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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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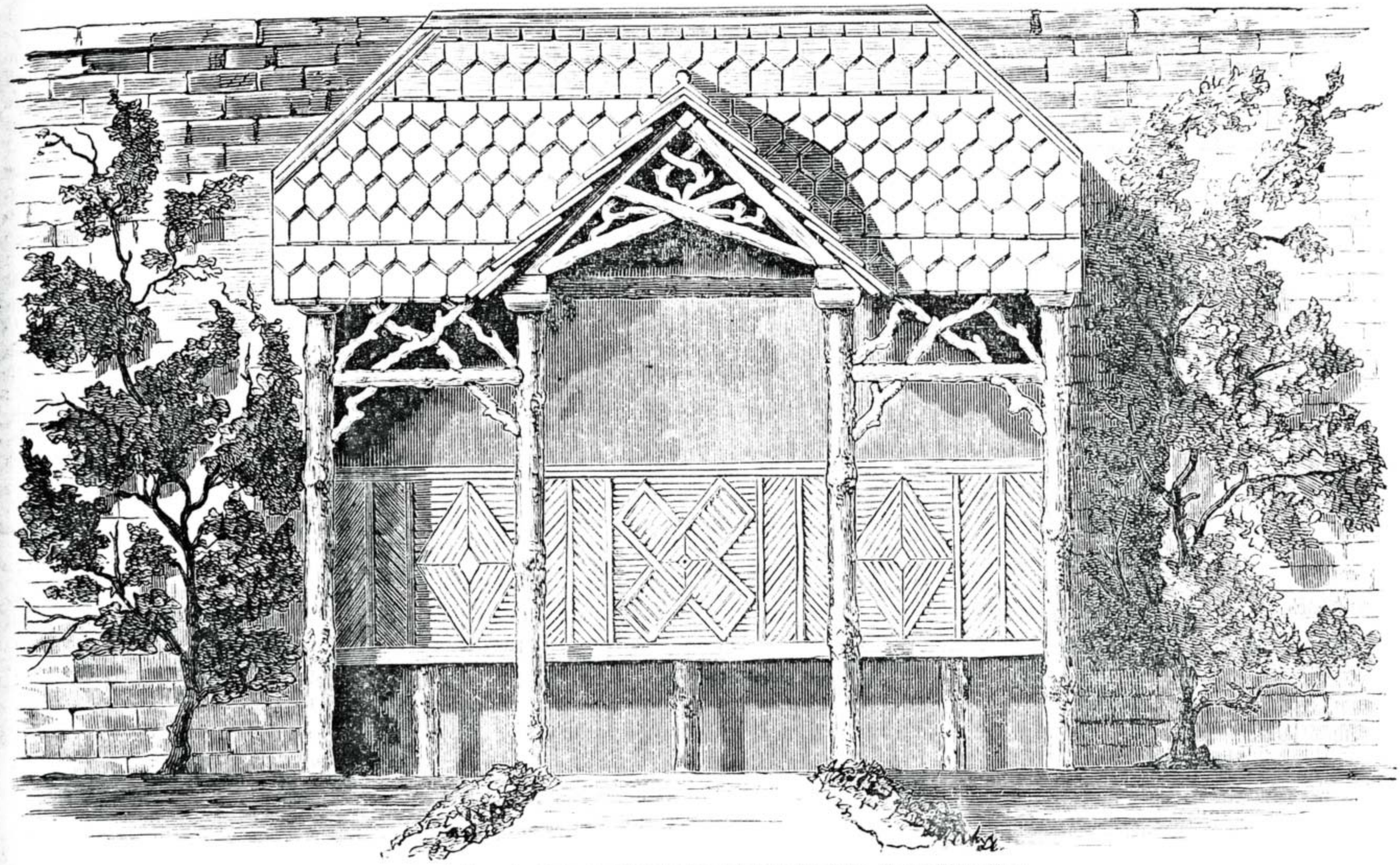


Fig. 1.—A Lean-to Summer-House for a Small Garden: Front Elevation.

A LEAN-TO SUMMER-HOUSE FOR A SMALL GARDEN.

BY ARTHUR YORKE.

ADVANTAGES OF A LEAN-TO FOR A SMALL GARDEN—ARRANGEMENT OF GROUND PLAN—CONSTRUCTION—ELEVATION OF FRONT—DECORATION OF INTERIOR—ROOF—SHINGLES: WHAT TO MAKE THEM OF AND HOW TO USE THEM—VARIOUS METHODS FOR LINING ROOF.

IT has been aptly observed that to nine men out of every ten life is but a series of makeshifts. This certainly holds true of those who love gardens, for few there are who have not to content themselves with something far short of the ample and charming paradise which forms their ideal. The summer-house which is the subject of the present paper is intended less for the happy tenth man than for his nine less fortunate brethren, and it will be found that the makeshift element enters largely into its composition.

In many, and especially in suburban, localities the gardener has to make shift with a narrow strip of ground. He has more walls or fences of some kind than horizontal space, and he may grudge room for a summer-house that would take up much of his open ground. This one has, therefore, so been planned that it shall get in the way as little as possible. It is intended to be stuck against a wall, from which—its eaves apart—it will project little more than a yard.

Perhaps in no better way can a dead wall or the back of some unsightly outhouse, such as is pretty sure to present itself in such a garden as we are contemplating, be better utilised than as the background for such a building. By availing ourselves of it we may save about one-half of the materials and labour necessary to provide the same amount of accommodation in a summer-house built in the open.

In Fig. 1 we have a front elevation of the very modest structure proposed. Perhaps some will rather incline to call it a covered seat than a summer-house. It will, nevertheless, afford sitting room, with comfortable shade and shelter, for half a dozen or more persons. Its dimensions are: length, 8 ft.; breadth, 3 ft. 3 in.: height, 8 ft.

Its general arrangement is seen in the ground plan (Fig. 2). Four pillars, A, B, B, A, occupy the front. These are poles 3½ in. or 4 in. in diameter. Any rough and tolerably straight wood will do, but larch is to be preferred. These rise 5 ft. above ground, and should not have less than 2 ft. below the surface. The dwarf pillars supporting the seat are marked C, C, C. These should be of similar stuff, but rather smaller. They show 14 in. above, and should be buried about 9 in. below ground. The pilasters—if the term may so be applied—which appear at D, D are of rather larger stuff sawn in half. These are only 5 ft. long, as they need not enter into the ground, being fixed only by strong nails to the wall.

The ends of the summer-house (the space from A to D) are of smaller half-stuff, ranged side by side (as seen at E. E), and nailed to the cross-pieces, F and G, which appear in Fig. 3.

In this last-named figure also appears one of the wall-plates, resting on and nailed to

the tops of the pillars (H, Fig. 3), and at I is seen where one of the front wall-plates meets it. There are two of these front wall-plates, each resting on the two pillars to right and left of the entrance, and their inner ends appear in Fig. 1, where the ends of the purlins which form the small gable rest upon them. The wall-plates are of large half-stuff, with the flat side above. In Fig. 3 will be seen how the short cross-piece which carries the sloping end of the roof is supported; and Fig. 4, which is a section through the centre of the building, explains how the ridge-piece of the small gable, E, rests at its inner end on a cross-piece from rafter to rafter, seen in section only, and marked M, whilst N shows the point at which the purlins meet and support the ridge-piece towards its outer end. The intersection of the diagonal braces in the gable is indicated at O, and P shows the course of one of the rafters, and how its upper end rests against the wall, and upon a ridge-piece of half-stuff, Q, strongly nailed to the masonry.

The elevation (Fig. 1) explains pretty clearly the ornamental details of the front. They are not elaborate. It will be seen that the top of each pillar has a small cap, formed of four pieces of quartered stuff, mitred at the corners, and that across the opening on each side of the entrance, near the top, is a "transom" of straight wood, with a little arrangement of crooked bangles round it. Over the entrance are diagonal

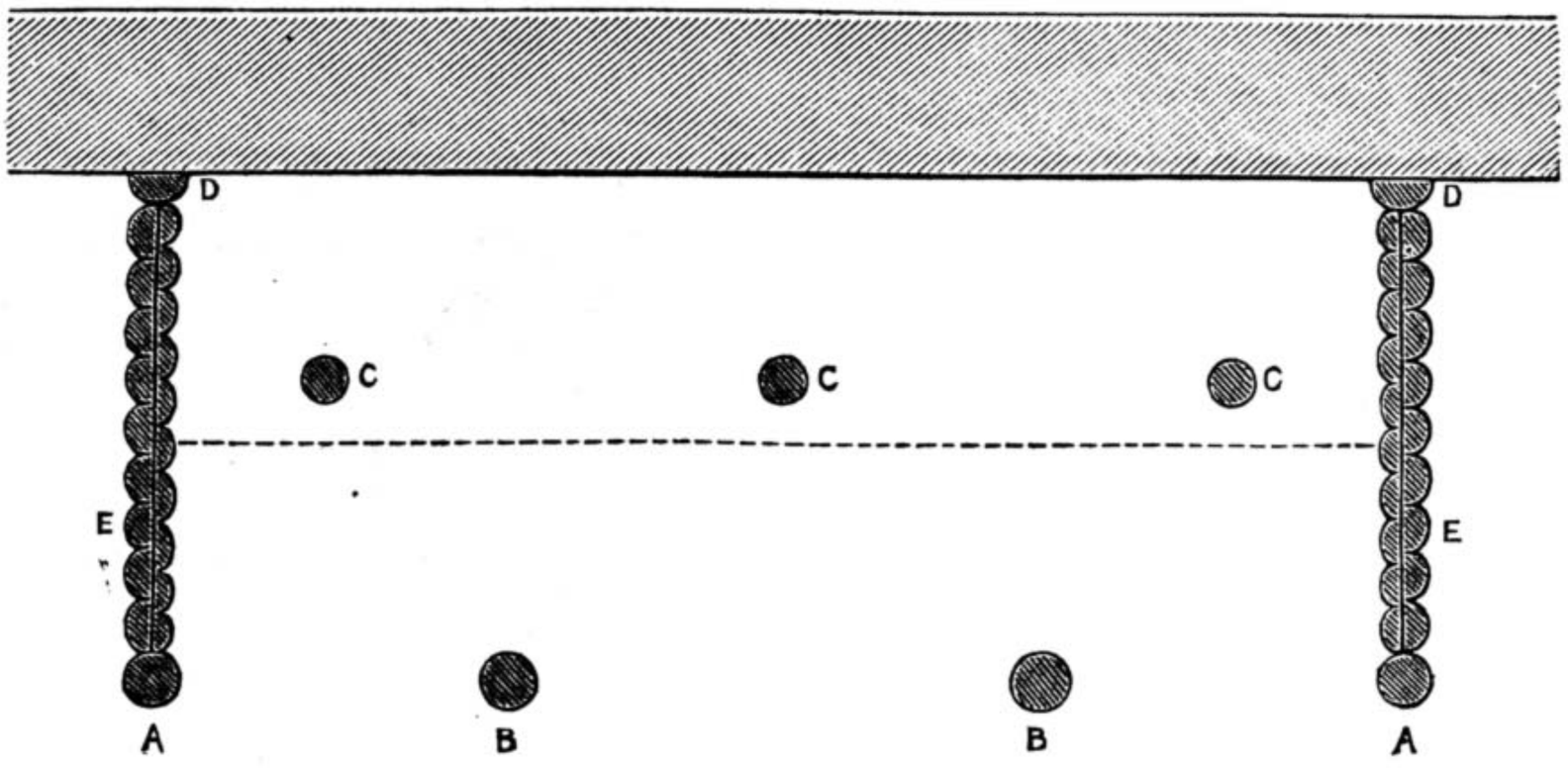


Fig. 2.—Ground Plan of Lean-to Summer-House.

braces crossing, and also a little filling-in with bangles. The entrance is 5 ft. 10 in. high, and will, therefore, admit any person of moderate stature without stooping.

In order that an ornamental and appropriate lining may be given to the back of our summer-house, it is recommended to plug the wall, and nail over it a level covering of thin boards—say, of ½ in. match-boarding, or, as a still less costly makeshift, of packing-cases from the grocer's, which will cost a mere trifle. Upon this the decorative work can be bradded. The back of the seat is shown in Fig. 1 to be of rustic mosaic, a kind of work fully described in the former article on summer-houses. Above this, as well as under the seats, a covering of bark has been introduced. Our home-grown bark, such as elm, can be made to lie more flatly, and, therefore, makes better work; but as in any but rural districts this may be hard to be got, virgin cork may be made to take its place.

Fig. 3 gives an inside view of one of the ends, and from this it will be seen that the ornamentation of those parts varies little from that of the back. The lower band, however, answering to the strip under the seats, is not bark, which, in this place, would be liable to be kicked and destroyed by the feet, but of smaller half-stuff, so arranged as to break joint with the outside pieces. This will be seen by referring to the ground plan. Any chinks in the ends should be neatly tucked with moss, so as to make them wind-proof.

In a former article thatch was emphatically spoken of as by far the most appropriate and pleasing of all coverings for buildings of this class. I have no wish to retract anything said in that place, yet it will be observed that the roof shown on the structure before us is not a thatched one. But this summer-house, as before stated, was intended partially to show what could be done with makeshifts. There is no reason why, in situations where the thatcher and his materials come readily to hand, it should not be thatched, though on so narrow a building the thatch will neither look so well nor stand so well as on one where the stetches could be longer. But in those especial situations in which this design is intended to be of chief use, thatcher-man and stubble can probably not be had. In place of the best possible roof, we must then use the best available one.

The makeshift suggested is one of wooden shingles — things which any rough hand at carpentry can prepare and put on for himself. As will be seen from Fig. 1, it is easy to give an ornamental character to these. They will have a rustic look, which will go well with other parts of the structure, and, if clumsily made, the effect will be none the worse. What I would recommend for the purpose, as at the same time cheap and well adapted, are the staves of paraffin casks. Such casks may be bought in any town at firewood price (indeed, the greater number of them are split up for fire-lighters when emptied), and they may easily be sawn to the required length and shape, and so trimmed with a hatchet as to make them lie fairly even. Being of oak, and thoroughly saturated with oil, it may be inferred that they will be durable, but on this point I cannot speak definitely, as my experience in connection with them for garden purposes goes back about eight years only; but in any case they will not, like thatch, need renewing every tenth year. The disagreeable smell of the paraffin soon goes off in the open air. For our present purpose, we suppose our shingles to be 12 in. by 4 in. The lower ends may be sawn to a variety of ornamental shapes.

If this covering is used, instead of nailing laths across the rafters, it is proposed to cover the whole roof with similar boarding to the back, and upon this it is a simple thing to nail the shingles, placing them just

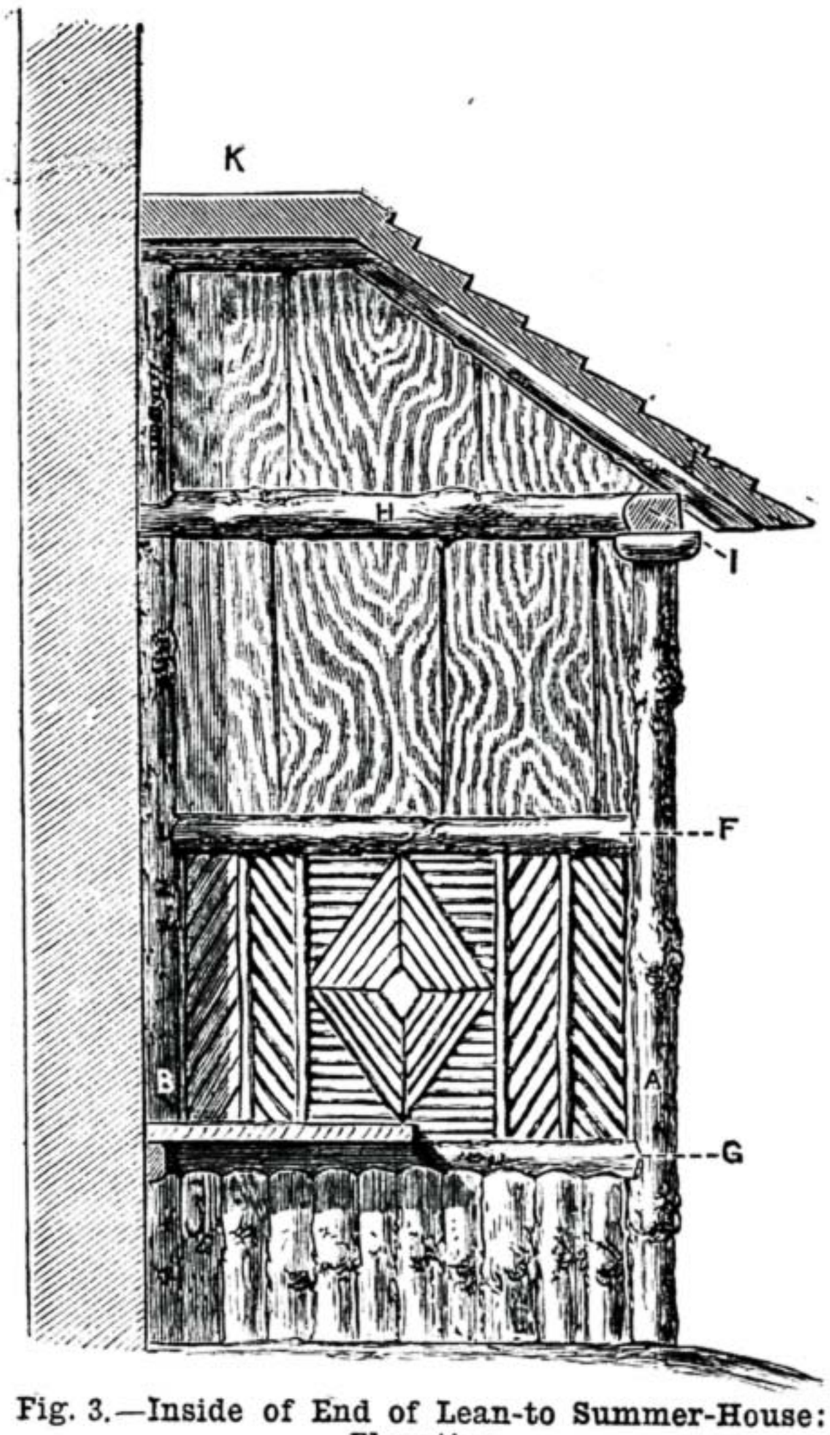


Fig. 3.—Inside of End of Lean-to Summer-House: Elevation.

