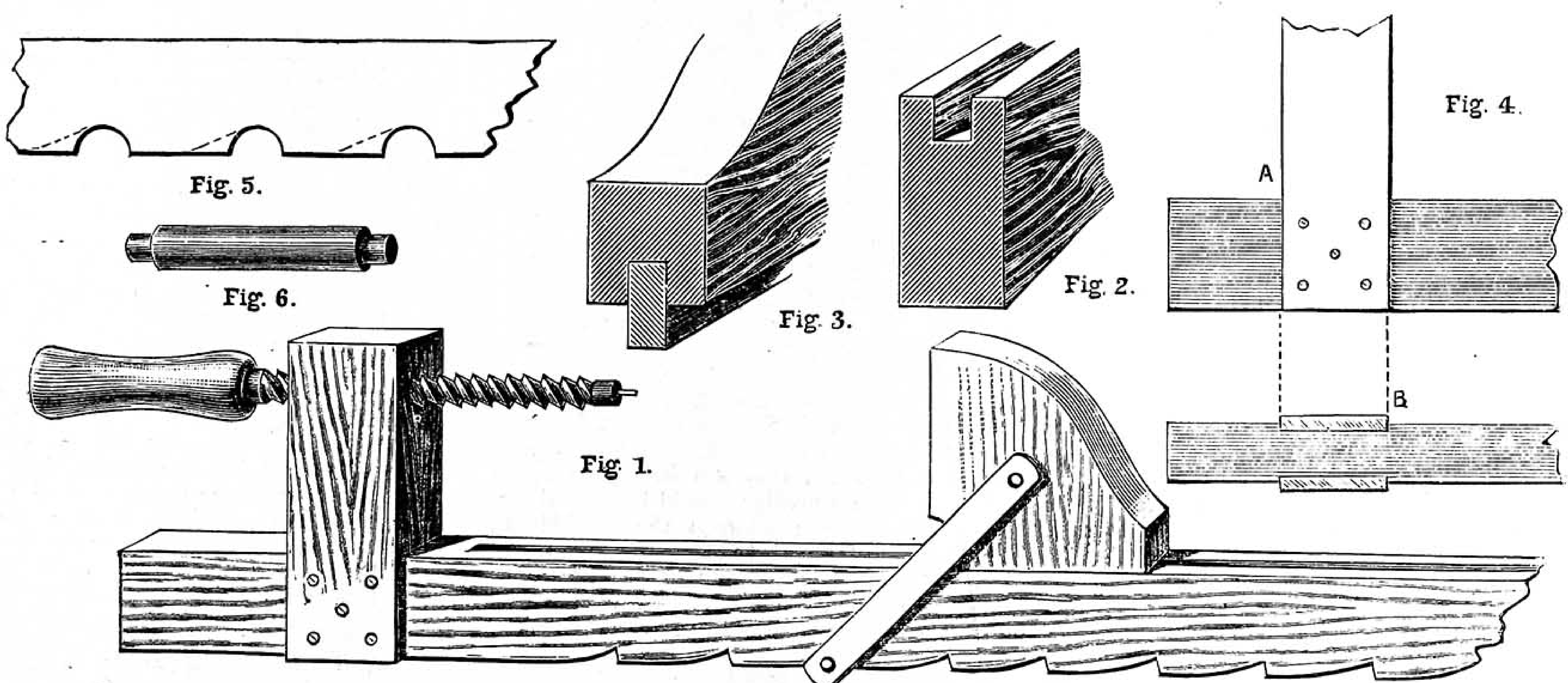


Fig. 1.—Joiner's Cramp complete. Fig. 2.—Ploughed Groove in Bar. Fig. 3.—Tongue in Movable Piece. Fig. 4.—Diagram showing Mode of fixing Screw Block—A, Side Elevation; B, Plan seen from below. Fig. 5.—Diagram showing Formation of Stops. Fig. 6.—Pin connecting Iron Straps.

The first thing is to determine the length of the bar, and this will depend on the size of the work that is contemplated. For general purposes about 3 feet will be found very suitable. If larger, the cramp is apt to be unwieldy, though it may sometimes be necessary to have them much longer. Any tough strong wood may be used, but nothing is better than oak, of which a piece of 1 in. stuff about 2½ in. wide will be required for the bar.

The sliding-piece must be of the same thickness. It may be about 4 in. wide and high. The shaping is purely a fancy detail, as for all practical purposes a square block of wood would answer just as well. It will, however, be noted that the grain of the wood is perpendicular instead of horizontal, or parallel with that of the bar, and the reason is that it may withstand the strain with the utmost of its strength when it is in use. The pressure is against the grain instead of with it.

Now, before proceeding further, the upper edge of the bar must have a groove ploughed along its centre, as shown by the sectional illustration (Fig. 2). The depth and width of the channel are not of importance. On the bottom of the sliding-piece a corresponding tongue will be inserted, as in Fig. 3. Those who prefer to do so may form the tongue from the block itself, but the better way is to do it as directed. It is now evident that the tongue acts as a guide to the sliding-block. The fit should be fairly easy, without being too loose to allow of lateral movement.

For the present this end may be left while attention is directed to the other. If several cramps are being made (and one, it will be noted, is by no means a sufficient number to have in a workshop, though in the amateur's workroom it will be better than none at all), it may be as well to get the holes threaded for the screws by the turner. If the maker has a box and tap for wood screws, he will of course be able to do what is necessary without further aid; but it is hardly likely that he will have them, and it may be satisfactory for him to know that he can do without either them or the turner by making use of handscrews. As these are obtainable at low prices at any tool-shop, there will be no difficulty in meeting with what is required. As there are two screws and two jaws in each handscrew, each of these will do for two cramps, and there is practically nothing wasted, although a piece of each jaw will be superfluous.

One of the jaws will do for the fixed block within which the screw of the cramp works, and some care will be required in fixing it to the bar, as at times there will be considerable strain on it. At first sight it may seem as though the bar is simply let into a mortice or hollow cut in the lower end of the block. This might do, but a moment's reflection will show that it will be better to make assurance doubly sure by partly sinking the block in the sides of the bar. It is then held as firmly as possible, and will withstand any strain of which the wood is capable.

Fig. 4, which is a diagram representing this part of the work, will make the construction quite intelligible to those to whom it might not otherwise have been so. When fitting this block, be careful to see that it is perpendicular with the bar, or, at all events, that the screw is parallel with it, and opposite to the solid part of the sliding-block. The fixed block is to be secured in its place by means of two or three screws, but these may as well not be inserted till the notches have been cut in the bottom edge of the bar.

It will be noted that these are not sloped off in a straight line, but that what may be called the teeth are rounded off instead of being carried at a straight bevel from point to point, as in a saw. The reason for this peculiar shaping, which undoubtedly entails more work, is that the points are stronger than they otherwise would be, for the wood runs to a considerable distance back from each. If we wanted to get the utmost possible strength, a series of half-round notches, as shown in Fig. 5, would suffice, but then the worker would labour under the disadvantage of not being able to slip the moving head backwards and check it so easily as at present. What is really done is simply, as it were, to round off the sharp edge at the front of each notch, as shown by the dotted line on the figure just referred to. The straight side of the other is, of course, the natural result of using the most convenient tool—viz., the saw—for making the cut. The points of the teeth may be about 2 in. apart, and the depth of the notch about ¼ in., or just sufficient to act as a stop to the pin connecting the strips of iron which confine the moving block.

There is nothing important about these pieces of iron either in thickness or width, and each maker may choose what is handiest to him. If it is all the same, he may as well use pieces of about the thickness of a shilling and about an inch wide. The proportionate length can easily be estimated by reference to Fig. 1. It must be understood that two of these pieces of iron are required for each cramp, and that they are connected by two pieces of iron rod. One of these engages in the notches, and the other goes through the sliding-block. In thickness the rods may very suitably be about $\frac{3}{16}$ in. to ¼ in. thick, but this is immaterial provided they are strong enough. At each end a shoulder should be turned or filed, the distance between the shoulders being exactly equal to the thickness of the bar. As cabinet-makers are not expected to be proficients in metal-working, Fig. 6 is a representation of one of these pieces of iron.

Holes must be bored through the thin pieces formerly mentioned to fit on to the ends of the connecting pieces, which can easily be fastened in place by riveting, but before this is done the hole must be made in the sliding-block and the iron pin run through it.

Having arrived at this stage, it will be seen that the sliding-block can be moved easily up towards the fixed head, but that when pressure is brought to bear on it from this direction the notches underneath prevent it being pushed back further than is desired. Its action is so simple that surely nothing more need be said about it.

The screw itself will be all the better of a little attention. The first thing that may be objected to about this, if it is a new one, is stiffness in working. This can easily be remedied by rubbing it with a mixture of ordinary blacklead and—no, not oil, for this is apt to cause the wood to swell, and so increase the defect we are trying to remedy—soft soap. This forms an excellent lubricant for the purpose, and may be a wrinkle worth noting by those whose wooden screws of any kind work too stiffly.

It will also be advisable to put an iron point at the end of the screw. Only a small one is necessary. If it projects ¼ in. it will be quite sufficient, and it should be sharp. The easiest way to make and fix the point is to screw a nail into the end of the wood, cut its head off, and then file down fine and thin. A piece of brass tubing put on the end of the wooden screw, the thread of which must be cut away for half an inch or so, completes the cramp, the manner of using which is so evident that nothing need be said about it.

A cramp made as described will be found quite equal for practical purposes to an iron one costing twelve shillings or more. "What will the cost of this wooden cramp be?" "Well, I can't say exactly; but if you wish to make one you can reckon this up as easily as I can, and from the same sources of information—viz., the tool-shops and timber-yards."

HOW TO MAKE A QUARTER HORSE-POWER STEAM ENGINE.

BY F. A. M.

INTRODUCTORY—SIZE AND POWER OF THE ENGINE—TIME REQUIRED TO MAKE IT—HOW TO GET HELP WHEN IN DIFFICULTY—A COMPARISON OF STEAM, GAS, HOT-AIR, AND WATER MOTORS, WITH THEIR COST AND RELATIVE CONVENIENCE—WORK AND POWER, WHAT THEY ARE—POWER OF ANIMALS AND OF MAN—WHAT IS A MAN-POWER?—WHAT IS A HORSE-POWER?—CONNECTION OF ENGINE WITH LATHE—CALCULATION OF THE POWER OF OUR ENGINE.

Introductory.—The engine about to be described is believed to be of convenient size for driving the turning lathe, etc., in an amateur's workshop. Although it is called a quarter horse-power, some would probably reckon it at a half horse-power; it might be either, according to the pressure of steam employed and the speed at which it runs. At any rate, it will be of about twice as much power as the amateur himself, and it will therefore drive any machine he could drive, together with the shafting required to convey the motion from the engine to the machines. The engine, too, is of a very manageable size, with no large or awkward work about it; anyone who has a 5 in. gap lathe will be able to do the whole of the work himself, whilst, if his lathe is of smaller capacity, he will probably be able to do all but turn and bore the fly-wheel.

The construction has been simplified as far as possible without interfering with efficiency, and the engine should be a really useful motor, which will wear well even when put to hard work. Besides, it will form an excellent opportunity for practice with lathe and tools and for learning some of the laws of mechanics.

Before going further, lest any reader should be led to undertake too lightly the task of constructing this engine, without having "counted the cost" in time and trouble, let us pause and consider what amount of labour we are about to undertake. It may, perhaps, be admitted that there is in the complete engine about £9 worth of labour by a workman whose time might be worth, say, 30s. per week of six full days of eight hours each. Now, 30s. per week is £3 per fortnight, and therefore £9 would pay for six weeks' work or thirty-six days, or 288 hours. Let us suppose an amateur would take 360 hours; then, if he works on an average three hours a day, it will take him four months, and if he works but two hours a day it will take him half a year. Let no one, then, begin with an insane desire to see the work finished, but let them first consider whether they will give the requisite time and trouble, and then work away steadily, determined simply to do each part thoroughly well, and then there will not be many disappointments.

If a reader, having already acquired some little practice in the use of metal-working tools at the lathe and vice, still feels afraid to undertake such a piece of work, he may probably be able to get assistance in one of the two following ways. First, he may be able to find a small working engineer's shop within reach, the master or foreman of which would be willing to give him lessons for one or two hours at a time in the evenings, when work is over. One or two such evenings a week would be a great help to an amateur, who would bring the difficulties he had encountered in his work at home for explanation, and would profit by the extra facilities in the way of tools, machines, etc., afforded by the engineer's workshop, and learn thus how best to complete his own stock. Or, secondly, the amateur might call in a workman occasionally, of an evening, to teach or help him at home. Such lessons might cost from 9d. to 1s. an hour. Of course it will be our endeavour to make such assistance unnecessary by describing every process and operation as clearly as possible; still, there are always some things more easily learnt by a little "showing" than by any amount of description. The workman, however, should not be allowed to do the work himself, but rather to stand by and show the amateur how to do it.

A Comparison of Workshop Motors.—The steam engine is not the only motor the amateur may employ to drive his lathe. He may use a gas engine, a hot-air engine, or a water motor; and as each of these sources of motive power has its advantages and disadvantages, a word or two by way of comparison, to enable the reader to choose between them, may be acceptable at this point.

We begin, then, by comparing each of the forms of motor as to their first cost, and we will put the engine we are about to describe as worth (to buy) about £12, and its boiler about £12—say £24 complete. A *gas engine* of the ordinary non-compression type, such as the Bisschop, of two man-power, costs £33. It has no governor, and it may do tolerably well without. There is a small Otto engine in the market, with a governor, for £32, and it runs very silently, whilst the ordinary non-compression kind make a very disagreeable thump, not pleasant to have in a room in a house. A *hot-air engine* will run silently, but it is large and bulky; a quarter-horse costs £35. The *water-pressure engine* may be made with a cylinder and piston, or like a small water-wheel in a case, a jet of water being arranged to impinge upon the floats, like the "Thirlmere" of Messrs. Bailey of Salford. This last would cost but £3 10s., and it is very silent and easy to regulate by hand.

We will now compare the expense of running the four kinds of motor. That of the first three will be very small—about a shilling for a whole day's running. The water engine, however, if run from the town mains, will prove so expensive as to put it out of the question, except in those cases where there is a natural supply of water, under pressure, available.

There are two other considerations which we can take together—namely, in how much time can we start each motor, and how much attention will they require to keep them going? The steam engine here appears at a disadvantage: it will probably take twenty minutes to raise steam ready for starting, and all the while the engine runs, the workman must keep it in mind, and see that neither fire nor water gets low; for the first would cause a stoppage and the second might bring an explosion. Coal must be put on the boiler furnace about every fifteen minutes, and though gas may be employed for fuel, it would probably cost about four times as much to heat in that way. The feed-pump will be set to supply water to the boiler at about the same rate as that at which it evaporates, but this will not obviate the necessity of watching the water-level in the glass water-gauge, to make sure all is right. The *gas engine* can be started in a minute, and but for an occasional oiling it requires no further attention; it makes a disagreeable noise unless it be of the compression type, and that is expensive. The *hot-air engine* will require about fifteen minutes to heat up before it will start, after which it requires but little attention more than a shovelful of coal or coke every half-hour or so; it is bulky and rather expensive, but makes no noise. The *water-engine* is by far the best motor for the amateur; it has but one disadvantage—the cost of the water. With the usual price of 1,000 gallons of water at 1s., the cost of obtaining two man-power comes out about 2s. an hour—more than it would cost to employ two men to turn a wheel! But where there is a natural fall of water to be obtained, then by all means have a water motor: it has no smell, gives out no heat, requires no attention, makes no noise, is started and stopped in an instant, and if the workman left it running he would find it running still when he returned, provided it was not worn out!

In spite of all that has been said in favour of the other three motors, the steam engine is not to be despised. It is quieter than the gas engine, more compact than the hot-air engine, cheaper than either, and better understood; moreover, it can be made by the amateur himself. But, before we begin to describe its construction, we must first give some notions of

Work and Power.—"How many horse-power is it?" must, of course, be the question whenever we have to do with anything in the shape of a steam engine. But, first, what is a horse-power? "Oh, the power of a horse," people say, and they seem to fancy that if one took a locomotive of 100 horse-power, and tied 100 horses behind it to pull it back, that the two forces would be equal. But no, there is much more in the question; and we shall never grasp this expression unless we understand that horse-power, like man-power and every other power, *is composed of three elements.*

The *first* element is *resistance* or *pressure*, such as that of a weight.

