WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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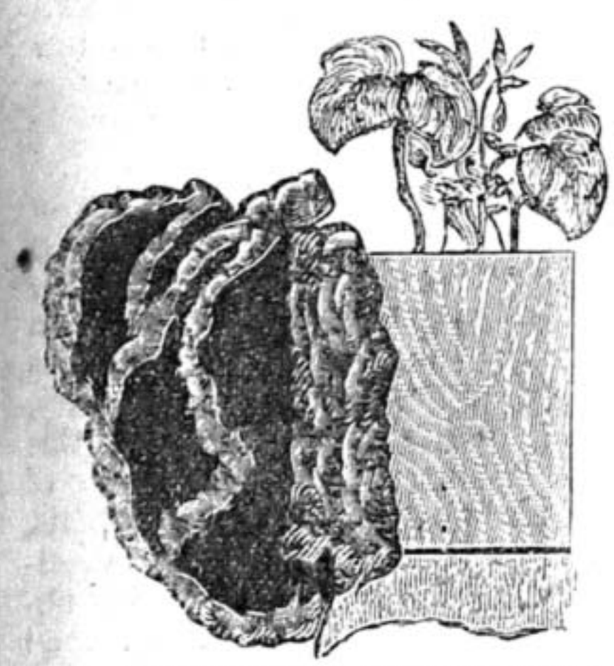


Fig. 2.—End View of Box shown in Fig. 1.

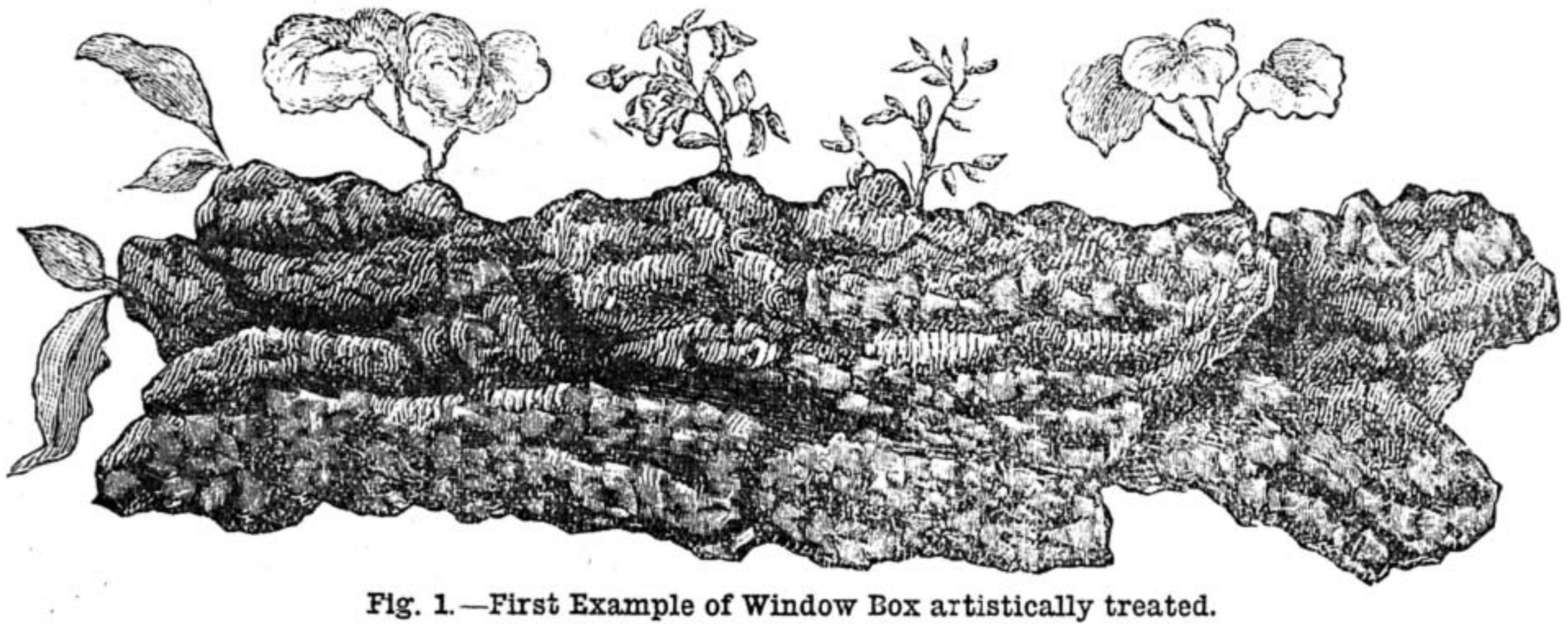


Fig. 1.—First Example of Window Box artistically treated.