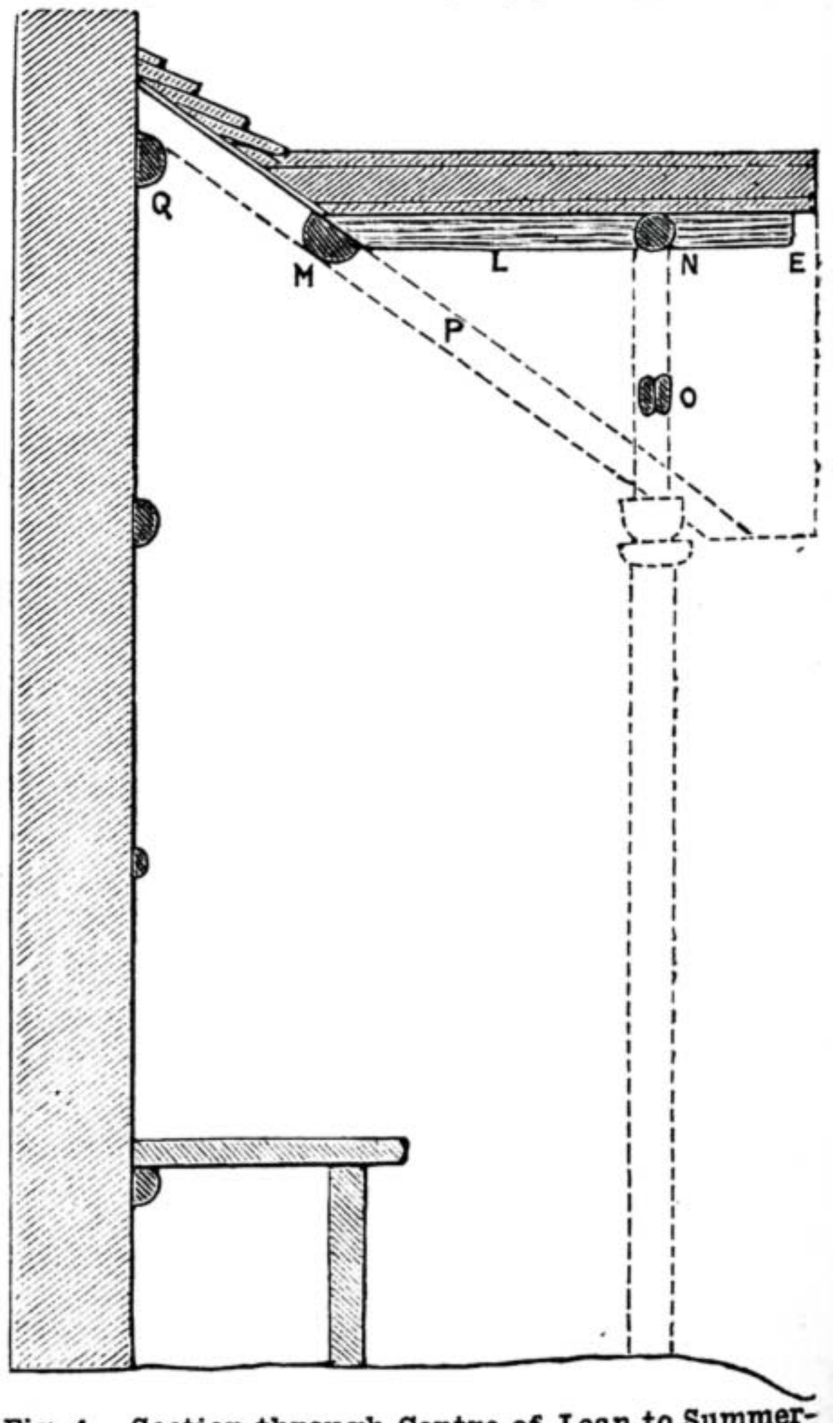


Fig. 4.—Section through Centre of Lean-to Summer-House.

as tiles might be placed. Whilst nailing them on, it will be necessary to have some person within to hold a heavy hammer against the place, otherwise the vibration will jar off the shingles as fast as they are fixed. A ¾ in. board, rather wider than half the length of the shingles, should first be nailed along the eaves, to make up the required thickness. It will be noticed that the ends of the rafters are made to project so as to give a good breadth of eaves—a desirable feature in so narrow a building, alike for shade, shelter, and the appearance of cosiness. If, however, the roof should be thatched, the projecting rafters will be unnecessary, as the thatch alone will form sufficient eaves.

But to return to our shingles. Down the "valleys" at the juncture of the main roof and the entrance gable a strip of zinc will, of course, be nailed before the shingles are put on, whilst along the ridges a strip of zinc will be nailed upon the shingles; and this latter will need painting to match the colour of the wood.

As regards painting the shingles themselves, the question is chiefly one of taste; and I imagine that the best taste would suggest that they should be left unpainted. Nature will soon tint them with her delicate green mosses, and give a far more pleasing colour than the brush can give. This, and the natural colour of the wood, will go well with the rustic work, and I presume that, saturated as they will be with oil, paint will not be needed to keep water out of them. If, however, paint should be used, it is recommended that a brown colour, in harmony with the natural bark of the rustic work, should be chosen.

Various suggestions may be given for finishing the inside of the roof. Supposing that round or half-round larch stuff has been used for the rafters (the latter is to be preferred for shingles, as giving a level surface to board upon), the space between the rafters may be covered with bark—virgin cork or otherwise—the chinks being stuffed with moss. But if this is done it will be well to fix the bark with screws, as the vibration caused by driving nails would displace or loosen the shingles.

A second plan under the like circumstances would be before nailing the boards upon the rafters to stretch matting across the latter—either ordinary garden bast matting or, better, the more substantial rush matting, both of which are very inexpensive. These have a pleasant natural colour (the last-named especially, of a greenish hue), and are so unartificial in their structure as to appear in no way out of place among rustic work.

Or it may so happen that suitable larch stuff is not to hand, and that ordinary sawn scantling has to be used for the rafters. If so, the whole roof may be hung with ling, as directed in a former article; or the rush matting may be stretched across the lower side of the rafters and tacked there, being afterwards more completely secured and finished by nailing a split hazel or other rod down the middle of each rafter. This last plan makes a neat and pleasing roof.

It scarcely needs to be said that to make such a summer-house look its best the wall on each side ought to be covered with ivy or other creepers; and it will also be obvious that, if the height of the wall permits the floor of the summer-house to be raised a step or two above the surrounding level, the structure will gain thereby both in effectiveness of appearance and in pleasantness as a place in which to sit.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

Grounds and Graining Colours for all Varieties of Oak.

The justly deserved popularity of oak graining for woodwork in situations which are very much exposed to either the variable influences of our English climate, or to hard usage and wear, is a fact patent to most of us. A passing glance at the houses in a street of middle or working-class build will usually discover that nine out of ten of the front, or entrance, doors are so treated; and although we find that amongst the aristocratic quarters of the metropolis and other large centres, very dark shades of bronze green, maroon, "leather," or cinnamon colours are much in vogue, with here and there an occasional entrance door of enamelled ivory white, oak graining of some shade and colour is still well patronised even in these high places. Notwithstanding the "monetary aspect" is, without doubt, the main reason of this partiality to oak for front doors—since woodwork finished in plain, varnished colours requires double the amount of preparatory work that suffices for work to be grained on—the patrons of the imitative art are sufficiently numerous among the wealthier residents of most towns to foster amongst grainers the study and introduction of distinct varieties of colour, instead of the monotonous repetition of ordinary polished oak. To this cause, far more than to any considerations of their suitability for *interior* work, the present use of "light oak," "medium," "dark," "antique," and other similarly termed graining effects, is undoubtedly due. In the papers upon oak graining already published in WORK, I have confined my efforts to instructing the learner how to proceed in the imitation of ordinary figured oak of one colour only—viz., light, or wainscot, oak. My object in so doing—that the energies and attention of both writer and student might the better be concentrated upon the imitation of grain and figure—being now, I trust, satisfactorily fulfilled, it is here desirable, in order to obtain some measure of completeness, that the learner should extend his knowledge and practical study to those other varieties of figured oak, the demand for, and advantages of, which have been already briefly indicated.

The basis of all oil paints which are prepared as grounding colours for oak graining is, invariably—or should be—the ordinary white lead, ground in linseed oil. Although when mixing the ground for a very dark, or "antique," oak, the amount of such is, naturally, much less in proportion to that required for light or medium grounds, it is preferable to consider the coloured pigments as purely staining factors—called "stainers"—than as "body" or base pigments. Beyond the main consideration of tint or shade—a question materially affected by the lead—it may be pointed out, with advantage, that none of the ordinary coloured pigments furnish the opacity or solidity, nor the desired amount of durability, that white lead is noted for. Whilst in respect to the colours of oak, the grainer who always uses white lead is seldom guilty of those unnaturally bright and garish grounds which are wrong from every point of view. Sufficient white lead for one's purpose, therefore, with the addition of about one-tenth of patent driers, having been well broken up in linseed oil, the stainers are added, and well mixed, until the required colour is obtained. The paint should then be strained through a piece of old stocking, or such like mesh, and, finally, thinned to working consistency with about two-thirds of linseed oil to one of turpentine; or, if required with less gloss and to be quickly grained upon, the proportions may be reversed.

The pigments used for oak in all its varieties, whether for grounds or graining paints, may be briefly classified as either *opaque* or *transparent*. Under the first heading are the chromes, Oxford and yellow ochres, and Venetian red; and these should only be used as stainers in making "grounds." Although the degree of transparency possessed by the colours in the other division varies considerably, not only one from the other, but with different qualities of one pigment, they are sufficiently translucent to give due effect to any coloured ground they are superimposed upon. Raw and burnt sienna—or *Terra di Sienna*—raw and burnt Turkey umber and Vandyke brown, are the most useful of this class; whilst for the purposes of glazing and overgraining, ivory and blue blacks, with Prussian and indigo blue, may be added to the list—the blues being, however, seldom required or advisable.

A detailed description of the above, and all other house-painters' pigments, having been given in the elementary papers in Vol. I. of WORK, it will only be necessary here to briefly reconsider the former in their relation to graining purposes.

Chrome, of either the "middle" or "orange" colour, may be useful, *to a slight extent*, in staining ground colours when very bright and rich imitations are desired. If used with other more sombre stainers to lower its tone somewhat, and providing the graining colour and overgraining are used to still more modify its native brightness, the effect may justify the means; but, generally considered, chrome is neither conducive to good colouring or a natural, woody effect. Although one may sometimes see a door grounded with a bright chrome-yellow tint for light oak, or a decided orange-red colour for medium oak, such will certainly not be the work of one who has studied and worked from the real woods, much less a good grainer.

Yellow ochre, *Oxford ochre*, *Italian ochre*, and so forth, are all of one similar nature and colour, their main difference being that of quality and price, and the degree of warmth or redness noticeable—the so-termed "Oxford" being the richest. Their proper function in graining is purely that of staining the white lead paint for ground colours. It is no uncommon matter to see an incompetent person prepare graining colour with this pigment, a use which it is totally unsuited for, since, being decidedly opaque by nature, the due effect of the ground it is spread upon is very much marred. If very rich and light oak is required, raw sienna is the yellow pigment which ought to be used, but even this is seldom required, as decided yellow and bright tones are not true characteristics of real oak colours. The ordinary commercial yellow ochre is, moreover, the only one of this class of pigment we need use, since the addition of a little Venetian red will make any warm tint desired. This latter pigment, a species of *burnt* ochre—whereby the redness is acquired—is the only one commendable for obtaining warmth in grounds, not only for oak, but also for the red imitations of mahogany, etc. Turning to the transparent and semi-transparent pigments, raw and burnt umbers are the two most useful amongst them, and, as such, demand a little more notice in these graining papers than they have heretofore received.

Umber is a natural pigment, consisting of a mixture of clays and brown hematite, originally obtained from Umbra, whence its name. The best is now obtained from Cyprus, and is usually known as *Turkey umber*. Besides the usual washing and grinding, which all such native pigments have to undergo before being fit for commercial use, the umber is subjected to a moderate amount of heat to obtain the tone we know as *raw* umber—an almost neutral brown. When strongly heated, the pigment attains to more warmth and richness, and we then have the *burnt* umber of commerce. This pigment is also largely produced from other artificial sources, the bulk of cheap umbers being of this kind. Besides being valuable on account of their transparency, the umbers are also particularly noted for their good drying qualities in oil, so much so, that under certain circumstances they may be employed as drying factors. For graining purposes in oil colour this is a very commendable property, and one which the competent worker will practically bear in mind when using large proportions of the pigments. If the grainer was possessed of only the raw and burnt umbers for staining his oil graining paint, the imitation of varieties of oak colour would rather gain than lose in natural colour status; for the former is not to be bettered, generally, for very light imitations, whilst burnt umber may be used from light to the darkest of "antique" oaks. They are, further, invaluable for mixing grounds.

Raw and burnt sienna, which were described fully in the elementary papers, are useful for oak colours when a forced richness is required. Similar in nature and preparation to the umbers, they appear rather more transparent than the latter, but lack the natural drying qualities of umber when used in oil. Their chief province in graining is for those imitations of woods which are obtained with pigments ground in water, and for mahogany, maple, walnut, etc., they are almost indispensable.

Vandyke brown is also an earth pigment, which owes both its name and, I believe, its popularity to the celebrated Dutch painter, by whom it was largely used. Our modern Vandyke differs but slightly in nature and preparation from the original pigment. It is a very dark and rich brown, neither inclining to yellow or red, but yet so rich and deep as to make ivory black look poor against it. Since in its nature it partakes largely of bituminous substances, it is a remarkably *slow drier*, and if used alone in oil will require to be diluted with little else than terebine or a similar drying liquid. "Japan gold size," it may here be mentioned, is not a suitable drier to use with linseed oil paints; terebine is far preferable, although with turpentine mixtures the gold size is an admirable drier. Like the *siennas*, Vandyke brown is mostly used for graining when ground in water. In overgraining oak, it is the principal pigment used, its colour, in water, being usually warmer and richer than when used in oil.

The few remaining pigments mentioned with the transparent colours for oak graining are all of the "cold" type—viz., neutral blacks and blues. Of the former, blue black is the most useful for oak and that principally for overgraining in combination with Vandyke. Black is also useful in mixing the dark, "drabby" *grounds* necessary for obtaining very "ancient" oaks. To some of my readers who have worked, perhaps, in a professional way at graining, the use of the transparent blues of Prussian and indigo may seem a questionable, or, to say the least, a curious, innovation. To those whose minds are open to the results of experiments and practical experience, I commend the study of such natural oak colour effects as are to be obtained by using occasional touches of "bluish" washes made from the above transparent pigments. It must be remembered that richness of colour in woods, as in polychromatic effects, is but a matter of comparison and contrast, and therefore, if, instead of forcing their colour values by bright grounds, bright graining colour, and richer overgraining, some contrasting cool tones are introduced, it is possible to obtain more *natural* colour variety and yet retain the native modesty of the real oak contrasts. One of the most successful pieces of interior oak graining that I remember to have come across was such an example, which had been worked upon a ground slightly "cooled" with blue, and with a graining colour anything but rich in tone. Again, Prussian and indigo when ground in water are vastly different to the same prepared in oil; whilst the mellowness given by ordinary copal or oak varnish is, generally speaking, very much in excess of that which either French or wax polishing will give to real oak. It is by far the better plan to work the first stages of a good piece of oak in sober tones, leaving to the glazing and overgraining to enrich, if necessary, the work, than to start with a false brightness, and, in the final phase, struggle to modify the fault.

The binding of distemper graining pigments may here be touched upon ere concluding this paper with a few definite recipes for oak colours. The principle which underlays the use of a gum with water-colour painting, and with which the pigments are fixed to the paper, is the same when the water colours are connected with graining. Beer for the latter purpose is, however, the usually accepted binding medium. Although it was once a recognised imposition for the grainer to represent beer—and that in no very minute quantity—as absolutely necessary to his work, a more honest and educated knowledge is now current. Vandyke brown requires no binder for overgraining in water, and the siennas but very little, and that in exceptional cases. When using black or the cool tones—either alone or in combination with warmer colours—a little beer is necessary, since black has no binding power of itself. Although if mixed with Vandyke in equal proportions, the latter will bind the black also, it is always best to be sure that the overgraining will not work up when varnishing our work. For black alone, when finishing "antique" oak, the wash must be strong in beer; and for mixed washes, the half beer is a safe proportion. For the student's future use and reference I now append a short list as a guide in mixing grounds and graining colours of the varieties I have indicated, at the same time commending him to work ultimately more by knowledge and understanding than by recipe.

For very light oak the ground colour is made from white lead paint, tinted to a decided cream with yellow ochre. The graining colour may be stained with raw sienna and raw umber, or the latter alone; and the work overgrained in water with Vandyke brown and blue black or indigo, used very weak in colour.

Ordinary light oak requires a clean buff ground, stained by ochre, and occasionally a touch of Venetian red or umber, according to required warmth or coolness. Raw umber is sufficient for the graining colour, or burnt umber, if desired of a richer cast; Vandyke and blue black for overgraining.

Medium oak is best upon a warm buff, the red and ochre therein being slightly toned down with umber. Burnt umber alone makes a splendid graining colour, and Vandyke is usually sufficient for shading.

For dark oak the grounds are best made with three pigments—ochre, burnt sienna, and burnt umber. The best grounds for this variety, although showing a decided yellow cast, require more umber than the preceding one. The presence of red should be very apparent in the mixture, but both that and the yellowness should be sobered by umber. The graining colour may be burnt umber, or burnt sienna and black, overgrained with black and Vandyke washes, either used separately or as a mixture.

Very dark or antique oak graining has been of late years in comparatively strong demand—a treatment doubtless introduced by the use of so much ammonia-fumigated real oak. A neutral, "drabby" ground is most suited for this, both the red and yellow being very subservient to the umber or black tones. The graining colour for this may be either Vandyke, ground in oil, or ivory black and burnt umber; whilst the overgraining will give very deep and transparent effects if blue black or even ivory black is used. A little Vandyke toning—here and there—will improve the work in its entirety. Vandyke alone for the overgraining will make it very rich, but transparent black tones are more characteristic of the real "antique" colour.

Mechanical and patent aids and imitations will be considered in the following paper of the series.

PRACTICAL DETAILS OF BOOKBINDING.

BY GILBERT CLARKSON.

Covering Pamphlets—Gathering and Collating—Rolling and Pressing.

After pamphlets have been stitched, whether with wire or thread, the next operation is that of covering, provided they are to be covered. This is a very easy matter, but as I see that operators in different places go about this process in as many different ways, it will not be out of place to say which method I like best, and which, to my mind, is the most economical of time—a very important item in a long job.

We will suppose the pamphlet to contain 16 or 20 pp. Proceed thus:—Lay the covers out on the table with the inside uppermost and the head at the right hand, knock up a parcel of, say, twenty or fifty pamphlets, and paste or glue the backs. Use paste by all means, if there is time to let them dry. Set them down at the right hand, and lift one and place it down in the centre of the cover and draw the front over it. Repeat the operation throughout the job. The operator will thus be able to watch whether the covers are being drawn on straight. The front of the cover has generally more printing on it, and if there are any lines they can be kept even, and the pamphlets will have a decent appearance when they are cut. A good workman should be able to cover close on a thousand per hour. If the pamphlets contain a number of pages,

and have been sewn, it will be best to knock them well down with the hammer before covering them, or they will cause no end of trouble in the cutting. They should be well rubbed in the back with the folder, to make the covers stick properly. People do not want pencil-cases in the back of a pamphlet or a shilling novel.

Pamphlets of many sections may be stitched with thread through the side, but it will be necessary to make holes for the needle to pass through. This may be done with the hammer and bradawl, or a stabbing machine may be had for the purpose. Make the first hole in the centre of the back, about midway between the printed matter and the outside margin, the other two at equal distances from the first and the head and tail of the book. I had almost forgotten to mention this operation as the wire machines have thrown this old fashion to the background.