The *second* element is the *space* or *distance* through which the resistance is moved.

The *third* element is the *time* occupied by the movement.

Suppose a man walk along the ground pulling a rope, and let the rope pass over a pulley and down a well, being attached to a bucket of water or other weight. Let us further suppose that the weight is such as to require all the strength a man can continuously exert. First, let him *stand still*, holding the weight suspended. What power is he now exerting? One man-power, do you say? No, indeed; no power is exerted nor any work done, because there is no distance moved nor space covered. Here we have only one element—resistance or pressure. Secondly, let the man now move slowly forwards, drawing up the weight as he goes, and what have we now? *Two* elements—pressure and space—and these two form *work* which can be measured, and is usually reckoned in *foot-pounds.* For instance, the bucket might hold four gallons of water, weighing together 40 lb., and the man might move forwards 10 ft.; then we should say he had done work represented by 400 foot-pounds. A foot-pound is the amount of work required to raise a weight of 1 lb. one foot high. To obtain in any case the number of foot-pounds of work exerted, we have only to multiply the weight *in pounds* by the space moved *in feet.* Notice, then, that the man would have done the same amount of work if he had raised 10 lb. 40 ft. high, or 1 lb. 400 ft. high, or 400 lb. 1 ft. high. Can we now reckon this work in horse-power or man-power? Not yet; for, observe, we might have told the man to exert his utmost strength and seen him pull up the weight in a moment; or we might say, "Take it easy," and have watched him, leaning gently on the rope, bring it up in a minute, when the power would evidently have been different. This brings us to the *third* element of power—*time.* Work is composed of only two elements, pressure and space; we cannot tell how much power is required to do a given amount of work unless we know in how much time it must be done. A man with a small pump can fill a tank as well as a steam engine if we give him plenty of time; in both cases the same weight of water will have been raised through the same space, and therefore the same amount of work will have been done, but if the work be done in one-tenth of the time by the steam engine, then the engine will have been exerting ten times the power of the man. It only remains to say, the element of time adopted is one minute.

When James Watt made his engines for raising water, it was stipulated that they should be able to do the work of so many horses. A steam engine is intended to produce power in return for a certain amount of coal, and, evidently, it is necessary to have some standard of comparison by which power can be measured; that standard is usually the *horse-power*—that is, the power required to raise 33,000 lb. one foot high per minute, which rule includes the three elements of weight, space, and time. It would amount to the same thing to say that a horse-power is the power required to raise 1 lb. 33,000 ft. high per minute; or, we might say, it requires one horse-power to do 33,000 foot-pounds of work in one minute. This is doubtless rather a high estimate of the power of a horse, which few horses could exert for more than three or four hours at a time; and here is inserted from "Molesworth's Pocket Book" another estimate of the power of the horse and of other animals (including the human variety), which they can exert continuously through an eight hours' day:—

	Lbs. raised 1 ft. high per min.
Horse	21,000
Ox	12,000
Mule	10,000
Ass	3,500
Man, as in rowing	4,000
Do., on tread-wheel	3,100
Do., turning a handle	2,600

3,000 foot-pounds per minute will, then, be about the power with which the amateur drives his lathe, going up to 4,000 for a short time when a hard piece of work must be done. As to what is a *man-power*, some allow five men to a horse-power, some six, some eight, and some ten. Until authority decides this point, we will assume to ourselves all the authority we can command, and state with the utmost decision that, so far as these articles are concerned, one man-power is, and shall be, that power which is required to raise 4,000 lb. one foot high per minute, making it about equal to one-eighth of a horse-power; so that we may call our engine either one-quarter horse-power, or two man-power.

Shafting required. — An independent workshop motor, whether worked by steam, gas, hot air, or water, will involve shafting and belting to connect the motor with the lathe and other machines to be driven; and as a lathe should properly be arranged to run both ways, forwards and backwards, the shafting is not quite such a simple matter as might be supposed. One way out of the difficulty is to make the engine with a link-motion reversing gear, and to bring the strap from the engine straight on to a pulley on the crank-shaft of the lathe; but this pulley and strap would be most likely in the way, and as the turner would have to go to the engine to move the reversing lever, he would not have that instant control of his lathe to which he was accustomed when using the treadle, and might probably get disgusted with his engine and go back to the old plan, for want of proper conveniences in the way of connections. He must have perfect and immediate control of the revolutions of his lathe, and be able to start, stop, reverse, in an instant, without leaving his work, or he will go back, for ordinary work, to his treadle again. Another way to avoid the shafting is to attach the engine to the lathe direct, and one may often see nowadays a powerful tool in an engineer's shop with a little engine of its own attached to it to drive it, so that it can run when all the main shafting is still. It would not be wise to attach a steam engine to a small light lathe, but to a good strong 5-in. centre metal turning lathe an engine may be fixed, either outside the right-hand standard or under the bed over the right-hand crank, and, when fitted with link-motion and the reversing handle brought up to the workman's hand, it will form a very convenient arrangement—self-contained, and therefore easy to remove, under complete control of the turner—whilst any other machine, such as the grindstone, might be driven from a pulley on the crank-shaft of the lathe. Thus no shafting or belting would be needed, and the steam and exhaust pipes would be led round the back of the lathe from the boiler. The plan is inviting, and working drawings have been made of it as suited to the writer's own 5-in. gap lathe (by Milnes of Bradford). However, considering that a special case such as that would not be so good to begin with, and also that a horizontal engine of the ordinary type would be more generally acceptable, these plans were abandoned for the present in favour of the more usual form, though it will involve the requisite shafting.

Calculation of the Power.—If the previous remarks on horse-power have been understood, this will not be difficult. We must begin by ascertaining the three elements of power—Pressure, Space, and Speed.

Pressure.—The pressure which drives the engine is the force in pounds with which the steam presses upon the piston, driving it to and fro in the cylinder; it is estimated in pounds per square inch. We will adopt a *maximum* pressure in the boiler of 50 lb. per square inch, and we must not reckon on more than an average of, say, 30 lb. per square inch in the cylinder. It will probably require a pressure of about 5 lb. per square inch to overcome the friction of the engine itself. To allow for throttling by the governor, friction of the engine itself, and other small sources of loss, let us take the average pressure on each square inch of the piston to be 25 lb. Now, the rule for the area of a circle is, square the diameter and multiply by ·78; the diameter of our cylinder and piston is 2 in.: $2 \times 2 \times {\cdot}78 = \text{area} = 3{\cdot}12$, say 3 square inches. Multiplying 3 square inches by 25 lb., we get 75 lb. for the average pressure on the piston, and thus establish the first element of the power.

Space and Speed.—The other two elements, space and speed, we will take together; and supposing that the engine shall be regulated by the governor to run 150 revolutions per minute, and since the stroke is $4\frac{1}{4}$ in. long, during each revolution the piston will travel a distance of two strokes, or $8\frac{1}{2}$ in.; multiplying $8\frac{1}{2}$ by 150 revolutions, we get 1,275 in., which divided by 12 gives 106 ft. travelled by the piston in *one minute.*

Now, we have only to multiply together our three elements, 75 lb. × 106 ft. × 1 min., to obtain 7,950 foot-pounds per minute as the power, near enough to 8,000, which we have decided to call two man-power, and not far from $\frac{33000}{4} = 8{,}222$, the true quarter horse-power. One pound more added to the average pressure per square inch would raise the 7,950 to 8,408.

A simple rule to obtain the approximate effective power of a small engine, such as that with which we are dealing, would be: Multiply the speed of the piston in feet per minute by the total pressure on the piston, and the result is the power in foot-pounds per minute; divide this by 4,000 and we get the man-power; divide by 33,000 and we get the horse-power—the effective pressure on the piston to be estimated at from half the highest boiler pressure to two-thirds.

It is hoped that this explanation of the way to obtain the power of a small engine will prove so simple that every amateur engineer will thoroughly understand what work is, what is power, and how to calculate them. It only needs to be stated that we have been dealing solely with *actual effective* power and not with "nominal" power, which latter is an arbitrary or commercial term of no interest to the amateur.

OXFORD FRAMES.

BY F. CROCKER.

SETTING OUT—REBATING—SIMPLE TOOLS FOR REBATING—CHAMFERING—PUTTING TOGETHER.

MOST wood workers, both professional and amateur, have at some period in their career tried their hand at Oxford frame making, and in most cases have found out that it was not as easily done as they at first supposed.

To make a good frame requires skill and taste, for, like everything else, to be satisfactory it must be made well, and the plainer it is made the better should be the workmanship.

The object of this paper is to describe a few varieties of the Oxford frame and how to make them (or at least how I should do it) without going into minor details, such as planing and sawing, which have been dealt with in other articles.

Having procured our timber we commence to make our frame. We will suppose, by way of illustration, that it is to be made of oak, for a picture 10 in. by 7 in. This will require four pieces, two being 14 in. long, $\frac{5}{8}$ in. by $1\frac{1}{8}$ in., and two 11 in. long, also $\frac{5}{8}$ in. by $1\frac{1}{8}$ in. I prefer Baltic to English oak for the purpose, as it is more easily worked, and in small pieces looks quite as well.

Face and edge, gauge and plane to size, then set out two pieces with a $6\frac{1}{2}$ in., and the other two with a $9\frac{1}{2}$ in., opening (this allows for a $\frac{1}{4}$ in. rebate); mark round each piece with the scriber or pencil (perhaps the latter is best, as the scriber, if not carefully used, leaves a deep mark, which has to be planed or scraped out) and square; put one on the other as shown in Fig. 1 and mark for halving, taking care that the members of the frame which are upright go right through on the face. Halve together in the usual manner, and we are ready for rebating.

Now, perhaps, a few words as to the easiest method of doing this will not be out of place. The best tool for the purpose (supposing we have no machinery) is a fence router such as a coach builder would use. One of these would cost from 4s. 6d. to 5s. 6d., therefore are out of the reach of the ordinary reader. Some use a rebate plane or fillister, but in that case the rebate is carried right through and filled up at the end by gluing a piece in after the frame is made. Unless the wood be very hard the rebate may be made with a cutting gauge. The ordinary cutting gauge will not be of much service for the purpose, but if the reader will make one as I am about to describe, he will find it useful for this and a great many other pieces of work where a stopped rebate is required. It will also be found useful for cutting off a number of parallel pieces of thin wood.

Procure two pieces of ash or beech, one 2 in. by $1\frac{3}{4}$ in. and $6\frac{1}{2}$ in. long (A, Fig. 2), the other $\frac{7}{8}$ in. by $1\frac{1}{8}$ in. and 6 in. long (B, Fig. 2). The sketch, Fig. 2, will describe the method of putting together; A is mortised to receive B, which may be driven backwards and forwards as in an ordinary gauge and fixed securely in any position by driving in the wedge, C. The cutter, D, is made out of a broken $\frac{1}{4}$ in. chisel or piece of steel, and is secured by means of a wedge shown in section (Fig. 3). A recess is made at E, Fig. 2, to allow the cutter to work close for a narrow rebate. It is rather an awkward-looking tool, but those who test its usefulness will pardon this. It is used as an ordinary gauge would be, but as the work is harder the tooth requires guiding with the finger and thumb of the left hand. In some cases you can take this piece completely out by gauging on both sides, but in others you have to use the chisel. A boxing router, or old woman's tooth, will be found useful for clearing out the rebate. A simple one, made out of a piece of wood and a chisel blade, is shown in Fig. 4. This is another tool which will be found useful for a variety of purposes, and will soon pay for the small amount of labour spent in making it. In fact, the rebate may be made with this tool alone by screwing a piece of wood on the face of it to act as a fence.

We now come to the most important part of our frame—viz., chamfering. Various tools are used for this, such as the drawing knife and spokeshave, but I prefer a sharp paring chisel, and a bull-nose or thumb plane. Some would use a pocket-knife and a bit of glass, but I hope the readers of WORK have got beyond that stage.

In Fig. 5 two of the commoner methods of chamfering are shown. Figs. 6 to 10 show various methods of finishing. Fig. 7 may be marked with a coin; the others will require a cardboard or veneer templet. In the centre of the rails a diamond is sometimes left (Fig. 6), or the pattern at the

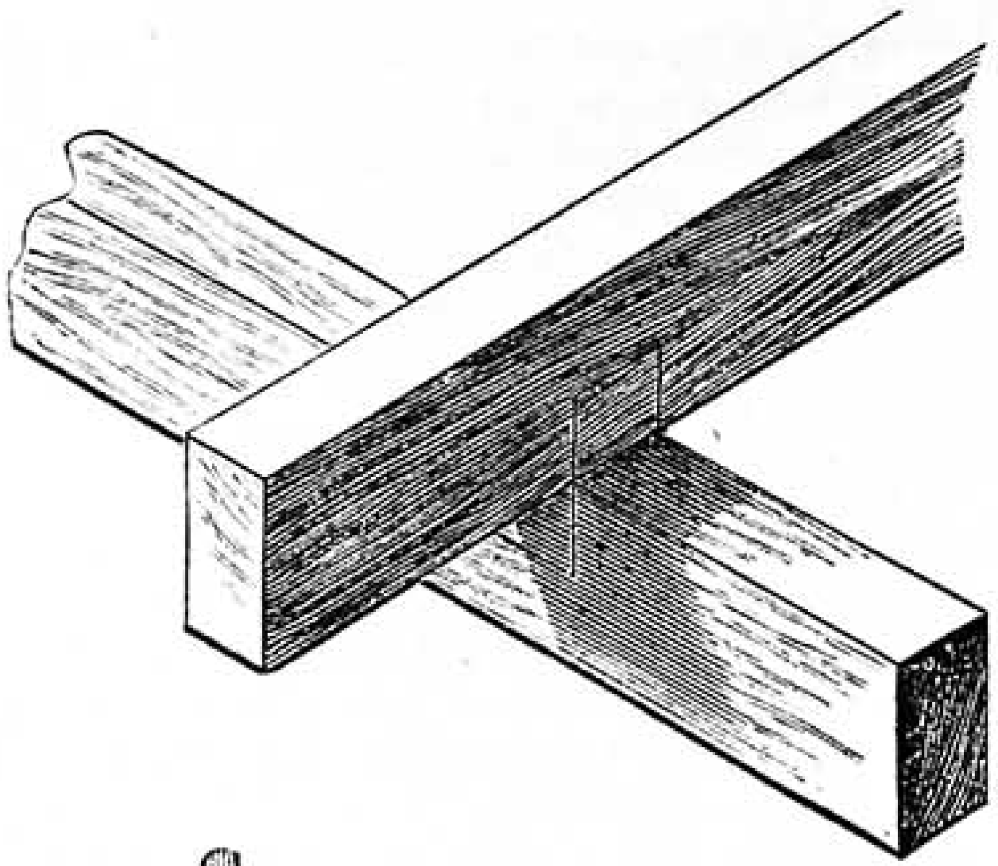


Fig. 1.—Diagram showing Method of setting out Halving.