WINDOW BOXES—ARTISTIC AND INARTISTIC.

BY F. ROPER HALIDAY.

NOTHING, perhaps, adds so much to the appearance of a house, nothing is so pleasant to the eye, so cheerful, so agreeable, as to have bright flowers about, growing and luxuriating in all their beauty. It greatly adds to the mansions of the rich and well-to-do, but it redeems the cottages of the poor from squalor and poverty, and raises them fifty — nay, five hundred — per cent. in the eyes of the lover of beauty. And for this great boon, which costs so little, we do not require a garden, not even soil; we merely buy a few plants in the spring at the cost of a few pence each, put them in our window boxes with some manure, and our houses are redeemed from the commonplace for the entire summer, and in winter also, if we like to fill the boxes with evergreen shrubs. The wonder is that they are not more general—in fact, universal—but I suppose the reason is that the difficulty of obtaining suitable boxes, elegant and artistic, yet cheap, seems insuperable. How to overcome this apparently unsurmountable difficulty is the object of this paper; but first allow me to remark, by the way, that some people appear to think that flowers will not grow in all aspects. I can only say that mine are in the most unfavourable position, due north, and exposed to all the cutting winds, and yet they bloom beautifully all the summer; the secret is—if it is any secret at all—don't use any soil more than is in the plant pot when you get it; fill your window box with good horse manure; take your plant (with the soil at the roots) out of the pot and plunge it in the manure; it will want nothing but a little water for the rest of the summer. And now to resume; for this is not a treatise on gardening, and I have digressed a little.

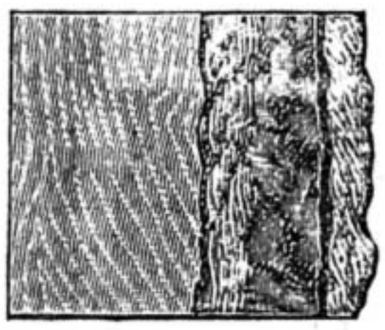


Fig. 6.—End View of Box in Fig. 5.

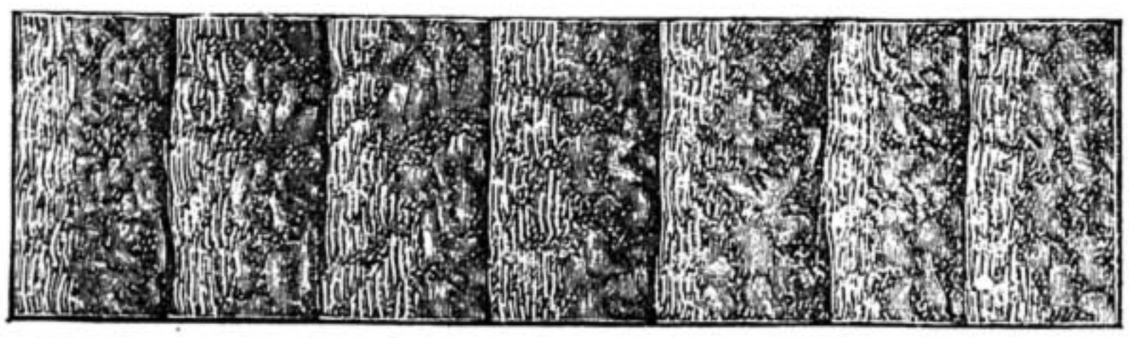


Fig. 5.—Window Box inartistically treated.