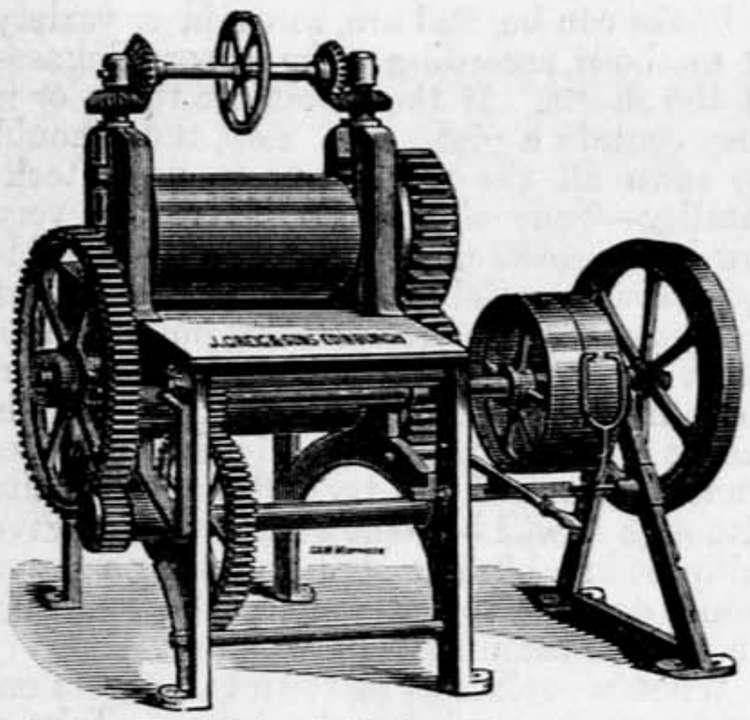
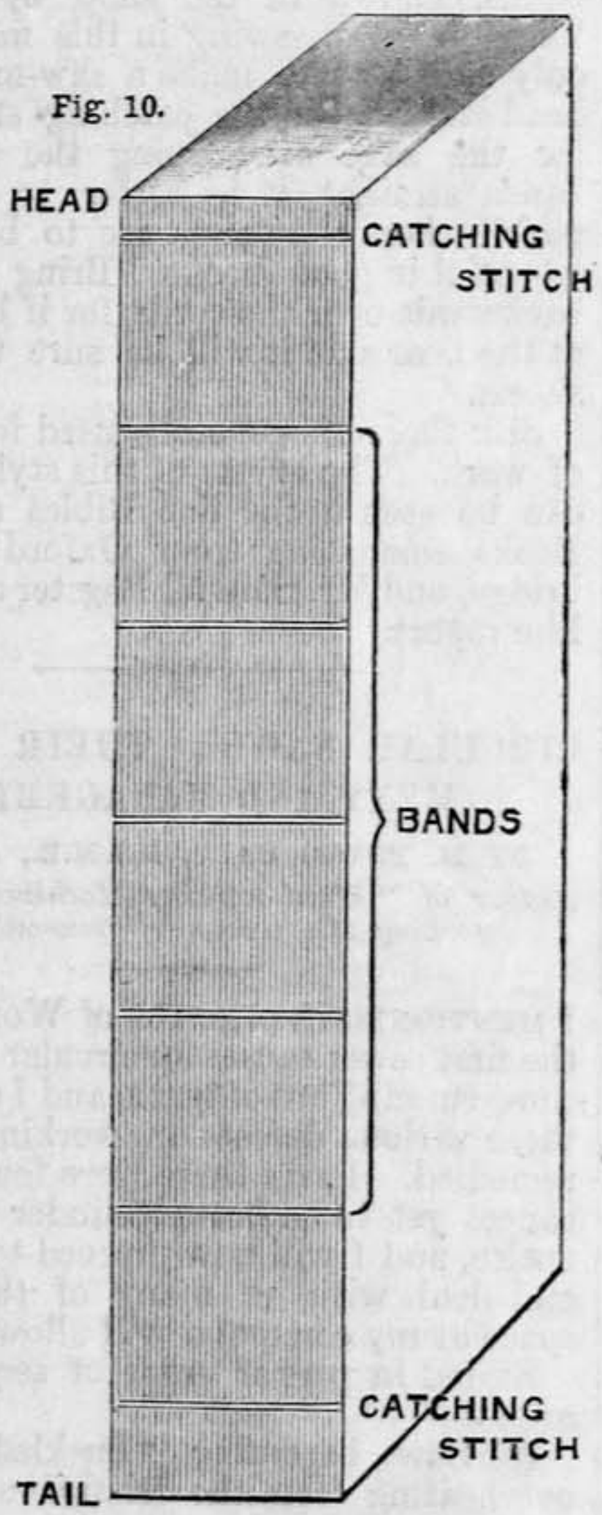


Fig. 9.—Greig's Bookbinders' Rolling Machine.

After the pamphlets have been covered and properly dried, it will only be necessary to cut the edges of them before sending them out to the reading public.

Fig. 10.



After the sheets of a book or an edition of books have been folded, they are laid out in heaps in alphabetical order and gathered. The usual way is to "begin at the bottom and rise to the top," as the song goes, *i.e.*, begin at the end or last sheet of the book and walk up the floor lifting one sheet at a time from every heap until the first or title page is reached. This is a long, tiresome job if the edition is a large one, and many a mile has to be walked before all the sheets are gathered. A large revolving table is now being introduced into the shops, and the gatherers sit, and as the sheets come round they pick them off one by one.

While the sheets are being gathered by one set of workers another set are engaged in collating them at the same time. This is the right method of procedure, for if there have been any mistakes made in gathering they can be rectified at once. There are sure to be mistakes made; two or more sheets may be lifted from one heap, or some one may be missed altogether. There might be two or three such mistakes in one book.

Collating is done by taking the book in the right hand by the upper corner of the fore-edge, and with the left hand opening the sheets at the back and letting them fall successively one after the other in alphabetical order, as A, B, C, etc., to the end. Sometimes books in folio or quarto are collated with the needle by raising the sheets one by one from the table, and it is amazing to see how quick some girls can do it. This practice, however, should not be encouraged, for it is apt to tear the sheets, and besides, it is better to take a little extra time for collating, as it is an awkward thing for a reader when he is enjoying his book to find a few sheets mixed up in some queer mystical fashion.

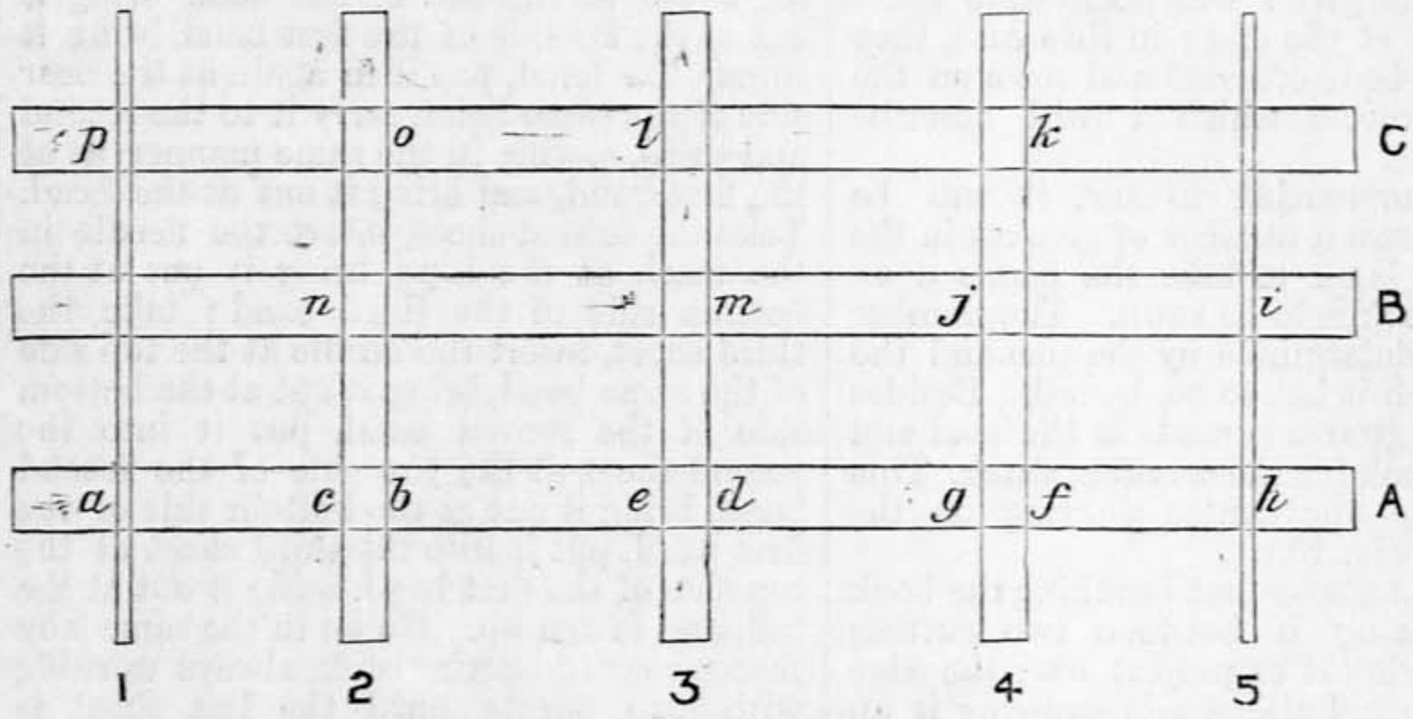


Fig. 14.

Fig. 13.

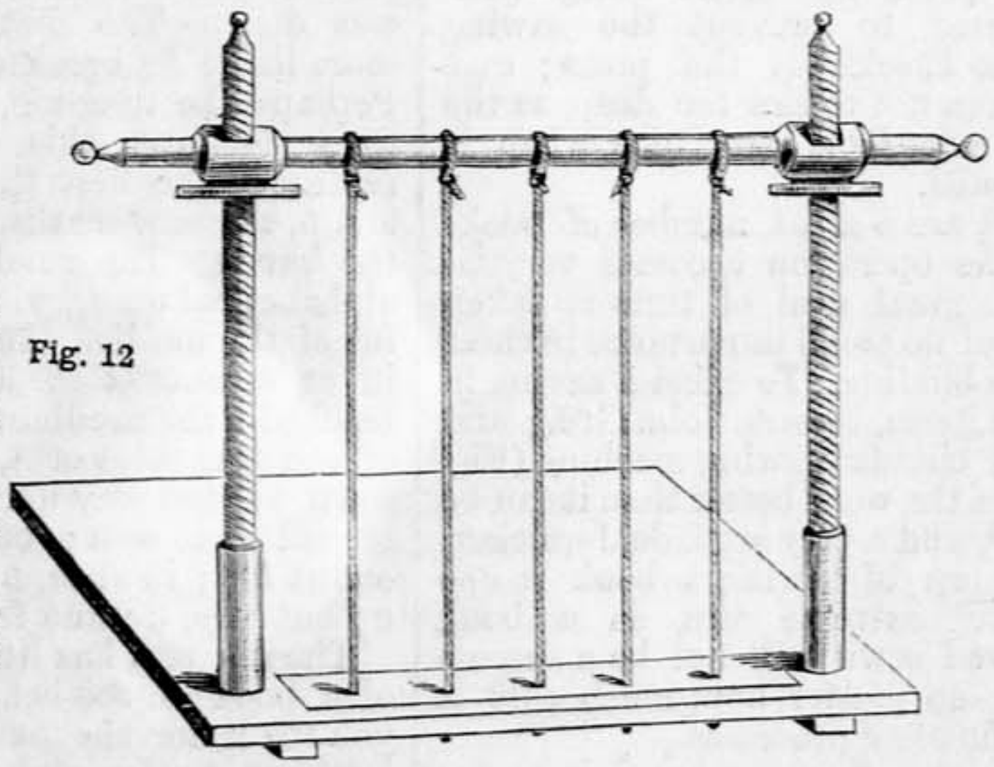
Fig. 10.—Back of Book, showing position of Saw Marks.

Fig. 12.—Sewing Bench set for Five Bands.

Fig. 13.—Key for fastening Cords to Bottom of Bench.

Fig. 14.—Diagram showing Method of Sewing "Two Sheet on."

Fig. 12



After gathering and collating, the books will be ready for pressing or rolling. Cloth books, *i.e.*, books bound in cloth, are seldom rolled; a nip in the press is all they get. If the books are not very thick, knock them up nicely at the back and head, and build them into the press between smooth wooden boards, taking care to have them built evenly, and on the top of each other, so that they will press flat all over.

The better class of books are always rolled or "machined," as this operation is termed. The mode of operation is as follows:—Divide the book into parts or sections, and place a section between two smooth sheets of zinc or tin, and pass it through between the rollers of the machine while in motion. It requires very little skill for this part of the work, a little care only being needed in setting the rollers to give the desired pressure. If too much pressure is given the books are liable to wrinkle or to get nipped at the corners, which would be rather a serious matter if the book was a valuable one.

Fig. 11.—Greig's Circular Sawing Machine.

The machine is just like an ordinary domestic mangle, only it is made much heavier, and the rollers are of steel instead of wood, as in the mangle. The rollers are adjustable to any thickness.

Messrs. John Greig and Sons, Fountain House Works, Edinburgh, supply thoroughly well-made machines of this class (Fig. 9). They can be fitted for steam or hand-power.

The amateur bookbinder will not have a rolling machine, nor is he likely to have an hydraulic press, so he will not be able to roll his books or press them sufficiently to give them a feeling of solidity. But he need not despair, for there remains for him the old process of "beating." For this a large flat hammer and a stone will be required. The books are divided into sections as for rolling. A section is taken and placed

upon the stone and well beaten over with the hammer, drawing it with the left hand towards the body, so as to bring the various parts successively under the hammer, and care should be taken not to give more blows in the one part than the other. The section is then turned and the beating repeated, and so on until the whole book has received the same treatment. It will be necessary during this process to keep the book knocked up even at the head and back.

If there are any plates in the book it will be well to put them in now. Care should be taken to make the margins correspond with the text of the book. They should be placed to face the page where reference to them is made; plates that are folded in the centre should be pasted out from the back or mounted upon a strip of paper called a guard, so that when the book is open the entire plate will be seen. Sometimes a book will contain a large number of plates, and the directions given will necessitate them being placed at the end; in this case, they will have to be overcasted and sewn on the bands—a process which I will describe further on.

Before commencing to sew, it will be necessary to saw a number of grooves in the back of the book to take the bands upon which the book is to be sewn. The number of bands is determined by the size and the style in which it has to be bound. Besides the bands, a groove is made at the head and tail of the book for the catching stitch. This prevents any unevenness showing on the back. (See Fig. 10.)

Sawing is done by first knocking the book up and placing it between two cutting boards, allowing it to project over the edge of the board, and afterwards screwing it up in the lying press, the whole being sufficiently elevated to prevent the sawing damaging the cheeks of the press; care should be taken not to saw too deep, as the book would not look very nice when it would be opened.

When there are a great number of books to be sawn, the operation becomes very laborious, and a great deal of time is taken up: matters of no small importance in these days of cheap binding. To effect a saving in both of these items, Messrs. John Greig and Sons make a circular sawing machine (Fig. 11) which does the work better than it can be done by hand, and a very great deal quicker.

The operation of sewing a book is one which requires extreme care, as a book unless it is well sewn will not be a success when bound, no matter how much care is taken with the after processes.

Fig. 12 shows a "sewing bench," set for five bands. The bench is formed of hard wood throughout. The bed has an opening extending to within a few inches from each end. Uprights are fixed at each end, and these are screwed or threaded almost the entire length, and are provided with nuts on which the cross-bar rests.

The bands are fastened to the cross-bar, which rises or falls as the nuts are raised or lowered. It can be easily made for a few shillings. The handy amateur can construct his own, or he may use the back of an ordinary kitchen chair in lieu thereof. Fig. 13 shows a key for fastening the cords to the bottom of the bench.

A good three-ply cord should be used for the bands, one that will scrape nicely. The reason of this will appear by-and-by. The thread also should be well selected: a good linen thread as free as possible from knots and burrs. The most useful sizes are 3-cord 25 and 3-cord 18.

Books can be, and are, sewn in a variety of methods, according to the size or thickness of the sheets. If the sheets are thick, or if they contain a plate or a map, they should be sewn all the way up, or to use a technicality—"one sheet on." There are very few books sewn one sheet on, unless there is something special about them. The most common methods are two sheet on and three sheet on. Sometimes, indeed, they are sewn four, five, and six sheet on. But what is meant by this "sheet on" business? asks some amateur. I will try and make it plain, although it will be somewhat difficult. Five minutes in a binding shop watching a sewer would do more towards giving the requisite knowledge than pages of writing.

When a book is to be sewn two sheets on, set up three bands on the bench. Take a sheet, turn it face down, and place it with the saw-marks close up to the bands. Insert the needle in the mark made for the catching stitch at the tail of the book, bring it out at the far side of the first band, bring it round the band, put it in again at the near side of the same band, carry it to the second and third, sewing in the same manner as at the first band, and bring it out at the head. Take the second sheet, insert the needle in the mark at the head, bring it out at the bottom side of the third band; take the third sheet, insert the needle at the top side of the same band, bring it out at the bottom side of the second band, put it into the second sheet at the top side of the second band, bring it out at the bottom side of the first band, put it into the third sheet at the top side of the first band, bring it out at the tail, and fasten up. Go on in the same way throughout the entire book, always working with two sheets until the last sheet is reached; sew it all the way up as the first was done. The first and last sheets are more liable to break away than the others. Perhaps the diagram, Fig. 14, will help us to understand this better; A, B, and C, represent the first three sheets; 1, 2, 3, 4, and 5, the saw-marks, and the position of the bands. The small letters, if taken in alphabetical order, will show the outs and ins of the needle. Thus in at *a*, A, out at *b*, in at *c*, out at *d*, and so on until *h* is reached; the needle will be at the outside of the first sheet or A, which will have been sewn all the way up. Now in at *i*, in the second sheet or B; out at *j*, B; in at *k*, C; out at *l*, C; in at *m*, B; out at *n*, B; in at *o*, C; out at *p*, C: and fasten.

The diagram has little of the appearance of a book on the bench; it was drawn as you see it, for the purpose of showing this intricate matter plainly and simply, which I think it does.

Care should be taken not to draw the thread too tight at the head and tail, and it is better to allow the book to swell a little, as this will help in the rounding process. Much of this, however, will depend upon the taste of the binder. Some men like to work with books that have been sewn tight, and kept well down on the bench while sewing. Others again prefer the opposite; *i.e.*, books that have been sewn slackly and allowed to swell. In the case of tight sewn books, the backs will always be flat, no matter how much they may be hammered; and in the other case the backs will be very easily rounded—in fact, too easy sometimes. I have seen many a little bit of unpleasantness arising between the sewer and the binder over this matter. It will be best then for the general sewer, unless special instructions are given, to take the middle of the two extremes.

When a book contains a large number of plates, or when the back is so far gone that they will not hold the thread, as in the case of music, it is usual to overcast it. This is done by first knocking the book up at the head and back, and taking a small cutting off the back to make the sheets even. It is then glued and allowed to dry. When dry it is sawn in the usual way. Three or four sheets, according to the thickness, are then taken, and commencing at the catching stitch, they are whipped over and over, allowing a sufficient number of stitches between the bands to give the necessary strength, ending at the other catching stitch. The whole book is treated in the same manner. This forms it into sections, and the sewing is proceeded with as in an ordinary book.