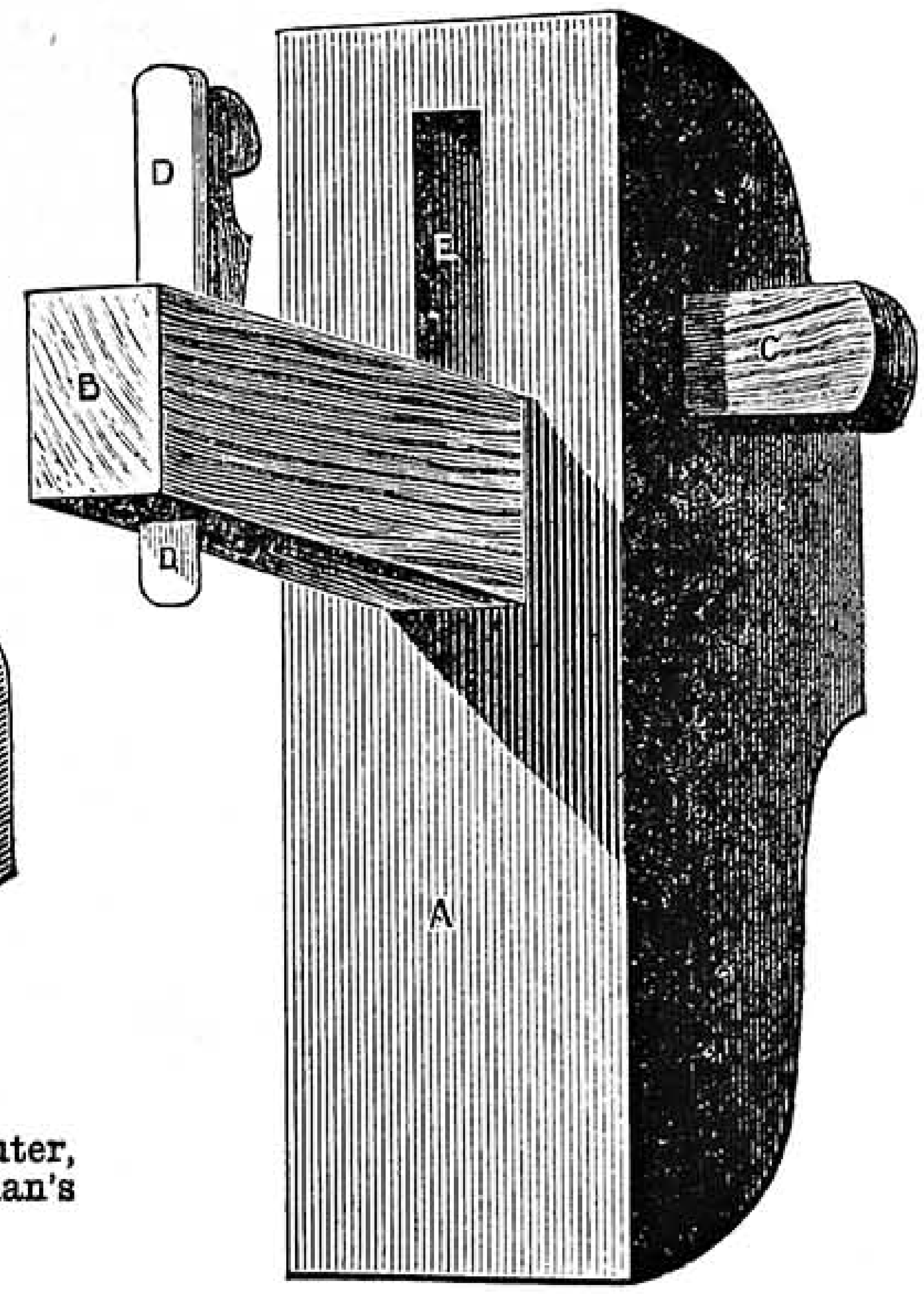


Fig. 2.—Cutting Gauge for Rebating.

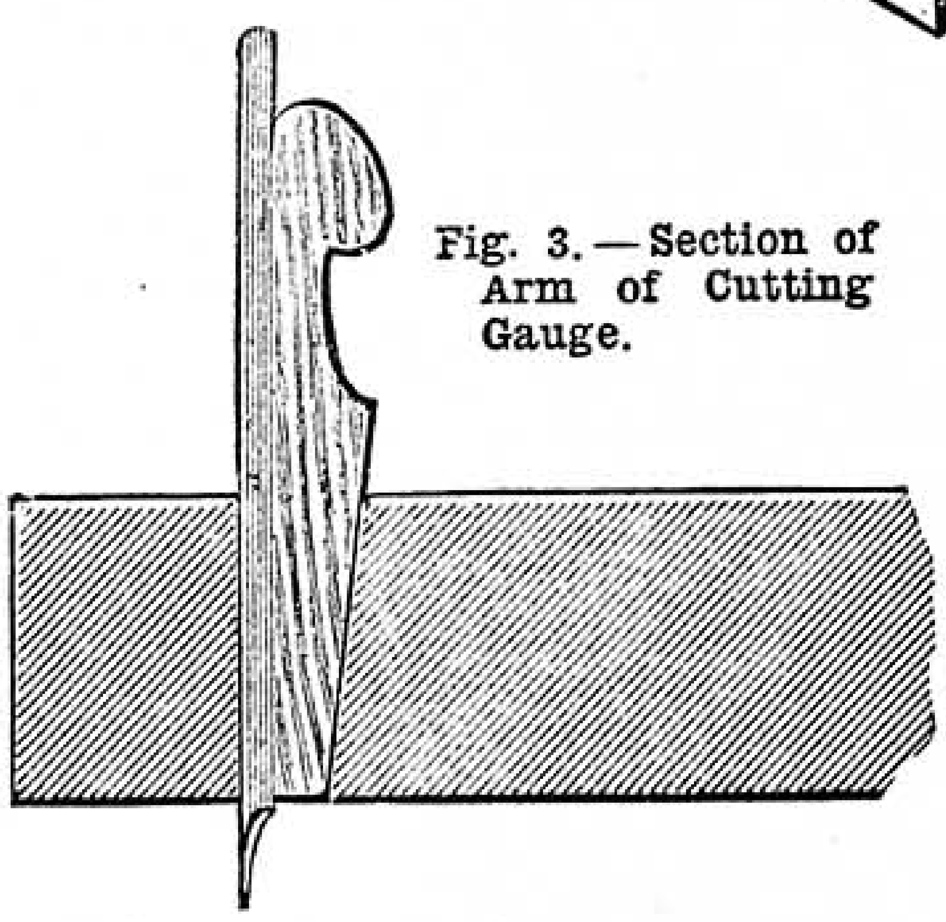


Fig. 3.—Section of Arm of Cutting Gauge.

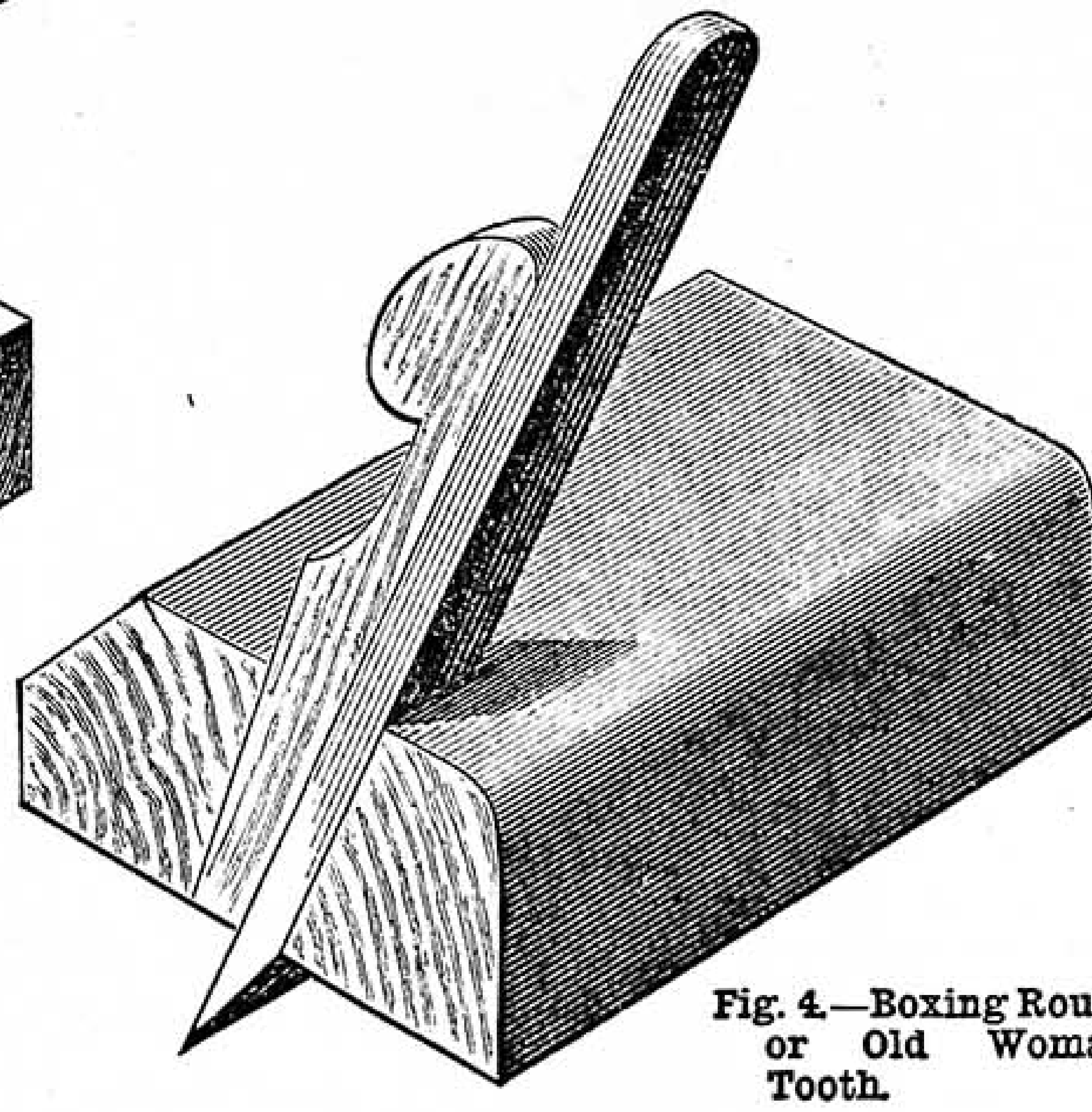


Fig. 4.—Boxing Router, or Old Woman's Tooth.

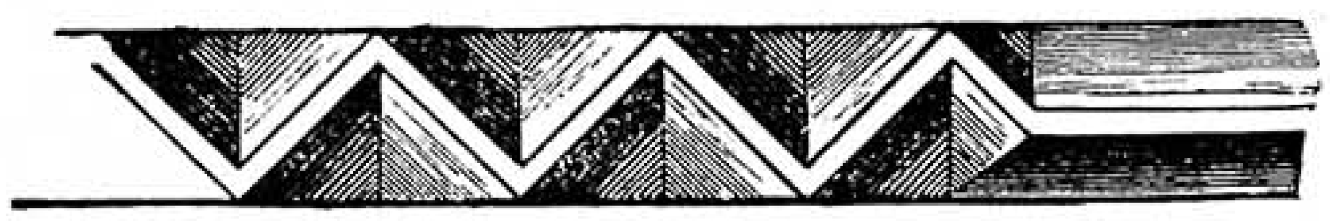


Fig. 11.—Zig-Zag Ornament to vary Chamfer.

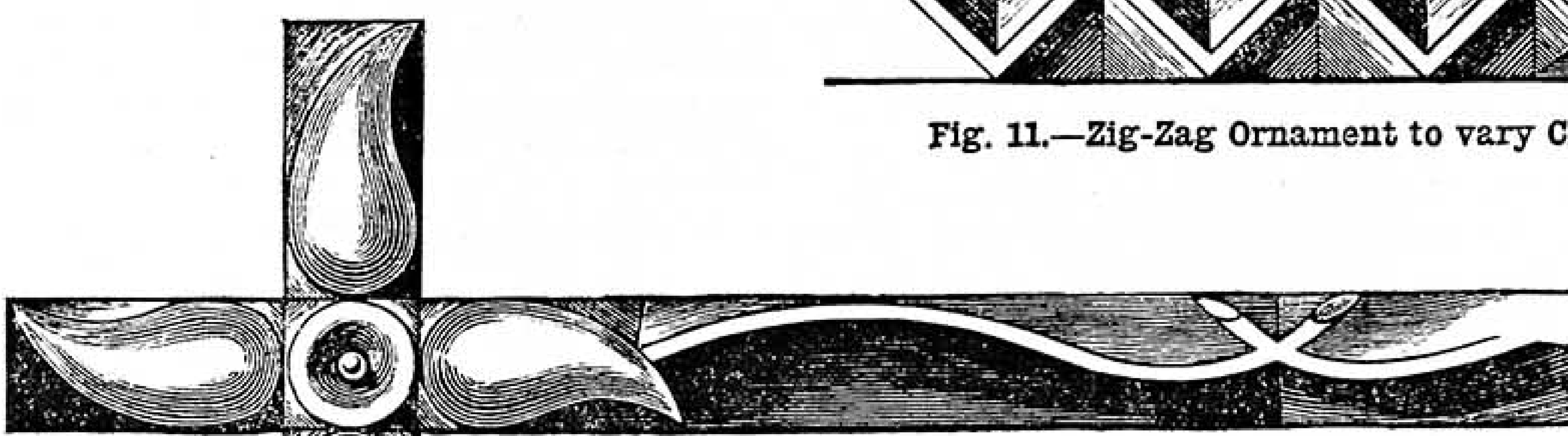


Fig. 10.—Design for Corner of Frame.

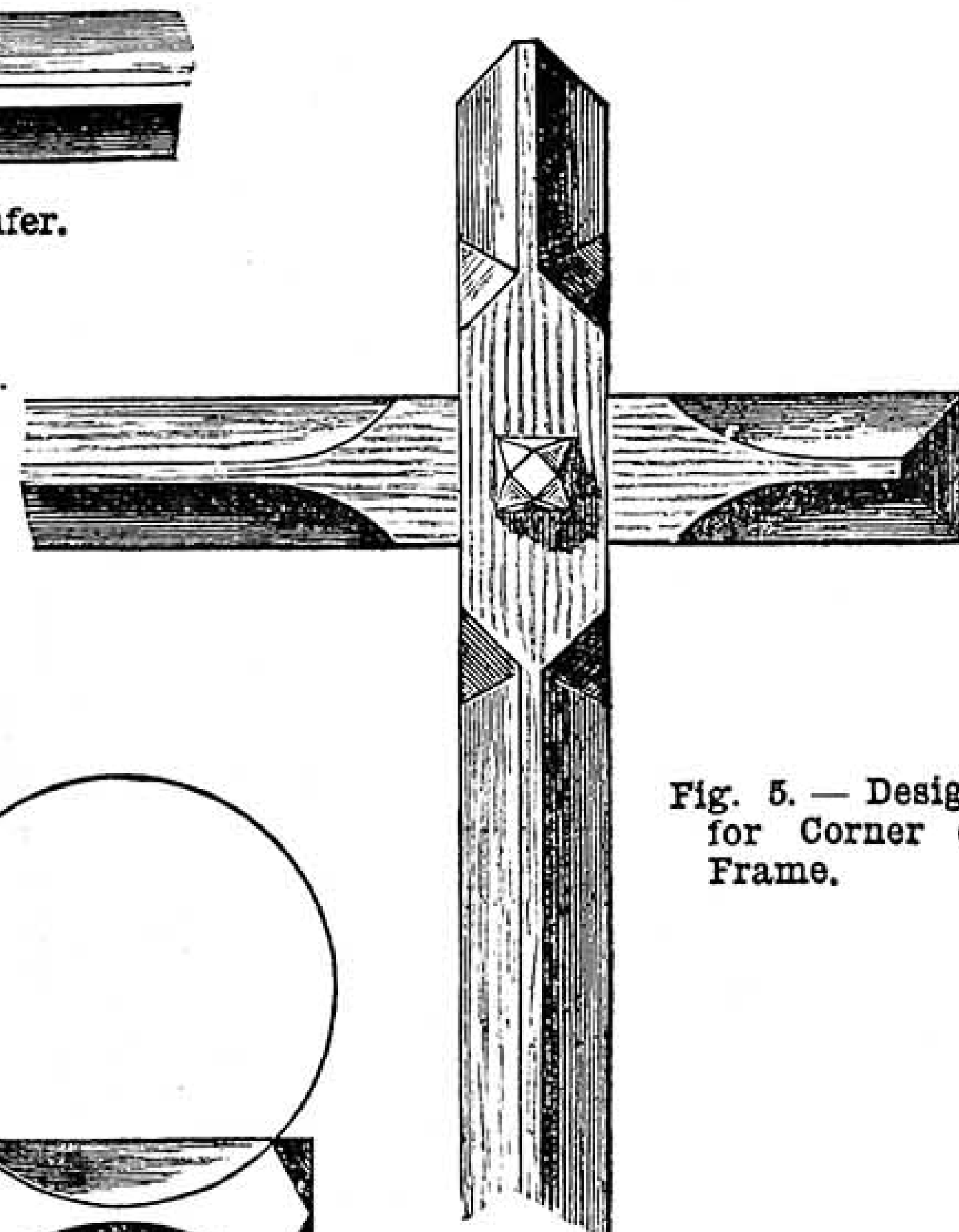


Fig. 5.—Design for Corner of Frame.