The window boxes one sees are nearly all unsatisfactory. If you make a deal one and paint it green, it has a common look, and seems to let down the appearance of the house; if you nail strips of cork on (as shown in Fig. 5), it is most inartistic and commonplace to begin with, and in a few months looks very seedy and forlorn indeed: in fact, nothing has a more woebegone appearance than one of these boxes, black, dirty, one of the strips off, and some of the others crooked, the soil damp and sodden, with a few struggling plants in it, more dead than alive: it always reminds me of the misery and decay of the tomb. Tiled boxes are very nice if well made, and with good tiles in, but they are rather expensive to buy or make, and then have not the fresh rustic appearance of Figs. 1 or 3; they have a much more formal character—suitable, perhaps, to some houses, but quite out of place in others, while those I am about to describe will suit any house, mansion, or cottage in town or country; they perhaps look best in a beautiful garden, surrounded by lovely trees, flowers, shrubs, etc., but they are not out of place anywhere. Virgin cork is the

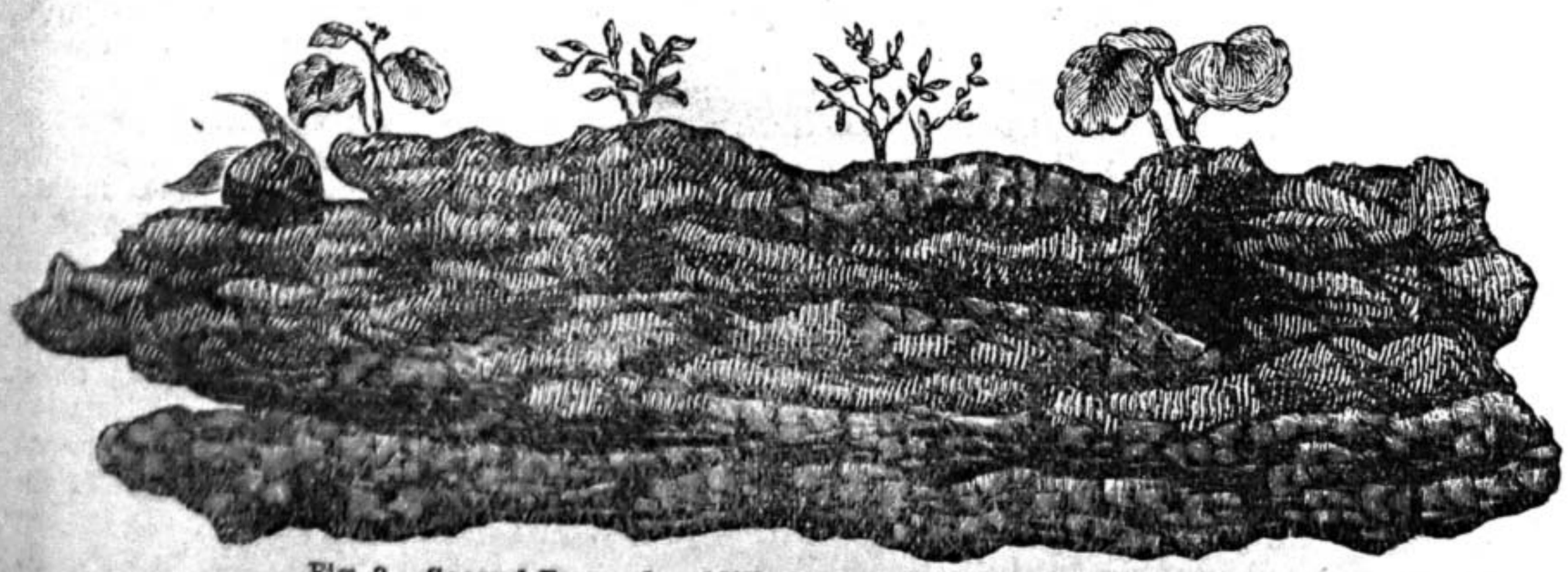


Fig. 3.—Second Example of Window Box artistically treated.