There is another method of sewing which is now resorted to for high class books. It is that of sewing on raised bands, known in the shop by the term "flexible." In sewing in this manner, it is only necessary to make a saw-mark at the head and tail for the catching stitches, and for the sake of keeping the sheets and bands straight, it is better to mark with pencil where the bands are to be. This *is* essential in good books. Bring the thread backwards over the cords, for if brought out at the near side it will be sure to tear the sheets.

Silk thread is generally used for this class of work. The effects of this style of sewing can be seen in the fine Bibles and Prayer Books emanating from Oxford and Cambridge, and Mr. Samuel Bagster and firms of like report.

CIRCULAR SAWS: THEIR ADJUSTMENT AND MANAGEMENT.

BY M. POWIS BALE, M.I.M.E., A.M.I.C.E.
Author of "Wood-working Machinery," "Stone-working Machinery," "Saw-mills," etc.

I MENTIONED in page 138 of WORK, Vol. II., the first seven causes for circular saws sometimes running out of truth, and I showed how these various defects in working might be remedied. I said there were fourteen other causes yet to be brought under the reader's notice, and I will now proceed to enumerate and deal with as many of these as the space at my command will allow.

Stated in proper order of sequence they are:—

(8) Saw becoming "buckled" through overheating from the friction of the wood or heat from bearings, etc.

(9) Collar or steady pin of saw spindle out of truth.

(10) Saw plate of too mild a temper or untruly ground.

(11) Saw not compensated, hammered, or distorted enough when cold—by the maker—to run true when warm and at its full speed.

(12) Too much "lead" or rake on the saw teeth.

(13) Saw teeth allowed to get out of space or shape.

(14) Too long a saw guide or fence, causing binding of the wood.

(15) Improper packing of the saw.

(16) Binding of the timber through not being "opened out" as it leaves the saw or other causes.

(17) Chips getting between saw and packing pieces.

(18) Through end play on the spindle.

I will now consider these eleven causes

and the means for counteracting them, leaving the remaining three to be dealt with in another brief paper.

(8) A very common cause for saws running untrue is the heat conveyed from the bearings through the saw spindle to the eye of the saw, and many plans to get rid of this have been tried. It arises, of course, in the first place from the bearings being out of order, screwed up too tight, or from driving with too narrow a belt, which has to be strained too tight, or from running at too short centres, which also necessitates a tight belt; thus undue strain and friction are put on the bearings and heat engendered. These defects can usually be remedied without much trouble. Many schemes for keeping the saw spindle cool have been tried, including one in which it is made hollow, and a stream of water allowed to pass through it and escape at the collar on both sides of the saw, the centrifugal force distributing it over the surface of the plate. To this spindle is fitted a contrivance for relieving the saw and allowing a little end play when necessary, and when the saw is through the cut the end play is taken up automatically by means of a weighted lever and knuckle-joint arrangement. For sawing pitch pine and gummy woods which clog the saw plate, this plan of lubricating with water should be decidedly useful, as it keeps the saw clean and cool, and it may consequently be run with less set. With the same object in view the author has recently constructed a new form of ventilating bearing, through which a steady current of air passes; this has been tried, with very satisfactory results. A saw spindle has also been patented, in which the collars are arranged with a circular groove, and several rows of curved grooves extending to the periphery; when the spindle is in motion a current of air enters into the circular grooves and escapes at the holes at the sides of each collar, thus acting somewhat after the fashion of a fan, and keeping the saw spindle cool. It is needless to say especial care should be given to the matter of lubrication. Get an oil with plenty of *grease* in it, and add one part of finely powdered plumbago to three parts of oil, and, with properly constructed bearings, little trouble should be experienced in keeping them from heating.

(9) Bear in mind if the collar of a saw spindle is only slightly out of truth, this is multiplied considerably in a saw of large diameter. Again, a seamy saw spindle with a bit of metal torn up is enough to throw a saw out, or if packing is used between the collars, and it is rucked up or uneven, it will have the same result. Saws are often blamed for cutting untrue, when the fault lies with the collars or pins. The side of the saw nearest the wood should be constantly tried with a straightedge, and should it be found to bulge in the centre, it will probably arise from the saw collars being out of truth, or improperly concaved. The collars should be carefully tried with a straightedge, and any inequalities or lumps removed. If the collar attached to the saw spindle—that is, the one nearest the wood—is perfectly flat, have it removed and slightly concaved, when the bulge in the saw plate will probably disappear. Inequalities in the saw collars may be temporarily remedied by introducing one or more paper or thin leather washers between them and the saw plate. If a saw should permanently buckle or bulge even slightly, from any cause, it should be at once hammered, as by use the trouble will be increased, and be more difficult to remedy. A skilful sawyer can tell by trying a saw with his fingers when running whether it is buckled or out of truth, even if it be only slight.

(10) This rests with the saw-maker. All circular saws should be made of the finest quality of steel, combining, as far as possible, toughness with hardness, be uniform in temper and gauge, and be ground on a face plate. It is important also that the saw be scientifically hammered, so that the tension or strain is properly distributed. "Cheap" (?) common saws—in fact, all kinds of wood-cutting tools—are dear at any price. No professional workman will be troubled with them, and no opportunity should be lost of warning the amateur against purchasing inferior articles, which will only be a source of trouble and vexation to him as long as he continues to use them.

(11) No. 11 also rests with the saw-maker to a considerable extent, but not entirely, as the speed at which the saw is run should determine the amount of distortion necessary. Thus a saw may be hammered to run perfectly true at a slow rate of speed, say, 6,000 ft. per minute, but if this is quickened up to the standard speed, say, 9,000 ft. or 10,000 ft. per minute, it may become wavy and pliant, and run out of truth. It therefore follows that, if saws are to be run at any unusual speed, the saw-maker should be so informed, that they may be distorted or hammered to a suitable tension, and the tension uniformly distributed. If a saw is distorted too much, either at the teeth or centre, it will, when subject to improper usage and the friction of sawing, become "rim-bound" or "dished;" hence the importance of a perfectly adjusted saw to commence with, and the absurdity of expecting fine work from a cheap saw. It is, of course, apparent that the rim of a circular saw runs faster than the eye, and consequently heats and expands faster. To overcome this unequal expansion, and allow the saw to expand equally and run true when in work, additional heat is created in the centre by means of "packing" in this country, whilst in America the same end is attained by distorting the saw to a greater extent when hammered by the maker.

(12) In sharpening saw teeth with a hook to them, such as is found in the different forms of gullet and briar teeth, care must be taken that too much "rake" is not given to the teeth, or they will be found to tremble in work, dig into and draw the wood, and run from the line; of course, some woods will stand more rake on the saw than others.

(13) Allowing teeth to get out of space will, in some cases, make a saw run untrue; say, alternate spaces set wider than the others; the teeth following those spaces have more work put upon them, and being set all one way—say, to the right—they naturally pull hardest into the wood in that direction, consequently the saw runs to the right. Hence the necessity of keeping all the teeth uniform in space. This can readily be done by using an adjustable sheet steel template shaped to the teeth in sharpening.

(14) The author is of the opinion that a not by any means unusual cause of a saw jamming and buckling is the use of too long a saw guide or fence, so that the timber becomes crowded against it and has not room to open out. A fence for rip saw should not, as a rule, project above three or four inches beyond the roots of the saw teeth unless very thin stuff is being sawn. For sawing deals, etc., some makers now fit friction rollers in the fences, arranged to project slightly beyond the face of the plate.

(15) The proper "packing" of a saw, unless of very thick gauge, is a matter of paramount importance in its effective working. The object of packing, in addition to supporting and lubricating the saw, is to allow it to expand equally from the friction or heat created by the packing rubbing against it. To ensure this it is very necessary that the saw is packed evenly and equally. The plan generally pursued in this country is to screw pieces of wood to the finger-plate, and below the saw table on either side of the saw, the wood being rebated to allow the hemp gasket, or other fibrous material, charged with grease, to be packed in tightly on either side. There are a right way and a wrong way of doing even this simple operation, and care should be taken that the packing is put in evenly, and bears uniformly and without undue pressure on both sides of the front half of the saw. However, in preference to the above, we can strongly recommend the following simple plan:—Take either two pieces of hoop iron or strips of hard wood of the length of the saw from the teeth to the eye, and of a width that will reach not quite flush with the top of the table; then take some flax or rope yarn and lap it evenly round the strips from end to end till they are made thick enough to fill the packing space and bear evenly and not tightly against the whole front half of the saw plate up to the spindle.

Instead of packing the back half of the saw as some do, take two small discs of leather and attach them to the wooden packing pieces which are fitted to the frame of the bench, so that they bear on either side of the saw at the back and near the rim or roots of the teeth, and so steady and guide it. It is a mistake to use much oil in the packing, as this is wasteful and unnecessary. The above will, I think, be found a decided improvement over the plan generally pursued—of ramming down packing on either side of the saw, as this is, at the best, uncertain, as should the packing be tighter at one point than another, or should it be lumpy, the friction on the saw plate is uneven, and it will often cause it to run "wavy" and out of truth.

(16) In sawing woolly-fibred and difficult timber special means should be taken to open them out as they leave the saw. This is usually done by the sawyer with wedges driven into the kerf by hand: this is often neglected, thereby causing many a saw to jamb and buckle. To obviate this, the use of a revolving opening wedge can be recommended; this should be fixed immediately behind and in the same line as the saw. The wedge should be made preferably of steel, circular in form, and say half an inch thick at its centre, tapered down to a blunt edge at its circumference, its diameter being regulated by the size of the saw. It can either be arranged to project through the face of the bench, or be mounted on centres at the end of a lever, and suspended behind the saw. The wedge as it enters the cut is revolved by the friction of the wood, and thus relieves the saw from a considerable amount of side friction. Instead of a revolving wedge a fixed steel spreading-knife or wedge can be employed; in any case something of the kind is certainly to be recommended, as it tends to relieve the saw considerably, and is always there when wanted.

(18) End play on the saw spindle should be prevented; this can be done by means of an adjustable lock-nut.

NOTES ON GLASS PAINTING.

BY FRED MILLER.

TRACING.

IT would be a great improvement to our window blinds if we painted each square with some simple pattern, and I will now tell my readers how to set about accomplishing this. You want some glass tracing brown, and you could purchase some where you get your glass and leads.

Buy a couple of fine black sable writers and mull up the colour on a glass slab, putting as much loaf sugar with it as will bind the colour firmly to the glass when it is dry. The proportion of sugar would be somewhere about one to ten of colour, but the best test is to put a small portion of sugar, and, when mulled up, paint a few strokes on a piece of glass and dry before a fire. If it comes off easily, add more sugar. Should the colour dry shiny and sticky, this tells you you have too much sugar in it, so you must add more colour. Colour improves by being kept, for though it will dry hard you have only to add water and mull it up again to make it fit for work. You must have your patterns drawn out the proper size on paper, and you then place your glass over the design and follow it with the brush. At first you will find that your brush touches the glass before you seem aware of it, and you will have some difficulty in following the design. Then possibly your hand will be shaky, and your strokes, instead of being firm and regular, will be uncertain. You must not expect to trace a square with feeling and precision until you have tried your 'prentice han' on many a failure, but it does not matter how often you rub out, as the glass is in no way injured. Keep your brush full of liquid colour (constantly add water) so that it flows freely on to the glass. Never work with a dry brush, for unless the colour flows freely on to the glass, a thin, scratchy line is the result, and lines on glass must have a certain solidity, as they have to look well *when held up to the light*, an important consideration.

Fig. 1.—Design for Circle of Glass for Centre of Window. Subject—Medlars, Tit, and Small Butterfly.

The secret of good tracing is to get a crisp, firm line without doing it in a laborious, mechanical way. The freer, and consequently easier, the tracing is done the more artistic the result. The outline need not be equally solid everywhere. I like to get a certain variety in it by allowing the colour to run on in a more diluted state in some places than others.

In making a line semi-transparent, effect

this by putting thin colour, *i.e.*, colour largely diluted with water, on freely rather than solid colour on thinly with a dry brush. When the outline is dry, I sometimes wash a little very thin colour on certain parts of the pattern, say where one leaf comes over another, or in the centre of a flower, or anywhere where a want of relief is felt. This washed-on shading, if done with feeling, adds to the artistic quality of the work, as it lessens the mechanical appearance. Should it be desirable to do this shading in a little more exact way, a little colour (ancient brown) finely ground up in turpentine, with as much Venice turpentine to bind it on the glass as the sugar did in the tracing colour, will accomplish this. This oil shading colour is put on with camel-hair brushes very thinly. It should be put on freely and in a liquid manner, but if you put an excess of turps in it the colour is apt to spread on the glass. You must use it thin enough to flow freely, and not too thin to run. When this shading colour is getting dry, dabbing the finger over it evenly will lighten a dark passage, and give an evenness of texture to it, after the manner of lantern-slide painting. Should it be desirable to remove this oil shading, even when quite dry, a little turps on a soft rag will effect this.

STAINING.

We now come to an interesting branch of our work, *viz.*, producing that beautiful, golden yellow colour on glass. As I have heretofore said, coloured glass is made in the "pot," and there is only one colour that can be given to glass after it is made, which enters chemically into its composition and stains it without lessening its transparency. Chloride of silver is the active agent of "yellow stain." It can be made by dissolving a piece of ordinary nitrate of silver, which can be procured of a dealer in photographic requisites, in water and precipitating it by throwing into this solution some common table salt, when the silver will fall to the bottom in the form of a white precipitate. Pour off the surplus water and wash the residue a few times in hot water. Allow this white powder to dry, and as it is sensitive to light it will darken by exposure. When dry, mix with about three or four times its weight of "yellow lake," and grind up thoroughly in turpentine, and as you use it remix a little with a small quantity of Venice turps in addition to ordinary turps. This yellow stain acts with varying strength on different makes of glass, and one way to test the strength of your stain is to paint a little on a small piece of glass and place it in the brightest part of a clear fire. When the glass gets thoroughly red hot take it out, and when cold rub off the yellow lake (this is only used as a mordant and has no effect on the glass), and see what strength of yellow you have obtained. The whiter the glass the stronger stain you can use, and the more colour the weaker. To stain some shades of greenish white it is necessary to add a good deal of yellow lake, for it does not do to merely put an ordinary stain on very thinly. The more stain you apply to glass the darker it comes out until you can get it a deep orange, but as a general rule you only want to have a suspicion of the yellow floating, as it were, over your pattern, with here and there a stronger touch to give accent to it.

This yellow stain you apply to the *back* of the glass when you have traced it, as it must never come in contact with other colours. Keep the stain well inside the pattern, and always look straight through the glass. If you look at it anglewise you are apt to get the stain beyond the outline.

Having traced and stained your glass send it to be burnt. The firm I have mentioned will burn it for you, but wherever you can get china burnt, there can you have your glass fired. Should the stain have come out too weak, or should there be any defects in the tracing, touch up and have it refired. After that the glass only requires leading. Of course, it is impossible to go very deeply into the art of glass painting in the space that can be devoted to one subject. I may perhaps make some remarks on the subject of figure painting and the use of enamels on glass in future papers, in addition to the brief hints given here on simple glass painting.

The illustrations accompanying this article are reproduced from full size designs drawn expressly for the purpose of glass tracing, and the reader ought to have no difficulty in enlarging any of them to the required size, or using them as given in the pages of WORK.

Fig. 1 is a design suitable for the centre of the window, the left-hand half of which is shown in Fig. 2. Here, as the design is *not* going to be *repeated*, a more naturalistic style can with advantage be adopted, and the introduction of birds, as the tits on the branch of medlar, give point and accent to the design.

Fig. 2, in addition to showing the left-hand side of the window, affords designs suitable for being repeated as often as necessary, until the required number of squares are painted. Windows composed of squares that are merely the repetition of three or four simple and not *too naturalistic* designs are most effective and beautiful, the yellow stain giving a great variety of colour. The quarry A may be alternated with the floral ones.

Fig. 2.—Design for Window, showing Treatment of Floral Quarries round Centre Panel.

OUR GUIDE TO GOOD THINGS.

25.—Britannia Company's Capstan or Turret Compound Slide Rest. 26.—New Patent Screwing Machine. 27.—Dividing Appliance for Engineers. 28.—Appliance for Sharpening Cutters for Milling Machines. 29.—Small Circular Saw Bench.

Capstan or Turret Compound Slide Rest.—So energetic is the Manager of the Britannia Company, Colchester, and so rapid is the rate of production of new machine after new machine at the Company's works, that it is difficult to manage the supply of space devoted to notices in Work in such a manner as to keep pace with the demand, and I am compelled to deal briefly and *en masse* with a number of the Company's specialities, each of which ought to have at least a column to itself. In Fig. 1 is shown an excellent Compound Slide Rest for brass finishers and electricians, to which—from the form of its revolving head, or tool-holder, which is rotated by hand—the appropriate name of "Capstan" or "Turret" has been assigned. This head is constructed to hold five tools of any desired form for sliding, surfacing, pointing, paving, etc., enabling all such operations to be done at one setting of the work; and, if used in conjunction with a headstock having a hollow spindle to take rods of brass or iron, studs, joints, pins, etc., may be quickly produced and cut off from the rod. The rests may be bolted to any ordinary plain lathe, or made to fit the saddle of a screw-cutting lathe. Prices range from £6 to £12 15s.

Fig. 1.—Capstan or Turret Compound Slide Rest. Fig. 2.—New Patent Screwing Machine. Fig. 2 A.—Enlarged View of A in Fig. 2. Fig. 3.—Dividing Appliance for Engineers. Fig. 4.—Appliance for Sharpening Cutters for Milling Machine. Fig. 5.—Small Saw Table, a Useful Adjunct to the Carpenters' Bench.