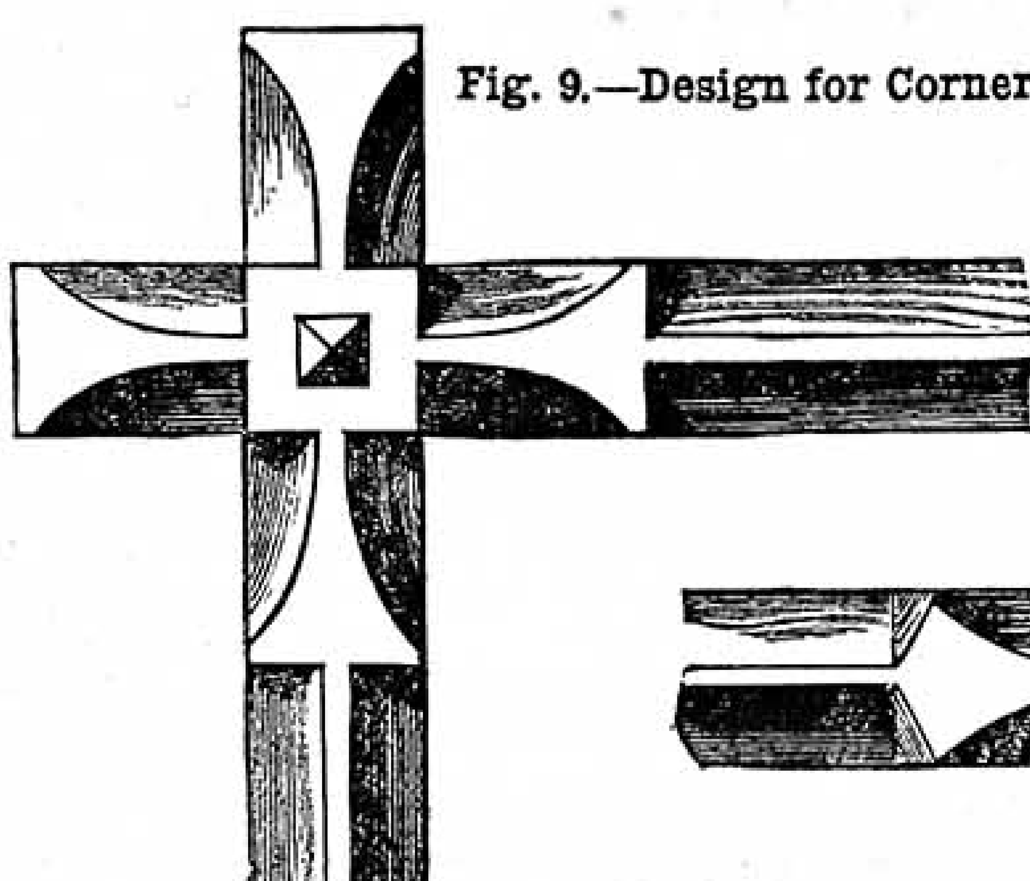


Fig. 9.—Design for Corner of Frame.

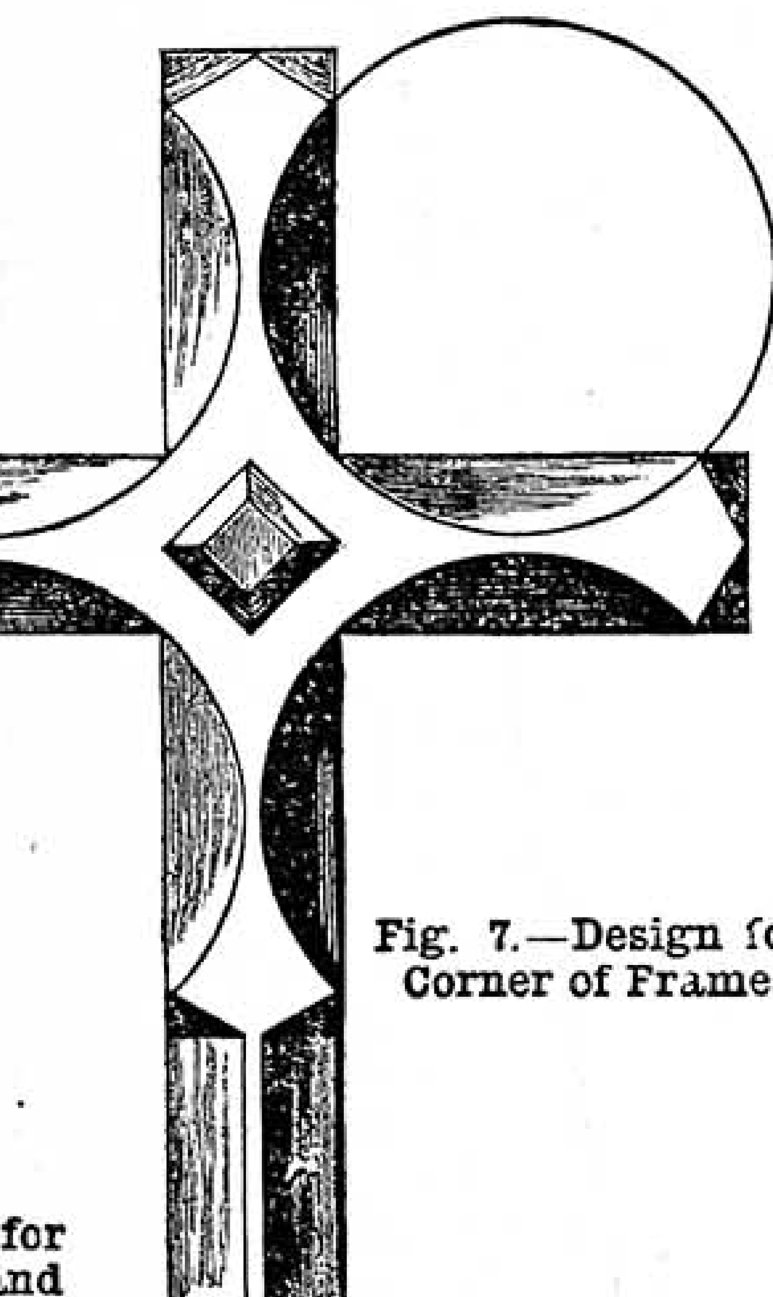


Fig. 7.—Design for Corner of Frame.

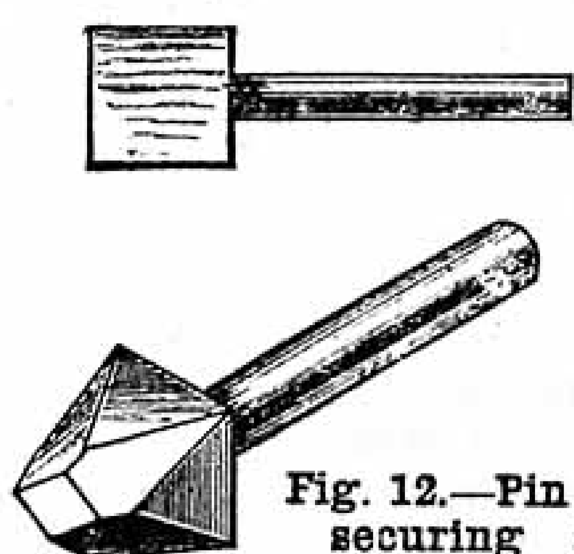


Fig. 12.—Pin for securing and finishing Corner.

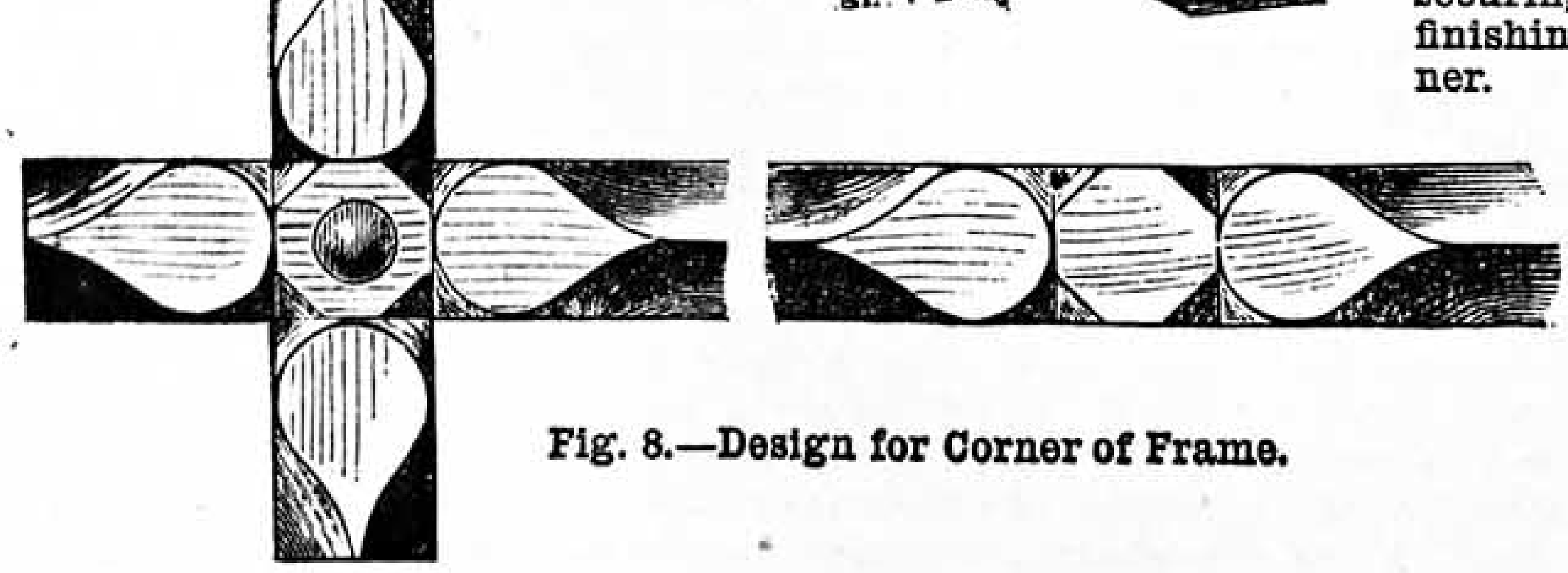


Fig. 8.—Design for Corner of Frame.

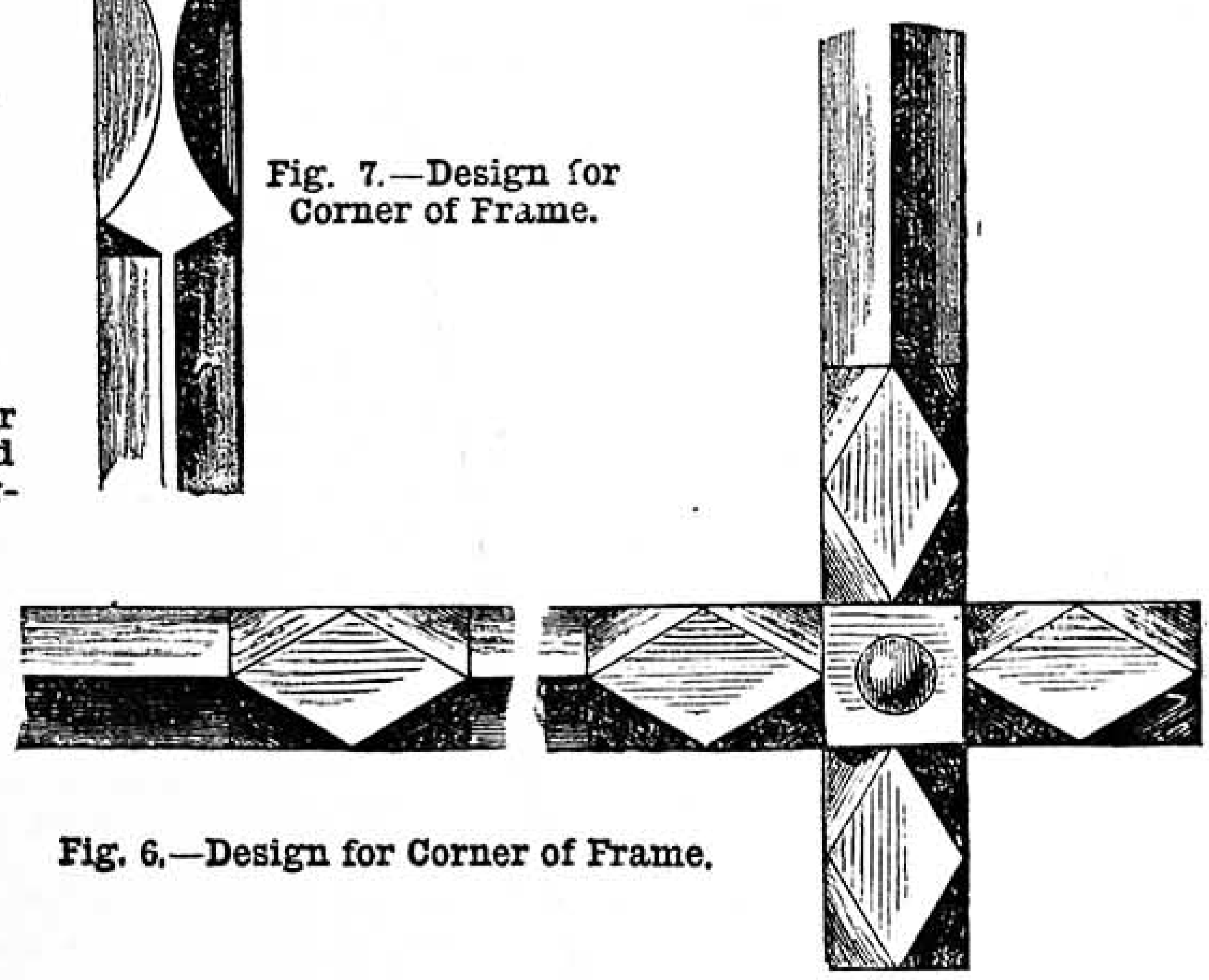


Fig. 6.—Design for Corner of Frame.

corner may be repeated (Fig. 8). Fig. 11 shows a method of varying the chamfer with a zig-zag made by notching a piece out on each side with the chisel. I merely give these as suggestions; other methods may be hit on without much trouble.

An important point in finishing is to avoid the use of sand-paper as much as possible, it takes the sharp arrises off, and makes the work look slovenly.

After chamfering, the frame may be glued together, but if you are not used to it glue has a peculiar knack of getting into the corners and leaving an unsightly brown stain.

For my own part I prefer putting the frame together, boring a ⅛ in. hole in the centre of each corner, and fastening by means of a rosewood or black oak pin as shown in the sketches. This pin goes right through and is glued in. Fig. 12 shows the method of making this pin. The head is first made square, then the corners are taken off with a chisel. Occasionally a conical-headed one is employed, which may be turned. Different forms are shown in the various figures. Some finish the corners with a brass-headed nail, but I think this gives the frame a poor appearance.

I do not think it necessary to say anything about the final processes of varnishing and putting in the picture and back—these are minor details; but if there is any point on which I am not clear, I shall be happy to answer any questions in "Shop."

MEANS, MODES, AND METHODS.

The Editor will be glad to receive communications for this department of WORK. There must be few who, in the course of their experience, have not picked up many a hint and wrinkle which they have found to be useful to themselves in the prosecution of their respective trades or hobbies. Those who have thus got hold of "something worth knowing" are requested to make a note of it and pass it on, that it may be put into general circulation and so prove helpful to many.

Reliable Cement for Lamps.

Powdered alum forms a simple, while at the same time thoroughly reliable, cement for attaching the brass rim to either glass or earthenware lamps.

The mode of procedure is as follows:—

(1) Thoroughly clean both rim and neck of lamp from everything of a greasy nature.

(2) Invert the brass rim, and fill its cavity with powdered alum, and place on the top of a hot range or stove.

(3) When the alum begins to get pasty (*not liquid*) with the heat, insert the neck of the lamp, press firmly into place, and remove the whole from stove, and set aside to cool. In about five minutes the lamp will be ready for use. The cement is thoroughly reliable, the oil apparently having no effect whatever upon it, and has the advantage over plaster of Paris that a lamp can be set and ready for use within five minutes, and if the vessel should meet with an accident, the rim can again be removed by re-heating, and adjusted to another vessel without all the trouble usually associated with such a job. W. H. W.

Trueing a Buckled Circular Saw.