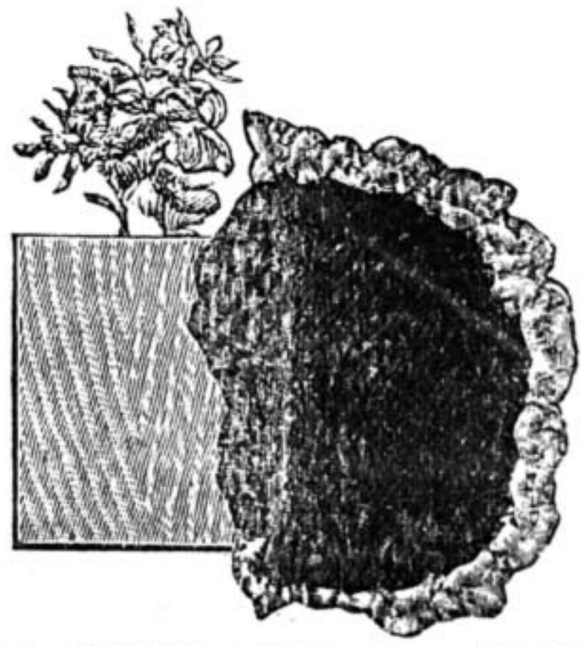


Fig. 4.—End View of Box shown in Fig. 3.

substance they are covered with, but in the application of this material lies all the difference between success and failure.

And now for the methods of procedure. The window boxes must be made, first, of ¾ in. deal, planed both sides, and nailed or screwed together. If you use joiners' tools this will be an easy job; if you have to buy, you can obtain them from the carpenter or case-maker at a very cheap rate. They are to be the full length of the window sill, just to fit in easily, 6 in. high, and to project over the stone about 1½ in.: this will give sufficient space in the box for the plants, and allow for the curl of the cork to come under the bottom edge at front (see Fig. 2). When finished, the boxes should be fastened to the woodwork of the window with screws for security: this by the way, as we have now to paint them, and put the cork on. I nailed my cork on after the boxes were fixed, but a better way, perhaps, would be to put the cork on first, being careful to mark the boxes with a pencil along the edge of the stone and brickwork, and not let the cork trespass beyond this line at bottom and sides, or they will not fit; also do not forget to bore a number of holes in the bottom of the boxes for the escape of the water. I once lost a boxful of plants owing to neglect of this precaution; the water must run away freely, or the plants will die at once. Having got your boxes ready, give them a good coat of paint outside: the colour does not matter, as the boxes are hidden, only the top edge being visible from the inside of house, the paint being merely for preservation. Now procure your virgin cork. This rough outside bark is sold in lengths of about 24 to 36 in.; get them as large, rough, curly and scabby-looking as you can: the rougher the better. I got a large bundle, the remains of some bazaar decoration, for about a shilling, sufficient to cover three window boxes, and had a lot left over, but I have no doubt it can be bought in any town at a cheap rate. Having got your cork home, proceed to select suitable pieces for the boxes. Box No. 1 in the illustration is covered with five or six pieces, the cork being nailed on the box lengthways, one piece overlapping the other (see Fig. 2), the centre piece going on last; there is now a grand opportunity for the display of your taste in the arrangement of the cork, and as no two pieces are alike, everything depends on the discretion you display in fixing. The cork should not be cut or trimmed much; arrange it in as natural a manner as possible. Box No. 3 is covered with one piece of cork, half round (see Fig. 4): this box looks grand, very curly-looking, and jagged: it looks like a piece from "The Monarch of the Forest" at one's own door, or rather window. I may mention that this virgin cork lasts remarkably well: it stands any weather, and never seems to change or decay; it gets black and dirty-looking, it is true, but this we can obviate. Having got your cork on, then, and being well pleased with the effect, you can use the boxes for one season, if you like, with the cork in its natural state.

You will see (by reference to Figs. 2 and 4) that the boxes have a very full half round appearance, the cork projecting very much in front, curling round over the top and bottom, and sticking out irregularly at the ends: this helps the appearance considerably.