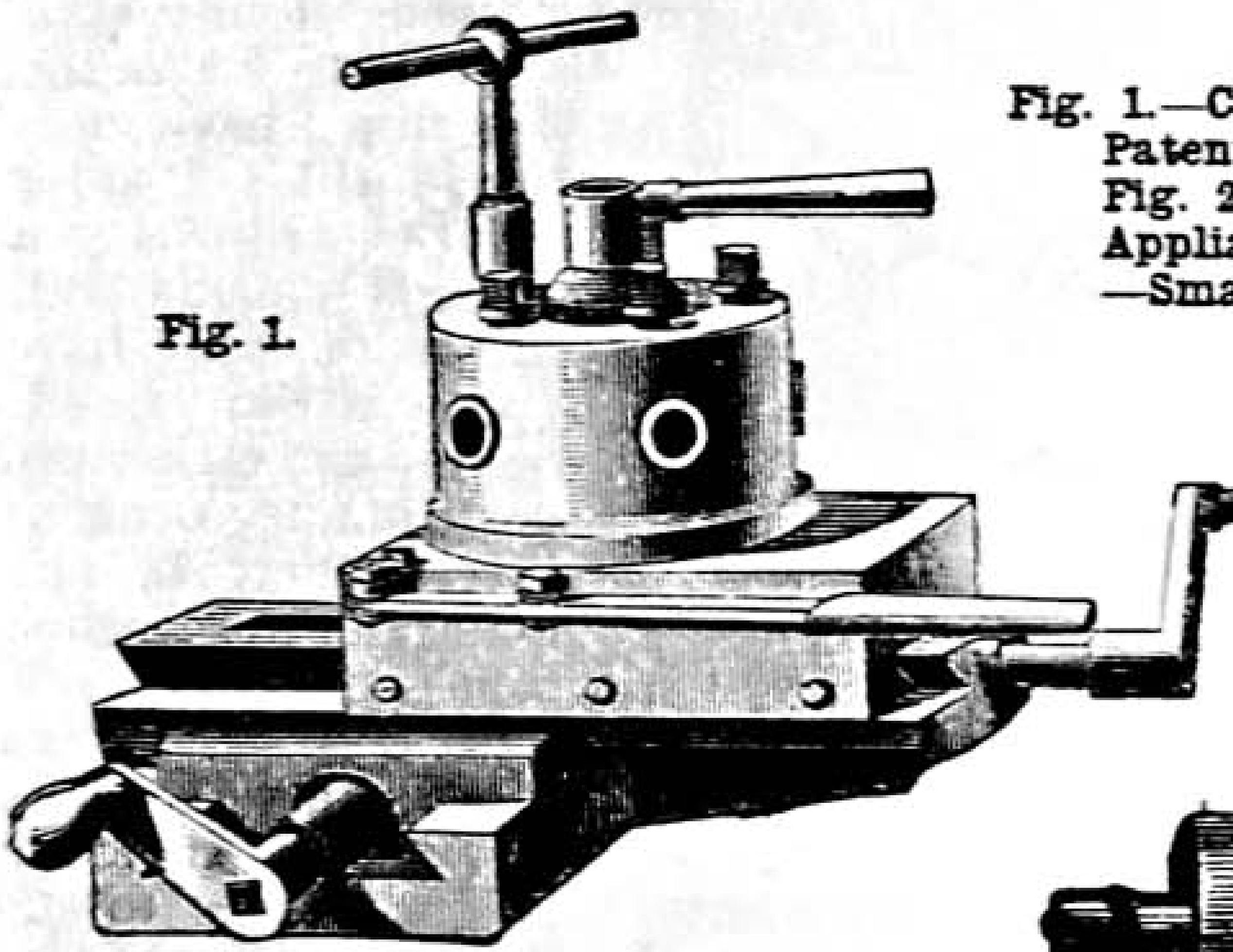


Fig. 1.

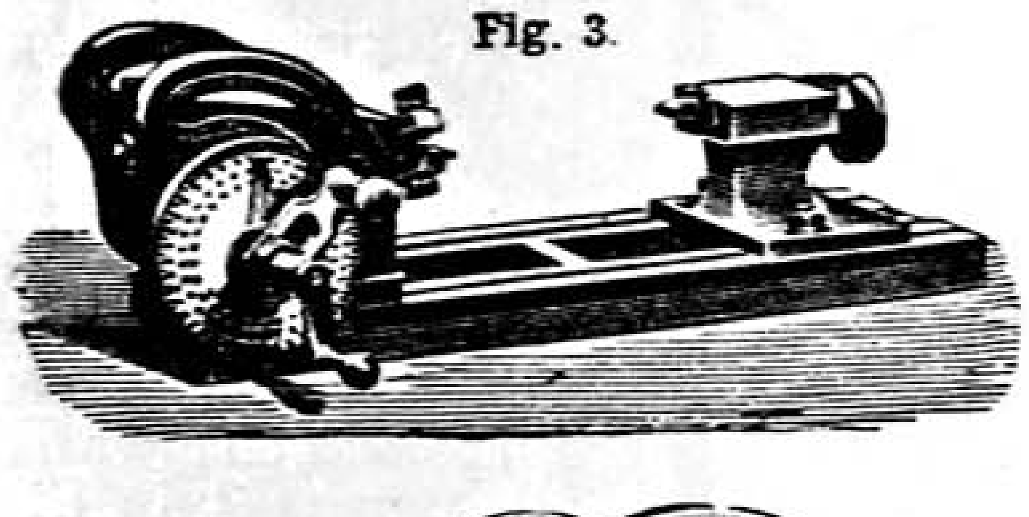


Fig. 3.

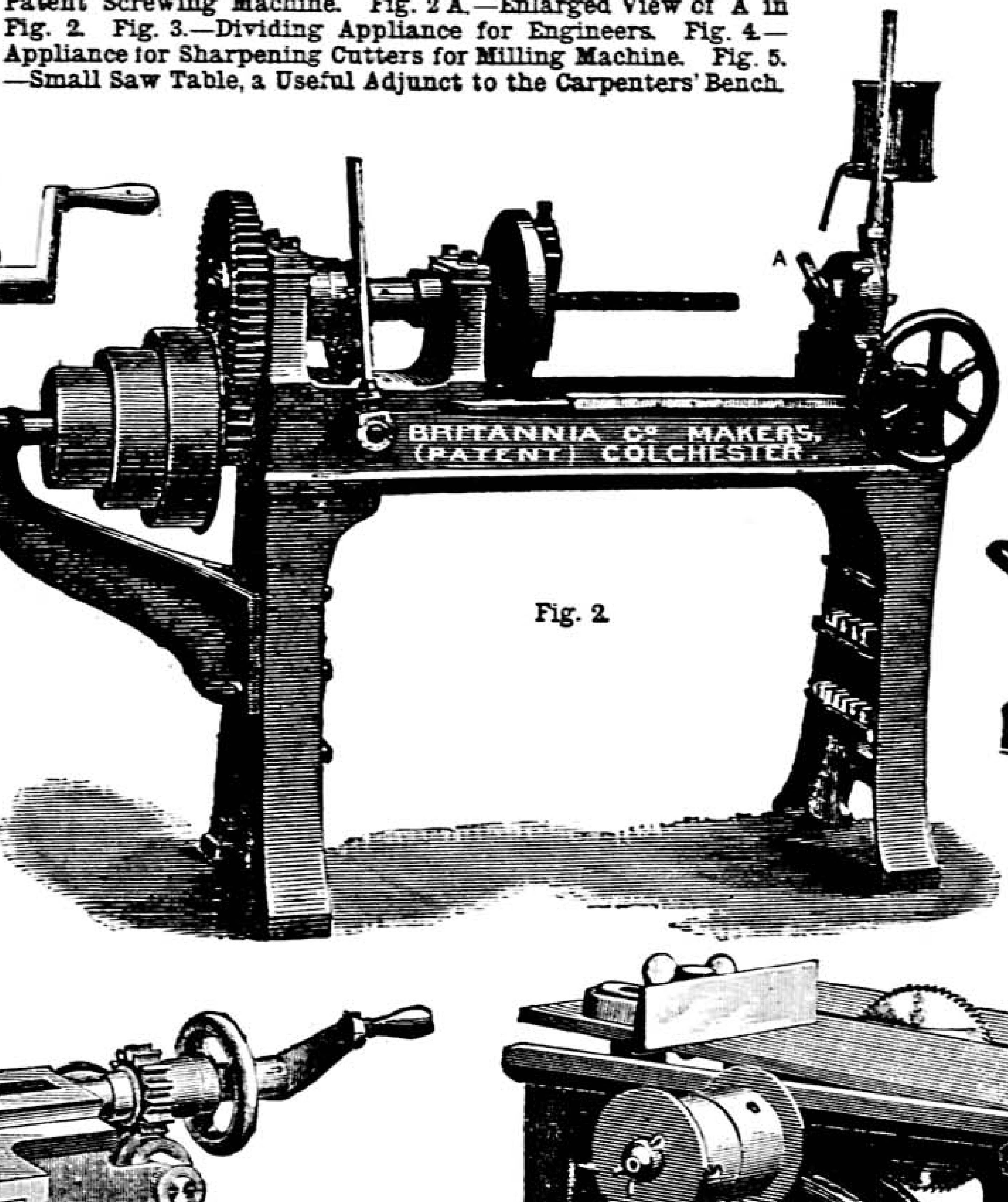


Fig. 2.

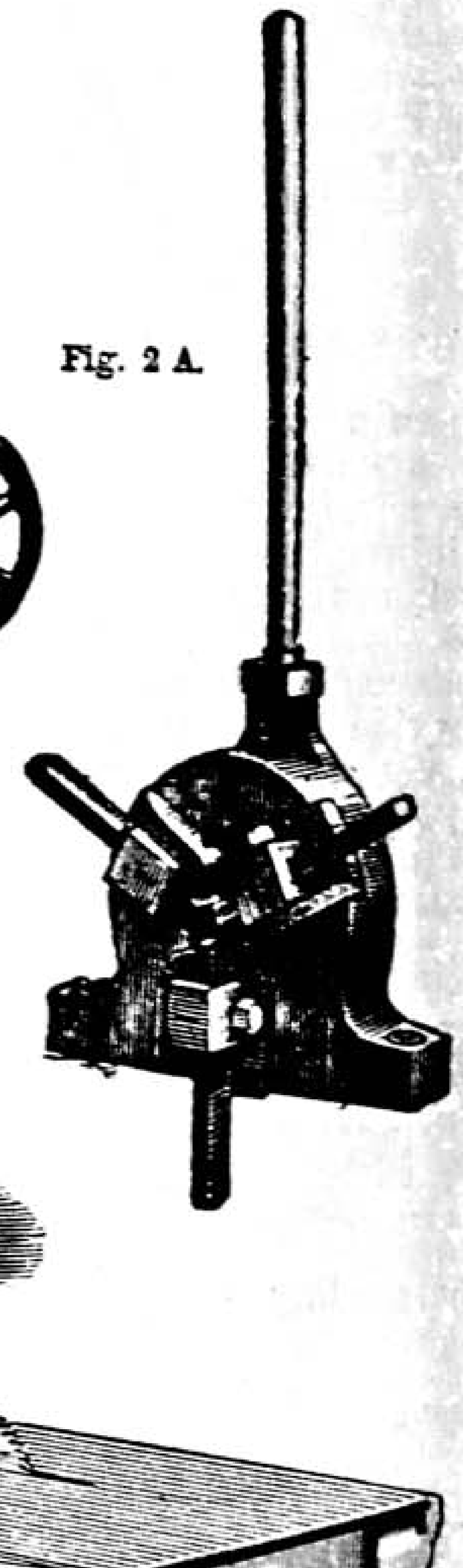


Fig. 2 A.

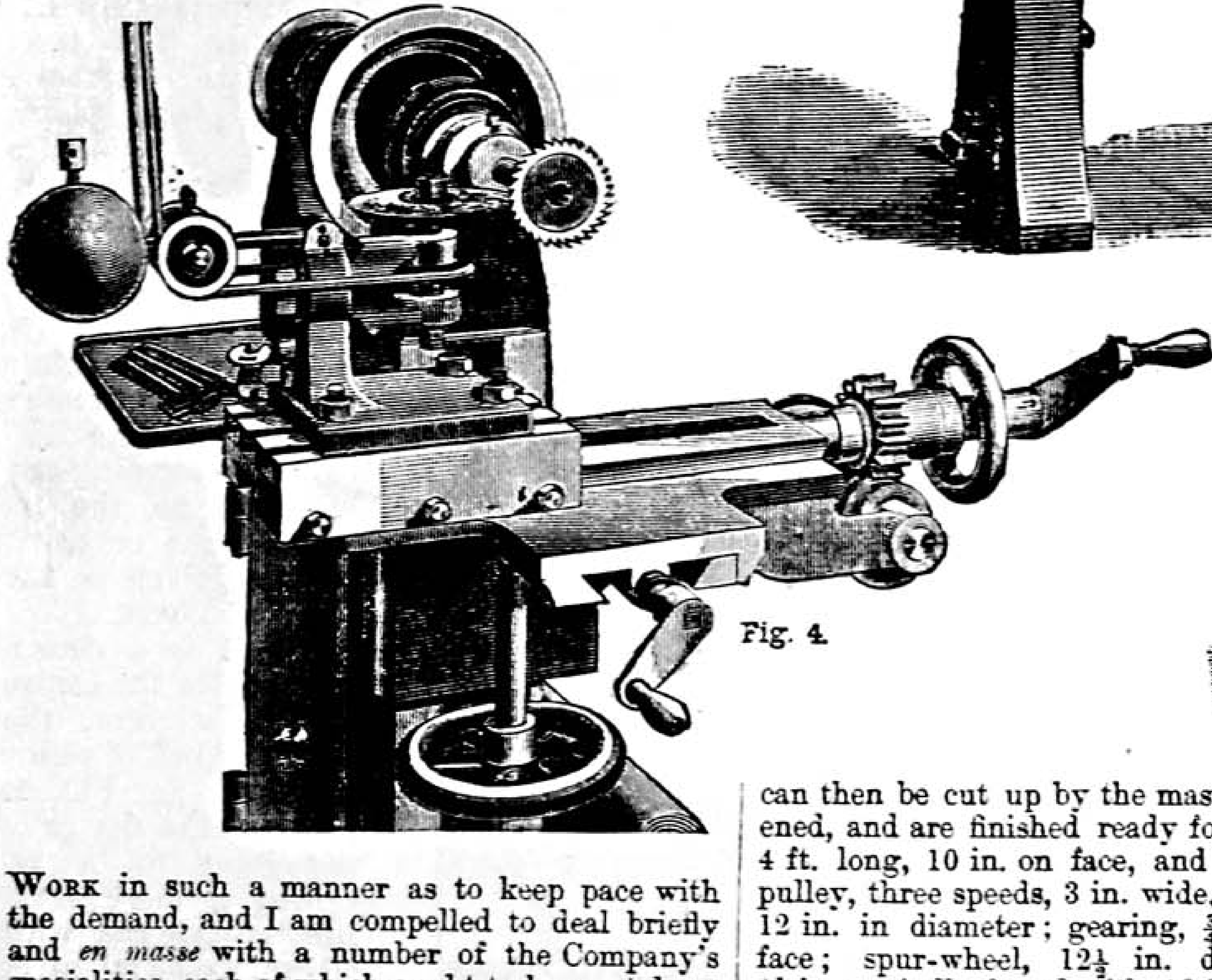


Fig. 4.

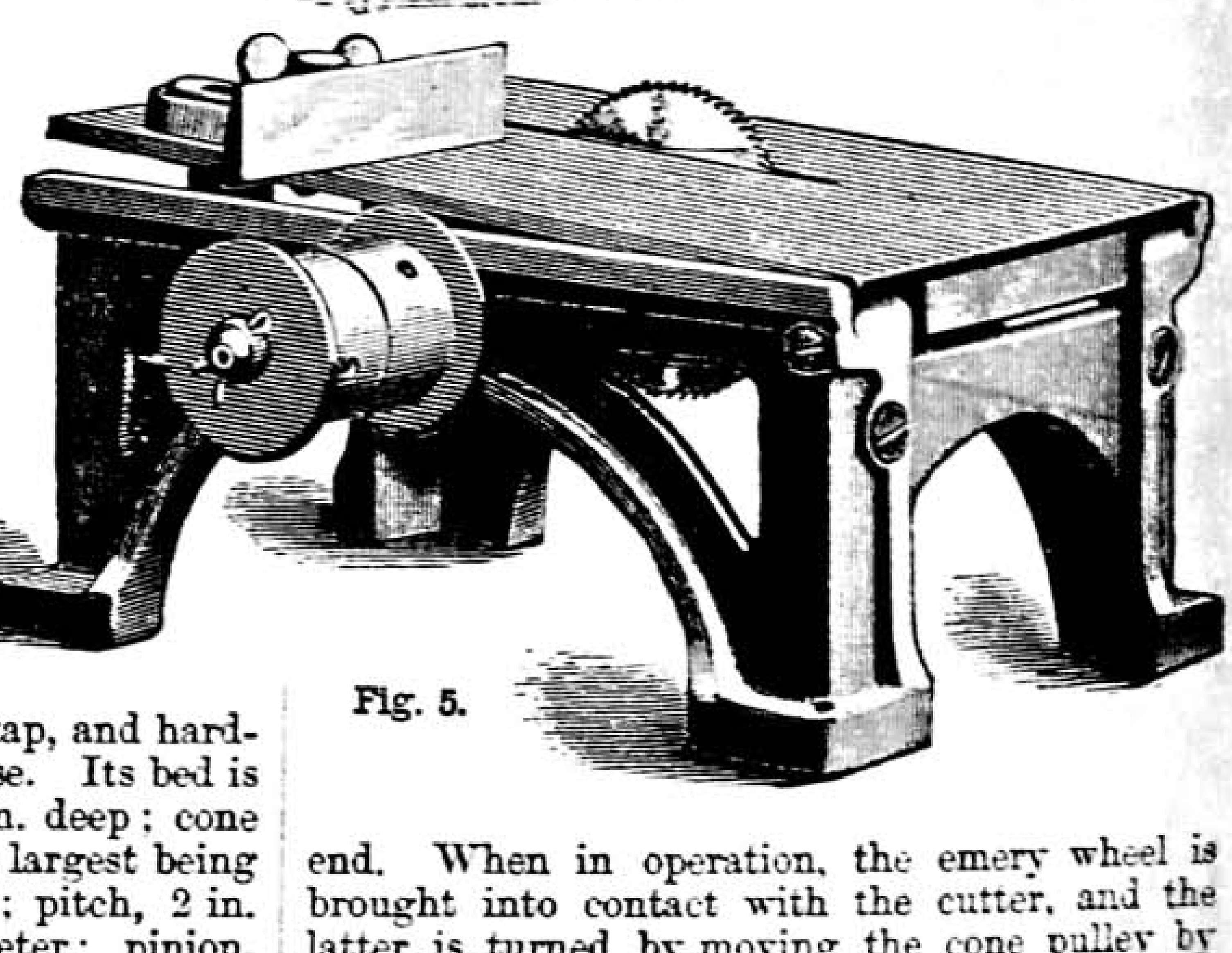


Fig. 5.

New Patent Screwing Machine.—This machine is shown in Fig. 2, and an enlarged view of the screwing head at A, in Fig. 2, is shown in Fig. 2A. The principle of the machine is extremely simple, and it is economical and time-saving in its use. The headstock is fitted with a hollow spindle to take rods or tubes of any length, and a self-centreing die chuck. The screwing head is carried on a saddle fitted to the bed, actuated by racks and pinions and hand-wheel. A clutch arrangement enables the machine to be stopped instantly in case of accident or necessity. The important feature of the screwing head is the simplicity of the dies, which are merely pieces of steel cut off the bar, put into the tool-holder, and secured by set screws. In this machine they can then be cut up by the master tap, and hardened, and are finished ready for use. Its bed is 4 ft. long, 10 in. on face, and 6 in. deep; cone pulley, three speeds, 3 in. wide, the largest being 12 in. in diameter; gearing, $\frac{3}{4}$ in.; pitch, 2 in. face; spur-wheel, $12\frac{1}{2}$ in. diameter; pinion, $4\frac{1}{2}$ in.; spindle bored with $1\frac{3}{4}$ in. hole; approximate weight, 8 cwt. Price, complete, with master taps and dies for $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in., and 1 in., and reversing overhead motion, £35.

Dividing Appliance for Engineers.—This is a machine of a strong pattern well adapted for use with milling, shaping, or other similar machines (Fig. 3). It has a cast iron planed bed to bolt on to the machine table, and quadrant slots to adjust to any angle for cutting worm-wheels, angled tooth-cutters, etc. The fast head is constructed for the spindle to be elevated and locked at any angle. The spindle is moved for dividing by a steel worm and wheel, and the worm-shaft carries a division plate with five rows of holes capable of dividing, with the worm gearing, up to 3·600 to an inch. The appliance is of the best materials and workmanship, and very accurately fitted. Height of centres, 4 in.; length of bed, 24 in.; between centres 11 in. Price £14 10s.