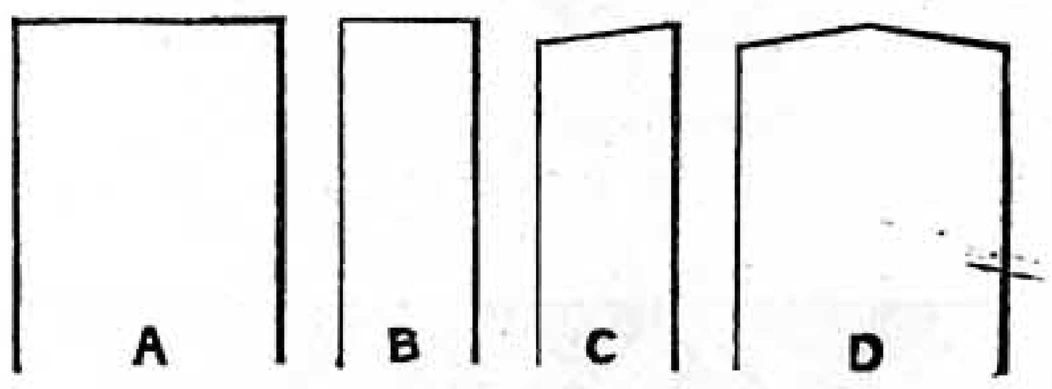
The following method I have seen used with success:—Immediately the saw commences to run wild, lift the wood you are sawing off the bench, and take a block of wood some 3 in. square, and rub the "end grain" against the side of the plate, moving it backwards and forwards with a firm pressure against the saw. *You must do it while the saw is warm,* so do not stop it. TURNER.

Boring Square Hole with Centre-Bit.

This is a workshop trick, and done in the following way:—Get a piece of stiff paper and fold it once, and put the folded edge up between two pieces of wood, say 1 in. thick, 3 in. wide, and 6 in. long. Pinch them altogether in bench screw, then with a centre-bit—say 1 in. bit—bore down (putting the point of bit into the paper between the wood) ½ in. deep. On taking out paper and unfolding it, a square hole will be found in it. H. H.

Trimming Flat Lamp Wicks.

As all those who burn oil lamps must be aware, a lamp wick of the flat variety should not be cut perfectly flat across, but should be slightly higher in the middle. To do this is generally a difficult task, especially



Trimming Flat Lamp Wicks—A, Wick; B, Wick doubled before cutting; C, Wick doubled after cutting; D, Wick trimmed complete.

after the wick has been some time soaking in oil; but if, instead of cutting it from side to side, the wick is first doubled down the middle and then cut through the two thicknesses towards the centre, a neat job will be the result. W. H. W.

OUR GUIDE TO GOOD THINGS.

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

2.—The "Frederick Crane" Chemical Company's Specialities.

Both professional and amateur brass and other metal workers and finishers will be glad to hear of some new lacquers and substitutes for lacquers which, while fulfilling all the requirements of the old form of lacquers, are easier of application and superior in results. Such will be found in the specialities manufactured and supplied by the "Frederick Crane" Chemical Company, 22, Newhall Hill, Birmingham. The defects of ordinary lacquer are well known, and also the difficulty of applying it in many cases, especially on large surfaces, amateurs especially finding that after they have completed a nice piece of brasswork, the lacquering of it often presents an insuperable difficulty. The lacquers manufactured by the above firm are called "Zapon," Brassoline, and Ferroline. The most important of these is zapon. This is a perfectly colourless, transparent enamel, which can be applied either by "dipping" the article in it or by brushing it on in the same manner as ordinary lacquer, with the exception that heat is not a necessity. It sets perfectly smooth, and is very hard and not easy to scratch; it also has the property of drawing up its own drip. From experiments that I have made with it, I can confidently recommend it, and bear out the statement of the manufacturers that an amateur is more likely to make perfect work with zapon than a skilled workman with lacquer. It is also claimed that articles coated with this lacquer or enamel will stand any climate, are proof against flies or other insects, sea air, salt water, and noxious vapours—qualities which certainly recommend it as being most valuable for export trade. The prices of zapon are as follows:—zapon, for dipping (colourless), 21s. per gallon; brush zapon (colourless), 21s. per gallon; diluting liquid, 15s. per gallon; brush zapon (gold colour), 21s. per gallon.

Brassoline.—This is also a capital lacquer. It is worked like ordinary lacquer, but is superior to it in many respects. For instance, it will not cloud, however damp the atmosphere; it is perfectly waterproof; all brush-marks smooth out in drying; and the loss by evaporation is small. No heat is required, and therefore the novice can use it as well as the professional. It is made in several varieties, the most useful being gold, and antique brass. Price in each case, 12s. per gallon; thinner, 8s. per gallon. Short as is the time that these lacquers have been in use, they have gained a good reputation, being used by some of our leading firms in the brass goods line, notably Messrs. Benham & Froud, Evered & Co., Tonks, Limited, and many others, who speak highly of it.

Ferroline is a lacquer or preservative for ironwork and bright steel goods, useful for ironmongers and others who keep a stock of bright iron and steel goods, and who will appreciate an article that will obviate the necessity for the constant care and looking after that such a stock involves. It can be applied with or without heat, with a brush or by dipping. It is clear and transparent, and does not change the colour of the articles to which it is applied. Prices as follows—

Ferroline, Grade KK	per gall.	12s.
" " thinner	"	8s.
" No. 30	"	5s.
" " thinner	"	5s.
" Grade HH	"	5s.
" " thinner	"	5s.

KK is the hardest and finest; No. 30 is not so hard, but has a heavier body than KK, and is especially designed for articles to be much exposed to atmospheric influences. HH is like No. 30, but thinner, designed for cheaper class goods.

Several other articles are also manufactured by the firm, amongst them being a Japan termed Negroline, in black and brown shades; Enameloid, a dead black for iron, brass, tin, or zinc; and Protectaline, a negative varnish for photographers. These I have not tried, but if they are equal to the before-mentioned, they will be found useful for those requiring such things. I might say that smaller quantities can be obtained, and should think that ironmongers and others who cater for amateurs and mechanics requiring such things would do well to stock these specialities.

3.—"Success, and the Way into It."

I have received a small pamphlet bearing this title from the Secretary of the Y.M.C.I.S., or, to give the name in full, the Young Men's Christian Industrial Society. Further, the address of the Secretary is 51, Old Bailey, London, E.C.; and from him all information respecting the Society and the establishment of branches may be obtained. It seems to be an attempt to bring about a combination of prayer-meetings and technical teaching as being, in the eyes of the promoters, the most likely arrangement to help our young men onwards and upwards. Surely there is a time for all things, and this being so, it seems neither desirable nor necessary to resort to this commingling of things sacred and secular. The promoters of the idea regard with suspicion the Volunteer Movement, Science and Art Classes, the Lecture Hall, the Club, the Public Bath, and the Gymnasium, as tending to deteriorate rather than improve young men. Most people entertain a contrary opinion.

THE EDITOR.

SHOP:

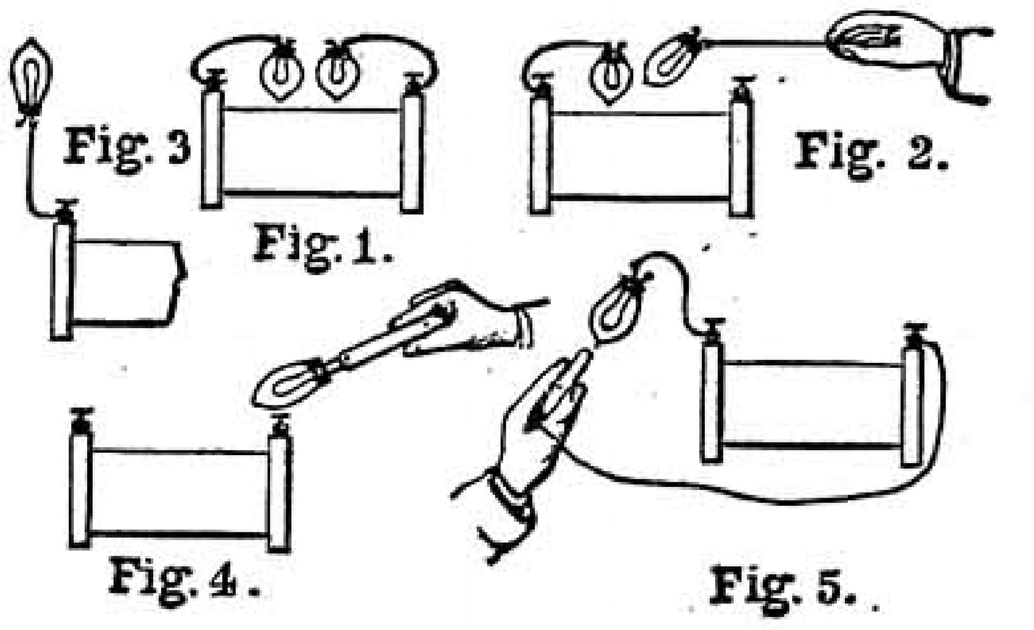
A Corner for Those who Want to Talk It.

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

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

I.—Letters from Correspondents.

Experiments in Electricity.—H. A. H. (*Tunbridge*) writes :—"The following experiments were published in the *Electrical Review*, and appeared originally in a foreign scientific journal :—(1) 'By attaching two curved wires—each supporting an incandescent lamp—to the terminals of the secondary circuit of a Rhumkorff coil (Fig. 1), we observe an approximation of the two lamps at the moment of the passing of the current. The phenomena is particularly marked at a distance between the lamps of from three to five millimetres. Care must be taken that the supports shall be very flexible, and for this purpose a copper wire one millimetre in diameter, and insulated with gutta-percha, will be very suitable. It is likewise important to avoid direct sparks between the lamp sockets. It is necessary to the attraction that there should be a discharge traversing the lamps and compelling the approximation. (2) By suspending one of the lamps (Fig. 2) and holding the other in the hand, the attraction between them will be the same. (3) A lamp placed upon the terminals of a Rhumkorff coil (Fig. 3) will become luminous, and it will be only necessary to approximate a lamp to a terminal to obtain gleams of equal brilliancy (Fig. 4). (4) Suspend a lamp by a flexible wire to one terminal (Fig. 5), and approximate to it any point in connection with the other terminal, and an attracted and sustained gleam will be observable.' Knowing that the current from the secondary circuit of a Rhumkorff coil partakes of the nature of frictional electricity, it occurred to me to try the experiments upon a Wimshurst influence machine, and I found that the experiments could be repeated upon it. Vacuum tubes can be shown also from a Wimshurst by connecting one end to one conductor, and the other end to the other conductor, and disconnecting the Leyden jars if it is found they retard the rapidity of the discharge. If instead of using the conductors they are taken away with the combs, the lamp will glow if held close to the glass plate while revolving. Vacuum tubes can also be illuminated by holding one end to the glass plate and taking hold of or touching the other end; indeed, the light ceases where the tube is held by the hand: it does not seem to make any difference to the illumination whether the platinum wire or the glass is held to the machine. I have also found that a momentary flash of light is obtained by rapidly approaching an excited glass or ebonite rod to a lamp or vacuum tube, and another flash by rapidly taking it away; in fact, a lamp or vacuum tube seems to act towards an excited glass or ebonite rod as a galvanometer does to an induced current in a closed circuit: upon approaching the rod there is a momentary flash, and all is dark; upon taking the rod away there is again a momentary flash and again all is dark. It is astonishing how little excitation a lamp or vacuum tube requires to make it show light; merely rubbing with an ebonite rod a piece of silk or a piece of cloth is sufficient. If you put either of them into an ebonite tube and rub the tube outside with any non-conducting material, they will show light, and after rubbing a minute or so, if the tube is tapped with the finger, they will light up opposite to where the finger touches. You may surround the vacuum tube with indiarubber, and place it in an ebonite tube, and the effects are the same as when the indiarubber is not there; the thickness of the dilectric does not appear to make any difference to the induction charges."



Electric Lamps and Terminals.

Model Electro-Motors.—Mr. George Edwinson Bonney writes :—"I regret that a mistake has been made in the illustration, Fig. 59, page 757, Vol. II., showing how to wind the F.M. cores of a Manchester dynamo. The winding on the right-hand core should be shown coiling round the core in the opposite direction to that shown in the illustration. I am very sorry such an oversight should have occurred, as I fear it will mislead some readers. Will you kindly publish for me an acknowledgment of my error?"

Window Cleaning. — H. B. S. (*Liverpool*) writes :—"Kindly correct two mistakes in my answer to C. T. (*Ashton-under-Lyne*) on page 766, Vol. II. of Work. The first is a vital one to the question. Instead of 'hydrochloric,' read 'hydrofluoric;' and instead of 'H. B. B.,' read 'H. B. S.'"

Erratum.—In the reply to J. S. (*Aberdeen*), Work, No. 100, page 780, on "Diamonds for Boring and Cutting Rocks," the word in brackets (carbonate) should have been "carbonado."

H.P. Formula. — W. H. T. (*London, S.W.*) writes :—"Puzzled (see page 718, Vol. II.) has fallen into an error by assuming that P. in the formula he quotes is the boiler or initial pressure. It refers to the average pressure throughout the stroke, which depends upon the point at which steam is cut off. The point of cut-off in the stroke being known, the average pressure can be obtained theoretically by formula, and practically by taking an indicator diagram. The engine in question no doubt cuts off steam very early in the stroke, and the expansion is very considerable."

II.—Questions Answered by Editor and Staff.

Sheet-Iron Stampings for Dynamos.—A. S. K. (*Sheerness*).—Sheet-iron stampings in any quantity may be obtained from vendors of dynamo castings, who will supply laminations for the armatures of dynamos made by them. The names and addresses of vendors of small castings may be found on pages 645, 678, and 766, Vol. II. of Work. Write to any or all of these, stating your requirements, and ask for estimates.—G. E. B.

Banjo Hoop.—Banjo.—You might solder the ends of a piece of sheet metal together, making it the exact size of outside diameter of wooden hoop and cutting it a little wider than the hoop. Slip hook inside metal, then hammer the metal over the edges of wooden hoop: this is a very primitive method. A properly made hoop has the edges spun over steel wires; the wooden lining is put in afterwards, making it fit tight against metal hoop by using a mould of wood or metal and by cramps. See the Nos. of Work for July 27, 1889; November 3, 1890; Nos. 70, 75, 79, 81, and 93 for other information. I can supply you with a hoop. You will find my address in the advertisement column.—J. G. W.