And now for the painting. I have as great a horror of shams and deceptions as Ruskin has, and kept my cork for a season or two in its natural state. Well, it was all right, but the time came when it was so black and sooty that something had to be done, and I had to decide either to remove the boxes or paint them. I was not willing to part with my beloved flowers, so I had to paint. I approached the subject with fear and trembling, as nothing looks worse than crude paint; white was not to be thought of, and garish colours gives one the horrors; however, I attacked them, and was so pleased with the result that I was sorry I had not done them sooner, the effect was so delightful. I will describe the process as minutely as I can, as if not properly done, the whole job will be spoilt. First procure some white paint; if bought ready mixed for use, pour off most of the oil, and add some turps, to cause it to dry dead; then with some yellow ochre try to get the colour of cork as near as possible. You will have to let it down with black, and also add a little red, and perhaps a touch of green; by careful mixing you will gradually get the colour of cork—a little darker, if anything. With this paint the cork all over, going into all the nooks and crevices, till it is all a uniform dead colour—one coat will be sufficient. When done it will look as if it had been painted with clay, probably; let this dry, and then take a little of the same colour mixed with plenty of dead white rather stiff, and drag over all the projecting parts with a large brush; if this latter tint is mixed to the proper shade, you will find it have a wonderful effect: it accentuates all the prominent parts and causes the others to retire, and transforms what was previously a dull, lifeless-looking mass into a crisp and beautiful object, the prominent light parts looking as if they had been worn grey by years of exposure to the weather. To finish the job, you now mix two tints of green, one dark and the other bright and clear: chrome or emerald green will effect this, mixed with a little bright yellow, to take off the crudeness of the green. You now give the artistic touches by applying the dark green in some of the crevices here and there, and touching it with the bright; also mix a tint or two of red, say burnt sienna, light red, etc., and touch some of the prominent parts to give the weather stains: this finishes the job, and if done with taste and discretion, will have a charming and beautiful effect.

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 WILL now specify the remaining three causes to which the running out of truth of circular saws is to be attributed.

(19) Driving pulley on the saw spindle being of too small diameter, or too narrow on face, causing slipping of belt and consequent marking on the wood, or running driving belts at too short centres.

(20) Using a "frozen" saw.

(21) Saws running at too high or too low a speed.

With reference to these I may say:—

(19) The use of driving pulleys too small in diameter and too narrow on the face is a fruitful cause of saws buckling, on account of the heat set up in the bearings through the use of narrow belts, which have to be strained excessively tight to drive; consequently, the undue pressure and friction on the bearings cause excessive heat, which is conveyed through the spindle to the saw plate. At the same time the belts themselves very much more rapidly deteriorate. Wide single belts are to be preferred to narrow double ones. In American practice the pulleys for driving circular saws are made somewhat larger in diameter and much wider on the face than they are here; consequently, the arc of contract, grip of the belt, and driving power are increased and the slip largely reduced.

Although I am aware that they are considerably wider than most of those in use here, it may be taken as a good and safe rule that pulleys on saw benches carrying saws up to say 4 ft. diameter should have driving pulleys wide enough to carry belts of a width of one-fourth the diameter of the saw, and for saws above 4 ft. in diameter a belt of one-third the diameter of the saw may be used with advantage. Anything extra in the cost of pulleys or belts is rapidly repaid by an increase of work of better quality than can possibly be obtained with narrow belts; at the same time the bearings and belts themselves last longer. With wide belts the necessity of using "quack" remedies for increasing the grip, which often damages the belt, is done away with; it is necessary, however, to keep the belts pliant, and this can be done by an occasional dressing of mutton fat and beeswax in equal parts. Castor oil is not by any means a bad dressing for leather, and it renders it vermin-proof. In driving saw benches, in fact all wood-working machines, running belts at short centres must be avoided, as it is bad in every respect, and greatly increases the troubles of hot bearings, torn belts, etc., above alluded to.

(20) English users of circular saws may possibly smile at the idea of a "frozen" saw, as we are not as a rule blessed with very cold weather in this country, but even a moderate amount of frost has a very distinct effect in many cases on the working of circular saws, especially should they be of thin gauge. In cold countries, or in very cold weather, the effect is so great from the contraction of the plate at its smallest part, *i.e.*, the eye, that the saw will become "rim bound," and not run true till the frost has been taken out of it by friction, or by a dose of hot water.

(21) The question of speed is a factor of immense importance in the proper working of circular saws; should they be run either too fast or too slow the result is equally unsatisfactory. In the first case the saw becomes pliant and wavy, and in the latter the work turned out is of bad quality and less of it. For ripping all ordinary kinds of wood a speed of 9,000 ft. per minute at the points of the teeth is now generally recognised as a standard speed in this country. This can, however, in the case of cross cutting, be increased with advantage another 1,000 ft. per minute. In sawing very hard woods the speed of the saw should be somewhat reduced, say about one-fourth. By using thick gauge saws, and therefore wasting wood and power, higher speeds than these may be attained.