Appliance for Sharpening Cutters for Milling Machines.—This appliance is illustrated in Fig. 4 as in use on a milling machine, and fits on its table. It is driven from the countershaft of the machine and adjusted to correct position for grinding by the slides of the machine, the cutter to be sharpened being meantime held in its usual position as for cutting in the mandrel of the headstock, the driving belt of the latter being thrown off for the time. It has a firm base to bolt to machine table, and a swivelling head, carrying a steel spindle with driving pulley fitted and arranged to hold an emery wheel at its end. When in operation, the emery wheel is brought into contact with the cutter, and the latter is turned by moving the cone pulley by hand, bringing each successive tooth in contact with the emery wheel. This, being fitted to swivel, can be arranged to suit cutters having teeth cut square across or obliquely, and can also be used with a square-edged emery wheel to run in a vertical direction and sharpen the cutter by grinding the tops of the teeth, which is sometimes preferable. Price £4 10s., or with overhead for driving it independently, £6 10s.

Amateur's Circular Saw Bench.—This handy little bench, which is illustrated in Fig. 5, is suitable for cutting wood or metal, has a rising table, and can be driven by any ordinary foot power. Length at base, 10 in.; width, $6\frac{3}{4}$ in.; table, $9\frac{1}{4}$ in. by $6\frac{1}{4}$ in.; height of bench, $4\frac{3}{8}$ in.; fast and loose pulleys, 1 in. wide and $1\frac{5}{8}$ in. diameter. It takes a $3\frac{3}{4}$ in. saw, and costs 35s.—The Editor.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

* * *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.

D Dulcimer Errata.—R. F. (*Norwich*) writes: "In my reply to H. M. L. (*Coatbridge*) (page 159, Vol. II.) *re* D Dulcimer, the natural sign (♮) is confounded with the flat sign (♭). Wherever the word *flat* occurs in the paragraph in question it should read *natural*."

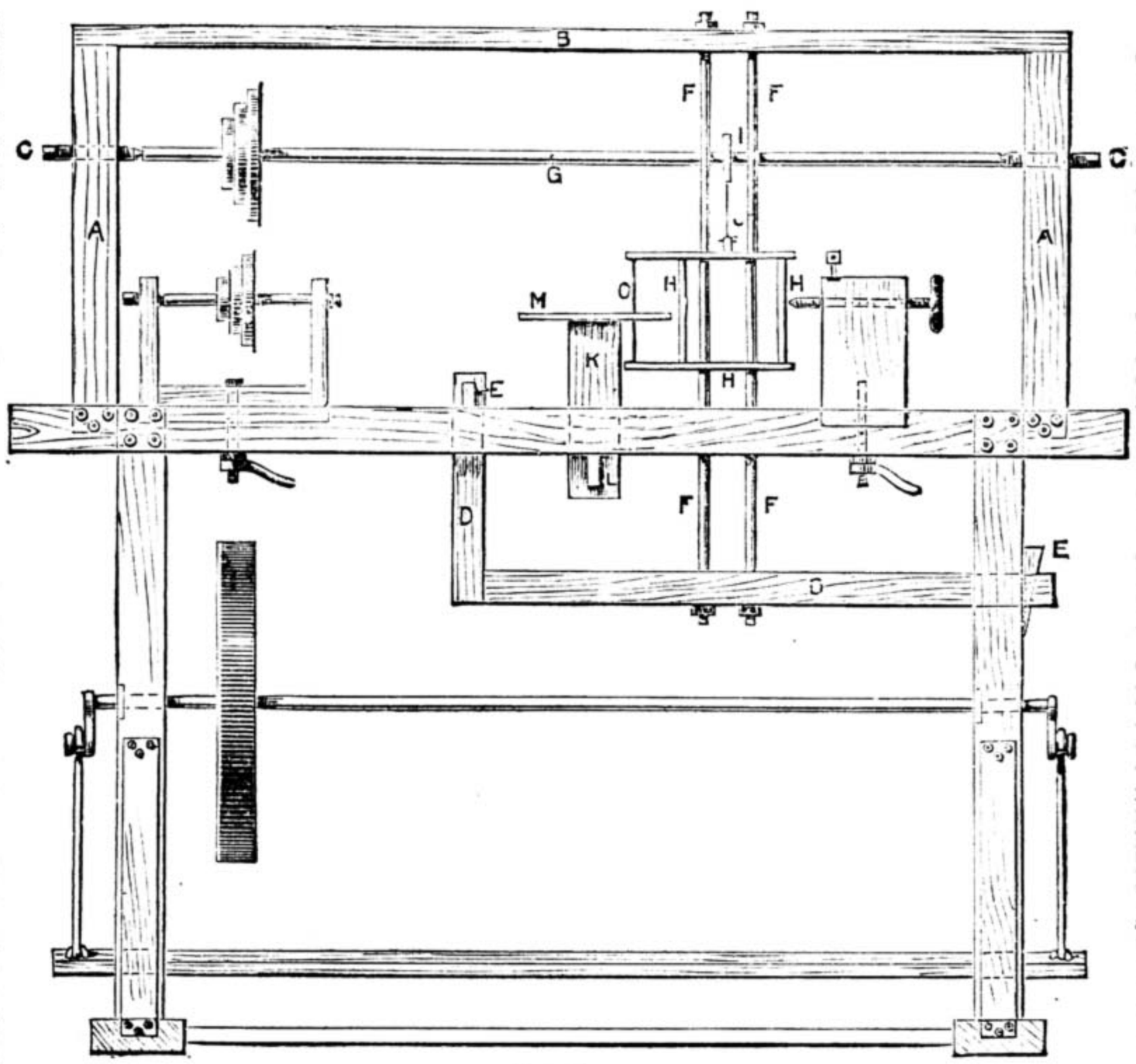
Case-Hardening. — A SMITH writes: — "J. H. is under a mistake in saying page 144, Vol. II.) that 'only wrought iron is treated thus.' Nearly all patent axle-boxes are cast iron—of all qualities, too; they are all case-hardened in the same way as steel and wrought or malleable iron.'

Lockmaker's Address. — BRASS writes:—"I think in the reply of T. W. to E. M. *Glasgow*) (see page 143, Vol. II.), the reference to Messrs. B. Walters & Co., lock manufacturers, etc., Willenhall, is wrong, and should be North Street, Wolverhampton. I do not know of a firm in Willenhall of the above name."

Trade Usages. — B. A. B. (*Hampstead*) writes to H. B. (*Jarrow-on-Tyne*) (see page 127, Vol. II.): —"I am not able to justify the terms used in workshops, and would hail with pleasure any effort by H. B. or any one else to make workshop language easily and readily understood by the youngest beginner. I know well how much better it would be for all learners and all teachers. But the fact remains that the operations of the workshop are named not by the material of which the work is composed, but, usually, after the tool by which the work is done, and the name is not always consistent. Sometimes the name tells its own tale, and is suitable, such as a plane, a joiner's tool to make flat surfaces. Work on which a plane is used is said to be planed, even if the work is far from the ideal plane. We have such contradictions as a compass-plane. I could give plenty of instances of confusion arising from careless nomenclature, still I must hold to my position that it does not matter if the material to be perforated is metal or wood, the terms remain. A steam-engine cylinder is metal, yet it is said to be bored; a gun or rifle is also said to be bored, H. B. notwithstanding. Only small holes bored with a drill can be said to be drilled, which, of course, throws us back to 'What is a drill?' which H. B. knows as well as any reader of WORK."

Opalistic Topaz.—OLRAC writes:—"I notice in the reply of H. S. G. to L. J. P. (*Wellingborough*) (see page 129, Vol. II.) that he states 'almost positively that it belongs to the same class as sapphirines, that is, it is a production of the chemist's, not of Nature's.' I beg to call H. S. G.'s attention to the fact that there is a stone, the work of Nature, called sapphirine, which is the name given to a blue variety of spinel which comes from Aker, in Sweden, imbedded in limestone; also in Forland and Straskan, in Moravia. My authority is H. Emanuel's book on diamonds and precious stones."

A Fret Saw Hint.—J. H. N. (*Malvern Wells*) writes:—"Seeing a fret saw in WORK, page 636, Vol. I., described by A. A. (*Coventry*), I thought it a pity for any one to go to the trouble of making it with such a bed without adding lathe headstocks. I have sent a rough sketch of a machine on same principle, which I think will be an improvement. Besides, it is not every one who has a beam to fasten fret frame guides to. As A. A. does not show beam fastened to bed of machine, I presume it is a separate affair. I was also wondering if the weight of the crank-shaft is sufficient to drive saw, as I see no fly-wheel in sketch. I now describe parts of machine sent: A are standards of overhead gear; B, beam along top; C, pins to hold overhead shaft; D, frame fixed to bed and right-hand standard of machine by wedges; E, F, guide rods fastened through B and D by nuts at each end, rods coming down between slot in lathe bed and in front of overhead shaft, G, so as not to rub; H, fret frame sliding on guide rods, F, and worked with an eccentric; I, an overhead shaft of lathe; J is a pin through rod and box, to allow for play of eccentric and give motion to frame, H. Of course, it is a well-known fact that whenever an eccentric is pitched out of centre it will give double that throw, so that if we have this one 4 in. out of centre, we shall get 8 in. throw, which is about right for a fret saw. K is a block with tenon cut to go between lathe bed, and fasten underneath with wedge; L, table on top of block at M; O is the saw, fastened with usual clamps. The table can be shifted along the bed for convenience by having a saw cut down same, for fret saw to run along. The arms of the frame could, of course, be made longer, from first stay of same to saw clamps, to allow more scope of work. I think I have explained all that is necessary, namely, the saw, as the lathe may be made from previous instructions by SELF HELPER, the only addition being the overhead gear, which will be found very useful for turning. All the saw parts may be removed to leave lathe clear for turning, as may be seen. The only part that may not appear clear is the removal of the eccentric, but this may be easily managed by having a set screw to clamp it to overhead shaft, so that when screw is loosened it may be pushed along to right-hand end and taken off by undoing centre pin; the pin at J may also be made so that it will slide in and out easily, to connect and disconnect eccentric rod to saw frame."



Fret Saw.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Paint for Boats. — W. H. (*Nottingham*).—Special preparations of paints and varnish are made for the shipping branch. It is not necessary that such should always be used, although, if any quantity of work has to be done, I should certainly advise them; it stands to reason that materials made specially for resisting water would be preferable to such as are used for all ordinary work. Three or four qualities of copal boat varnishes are made by most firms, ranging from 10s. to 18s. per gallon, price depending chiefly upon colour (see paper on varnishes). Mander Bros., Wolverhampton, make all kinds of varnishes, or Messrs. Farmiloe, of Rochester Row, London, N., make the above at prices quoted. Messrs. Pontifex & Wood prepare special "anti-fouling compositions" (varnish paints) for ship and boat work; their London offices are in Shoe Lane, E.C. If you don't require a gallon, you may make your own paint, using plenty of boiled linseed oil for mixing and varnishing with any good outside copal varnish. Previously make watertight with putty.—F. P.

Gilding Frames.—T. N. (*Halifax*). — (1) The best to use is the gilder's oil of gold size, which you can buy of any respectable oil and colourman. (2) It requires about twelve hours to dry. The usual method adopted in the trade is to use it at night, and it is ready for gilding in the morning, and is also less liable to get dust or grit upon it. (3) The best to use is English gold leaf, sold in books at about 1s. 6d. book. When the gold size is just tacky take a few leaves upon your cushion, cut into strips the width you require, and pick up with tip in right hand, and place it at left end of moulding or parts you propose gilding; and so continue until the whole is properly covered with gold, using a cotton-wool dabber to get it well down; put aside to thoroughly dry, then wipe round with cotton-wool and clear size with vellum size. When dry it is ready for use.—G. R.

Gilding Mounts.—W. H. (*Stockport*).—You can buy best gold paper, gilded in gold leaf, not such as is used for bon-bons, ready prepared for use at about 1s. large sheet, which requires cutting into narrow strips the width required according to thickness of your bevel; cut the left hand at angle (if for square mount), moisten the prepared side with your tongue, place on the bevel neat and straight, and rub down with a linen rag until it all sticks, which you will find do very easy.—G. R.

Mitre Cutting.—J. A. C. K. (*Darwen*).—If you screw your machine to a solidly fixed bench, and have a good sharp blade in and gently push your handle over from left to right without stopping, you must get a clean cut without chipping. Of course if the machine gives, or you have it fixed to a table that jolts, you cannot avoid chips; a sharp knife is also very important. I have used one for this past two years, and make many fancy frames without the slightest chipping, except through my own carelessness.—G. R.

Books on Metal Working.—METAL WORKER (*Tiverton*).—There are no separate works on subjects you mention; you will probably find them in "Spon's Workshop Receipts," of which there are 4 vols. published, price 5s. each, Spon & Co., 125, Strand, London.—F. J. C.

Chinese or Japanese Models.—BIRD CAGE (*Folkestone*).—In making a bird cage I fear the model of a Chinese house would hardly help you, as it is too crowded with balconies, verandahs, and so on, to give room for the wirework. I have many hundred volumes of Japanese books, and amongst them a series of drawings of houses by the famous artist Hokusai. I have just completed a sketch of a bird cage after the details given therein, which, if not a model of a Japanese house, will be a fair imitation of one. This drawing I am sending to the Editor, who will doubtless publish it in due course; but remember please that engraving takes time, and that a paper with the circulation of WORK is arranged many weeks in advance, so that if time elapses before it appears, it will be from the result of circumstances, and not the fault of the Editor or of E. B. S.

Gold Leaf.—M. L. (*Clapham*).—Gold bronze for gilding is sold by Hughes & Kimber, Fetter Lane, E.C., who, if they do not also keep gold leaf, would doubtless give you information concerning it.—E. B. S.

Transferring Papers.—J. T. F. (*Sunderland*).—The transfer pictures for decoration are sold at any fancy stationer's. But I doubt whether they could be effective on a painted surface. The glacier window decoration you suggest would most certainly not be satisfactory, since it needs a transmitted light to show the pattern. If you cannot paint the decoration required, I would suggest that you buy some odd patterns of handsome cretonnes and cut the flowers out. These would be far more effective than transfer pictures, as they are bolder in design and colour; besides, the texture shows out well on a painted surface. Wall papers might serve as well if you could get access to a good pattern book and choose a few appropriate sheets.—E. B. S.

Screen Covering.—J. T. F. (*Sunderland*).—The Japanese gold leather paper, sold by Messrs. C. Hindley & Co., Oxford Street, or at Liberty's, Regent Street, or of any good decorator's, is the best screen covering I know, costs 1s. a square yard, upwards, looks well, wears splendidly, and is gorgeous in its colour and design. Failing this, there are pretty cretonnes in imitation Japanese designs at Liberty's and elsewhere. A plain covering of American cloth, with the pattern of a good

cretonne—a paper cut out and stuck on—as an all-over design is also effective.—E. B. S.

Sticks for Wooden Bird Cages.—ST. ANDREASBERG.—With regard to the sample of sticks used for making the small Hartz cages at St. Andreasberg, in the Hartz Mountains, I note that they are rather more than ⅛ in. in diameter, and not very perfectly rounded off. You ask me to suggest a tool to make them with. If I wished to make any myself, I should get wood ¼ in. thick, cut it into strips of the same width with a cutting gauge, and then take off the sharp edges with a scratch in the form shown in the accompanying illustration. To prevent breakage, clamp your sticks down on a piece of board while scratching or scraping them into shape. You will find how to make a scratch complete in an article entitled, "The Scratch or Beading Router," in No. 7, on page 101 of Vol. I.

Tricycle Making.—J. T. (*Bradford*).—This subject will be taken up in due course, but it is difficult for me to say when papers will appear.

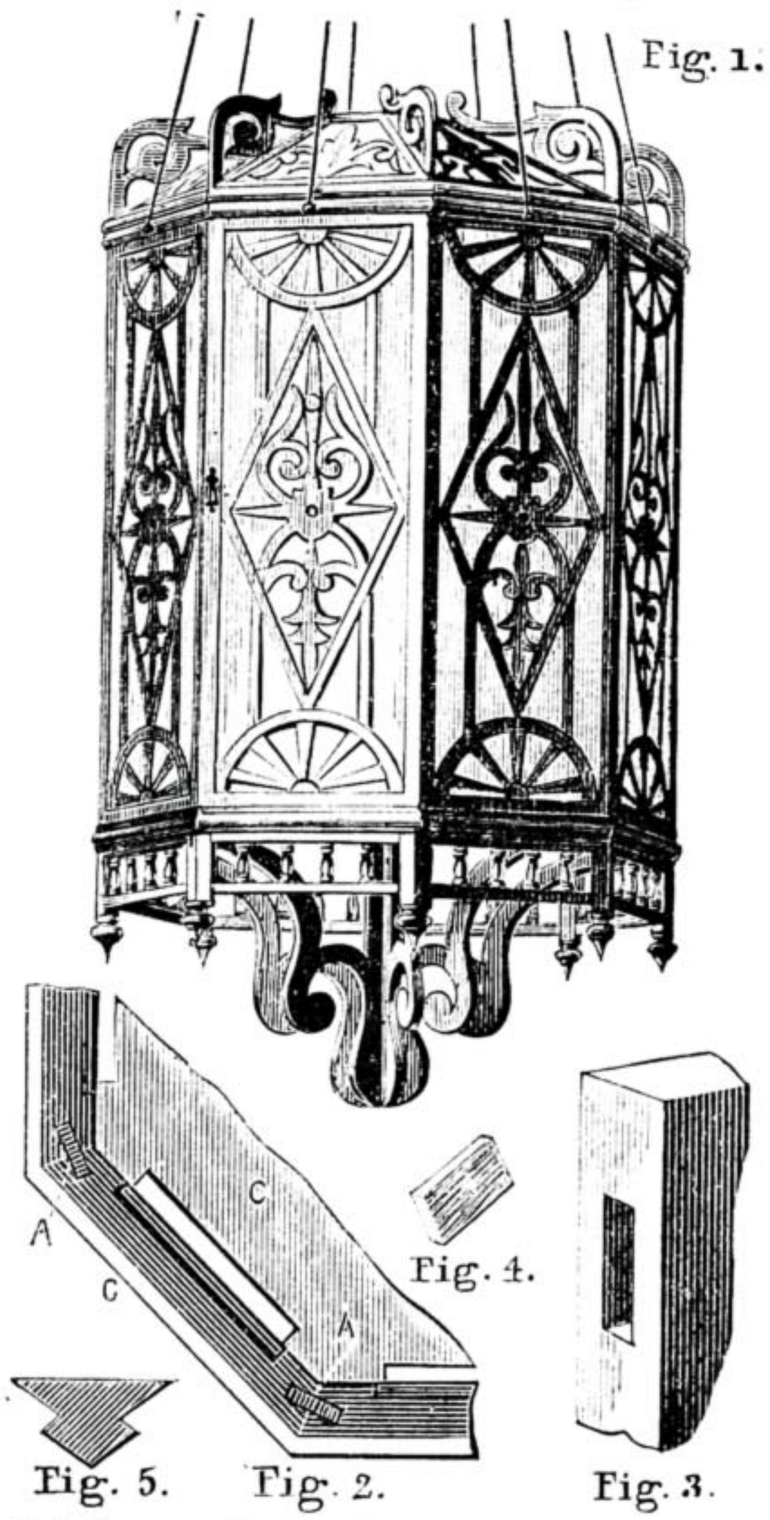
Banjo Making.—E. D. (*Clapham, S.W.*). — If you have plenty of work in your own line of business, my advice to you is to stick to it and leave banjo making as a business alone. I presume from your letter that you do not know much about making a banjo, and there is more art in making a banjo than most people credit. By this I mean to make an instrument to take round to the trade and offer it in competition against other makers. I have no wish to dishearten you; every one must have a beginning, but to satisfy yourself you might make up a decent instrument and take it round to the various music warehouses and music shops, and ask what you think would be a fair price for it, reckoning material and labour; it is ten to one if they do not show you instruments they have bought for a third or one half less in price than you ask for yours. You might stand a chance if you had capital and could fit up a workshop with machinery and employed cheap labour; even then you would have to be thoroughly practical yourself, and see all material cut and used up to the best advantage. If you could make a first-class instrument, one that would advertise you whenever it was seen and heard, and sell direct to the public, that would be the best way for you to get on. Then again you must have practice, that is, make a few instruments before you get into the style and swing. There are lots of small difficulties you will encounter and which experience alone will teach you to surmount. The best time of the year for you to commence would be the beginning of winter; this business in summer is wonderfully quiet, and after making a start, if you got enough business to keep you going all through the summer you would be fortunate indeed. You could get the fittings from the music warehouses; if you wanted your brackets good you should get them made by some brass worker. The hoops of the best banjos are made of German silver, and the edges spun over two steel wires, which you would have to get made for you by some metal spinner. It would not pay you to cut your own pearls, they would cost you much less by getting them made by a pearl cutter. It would be expecting too much from human nature to ask a banjo maker to give you addresses of firms who make articles in connection with the trade for him that he cannot make himself. Borrow a directory (if you have not got one), and look out the addresses of people in the various lines that are nearest your own home; take your designs and sizes and get them made to your own liking; if you have anything new and novel, so much the better chance you will have in making a name. You could buy your fittings from a good banjo maker until you made two or three instruments and saw how you got on with them; it would hardly be wise to lay out a lot of money to start with, until you were sure of what you could do and knew exactly what you wanted. I am afraid this reply is hardly what you expect, but what I have told you is correct and taken from my own experience.—J. G. W.