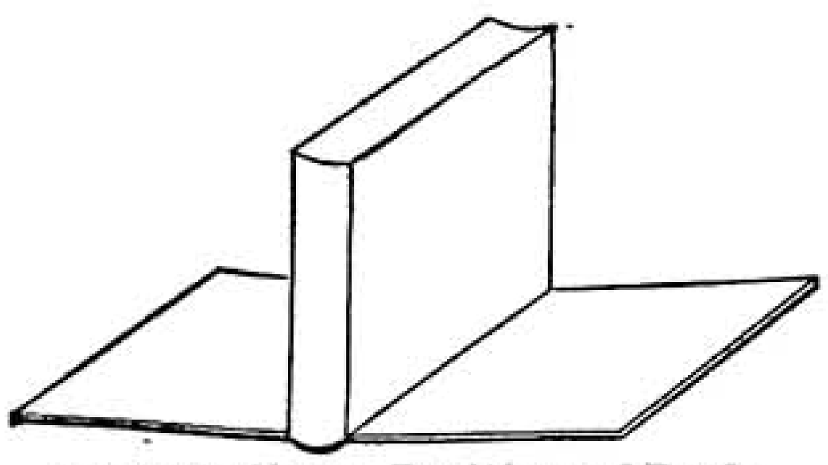
Inspectorship.—J. J. (*Argoed*).—The qualifications necessary to pass the examinations for an architect as required by the Royal Institute of British Architects are of a very different character to those required by the Sanitary Institute for an Inspector of Nuisances. From your letter I infer that, to a certain extent, you think the above studies are analogous, and that it does not matter which you pass, as it were, but you will at once see from the short description of the requirements of both institutions I give below that there is a vast difference between them. The examination of the Royal Institute of British Architects is divided into three stages to qualify the student as associate. Those for 1891 are as under :—First stage, or preliminary examination—to qualify for registration as probationer, R.I.B.A. Fee, one guinea. Occupies two days of about five hours and a half each, and embraces the following subjects :—(1) Writing from dictation. (2) Short English composition. (3) Arithmetic, algebra, and elements of plane geometry. (4) Geography of Europe and history of the United Kingdom.. (5) French, German, Italian, or Latin; one language to be selected. (6) Geometrical drawing, or elements of perspective: either subject to be selected. (7) Elementary mechanics and physics. (8) Freehand drawing from the round. Second stage, or intermediate examination—to qualify for registration as student, R.I.B.A. Occupying two days of written examination and one day of oral examination. Fee, two guineas, on application with certain testimonies of study, accompanied by a certificate from a member of the Royal Institute, or other person of recognised position. This examination embraces the following subjects :—(1) The orders of Greek and Roman architecture, their origin, development, and application. (2) The several varieties of classic ornament. (3) English architecture from the Conquest to A.D. 1500, and the successive developments of the styles. (4) The characteristic mouldings and ornament of each period. (5) The nature of ordinary building materials, as stone, brick, tiles, timber, metals: and their qualities and defects. (6) The calculation of strengths of materials and resistance from data and formulas given. (7) The elementary principles of construction. (8) Elementary physics, as applicable to building. (9) Mensuration, land surveying, and levelling. (10) Plane geometry applied to actual work, projection of solids, and development of surfaces. Third stage, or the examination in architecture. To qualify for candidature as associate. Occupying five days. Fee, three guineas on application, with such probationary work as may be decided by the examiners. This examination embraces the following subjects :—History of architecture (to be illustrated by sketches). The leading characteristics and history of the principal styles of architecture. The special characteristics and history of any one of the following periods which the candidate may select, namely :—(*a*) Greek or Roman architecture; (*b*) architecture of Italy or France from the tenth century to the end of the fourteenth century; (*c*) architecture of Italy or France from the beginning of the fifteenth century to the present time; (*d*) architecture of England for some one century between the years 1100 and 1700 A.D. Mouldings, features, and ornament (to be illustrated by sketches) :—As characteristic of architectural styles generally. As characteristic of the special style which may have been selected by the candidate in his probationary work. In this work the candidate will be expected to show a thorough acquaintance (graphical and historical) with the style and period selected by him, though such knowledge will not exonerate him from being required to show acquaintance with the details of other styles. The words "architectural style" may be understood as meaning Greek, Roman, Byzantine, Romanesque, one period of Gothic (English, French, German, or Italian), Renaissance, or one of the transitional varieties. Sanitary science, strength of materials, shoring, etc. :—Drainage, sanitary arrangements and requirements. The application of formulas for calculating the strength of materials. Shoring and under-pinning, and dealing with ruinous and dangerous structures. Plans, section, and elevation of a building :—The detailed arrangement of a building for a given purpose: as, for example, a parsonage for a town parish; a residence for a surgeon or other practitioner; a set of offices—to be filled in upon a skeleton plan (to a scale of ⅛ in. to a foot); a plan of one upper floor and of the roof, with details of the principal constructional arrangements; the section and elevation (to a scale of ⅛ in. to a foot), with constructional and artistic details to a larger scale. For the guidance of the candidate, a short statement of the requirements will be set forth. Materials, construction, etc. :—The nature and properties of building materials, including their decay, preservation, quality and strength, and their application in building. The principles of construction as applied in practice to foundations, walls, arches, vaults, roofs, floors, and partitions. Specifications and methods of estimating cost :—A specification of the work necessary in one or more trades for the building described above. Manner of specifying for other trades, and methods of estimating the cost of any building. Professional practice :—The general conditions usually appended to a specification and contract. The fifth day is devoted to an oral examination. Examination for Inspector of Nuisances :—Occupies a portion of two days, the first day being a written examination of about three hours, and the second an oral examination, with one or more questions, to be answered in writing if deemed necessary. Fee, three guineas if in London, but when the examinations are held in provincial towns, one guinea extra is charged. The examination embraces the following subjects :—The provisions of the Acts and Model Bye-Laws relating to the duties of Inspectors of Nuisances. A knowledge of what constitutes a nuisance; methods of inspection of dwellings, cellar dwellings, dairies, milk-shops, markets, slaughter-houses, cow-sheds, and nuisances especially connected with trades and manufactories. The physical characteristics of good drinking water—the various ways in which it may be polluted by damage to supply works or in houses, and the means of preventing pollution. Methods of water supply. The characteristics of good and bad food (such as meat, fish, milk, vegetables). The Sale of Food and Drugs Act. The regulations affecting persons suffering or recovering from infectious diseases. The principles of ventilation, and simple methods of ventilating rooms. Measurements of cubic space. Disinfectants and methods of disinfection. A knowledge of the general duties of the office, and methods of keeping the necessary books and records. Writing and spelling. The proper conditions of good drainage. The advantages and disadvantages of various sanitary appliances for houses. Inspection of builders' and plumbers' work. Scavengering and the disposal of refuse.—E. D.

Incubator.—W. M. (*Plaistow*).—The well-piece of incubator as shown in the drawing (see No. 89, page 589) is open at bottom, and it is intended that the water of boiler should flow in and out—that is, rise and fall with the changes of the temperature. If you take the scale of the drawing it will give you the dimensions of the float sufficiently near.—C. M. W.

Incubator.—No. 305.—Full particulars of a simple and effective Incubator were given in No. 89 of Work.—C. M. W.

Villas and Cottage Plans. — J. M. B. (*Dumfries*).—These, together with full detailed estimations, will be given in Work as soon as opportunity offers, and some suitable writer and designer well up to the subject is forthcoming.

Binding. — Ruler. — Papers on the above appeared in Vol. I. Look them up and read them over. If you write to the publishers for the Index to Vol. I., you will be able to find out for yourself, and you can order the numbers from a newsagent, or direct from Messrs. Cassell & Co., Limited. However, I will try and give you sufficient information to enable you to do quarter-bound work in this column. I presume that it is cheap account-books you mean. The books are taken from the sewer, and if the end-papers have not been sewn on, the first operation is putting these to the book. This is done differently, according to the style of the book. We will suppose for the sake of lucidity that we have a 3-quire foolscap, ruled special, with a printed heading. This is plain and tradesman-like; being a ruler you will understand it so far. The book has been sewn on three tapes or slips: this is the sewer's business, and you as a binder need not trouble why it is so. Now for the end-papers. You take two sheets of the same paper—these are left off by the ruler from the job—and fold them; next you lay them down upon a wrapper or waste sheet, and glue one page; you lift this and lay it upon the first page of the book, with the fold even to the back of the book, taking care that the slips are put back out of the way. You now glue the other sheet, and having turned the book, you put it down upon the last leaf in the same way. You must rub these down very carefully with the heel of your hand. The next operation is pasting down the slips. This is done by laying the book on the bench with the back towards you. Taking a little bit of paste on the forefinger of the right hand, placing the thumb of the left hand on the outside of the slip, you now rub the paste upon the inside of the slip, and with the thumb stick it down upon the book. The three on one side are treated in the same way; the book is turned over, and the other side done ditto. Now glue the back, and allow it to become nearly dry, taking care while gluing that the glue gets well in between the sheets or sections of the book. Now get two pieces of straw-board—about 2½ lbs. to the board will be heavy enough—the size of the book. Lay them down, and glue or paste them, and place them evenly upon both sides of the book, keeping them about ¼ in. from the back, and put the book in the press, between two pressing boards. I should have told you, just before putting on the boards, to give the book a few taps with the hammer along the back, but do not allow it to become round. After the book has become sufficiently pressed, which will be in a few minutes, take it out and ask the foreman to cut out a back for it. He will likely give you a strip of sheep or skiver. You take this and pare the two long edges of it, paste it, and having again glued the back of the book, you draw the back on as tight as possible, allowing as much of the leather to come over on one side as the other. A sheet marble paper is cut in two, glued, and put on the sides; it is now laid aside to dry, after which it is cut round, and the book is done. This is what is called quarter-bound flush. Quarter-bound, cloth sides turned in, is not much more difficult. In this case you will want four sheets for end-papers, and they will likely be sewn on; but if they are not, glue two of them as before, and put them to the book as already described, and tuck the other two inside of these by lifting up the first leaf of each. Paste down the slips, and glue the back as already directed. Cut the fore-edge now, and *round* the back in this case; cut the ends, and sprinkle or marble the edges. Now cut the boards, but this time you will have to cut them very exact. They should be ¼ in. longer than the book, and ⅛ in. less than the book in breadth. This will allow them to project ⅛ in. all round over the book; this is called the square of the board, and will allow ⅛ in. at the back for the joint as in the last-mentioned case. Put them on with paste as before, and press. The back that you will get to put on this time will be the same breadth, but about 1 in. longer. Pare it all round, paste it, and draw it on, gluing the back. After it is drawn on, it must be turned in. To do this, lay the book down upon the bench in the position shown in sketch. Hold the fore-edge tightly with the left hand, and with the thumb of the right hand turn in the leather to the inside of the board, breaking the end-paper to allow the leather to go into the back without creasing. When the other side has been done, shut the book, and rub the leather well with the folder to make it stick to the back, and rub the leather well into the joint. Now get two pieces of cloth for the sides, cut them evenly, glue them, and lay them up to the leather; rub them down with the hand, cut the corners with the scissors, and turn them in to the inside of the board. When the sides are dry, the end-papers are pasted up. This is easily done. Lift up one board, and paste the first page of the end-paper all over, shut the board, turn the book over and lift the other board, and paste the other end-paper; shut the board, and put the book into the press again. When it is dry, it is taken out, and your work is finished. —G. C.



Bookbinding: Position of Book on Bench.

Shocking Coil.—A. J. S. (*Edinburgh*).—Full illustrated descriptions of shocking coils will be given.—G. E. B.

Medical Coil.—W. B. (*Manchester*).—We have not yet given an article in WORK on "How to make a Medical Coil," but an illustrated description of one will be included in a series on induction coils. I do not know of a book giving the instructions you desire.—G. E. B.

Screen.—A. O. (*Manchester*).—You do not say what size you want to make the screen. Presuming the whole of the wood is to be covered, the framework may as well be of pine, say, 1 in. stuff. Set the wood out so that the three frames will be of exactly the same size. Either halve or mortice and tenon the joints, and if the screen is a high one it will be better to have a cross-rail about midway between the top and bottom. If you want the folds to move in any direction, you must use the "double-action" screen hinges, unless you are contented with canvas on webbing hinges—*à la* clothes-horse—to which I may refer you in case you do not know what is meant. If a simpler form of hingeing will suit, use ordinary butt hinges.—D. D.

Fairy Bells to Piano Works.—ADMIRER.—To make a fairy bells is perhaps one of the simplest musical instruments you can make. You require one to accompany the piano; therefore, you must have it tuned in unison with the notes on the piano. If you will kindly glance at the sketch (Fig. 1), you will find that the middle C is marked thus—X. This is the middle or pitch C on your piano, or is the same note as a C tuning-fork. This is the highest note on your fairy bells, and is consequently the shortest string; the other notes follow in rotation, first to the right, eight notes to C, then commence on the next bridge at B, and tune to the left seven notes with the longest string, C. Over the bridges you will find the sizes of the wire and the number of notes in brackets. Fig. 2 shows the top, which slides in a groove; Figs. 1 and 3 show how the string is adjusted, and Fig. 4 shows the loop at the end of string. Take a large sheet of paper and make it like Fig. 1, and bend it at the dotted lines at right angles, and you will see at a glance how the fairy bells are made. When you are perfectly clear as to how it is formed, commence operations. Make it of ⅜ in. pine; glue the side pieces (after grooving for the top to slide in) to the bottom, and drive a few needle points in to further secure it. Now make the bridges of beech; these are 1 in. in height, and 1¼ in. wide. Glue these on after cleaning the bottom with glass-paper, and put three ⅜ in. screws in each bridge

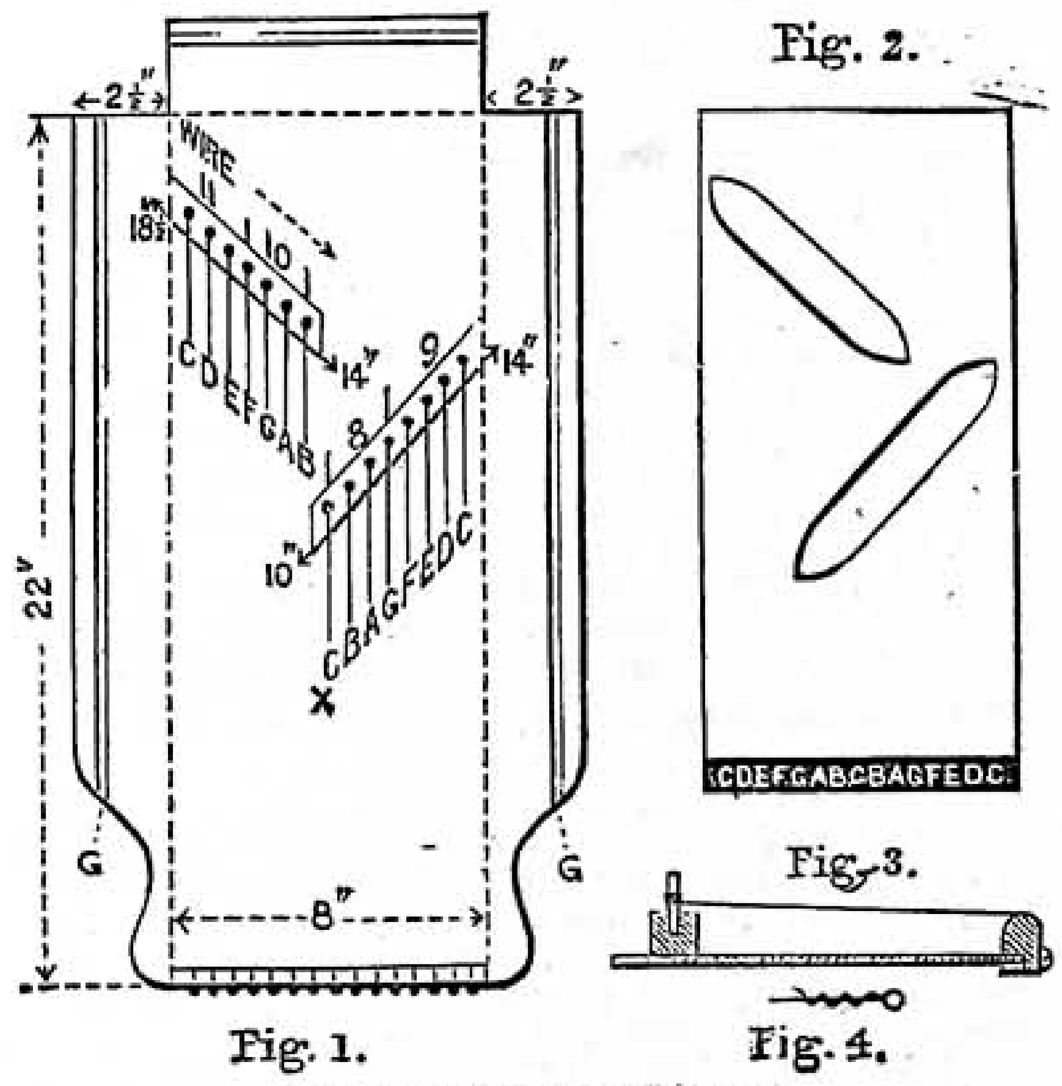


Fig. 1. Fig. 4.

Fairy Bells to Piano.

from underneath. At the bottom end there is a bridge made of beech, 1 in. wide and 1½ in. thick; this is rabbeted out (see Fig. 3) so that the round-head screws go through that the wire is looped on, while underneath the bottom bridge is a slip of beech 1 in. wide glued on; this is a support to it, and prevents the liability to warp. When you have completed the woodwork, varnish the whole of it with two or three coats of white hard varnish, and bore holes for wrest-pins; you will need 1 oz. of each size wire: cost about 4d. per oz.—T. E.