I will conclude my remarks on working saw benches with a few gentle hints (some of these may not be new, but I take it they will bear repetition in some establishments I wot of). If a saw bench is used for small and large saws, occasionally the latter will run untrue, from going at too high a speed. For quick rough sawing a swaged set tooth has much to commend it, especially with tough and difficult woods and large saws, as they are much less liable to be strained than if set with a blow or spring set. In sawing difficult woods they are liable to spring away

from the saw considerably in the centre of the log; consequently the boards sawn are thicker at each end. To obviate this, instead of sawing in the usual way all from one side, a cut should be taken alternately from each side of the log; this will keep the boards uniform. Should a saw crack in working, to prevent a short crack from extending, drill a small hole at the end of it.

For ripping purposes most of the filing or saw sharpening should be done on the face or front of the teeth; the backs or tops should be scarcely touched at all. The face of the tooth should never be filed to a fine edge, but a very slight bevel should be left. A round gulleted tooth is less liable to crack than one filed to an angle. In gulleting with emery wheels work with a light pressure, and if necessary go over the teeth several times; if the wheel is forced and the saw plate burnt it is much more liable to fracture. In filing teeth for swage setting make them sufficiently hooked at the points that the swage will readily spread them, also be sure that the points of all the teeth are wider than the rest of the blade; the tops and backs of swage set teeth should be filed square across. In bending or spring setting always use a gauge; in setting saws with a blow or spring set, care should be taken that the teeth only are set say about one-third of their depth, and that the plate itself is not strained, or it will be found to heat rapidly when in work and run out of truth.

In filing saws, file every alternate tooth from one side of the saw, then reverse it, and file from the other side; never file all the teeth from one side of the saw, and, if it is spring set, set after the same fashion. If in working the saw heats at the rim, and the teeth are of the right shape for the wood and properly sharpened and set, hang or line the saw to lead very slightly out of the wood. If the saw should heat at the centre and the spindle and bearings are cool and in proper order, reverse the above and let the sawlead into the wood a little.

For thin sawing, such as light box work, frame backings, etc., a "ground off" saw can be recommended to effect a very considerable saving in wood, and, if carefully sharpened and handled, will do very excellent work.

For very accurate dimension sawing, such as pattern-work, etc., a saw "ground hollow" on both sides and run without set can be used with advantage, as it will cut extremely true and leave a fine surface.

If timber carriages and rails are used for bringing the wood up to and taking it from the saw, it is important that they be fixed to run exactly true with it. Should the wood be presented to the saw even at a very slight angle, this is multiplied to a considerable extent in a long log, and, if the cut be once commenced, a very considerable leverage must be put upon the saw to keep it anything near the line.

When having saws hammered, be sure they are placed in competent hands; I have seen saws that have been hammered by so-called experts that might have been better done by a blacksmith's striker.

For guarding circular saws and preventing accidents I can recommend the following arrangement: Make shield of sheet steel formed as an arc of a circle, and against the saw; the shield rises before it and rests on the top of it till the cut is completed, when the counterpoise brings it back to its original position. It is important that the driving power be uniform in its speed; if there is much variation, the quality of the work will vary accordingly.

AN AUTOMATIC ENLARGING WORK-TABLE.

BY JAMES SCOTT.

SIMPLICITY of action is the main object to aim at in designing an article of the kind I here show. To have something that possesses a certain amount of utility, but which is likely to exhaust one's patience in obtaining that utility, is far from what any of us desire, and therefore it is that simplicity of action should receive due and careful attention.

In this small table, the action is as simple a one as can possibly be obtained. In the centre of the table is a small spindle. When this is turned in a certain direction, *the five compartments* shown in. Fig. 2 *open at the same time.* When these are open, and the spindle is turned in the reverse direction, the five compartments (or, as I shall hereafter call them, boxes) close together.

I have intended the article to be of use principally to ladies as a work-table, but probably some readers may find the table, or the idea adopted to work it, of use to them in some other direction.