Scale Drawing.—KROW.—"Drawing to Scale," by Wilkinson, 2s., Jarrold, 3, Paternoster Buildings, London, is a book to answer your purpose.—F. J. C.

Dulcimer Making. — NOVICE HOMO. — I am afraid he would find some difficulty in boring eighty holes 1 in. deep, and all in exactly the same direction, in a hard block with such a primitive tool as a gimlet. However, if he cannot beg, borrow, or annex the necessary articles for the short time he might require them, he may try his hand with the tool he has, but I tremble for the result. The hitch-pin block is only bored about ¼ in. with a small bradawl, and the pin is driven in with a hammer to within ½ in. of its length. The top part of the wrest pin, viz., the part that is flattened, is the part to blacken. The diagram on page 645, Vol. I., represents the finished F instrument, that which was mentioned in the first paper, but whether the instrument stands in F, E, D, or any other key, the scale is the same.—R. F.

Tins for Blacking. — STAUNCH (*Carnarvonshire*).—You will be able to get boxes of the kind you require—viz., for paste, blacking, and so forth—of the following:—A. Truelove, 11, Carver Street, Sheffield, or G. Shadling, 21, Florida Street, Bethnal Green Road, London, E.; prices I cannot give, but they will, no doubt, quote them to you on application.—R. A.

A Hall Lamp.—GLACIER (*Maidstone*). — The method you mention in your letter would be as suitable as any for making a square hall lamp, but if you construct one, I should say make one side as a door, which is easily done, instead of having a glass to slide upwards. I have designed this lamp here, which is intended to be octagonal in shape. The dimensions depend upon the size of the lamp you wish to place in it. Fret-cut eight comparatively thin boards after the pattern of Fig. 1. Secure six of these as in Fig. 2, and the remaining two by themselves; these latter will act as a door. Frame up some narrow rails and spindles to go under the bottom of the lamp, and then have eight other rails the width of the combined thickness of the bottom board, bottom of the fret frame, and top spindle rail; pass these through the spaces shown in plan, Fig. 2, in the bottom board, and nail or screw top and bottom half of them respectively to the fret frame and the spindle rail. This will prevent any weight pushing out the bottom board, which would be a serious matter if it occurred when a lighted paraffin lamp were upon it. The top board, etc., might be treated in a similar manner, although this top board must have the greatest part of its



A Hall Lamp. Fig. 1.—Lamp complete. Fig. 2.—Plan of one Corner. Fig. 3.—Edge of Frames. Fig. 4.—Corresponding Part to A in Fig. 5. Fig. 5.—Section of Uprights to secure Glass.

middle cut away (making it really an octagon frame) to allow the heat to pass through. Eight pieces of fretwork slope a little distance on the top, but not far for the reason just mentioned concerning the top board. The edges thus formed by them should be planed down, and small pieces of scroll fretwork joined along them. Small brackets are also joined under the bottom of the lamp. I think sufficient ventilation will be found in this design. For the insertion of the glass, I have represented the frames in Fig. 2 cut away to receive them, being held in position by uprights, shown in section in Fig. 5; but I think that if the uprights were fitted into each corner there would be no necessity to cut the fretwork thinner; neither do I think the heat from the lamp will injure the glue. Of course, you might have eight boards thicker at the sides than that part which will be fret-cut, and shape the sides the same as Fig. 5, but each would have to be done separately, whereas, you may make Fig. 5 in one long piece, and slice it up to the required lengths. For the glass, I think if one were red, the next yellow, the next blue, and the next yellow, and so on, so that every opposite pair would be the same colour, a pretty and effective article would be the result. Your suggestion to attach the patent glacier, to imitate stained glass, is a good one, and I mention it for the benefit of others.—J. S.

Modelling, etc.—C. E. H. (*Hull*).—After a very careful perusal of your letter, I will do my best to supply you, and, doubtless, thousands of others, who appreciate as you do the excellence of Cassell's "Technical Educator," to which WORK, as you evidently think, ought to be a practical supplement. As the one gives you the theory, so ought the latter to give you the necessary knowledge to enable you to carry out that theory into practice. Knowledge lies dormant in the mind, whilst Practice is the evidence given before the Court of Public Opinion that proves the deponent has rightly understood his lessons in theory, and has discovered for himself their utility and value to the busy world. I glean from yours that you have spaced out for yourself a rather ambitious course, and I am glad to have this opportunity of giving you advice that will be of service to you long before you can possibly attain the summit of your ambition, and may save you, if you act upon it, many a weary mile of climbing. "Let all the ends thou aim'st at," as Shakespeare says, "be," to take his latter subject, "truths." Truth, absolute truth, in words matters less than in deeds, but in WORK, truth of workmanship in action is of the highest and most paramount importance. Accuracy is its modern name, but I like the grand old Anglo-Saxon name far better. In setting out to make anything, the drawing is the truthful way of expressing your intentions. Therefore let your drawing be perfectly clear, honest, and truthful. There are three dimensions—length, breadth, and thickness, in all solid forms. Before commencing to make anything at all, make a drawing, which will show you, as in WORK, length as in "elevation," breadth as in "plan," and thickness as in "side elevation." To convince yourself that the drawing in feasible and practical, make sections, to show how you intend the interior and other hidden portions to be executed. Then if you have fallen into error, indiarubber and thought will put you right, without expense. Drawing is better practice than you think. Now, suppose you have done what was done before the Menai Suspension Bridge, the Tubular Bridge, the Manchester and Liverpool Railway, the Forth Bridge, the Eiffel Tower, and every other engineering work, every public building, every sea-going ship, were commenced, prepared a drawing, to be followed in every particular conscientiously in the construction. Go to work consulting the drawing which you must (having decided that it is correct and true) consider as an authority—in fact, as your judge—never to be departed from upon any pretence. Remember this, that if you cannot make a correct and truthful drawing of what you want to do, you cannot hope, unaided, to execute in the solid your ideas and plans. This fact, which you appear to have, to some extent, realised, will be more impressed upon you as you go on, and you will no doubt find yourself, as I and others have done before you, that you will have to abandon the labour business and go back to the drawing part of it and reconsider the drawings, correct them, re-modify them, and commence again, with the actual carrying out of the work in its material form, which you denominate "modelling." I hardly know what books or tools to recommend, your range is so wide; better begin under the foregoing advice, and write again for assistance, not before you begin, but when you meet with a real difficulty; express it as clearly as you can, and I will try and wipe away the cobwebs for you. There are within a few miles of you splendid examples of architecture: York Minster, Thornton Abbey, Selby Church, Howden Minster, endless churches, ancient and modern, Leeds Guildhall, and other examples which you can readily measure and take all particulars of; then reduce them to drawings and reproduce them. The clay used for modelling is Staffordshire pipe clay. The Hull School of Art, if it declined to supply it, would tell you where to get it. Canova used a pocket knife and a piece of a broken wooden platter; Michael Angelo a piece of broken reed, which he whittled to the required shape with the knife with which he ate his bread and cheese, and the stick he used for his macaroni, for modelling the clay with. Go thou and do likewise!—J. W. H.

Zinc Etching. — INQUIRER (*Portland, Maine, U.S.A.*).—The plant for zincography consists of a lithographic or copperplate press, half a dozen rollers for ink and varnish—some covered with flannel, some with calf leather—a trough mounted on rockers, ink and varnish slabs, a planed plate or table of iron heated by means of gas or oil, a circular saw, a fret saw, a metal shooting board and plane, and work benches, etc. INQUIRER is not very explicit, and I can scarcely determine whether he means photo-zincography or intends to make drawings in line on transfer paper, transfer them to stone, and then make zinco blocks from them. All the processes are fully described in a cheap little manual by Josef Bock (Wyman's "Technical Series"), 2s. 6d., published at 65, Chancery Lane, London, E.C. I believe, also, that the American Lithographic Publishing Co., 37, City Hall Place, New York, have published a similar book, but I have not read it. (See also my answers in "Shop" to J. W. S. (*Sheffield*) and F. J. T. (*Bristol*).—J. W. H.

Joint Making and Roof Sweating.—AMATEUR.—There ought to be no difficulty in wiping brass bosses into lead pipe to keep the metal at its proper heat. You should not begin to wipe too soon; let it all get well hot before you commence to wipe; tin the bosses first. With regard to your roof sweating, I can only put it down to exhalations from the earth; but at the same time I must say that I have seen iron roofs with earth floors under them that have been quite free from this peculiarity.

I suggest a wood floor or a good stove, or, better still, both of them.—R. A.

Violin Bass Bar.—B. F. E. (*Carlisle*). — The Editor of WORK is always willing to find means for the ventilation of new ideas, and would give proper consideration to anything you have to communicate. A consultation with a practical man might have enabled you to attain in a short time that which has, you say, cost seventeen years to investigate. Many experiments have been made with the bass bar, and I should be interested to hear the tone resulting from the working out of your theory.—B.

Victor Cycle Company.—P. W. (*Bowling*).—As this company has not sent any other address than the above, I am at a loss to say at what part of the east coast their place of business is situated. Perhaps they will kindly send on their full address for the benefit of our readers. In the meantime you can get your axle and a pair of rubber-tyred wheels from Mr. G. P. Lee, 60, Tib Street, Manchester. Write first for him to quote a price for the same—not forgetting to give the diameter of wheels required—including the carriage fare for sending them on to you. But I should think that you would be able to get them at your nearest town—Bradford.—W. P. [The address of this company is very properly advertised in our Sale and Exchange Column, see page 734, Vol. I.—ED.]

Future Subjects.—U. C. (*Hitchin*), B. E. C., (*Stepney*), and others.—Papers on the subject you write about may appear in the present volume of WORK.

Polishing.—W. R. H. (*Leeds*).—Are you sure you are not comparing your varnished work with French polished goods? If you do, of course you will not be satisfied with it, as the same high finish cannot be got with the brush as with the rubber. However, assuming that yours does not look so well as even varnished work may do, it seems to me that one, if not the principal, cause of your finish being inferior is the stain you use. The mixture of red ochre and glue will give a muddy appearance to work coloured with it. Try a liquid transparent stain instead, and I fancy you will find the appearance of your tables, etc., greatly improved.—D. D.

Polish Stains.—JAS. MCG. (*Salford*).—Possibly you may get the marks out by going over them with raw linseed oil and methylated spirits, applied with a soft rubber. If they do not yield to this treatment, the only thing you can do is to scrape and repolish the table top.—D. D.

Fairy Bells.—A SUBSCRIBER (*Homerton*) has asked for instruction to make the instrument known as fairy bells, and cost of same. I will, therefore, as far as possible, comply with his request. The writer does not know whether there is any standard size, but the measurements given will be large enough for a full-grown hand to play; if SUBSCRIBER is only a youth, why then he must alter the dimensions to suit himself. The wood for back, belly, and sides, must be of straight even grained pine, perfectly free from all shakes and knots; the pin and wrest blocks must be of some even grained tough wood. Beech, elm, or, indeed, any wood with a tough close fibre will be suitable. For the back plane and square up a piece of ⅜ in. pine, 2 ft. by 2 in. This when finished will be ¼ in. full. For belly, same thickness and width, and 1 ft. 4 in. long. Sides, 2 ft. by 2 in., by ⅛ in. full when dressed up. The top ends are hollowed out (as shown) where the hands grasp it. The pin block at the end must be 9 in. long and 1½ in. square; the top must be rounded off as shown. The wrest blocks will be about 8 in. long by 1⅛ in. wide by 1¼ in. thick. To one side of each block a thin strip of hard wood—mahogany—is glued; this should be ⅛ in. thick, and projecting above the block ¼ in. Care must be taken that both surfaces are true, so that when glued together the joint shall be perfectly sound without any shake. The end must be of the same thickness and width as the sides. Glue the pin block in its place (using the best glue), and clamp it until dry. Now mark off twelve points to receive the screws to take the strings. Lay the top on the back and draw a diagonal line at such an angle that one end shall be twice as far from the pin block as the other. Draw parallel lines from the screws to this line; where the lines cut will be the position of the wrest pegs. Two (F) holes must be cut as shown; the diagonal line marked will form the front edge of left-hand hole and lower edge of right-hand hole. By placing the holes one in advance of the other, we shall not weaken the belly so much; also we shall be able to bring the two middle strings in their proper place, *i.e.*, the same distance apart as the others. Having made the wrest blocks, draw a line down the centre, and place them on the back. Put the front in its place and adjust the blocks so that the central line shall lie parallel with the centre of the F holes; firmly glue them in their position. Care must be taken that the parts glued together are perfectly level, so that no hollows exist. They must either be clamped or put under weight until perfectly dry. We shall now require one dozen screws, such as are used in pianos, and of the smallest size. If the smallest procurable at a music shop are too long, they must be cut to the proper length. Find where the strings cut through the line drawn on the centre of the blocks. At these points holes must be bored with a bit that will admit the wrest pins, but sufficiently small so that the pins will hold the strings when tuned. The sides and end must now be glued in their places, the top glued on, and all clamped firmly together, and set on one side to dry. One general remark about gluing. Care must be taken that all joints are good. There must be no hollows, else there will most certainly be an unpleasant jar in the instrument. Round-headed screws must be used in the pin block to receive the wires. Procure from a music shop a sufficient quantity of piano wire of the smallest gauge; the quantity can be ascertained by measurement by a bit too much rather than too little. Cut the strings three or four inches longer than the distance between the blocks. At one end twist a small loop, and pass it over the pin. Carry the other end under the belly, and pass it through the hole in the wrest pin, and with a wrest key twist the wire on the pin, but not tune it up to pitch. When all the strings are on, roughly tune it by a piano or other instrument, commencing at the middle C, and by it tune the lower C; then the higher G, and by it the lower G. Tune the other notes of the scale, working alternately on each side so that the strain in tuning shall be equally distributed. It will be understood that all the wood must be

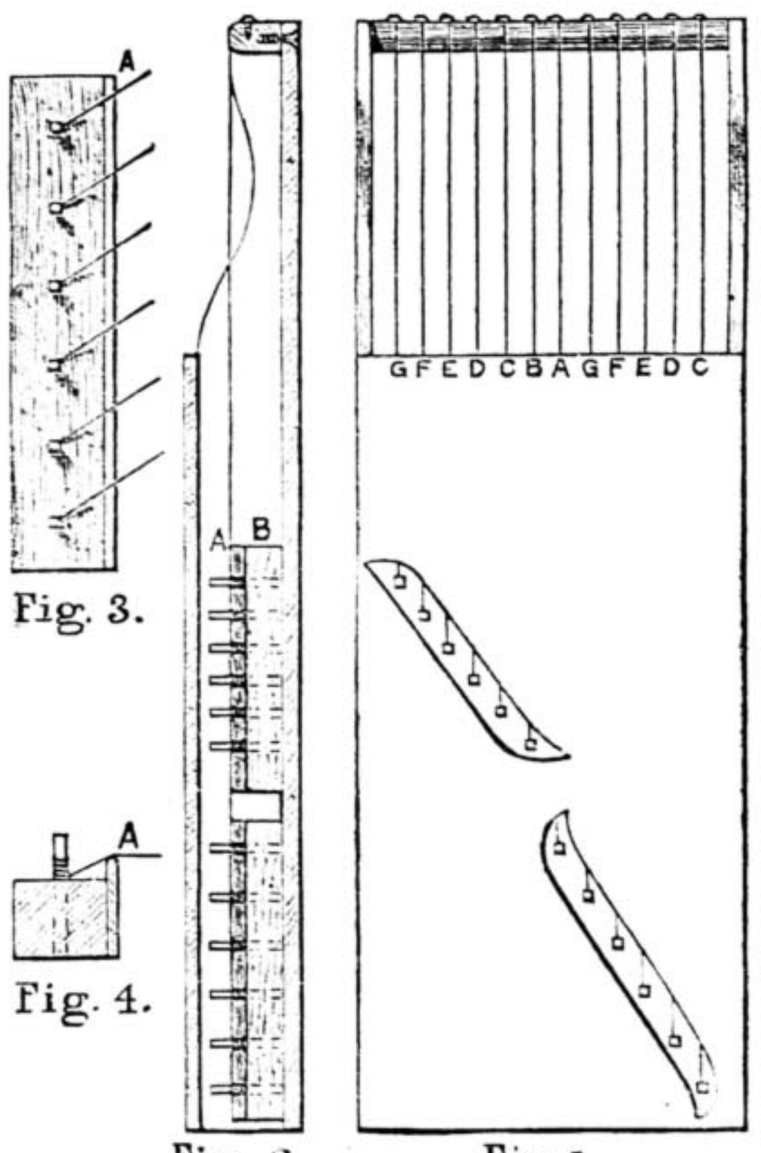


Fig. 3. Fig. 4. Fig. 2. Fig. 1.

Fairy Bells. Fig. 1.—Fairy Bells as seen from above. Fig. 2.—Section of the same. Fig. 3.—Wrest Block. Fig. 4.—End View of Wrest Block.

thoroughly well seasoned, else there be will be no end of warping. When finished so far, it must be varnished with fine white varnish. Some, perhaps, would like it better if the wood were stained reddish or yellowish. As to cost, I should judge it would be under 2s. 6d. The wood ought not to be more than 9d., the pins 1s., and the strings another 9d.; but I really think this sum would include glue and one dozen round-headed wood screws for the pin block. If the joints are good, no screws will be needed, except perhaps join in pin block, as there will be considerable leverage exerted on this. Fig. 1 represents the instrument complete. Fig. 2 gives a sectional view—A the bridge, and B the wrest block. Fig. 3, a wrest block, showing the bridge, A, taking the strings. Fig. 4 is the end view of the block, showing the pin, string, and bridge, A. Note.—On looking over my drawings, I think it will be an advantage if the right hand, or G F hole, is brought forward two inches with the corresponding wrest block.—O. B.