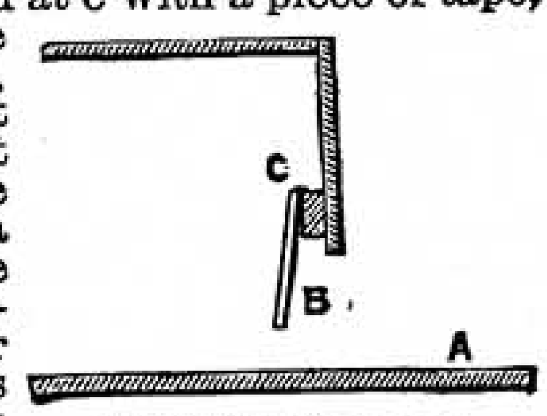
Graph Composition.—A. B. C. (*Wood Green*).—All graph compositions are much the same in their ingredients, though no doubt each manufacturer has his own favourite receipt which he is hardly likely to divulge. You will therefore understand how it is the exact composition of the graph you name cannot be given. The following is, however, an excellent recipe, and will no doubt suit you:—One ounce each of crushed loaf sugar and Nelson's gelatine, two ounces of sulphate of baryta, six ounces of glycerine, and four ounces of water. Melt the gelatine as if it were glue in the water, and while quite hot add the other ingredients, taking care to mix them thoroughly. When this has been done, pour into a shallow tray. When cold, the graph is ready for use. The great trouble will probably be caused by air-bubbles in the mixture; these must be removed by pricking before it hardens.—D. D.

Lantern, etc.—J. McB. (*Sheffield*).—That a magic lantern worth £30 can be made for £5 by a beginner is doubtful, but with care you should make one that will be serviceable without incurring any very serious outlay. A good deal, of course, will depend on the way in which you buy your materials, and the amount of assistance you require. If you get the assistance of a carpenter, he will naturally have to be paid for his time, which may or may not be an important item in the cost of production. As you do not appear to have had much experience in mechanical work, you will find it better to attempt something simpler than a biunial lantern for a commencement. If you are inclined for joinery, as you seem to be, the construction of several easily-made articles of furniture has been described in WORK, and you would no doubt gain much profitable experience by making them. It is not easy to answer your second question satisfactorily, for you must be the best judge as to whether it is worth while to take lessons in carpentry to enable you to make things described in WORK, or not. If you have absolutely no knowledge of your tools or their manipulation, you would save time in learning them by taking a few lessons; but most of the descriptions are so full and lucid, that you ought to experience no great difficulty in following them. Naturally, you must not expect your early attempts to result in anything very first-class. Should you resolve on going in for wood-working, you will find the articles on "Artistic Furniture" in Vol. I. well worthy of your study. They have been of great use to beginners. I am sorry to say that I do not know of any book on the penny whistle. For flageolet music, inquire of any music seller in your own neighbourhood.—L. I. P.

Book on Metal Turning.—LEARNER.—Apply to Messrs. Whittaker & Co., Paternoster Square, London, for the book on the above subject.

Magneto-Electric Machine.—MAGTELO.—The principal parts of the machine may be obtained from Messrs. F. C. Allsop & Co., 165, Queen Victoria Street, E.C.—G. E. B.

Trap for Pigeons.—W. B. (*Bridlington*).—The commonest arrangement for your purpose is a sliding door, pulled by means of a string. Of course, this requires to be watched, which is not always convenient, and the arrangement shown in the annexed diagram may suit you better. The pigeon alights on the outside sill, A, and enters the cot; in doing so, it has to pass the flap, B, which is made of light wicker-work, hinged at C with a piece of tape, and forms no hindrance to entrance; but, once in, the bird cannot get out again, as the flap will not yield to pushing from the inside. I lately saw a dovecot with every hole fitted with this arrangement, which the owner said worked well. In this case there were catches by means of which the wicker flaps could be kept up out of the way, if so desired. I may advise you in trapping pigeons to be careful not to get hold of anyone else's birds, or you may get into serious trouble.—G. LE B.



Trap for Pigeons.

Bariquand Distance Register.—KILOMÉTRIQUES.—I cannot glean any particulars respecting this make of distance register, but suppose from the exterior appearance of the engravings that it does not differ materially from others of its class. A train of wheels inside the instrument causes a set of discs to revolve before the openings in the sides or top of the case. These discs have numbers printed or stamped upon them from 1 to 0, and are speeded in the following manner:—The first disc records single revolutions of the actuating wheel up to 10. One revolution of this disc moves the second disc forward one notch, and this registers 10. When the second disc has made one revolution it moves a third forward one notch, and the three together then register 100. In this way any number of discs may be actuated. The actuating wheel is fixed in the nozzle shown at the side of the instrument, and this is moved by the wheel of the vehicle. The action is much like that of a gas-meter.—G. E. B.

Current from Shunt-Wound Dynamos.—C. N. (*London, S.E.*).—Taking up your line of reasoning, suppose we have a shunt machine capable of running 200 incandescent lamps of 16 c.p. The total output of the machine would probably be 11,200 watts. The maker of the machine would design it to give this output at a certain pressure, and would wind the fields with wire having a resistance calculated to balance the likely resistance in the lamp circuit. Whilst this resistance is maintained, a sufficient portion of the current will pass through the coils of the field magnets to magnetise them. If the resistance is lowered, an insufficient portion of the current will pass through the field magnet coils. If the resistance is raised, as by taking off part of the lamps, a larger portion of the current will go around the fields, and this will raise the E.M.F. of the current; but this cannot harm the lamps, because they resist the passage of current quantity (as expressed in ampères), and it is this more than E.M.F. that will destroy their filaments. Fusible cut-outs are inserted in lamp circuits to guard the lamps from accidental over-rushes of current.—G. E. B.

Wheels for Back-Gear.—R. T. (*Paisley*).—A wheel of 5¼ in. diameter and 60 teeth is not of the same pitch as a pinion of 2 in. diameter and 20 teeth; therefore, the wheels will not work together. Test this by dividing the number of teeth in each by the diameter:

$$\frac{20}{2} = 10 \text{ pitch}: \quad \frac{60}{5\frac{1}{4}} = \frac{\frac{60}{1}}{\frac{21}{4}} = \frac{80}{7} = 11\tfrac{3}{7} \text{ pitch.}$$

These are what is called the diametral pitches of the wheels—that is, the number of teeth for each inch of diameter. If the pitch, measured round the circumference, be the same in both wheels (as, of course, it must be if the wheels are to work together), then there must also be the same number of teeth to each inch in the diameter of both; whereas, in the case of the pinion there are 10, and in the wheel 11⅜. I find the detailed description of a 4 in. lathe in numbers 1121, 1123, 1125, 1128 of the *English Mechanic*; if you obtain these four, you will have just what you require, including drawing and description of the nut for clamping the pulley to large gear wheel. I dislike this plan for a small lathe, and prefer to have a nut on the mandrel to the left of the small gear wheel, by means of which the pulley can be firmly screwed against the large gear wheel; you make a narrow cone fitting at the rims of both, and between their bosses on the mandrel you can place a spring washer to keep the rims apart when revolving separately. This requires no balancing, as the other does; it allows you to turn the inside of the pulley to equalise the weight all round; there is no looseness or rattle, and the front of the large gear wheel is left free to be drilled as a division-plate. The following wheels are suitable:—Wheels, 54 teeth, diameter, $5\frac{5}{8}$ in. bare; pinions, 18 teeth, diameter, $1\frac{7}{8}$ in.; pitch on pitch line, $\frac{5}{16}$ in.; distance between centres, $3\frac{15}{16}$ in.—F. A. M.

Dividing the Circle.—Mechanic.—You propose to mark a plate off with dividers, and then centre-punch and drill; but remember your drill may "run," and not continue exactly on the spot where you first placed it. Dividing the circle is a very interesting subject, and many different plans have been adopted for doing the work accurately. If you have not already done so, I think you should read the papers in Work, Nos. 10 and 14 of Vol. I., on pages 153 and 213. In the *American Machinist* of September 25th, 1890, is an extremely accurate method of originating a division-plate, but it is too long to describe in the "Shop" columns of Work. Another plan is described in the *Scientific American* of March 8th, 1890, and of this I will try to give you an idea. Suppose you wish for a circle of 240 holes on a 10 in. circle: diameter being 10 in., the circumference will be 31·416 in., and the holes will be 0·1309 of an inch apart. Take a little block of steel about 1 in. wide, $\frac{3}{4}$ in. thick, and $1\frac{1}{2}$ in. long, and file it so that its cross section will form a ∟ (see Figs. 1 and 2); drill the two holes *a* and *b* 0 1309 in. apart, and fit a steel pin, *c* (Fig. 1), into one of them. Now obtain a strip of spring brass, say $\frac{1}{16}$ in. thick, $\frac{3}{4}$ in. wide, and about 30 in. long, one side of which must be fairly straight; lay the end of this in the angle of the ∟-piece, and, running the drill through one of the holes, bore it through. Now you can pass the drilled hole over the peg, run the drill through the other hole, and drill another; by keeping the edge of the brass close to the fillet on the ∟-piece, you get the holes parallel with the edge; continue drilling till you have made in the brass strip 241 holes, one more than the required number; thus you will have the holes *equally spaced*, and you can spring the band into a circle and put a peg through the first and last hole. To solder it in that position, we may chamfer the ends, and keep the peg in till the solder is set. Now you have probably guessed that we have only to turn a disc of wood so that the band of brass can be pushed on tight, and fixed with a few small screws, to get a pattern divided circle, from which our first row of 240 holes can be drilled. To drill any less number of holes for the other rows, cut the same band shorter, and use it again by turning down the wooden disc. You will, of course, have to mount your plate so that it will have to turn with the drilled band, and arrange a driller to act upon the plate while an index peg is dropped into the several holes. I say nothing about the form of the drill, shape of peg, size of holes, etc., because all that is treated at length in No. 10 of Work.—F. A. M.

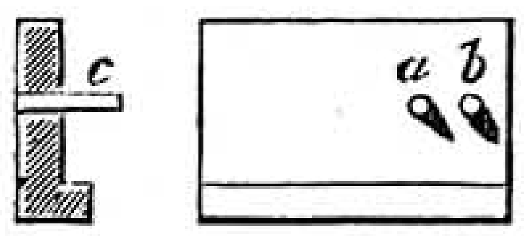


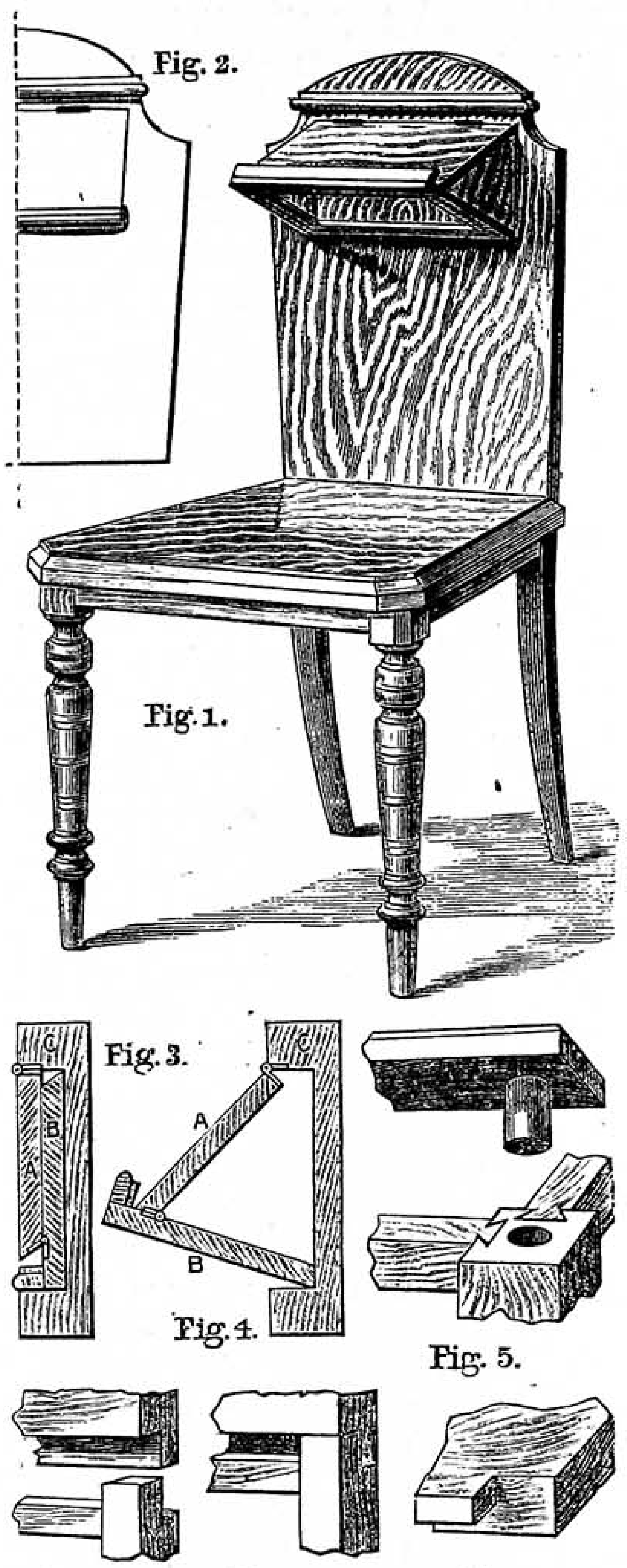
Fig. 1. Fig. 2.

Dulcimer Wire.—Demented.—You can procure the wire necessary for stringing your dulcimer of Messrs. Chilvers & Co., St. Stephen's, Norwich (see page 645, Vol. I.). Steel wire will not do for the lower notes, as it is not heavy enough for the purpose.—R. F.

Piano Wrest-Pins.—J. H. (*Wednesbury*).—You should examine the wrest-plank or block as you name it, and see if it is sound and not split. If it is split, it will require to be renewed. If it is sound, you might try a little powdered resin in the hole where the pin is placed; if it is not very loose, this sometimes makes them grip if there is any grease that has found its way on the pin. But you should look at the bottom of the piano also, and see if there is anything pulling away. If they are very loose, and the wrest-plank is sound, procure a larger pin.—T. E.

Musical Box.—G. F. (*Walsall*).—In reply I shall be most happy to supply all additional information required, but I do not write to bring grist to my shop, as some do in a contemporary journal—such as engine models (the parts), telescopes and microscopes, etc., then offer the parts to fit up for sale. Wheels you can get cut to order, also main-springs, fans, etc., at any watch and clock material shop—of Cohen, Leeds; Barton, Liverpool; or Nicholson or Reid, Liverpool. But for a *new* comb or barrel you will have to send *number* of box to maker in Switzerland or Germany, as the case may be, choosing your tunes. Cost about 30s., and carriage for either comb or barrel. I am glad you are pleased with Work—so am I. I am at present over three thousand miles away, hence delay in reply.—J. S.