It requires very little examination to comprehend the convenience of having the five boxes made to open at once. I do not know whether I shall be right in supposing the following as an illustration, as, doubtless, *ladies*, who require to be called such in preference to being termed *women*, would not be found guilty of committing such a breach of *ladies'* etiquette; but I will suppose that one of them finds it necessary to sew a button on to some part of either her husband's or children's garments. Now any one who watches such a process as button sewing, knows fully well that it does not consist wholly and solely of *sewing on* the button—here I am reminded of the cooking recipe in which the writer said, in reference to preparing a goose for the table, "first catch your goose"—the button must first be found; and as there are so many kinds of buttons, and the particular sort required may not be within the first box opened (supposing they only opened one at a time), the convenience of the table as I represent it will be understood.

With regard to this article, I can say, what sometimes I have been unable to say concerning some of my previous articles, that, although, as usual, the appearance of the article has been a secondary consideration on my part, it will not make an unpleasant addition to the furniture of a drawing room. But with its appearance, however, I cannot claim much in the way of newness; the newness simply consisting in its automatic arrangement, which, I hope, may be sufficient to entitle the table to a little amount of credit.

The making of the table will be as simple as its action. The shaping of a top board and a bottom board—the former a trifle over 18½ in. in diameter and ¾ in. thick; the latter 18½ in. in diameter and ½ in. thick—will not be beyond the skill of most of my amateur friends. Neither will the turning of the pillar, nor the shaping of the claws; both of which, however, in the absence of the required skill, may be obtained from any turner's and wood-carver's respectively.

Then, again, should the shaping of the rails required as sides for the boxes also be considered difficult to accomplish, they as well can be performed by the sawyer or carver. "But," someone murmurs, "you are telling the amateur to get his table made; and then he will, after gluing it together, claim the credit of its manufacture." Oh no, dear reader, I do not advise, should the different necessary parts be bought, the builder-up of them to claim the credit of the making; neither do I recommend that, when showing the table to his friends, he should say, "I bought the pillar from So-and-so; the claws from So-and-so; the circular framing from So-and-so," etc. Such a course would necessitate many repetitions of the information, and in time I am afraid the honest soothsayer would become unhappy. I have given the simple information that some of the parts can be obtained ready-made, because of late I have found that it is sometimes advisable to give the very simplest information. Now, although nearly all the table may be bought piecemeal, it is supposed that the automatic part, etc., shall be home-made—this is a very gentle term, but it will convey my meaning.

In Fig. 3 is shown a plan representing the inside construction of the table. The circle in the centre indicates the spindle. To this is joined five rails, the end of each being at 8½ in. distance from the centre of the spindle; which latter might conveniently be 1½ in. thick. The end of each rail should be shaped as shown by A in Fig. 7. Five thin strong spindles, with attachments similar to those shown by B in Fig. 7, will work along the insides of the boxes, the ends of the longer rails being, of course, outside the boxes. To the end of A is pivoted B in such a manner that allowance is made for the intervening thickness of the box. The depth of A is shown as rather more than that of B, the reason for this being on account of the thickness of the bottom of the box, the bottom edge of A being intended to touch the top of the table bottom board.

Each box will be 8 in. across, measuring from point to point, and about 2½ in. deep, and if ⅜ in. thick, that will be found quite sufficient. The back board of each will be quite straight, and shaped as in Fig. 8. The cutting need not extend right to the middle of the board, as a very slight turn of the spindle and, consequently, a very slight movement on the part of the rails will effect the opening. The framing for the boxes, and also that required as stationary between the table top and bottom boards, can be obtained from two circular wooden rings each 18 in. in diameter (outside measurement). They should be either pivoted or hinged.

The boxes will look effective if lined with some such material as silk, satin, or plush.

The only fixed connection the table top will have with the bottom board will be that afforded by the small stationary pieces of the framing, and, therefore, these pieces must be strongly joined.

The centre column should be turned from stuff not more than 2½ in. thick, and, of course, the pattern of it is entirely optional. The top end of it will be joined into the table bottom board, and for additional strength it is advisable to have a square or circular block (Fig. 11) glued round it to the under part of the bottom board.

In Fig. 9, I have given a sketch of one of the claws. If the squares on my drawing are reproduced on to a sheet of paper or block of wood, each square being three times the size of those in the diagram, the correct enlargement of the claws will not be found a difficult matter. The thickness of each can be better determined during the making, but 2 in. diminishing towards the bottom end will be found suitable. The manner of the junction of the claws with the centre pillar is shown by Figs. 5 and 6.