Painting Polo Cart.—VAN BUILDER (*Glasgow*).—In the first place, you have started wrong in painting it in lamp-black ground in oil, as this colour will never dry without plenty of driers; and in the second place, painting it in a shed at that time of the year (January), unless well heated with a stove or hot water pipes. In the first place, scrape all the old paint off the body with a steel scraper, or the edge of a piece of glass, sand-paper, and dust well off. Give the body a coat of lead colour composed of boiled oil, white keg-lead, and a little black to colour it, also in this case add a little driers; when mixed, give the body a coat, leave it for a week to dry, then sand-paper it down, dust off, and give it another coat of lead colour, leave for a day, then stop all the screw and nail holes up and any dints or cracks, etc., with stopping made of keg-lead, gold size, and filling, as stiff as putty. We next make a can of filling—take of keg white lead one part, and two parts of filling, mix on the stone with the palette knife into a paste with turps, place into the can, and then this filling down with equal parts of gold size, varnish, and turps to the consistency of paint. The body should receive six coats of this filling. The first two coats have a day each to dry in, the remainder being put on two coats a day. If the first coat dries shiny, too much varnish is in; to remedy this, put some powder filling in the can with a little turps; this will absorb some of the varnish. The filling when on should be dull when dry. We now mix some staining by putting in some rose-pink or Indian red in the remainder of the filling left in the can, and thinned down with turps. This will change the colour in the can. Then we give the body a coat of staining all over, and then leave it to dry for a few days. The body will now have a very rough appearance. To get the body quite smooth, we have to rub this staining colour until we get it all off by means of a piece of pumice stone sawn across the grain. Have by your side on a little table a flat piece of a flag, with a sponge and a leather, also a bucket of water. Hold the piece of pumice stone in the right hand, and rub the sawn part on to the stone, using a little brickdust to make the pumice stone bite and to help keep it clean. Hold the wet sponge in the left hand and wet the panel to assist the stone in rubbing the panel down until you get all the staining off, then you have the panel flat; water must be freely used, and the pumice stone kept clean, or else it will tear the filling up. When all the rubbing down has been accomplished, leave for a few days to dry. If you now rub your hand over the flat panels they will feel as straight and smooth as marble. We next dust the body off well, and mix some lead colour up very fine, and give the body a nice and even coat of colour; stroke the paint well down and avoid all runs, fat edges, and brush marks; when dry, in a few days any little place or scratches can be filled up with the stopping and rubbed down with the pumice stone; next day, when dry, also rub the body down with a piece of fine spent sand-paper; dust well off, and give it a coat of lead colour, with just sufficient oil in the colour to keep the paint from looking shiny when dry. When this last coat of lead colour is dry, we rub the body all over with the pumice stone and water, keeping the stone clean and frequently rubbing it on the flag, and not using brickdust this time as it would make the stone too keen, and would, instead of flatting the paint down, fetch it off instead; dust off well, and give the body a coat of dead black, made of dead black ground in turps and bound with gold size mixed; this will dry in a few hours. Afterwards give it a coat of the best black carriage japan. In a couple of days after, flat the body down with a pad and wet pumice-stone powder. When the body is flatted down, it will look like ebony. In flatting mind the edges, and be sure to wash the body off well, and only flat and wash off a panel or a couple of rails at a time, using a water tool in the corners and wiping off well with the leather, for if any grit is left on, it will get into the varnish and show. Some painters give the body two coats of japan, others can make it look well with one. After it is flatted down and dusted off, we give it a coat of carriage or undercoating body varnish, then leave for a week to dry; then flat down again with the pumice stone and the pad, wash, and dust well off, and finish by giving the body a flowing coat of the best durable body varnish. In painting and varnishing, always stroke the paint down from the top to the bottom, and take out all runs and fat edges before the paint dries or the varnish sets. In varnishing, the success and the secret lies in a good varnish brush and putting it on freely, working it all over, then stroking it down, and leaving it to flow out smooth in a warm room, the heat being kept up until dry. The inside can be painted buff, the bottom painted black: the wheels, shafts, and springs painted vermilion, picked out black, or any other colour to match the upholstery. If there is any little point in coach painting which you do not understand, I shall be pleased to explain it to you.—W. P.

Lock Pick.—J. S. (*Spilsby*).—The pick you mention may be used for any kind of solid warded locks, either rim or mortise. You could obtain excellent sets of picks from G. H. Buck, 261, Edgware Road, London, N., on enclosing trade card and stating what you required.—T. W.

Galvanic Battery.—J. S. (*Kirkcaldy*).—A galvanic battery is an apparatus for making electricity. There are some dozens of varieties now in use, and you must please say which you require, and what you want it for, before I can undertake to describe it in "Shop." At some future time I hope to write a series of articles on "How to Make Galvanic Batteries at Home," for the benefit of amateurs and youths taking an interest in electrical subjects.—G. E. B.

Small Electric Lights. — PO BAH (*Swansea*).—You will find full details in my articles on model electric lights. All the parts will be described and illustrated in them shortly.—G. E. B.

Electric Lamp, etc.—W. W. (*Dublin*).—I am pleased with the account of your success in making an electric bell, but I cannot advise you to make an accumulator to light up a 10 c.p. incandescent lamp for three hours a night, such accumulator to be charged with current from a primary battery. You know not what you ask. You have no idea of the cost in material and labour, and the poor return for the same. This you will learn by reading my articles on model electric lights. If, after reading them, you feel you need further instruction, I shall be pleased to give it. A volt is the unit of electrical pressure, and is equal to that obtainable from the current given by one cell of a Daniell battery. An ampère is the unit of electrical volume, and is represented

by the volume of current obtainable through the resistance of one ohm at a pressure of one volt.—G. E. B.

Galvanometer.—GALVANUM (*Manchester*).—An illustrated description of a galvanometer to suit your purpose will be given when space can be found for it in WORK. Soak the plaster in dilute muriatic acid.—G. E. B.

Wood Carving.—TO PO (*Shepherd's Bush*).—All right. If you prefer shorter handles, by all means use them. The writer of the article gave the lengths as being best in his opinion, and in that of many authorities on the subject. There is, however, no invariable rule, and, of course, a small tool would not require so long a handle as one of a larger size. As you have apparently made some progress in the art of carving, you will naturally know what size tool suits you best, and you cannot do better than follow the dictates of experience. Of course, when mentioning the length of new tools, wear was not taken into account. As you say that you invariably cut an inch or so from your new handles, in order to make them 4½ in. long, it seems to me that you have, while finding fault with the length stated in the article, proved the correctness of the size preferred by the writer of it.—D. D.

Painters' Blouses.—GRAINER (*Manchester*).—You will get these at Charles Baker & Co.'s, at the corner of Euston and Tottenham Court Roads, London.—D. A.

Rubber Stamp Matters.—QUICKSILVER (*Manchester*).—Quicksilver containing merely dirt may be purified by filtering it several times through a filter made in the following manner, and then squeezing it through clean wash-leather:—From a piece of clean writing-paper cut a circular disc, five or six inches in diameter, and fold it twice, so as to form a quadrant of four thicknesses of paper; insert a finger in the curved edge in such a manner that one thickness of the paper shall be on one side and three thicknesses on the other, and open out the paper in the form of a cone; prick a hole in the point of the cone with a pin, and allow the quicksilver to run through. Repeat this several times, using a fresh piece of paper each time, and taking care to make the hole no larger than necessary. Should the quicksilver contain metallic impurities, such as zinc or tin, it should be placed in a wide-mouthed bottle and covered with dilute sulphuric acid, which should be changed two or three times and the whole well shaken at intervals. The acid will dissolve the impurities, and the quicksilver must then be washed several times in pure water and dried, after which it will be fit for use. To fill the thermometer tube, affix a small paper or glass funnel to its open end, and place in the funnel a little quicksilver. Gradually heat the empty bulb by means of a spirit-lamp, which must then be removed, when some of the quicksilver will be found to enter the bulb to replace the air driven out by the heat of the lamp. This portion of the quicksilver must then be made to boil over the spirit-lamp, and when it is judged that all the air in the bulb and tube has been expelled and replaced by the mercurial vapour, the lamp must be again removed, and the tube and bulb will speedily become filled with quicksilver, care having, of course, been taken to keep the open end of the thermometer tube immersed in the quicksilver during the entire operation. When satisfactorily filled, the tube must be drawn out before the blowpipe and hermetically sealed, the tube being kept quite full of quicksilver all the time by heating the bulb. A tube of wide bore must be used for the purpose now under consideration.—QUI VIVE.

Handrailing.—T. O. (*Bootle*).—Your question on this subject has been already answered. I am endeavouring to find another writer to take up the subject.

Bicycle Enamel.—W. A. E. (*Manchester*).—I don't think you would better the enamel sold by any good maker for the article under notice. A good black enamel could be made from lamp black mixed with either bath varnish or "carriage" copal varnish. Unless you used pigments out of collapsible tubes, you would not, in most cases, get them ground sufficiently fine to make a smooth surface when mixed with varnish. You would find either Aspinall's, Wills', Davies', or any such make of enamel far better and cheaper for your purpose than anything I could instruct you to make yourself. Sorry I cannot advise as to cement. Can't you buy a little, or write to a bicycling paper?—F. P.

Graining and Marbling.—YOUNG GRAINER.—A more welcome answer to your inquiry will have appeared—the papers on graining—doubtless, before this is printed. I believe you will find them sufficient for your purpose, and providing plenty of scope for your talent. "Marbling" will appear in this volume; and both series will be illustrated as much as appears useful to the learner. I do not believe there is any *English* work published on the art and illustrated in colours as you desire, although I expect such a volume will soon see the light in Manchester. The "brush and pencil" method of marbling is the one we shall treat, as being more convenient than the "crayon" process; and to make them thoroughly successful I hope to be able to supply hand-painted samples on paper, executed by a medallist in the work, at a price to suit students, providing the Editor is agreeable. Litho specimens of marbling in colour are usually very poor copies.—DECORATOR.

A Ratchet Drill.—SPOKES.—SPOKES wants a ratchet drill to drill holes from ⅛ in. to ⅝ in.; this is entirely out of the question. No hand drill will drill holes up to ⅝ in. SPOKES would sweat a good deal over a ¼ in. hole. If he wants to bore out spoke stumps, the ratchet brace with bent pinions will do it, provided he puts on enough pressure, with the drill made left-handed and the brace driven backwards, when he may possibly wind the stump out of the hub with little or no drilling. I have a machine for drilling out spoke stumps wherein the above ratchet brace forms a part. It is my own invention, and does the work very quickly and effectually. Fig. 1 in the annexed sketch is the ratchet brace referred to entire; I first of all cut the shank off at the point, A, and fit the mutilated brace to the apparatus as in Fig. 2, which shows the brace in place ready for work. In Fig. 2, B is a round ⅝ in. steel bar 22 in. long; C is a bracket formed as in Fig. 3. It is V hollowed on the upper side of each arm, as shown, 3½ in. from the centre of the bar, B, which is the distance of the drill-point from a line drawn downwards through centre of bar, B; and the top of the drill brace is also the same distance

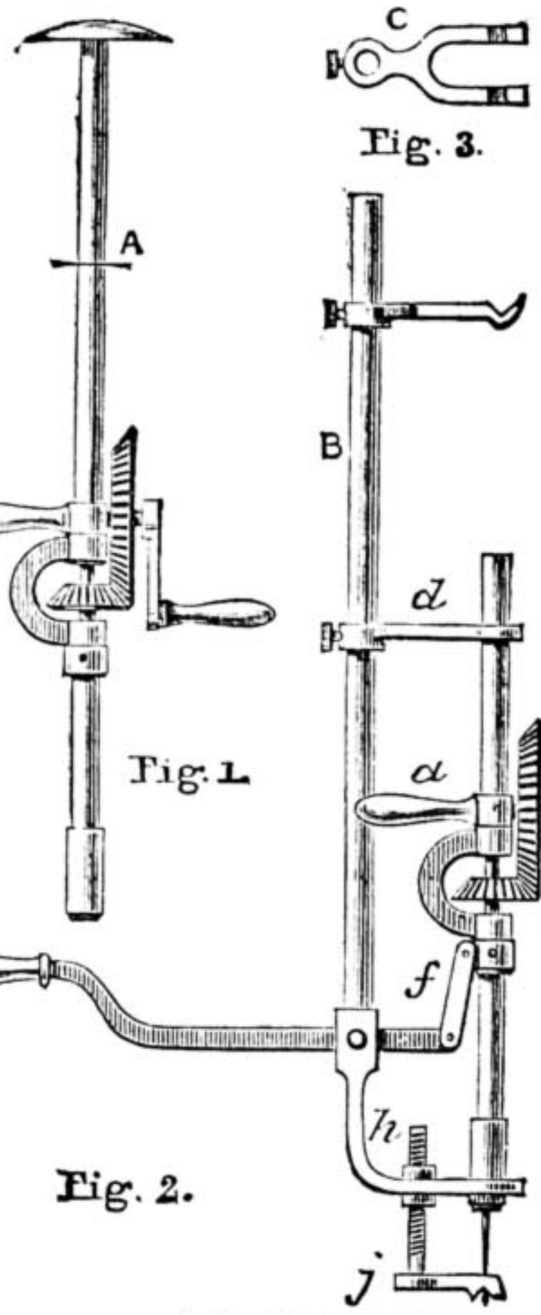


Fig. 3.

Fig. 1.

Fig. 2.

A Ratchet Drill.

from the bar, B; C, Fig. 3, slides on the bar, B, and may be fixed at any distance to fit wheels from 30 in. to 60 in. diameter. *h* is an arm which curves from under the lever handle; at 3½ in. from the line of the bar, B, it is bored to receive the lower end of the drill brace; thus the brace is supported by this arm and that marked *d*, and moves freely up and down in them. The wooden handle, *a*, is also slotted to slide on the bar, B. An up-and-down motion is given to the brace by means of a link attached to the lower side of the D-shaped part and to the inner end of the lever handle; this link is marked *f* in the sketch. About midway on the arm, *h*, a ½ in. rod passes, with nuts on either side; this rod descends to about the length of the drill used, where a foot, *j*, is provided with a V cut in its forward end; this rests on the rim of the hub, and through the foot at the V is drilled a small hole to allow the drill to pass through; now you have the instrument complete. To use it, you rest the foot last described on the hub rim, with the hole right over the broken spoke, then push the arm, C, upwards till it jams firmly against the inside of the wheel rim exactly at the place where the new spoke is to be put in, and with the rim in the V-hollow of C. Now, the drill is in position to bore in the exact direction for the spoke. Motion is given by the right-hand handle, *a'*, and the lever handle being pulled with the left hand in the direction of the arrow, gives feed to the drill, and a very powerful feed it is. I have described this apparatus at some length as it may interest some others, if not SPOKES. As there is no drill apparatus of this form in the market, of course SPOKES would have to make one, or get one made, which would cost him from 40s. to 50s.—A. S. P.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—F. P. (*Heywood*); F. McC. (*Glasgow*); J. T. H. (*Liverpool*); E. T. L. C. (*London*); J. M. P. & Co. (*Nottingham*); J. P. S. (*Swanley*); F. H. W. (*York*); W. J. (*Belfast*); W. D. O. (*Newnham*); J. G. W. (*Hackney*); G. D. (*Oldham*); D. D. (*Edinburgh*); COACH TRIMMER; L. B. (*Ilkeston*); W. E. B. (*Hull*); F. C. (*Belfast*); IBEX; G. A. M. (*Chorley*); G. L. B. (*Bridport*); THEO; VICTOR CYCLE CO.

Trade Notes and Memoranda.

A SOMEWHAT bold departure is being made on the locomotives of an American railroad, by substituting solid connecting rod ends for the usual adjustable arrangement. The locomotive superintendent of the line in question asserts that his experience with engines fitted with straps and keys in the ordinary way has shown very conclusively that adjustment of the crank-pin brasses is no more necessary than of the ends of the coupling rods, especially if the crank-pin journal is of the proper size, and the best materials are used. On this road mild steel, case-hardened, has for some years been employed for crank-pins with very successful results, the only precaution found necessary being to avoid such high carbon steel as would harden to a great depth, and thus prove dangerous. It was found that the engines on this line would run from fifteen to eighteen months without adjustment of the rear end of the connecting rod being required, and this led to the adoption of solid ends in some new engines now building. These engines have cylinders 17 in. in diameter and 24 in. stroke, the driving wheel being 62 in. in diameter. The main crank-pin journal is 5 in. in diameter and 5 in. long. The durability of the brasses and pins is largely attributed to the use of hardened steel, and it is considered that the success of the new departure will be questionable if soft steel pins were employed. It is very probable that the successful working of solid end coupling rods has in a measure suggested this innovation, but we question very much if solid connecting rod ends will prove as satisfactory in working.

ANOTHER Blue Book of 104 pages, completed by Mr. Burnett of the Labour Department of the Board of Trade, deals very exhaustively with the subject of strikes and lock-outs. From this it appears that no less than 509 trade disputes, involving stoppage of work, have been recorded for the year 1888. In these the cotton trade takes the lead, numbering 155 strikes, and coal mining follows with 137. If to these branches of industry we add the shipbuilding and engineering trades, then in these four 74·6 per cent. of the disputes of the year have occurred. Of the total of 509, 392 strikes happened in England, 22 in Wales, 94 in Scotland, and 1 in Ireland. Again, in 320 instances, or 62½ per cent. of the whole, the strikes were for advance in wages. Of these 175 were successful, and 76 partially successful, the remainder having failed, or the result is not known; 54 strikes were against reduction in wages, and of these only 12 succeeded. Several miscellaneous causes make up the remainder. Then, as regards mode of settlement of the 509 reported cases, 332 were settled by conciliation, 15 by arbitration, 85 by the submission of workpeople, 23 by hands being replaced, the results of the rest not being known. As regards numbers, these strikes affected directly and indirectly 118,288 persons, and as far as is known their aggregate duration was 7,265 days. The whole of the blue book bristles with tables of statistical figures which may be profitably studied *in extenso*. And not the least valuable part of the report is the early section, wherein Mr. Burnett traces in outline the whole history of the warfare between the employees and the employed, and of parliamentary legislation bearing thereon from 1824 to 1888. Finally, there is a summary of foreign strikes, which goes far to show that the English workmen are no more guilty of driving trade abroad by striking than the workmen of some other countries. Thus, in the United States, between 1881 and 1886, Mr. Burnett states that 3,902 strikes took place, involving 22,304 establishments, and 1,323,203 hands, and that in 1888, 5,589,578 days were lost in unsuccessful strikes, and 1,972,902 in those which were successful. After giving an account of some continental strikes, Mr. Burnett concludes: "Violence and bloodshed seem concomitants of most continental strikes. Workmen appear to turn out in a transport of passion, and after a few days of violence and uproar return to work, after having been subjected to severe treatment by the authorities. Details of these foreign disputes are necessarily meagre, and in most cases even the duration can only be fixed approximately, but it is quite clear they are mostly brief, and seldom, if ever, go on for months and years with dogged persistency as often happens in England."

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