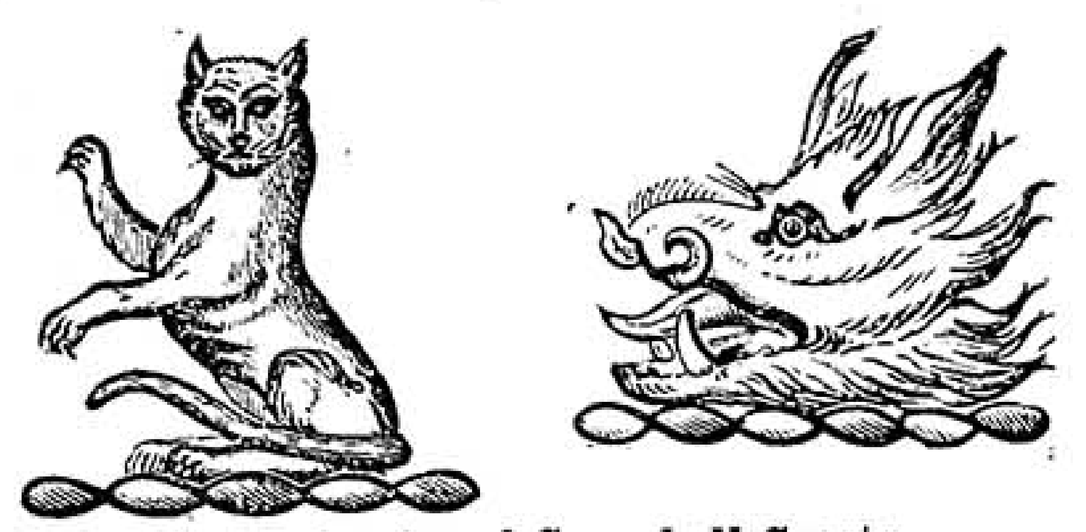
Prayer Desk and Chair Combined.—F. C. (*Hereford*).—Your query for "a prayer desk and chair combined," certainly speaks of a good idea for something truly useful for the purposes required of it. It is a common mistake with some men that the possession of an idea is the completion of an invention. I have discarded many stray ideas indeed lately, simply because in putting them to practical test they were found to be unworkable in some respects. I mention this because some would have inserted in their letters such phrases as "this is my own idea," "I am sure the world will benefit," which you happily have refrained from doing. Only lately a trade acquaint-



Prayer Desk and Chair combined. Fig. 1.—Chair, showing Desk adjusted. Fig. 2.—Half of Back, with Desk closed. Figs. 3 and 4.—Sections of Desk down and up respectively. Fig. 5.—How to unite Seat to Leg Blocks. Figs. 6 and 7.—How to join Back and Back Feet. Fig. 8.—Back Edge of Seat. Letters show correspondence of Parts.

ance of mine was struck with an "idea." He commissioned me to work it out for him. His method, as was satisfactorily explained to him, was complicated and unworkable. After a few hours' hard study, I arrived at a very simple result—the simplest results *nearly always* require the hardest forethought—and it was acknowledged by him to be very useful for its purpose. A few days afterwards, however, I called upon him and found him very exasperated. Down in a lower corner, in very small letters, I had humbly inserted my name. Now, although his name was attached in very large characters as the intended manufacturer of the article, he was annoyed to think that he could not claim the whole honour of the invention, which he as good as told me he desired to do. He may, or may not, have worked the "idea" out without my assistance, but he was one of many of the kind who are greedy of things mental as well as material. You say you want something "wherein the back of the chair could be made to form the prayer desk whilst the seat would be used for kneeling upon." I am afraid it would be difficult to have a chair of ordinary height to answer the purpose if you wish to kneel upon the *seat*. This one could be made use of comfortably and conveniently if you kneel in front of it, resting your arms upon the seat. I presume this is what you mean; and I also suppose you want something with an ecclesiastical appearance. You could insert the desk part into a bought chair. The pattern is optional. If, however, you wish to make it completely yourself, have the seat 15 in. in front and 14 in. at back, 15 in. long, and 18 in. from the floor. Join the legs and back feet together by means of a narrow framing. Dowel the seat to the leg blocks as in Fig. 5. The back might be in one piece, connected to the back feet as in Figs. 6 and 7, so that a groove is left for the insertion of the back edge of seat, which should be shaped as in Fig. 8. The back can be from 16 in. to 18 in. high. Side sections of desk part are shown in Figs. 3 and 4; A and B will not be wanted very thick. You will see how they are hinged. If made as shown, all will lay quite flat when so desired, and can be instantly adjusted by drawing out the bottom end of A; that end of B which is at the top part of Fig. 3 falling down as in Fig. 4. To close it, push B upwards. For appearance' sake, have a moulding on the end of B which shows in front of chair. This will also be found very handy for keeping the leaves of the book down. You must have B long enough to allow it to project a little beyond the bottom edge of A as in Fig. 4. It must not fit too tightly, otherwise you will not be able to get it out of chair back. It is really a pity that correspondents will not give fuller particulars. I have presumed you are a member of some congregation; but it may chance that you are a leader or preacher. In the former case, this will suit you; in the latter, it will not be found so useful. If, however, you do not think this will suit, write again, stating, *as all should do*, everything that bears upon the subject.—J. S.

Hammered Metal.—A. G. (*Hanley*).—Copies of the Milton shield are allowed to be sold in plaster, or in any other material, as the original is national property, placed in South Kensington Museum for the benefit of the nation at large. I have not heard of the antique head of Medusa being produced in plaster. If I were doing the job, I should purchase



Sutherland and Campbell Crests.

the head, and when done with, have it gilt, and try to dispose of it; you would then probably not be out of pocket by the transaction. I send rough sketches of the "Sutherland" and "Campbell" crests; could you not model from these? You would probably find it very difficult to obtain them either in metal or plaster of a suitable size for your work.—F. R. H.

Æolian Harp. — Aquilus. — In tuning the harp the notes must be in *perfect unison*, not a shade difference either sharper or flatter. The exact note to which to tune it depends in a great measure upon the length of the string, but the best results are obtained from a low tension. For instance, if Aquilus makes his harp 32 in. in length over all, which is the usual length, then the vibrating length of the string between bridges would be about 26 in., and this might be tuned to the note C, the third C counting from the bottom of the piano. The higher the tension—that is to say, the tighter the strings are—the stronger the current of air necessary to set them in vibration.—R. F.

Water Delivery.—Trying.—There can be no reliable table, as the loss by friction varies with the length of pipe, but you will find it quite easy to calculate from the following formula:—

G = number of gallons delivered per hour.
L = length of pipe, in yards.
H = head of water, in feet.
D = diameter of pipe, in inches.

$$D = \frac{1}{15}\sqrt[5]{\frac{G^2L}{H}} \qquad G = \sqrt{\frac{(15D)^5H}{L}}$$

The above is known as Hawksley's formula, and you will find it most correct.—T. W.

Time Alarum.—A. F. S. (*Stamford*).—Respecting the simple time alarum described by H. F. S. on page 699, Vol. II., a small electric bell quite good enough for the purpose may be bought for 4s. 6d., and this may be rung with current from a two-celled No. 2 Leclanché battery, costing from 3s. to 4s. more. These can be obtained from any dealer in electrical materials. Perhaps a local ironmonger will get them for you. The end of the switch-bar may be left uncovered, or the noise may be deadened with a bit of leather if you object to it.—G. E. B.

Dynamos.—J. P. (*Colne*).—The illustrations in my articles on "Model Electric Lights" are not drawn to scale; but in the illustrations of dynamos, the parts are shown proportionate. I have not attempted to show how the castings are made, because these are sold at a low rate by dealers, and it will not pay an amateur to make them. An amateur buying a set of castings need only know the particulars set down in the tables I give of their sizes. He need not know the dimensions of the pole-pieces, nor the thickness of the web of the armature, as he will not have to make these parts. As a general rule, a dynamo will only give out half its designed current when driven at half speed. Double cotton-covered copper wire averages 2s. per lb. up to No. 22. Finer sizes command higher prices, and these may vary with vendors and districts.—G. E. B.

Battery Carbons and Zincs.—J. P. (*Colne*).—Select the carbon plates of a size to go easily into the jars, with quite ½ in. space between the edges of plates and sides of jars. The plates should be ¾ in. in thickness, and as long as the jars are tall. They may be obtained from dealers in electrical goods at prices varying from ½d. to 1d. per square inch. The zinc should be not less than ⅛ in. in thickness. The plates may be as wide as the carbon plates, but should be ½ in. shorter—that is, the bottoms of the carbon plates may well hang down ½ in. below the bottoms of the zinc plates. If your $\frac{3}{16}$ in. zincs are good and well amalgamated, they may be used in a chromic-acid battery, but will not last so long as plates made of thicker zinc.—G. E. B.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Paper for Screen.—J. M. (*London, S.W.*) writes, in answer to SCREEN (see page 765, Vol. II.):—"I obtained a most suitable paper for the purpose at a much reduced rate from a wall-paper warehouse, the pattern of which had gone out of date, and have no doubt SCREEN would be able to do the same if he asked for an old paper, and gave the purpose for which he wanted it. Japanese paper is much too expensive."

Pig-Scalding Tub.—HAMMER AND DRIVER writes, in reply to J. G. (*Hull*) (see page 782, Vol. II.):—"If J. G. is not a cooper, I would advise him not to try his hand on a large oval tub, for there are hundreds of coopers that would fail in the attempt. The tools required are heavy and expensive, and of little service, except for coopering. Probably a bark or square would answer his purpose, and at the same time be much easier of construction. If so, he will find 6 ft. 6 in. by 2 ft. 6 in., and 2 ft. 4 in. deep, a nice size, inside measurement. It can be made of best red deal, free from shakes, sap, and dead knots, and must be dry. The narrower the boards, the longer it will last, boiling water having a tendency to warp deal. It should be bolted with iron bolts throughout, and the sides should overlap the ends about 3 in., and the ends be shouldered into the sides about ½ in. Make carcase first, being very particular as to joints being square and dead, and rush the joints from end to end. Rushes suitable may be had from any cooperage. They should be opened by inserting thumb-nail and drawing rush along, and spread out as flat as possible, but he must not grease them, as stated in a back number of WORK. Screw each part well together, levelling the joints with a piece of wood and heavy hammer as he proceeds. When carcase is together, he must be sure and true the bottom edges, for herein lies the making a good job. He should next make the bottom, allowing 1 in. over outer measurements; firmly bolt together, and true the side—that will be inside of bark; rush the bottom edges of carcase, and bolt bottom on to it; three pieces of scantling crosswise on bottom will lift bark of ground, and lend to its stability. A plug should be fitted as near to bottom as possible to empty, and his job will be complete. Being no draughtsman, I hope the above is sufficiently clear to J. G. without sketch. ⅜ in. bolts will be strong enough if a square does not suit him, and if he feels disposed to try and make an oak tub, and will repeat his question, I will endeavour to describe the making of an oak oval tub or kinmel."

Hand-Power Circular Saw.—W. G. (*Southport*) writes, in reply to S. P. (*Penarth*) (see page 782, Vol. II.:—"As a regular user of a circular saw, I would advise S. P. to abandon the idea of being able to cut 5 in. stuff on a circular saw bench, driven simply by manual power. My saw-bench is driven by a ½ h.p. gas-engine, but even with the saw in the best of trim, it is very slow tedious work, cutting stuff 3 in. thick. If neither steam, gas, or water-power is available, S. P. would find a bench such as he wishes to make a disappointment."

Soldering.—B. T. W. (*Leeds*) writes, in reply to NORTHERNER (see page 734, Vol. II.):—"NORTHERNER should make his hard solder of two parts sterling silver, one part pin-brass or brass wire, taking care to keep his brass under weight. Melt on a piece of charcoal, drop on his work-board whilst hot, and flatten with iron stake. To make it thin for using in small pieces, I have found from experience that solders should not be rolled. NORTHERNER is trying rather a particular job when he goes in for soldering Geneva bezels, as most of them are little better than 9-carat, and as thin as tissue-paper. The best way is to spring the broken parts together—not bind it at all. Use borax in lump, rubbed on a bit of slate wetted with water, and use sparingly on part to be soldered only. The secret of hard soldering is knowing what heat the article will stand before melting, and that can only be come at by experience."

Curing Skins.—W. N. (*Tottington*) writes, in reply to IDEM SONANTIA (see page 634, Vol. II.):—"First see that the skin is fresh; put it into cold water for twenty-four hours; and if it is full of blood, put ½ pint of salt in. Then take out and flesh it—that means, take the inside skin off altogether—not fat altogether, for there is a second skin to all skins which must come off, or you cannot cure it to be soft. When this is done, for rabbit or hare or cat skins, take ¼ lb. alum and ¼ lb. salt, and boil in one quart of water; then let it cool down until lukewarm. Into this put your skin—for a small skin six hours is long enough—then take out and hang up to dry, and as it dries take it down and keep ratching it all round, and you will come at it in time."

H.P. Formula.—BRASS writes, in reply to PUZZLED (see page 718, Vol. II.):—"I do not see how you get your formula to work out to about 200 h.p. I make it come over 1,000 h.p.; but this is due to an error in your formula. You have omitted, in your formula, to take into account that the stroke should be calculated in feet, not in inches. Units of work are calculated in feet, and to do this in your formula ·75 would have to be substituted for the 9 in. in the numerator, or ·12 have to be multiplied into the denominator, thus:—

$$\frac{2 \times 78{\cdot}54 \times 9 \times 80 \times 350}{33000 \times 12} = 99{\cdot}96,$$

bringing the h.p. down to 99·96. There is still a great difference between the brake h.p. and the h.p. as above. How this is to be accounted for is hard to say, but is the 80 lb. pressure the pressure in the boiler or the mean pressure in the cylinders? If it is the pressure in the boiler, then the mean pressure in the cylinders would probably not be more than 50 lbs.; but it is useless guessing at it. The only way to get the correct mean pressure is to have the engine indicated (the process of which a very good description was given in 'Shop' a few months ago). If 80 lbs. is the mean pressure, then, as the song says, 'there's something gone wrong with the works,' or the brake test is not correct. The indicated h.p. will always be greater than the brake h.p., and the ratio between the two is called the 'modulus,' or the efficiency of the machine. The one may be termed the gross power and the other the net power, the difference between them being due to friction, leakage, or other causes."

Paint for Tickets.—J. H. (*Monkwearmouth*) writes, in reply to A. J. S. (*Moseley*) (see page 601, Vol. II.):—"If A. J. S. intends going in for tin ticket-writing, he will do well to try the following plan:—After getting the tins ready, give them a coat of 'medal brand' or 'Foochow' enamel. I have not tried the latter, but the 'medal' I always use myself for white tickets; they require two or more coats of enamel. A white ticket, black figure, and French grey shading, with a black line round outside edge, is the best. A dark ticket with white enamel figures never looks well. The best job is always the white ticket and black figures. Tin tickets, as a rule, do not pay, as tradesmen will not give a proper price for them. We do as few as possible of them. If A. J. S. wants any more information, I will tell him to the best of my ability. I send a specimen ticket to the Editor done with the enamels. The above makes a better job of them than dipping them in varnish colour, and letting them drain. Will any of the numerous readers oblige me with instructions for making a machine for cutting card-board? as cutting it on a table hacks the table top all to pieces."

Transparleum.—L. E. (*London, E.C.*) writes, *re* inquiry by C. E. H. (*Horwich*) (see page 734, Vol. II.) in WORK about "Photography":—"Your correspondent probably means 'Transparleum.' The method is as follows:—Paste the photo (unmounted) on the concave side of a crystoleum glass; rub it down with sand-paper on the back till all the paper is removed, but without scratching the film that bears the photo; cover this film remaining on the glass with spermaceti wax, evenly rubbed on, and then paint with oil-colours. The background, flesh tint, hair, etc., should be painted on another glass, which is then placed over the first, and the two joined together at the edges by strips of paper. Do not forget that all the work is done on the concave side of the glasses."

Plate Rack.—C. B. (*Tonbridge*) writes:—"On seeing your answer to J. N. (*Erith*), No. 102, page 812, regarding rods for plate rack, I venture to think a plan of mine may prove acceptable to some of your correspondents. Instead of using wood rods, which are apt to rot, I tried bamboo canes, usually sold for flower stakes; they are about 4 ft. long, and cost about 2s. 6d. per hundred, and I have found the plan most successful."

Violin Materials.—M. (*Bishop Auckland*) writes, in reply to J. E. (*Chatham*) (see page 814, Vol. II.):—"You can obtain violin materials and tools from Mr. Hill, 72, Wardour Street, W. I believe there is a book on the subject, published by Messrs. Ward and Lock."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—A. K. (*Edinburgh*); AN ARDENT READER; W. G. (*London, W.*); F. P. (*Withington*); J. H.; DECORATOR J. W. (*Manchester*); T. P. J. (*Manchester*); A. J. A. (*Rouen*); A. W. (*Exmouth*); CONTRIBUTOR; APPRENTICE MASON; M. J. C. (*Glasgow*); AMBIDEXTER; J. M. (*Manchester*); HOOP-BENDER; B. C. (*Nottingham*); J. K. (*Leeds*); RAINFORD; UBIQUE; H. G. W. (*Bath*); E. D. S. (*Rye*); J. W. M. (*Halifax*); J. D. (*Holyhead*); WAX; T. R. B. (*Blaydon-on-Tyne*); WANTS TO KNOW; W. J. (*London, N.W.*); SHOEBLACK; F. E. H. (*Islington*); A READER; HORA; J. M. (*Newcastle-on-Tyne*); LIVERPOOL; A. F. (*St. Leonards-on-Sea*); J. W. R. (*Westminster*); X. L. U. M. (*York*); D. R.; TERPSICHORE; DRAUGHTSMAN; A. C. W. (*Bermondsey, S.E.*); R. J. A. (*Seacombe*); TYRO; R. S. E.; S. L.; M. P. (*London, S.W.*); F. W. S. (*London, W.C.*); GRADUATE; C. A. O. (*Chatham*); H. J. W. (*Romford*); F. C. P. (*London, W.C.*); J. G.; G. (*London*); CONSTANT READER; A PLASTERER; DELTA; GLENIFFER; J. L. (*Somerton*); BLACKSMITH; F. S. (*Manchester*); H. S. (*Liverpool*); OLD SUBSCRIBER; J. N. (*Surrey*); JOINER; A. T. (*Nottingham*).

WORK

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