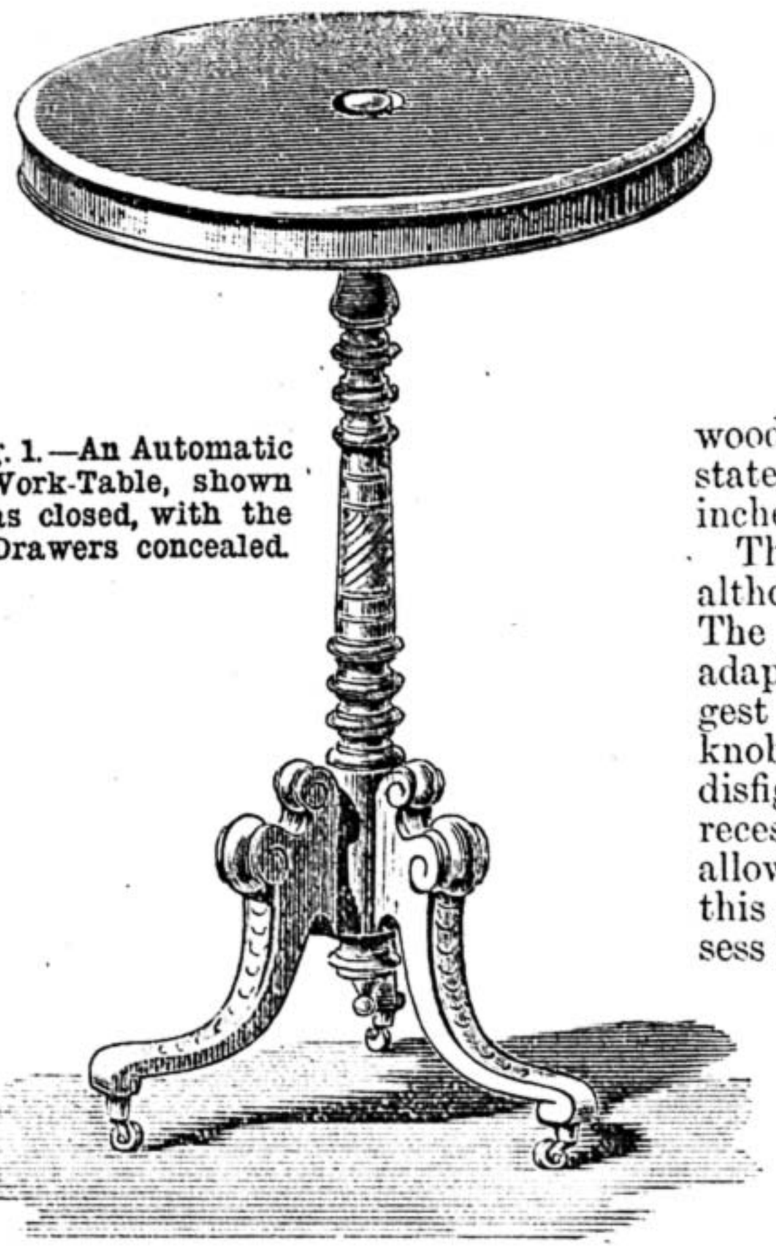


Fig. 1.—An Automatic Work-Table, shown as closed, with the Drawers concealed.

The small centre spindle need in no way interfere with anything on top of the table; as, if the latter is shaped as shown in section in Fig. 10, the top of the spindle will be below the surface of the table top.

This table would look very well made in rosewood, and lined within the boxes as before stated. The total height of it will be 28½ inches: it should not be higher.

The table is by no means difficult to make, although at first sight it may appear so. The uses to which such a table may be adapted are various, and will readily suggest themselves to the readers. The sunk knob in the centre of the table top is no disfigurement, the only thing against the recess being that in some houses it might be allowed to become a receptacle for dust; but this would be the fault of those who possess it, and not of the table itself.

Four boxes could be used instead of five, but after careful consideration I have decided that the preference should be given to five boxes. And now I leave it in the reader's hands.

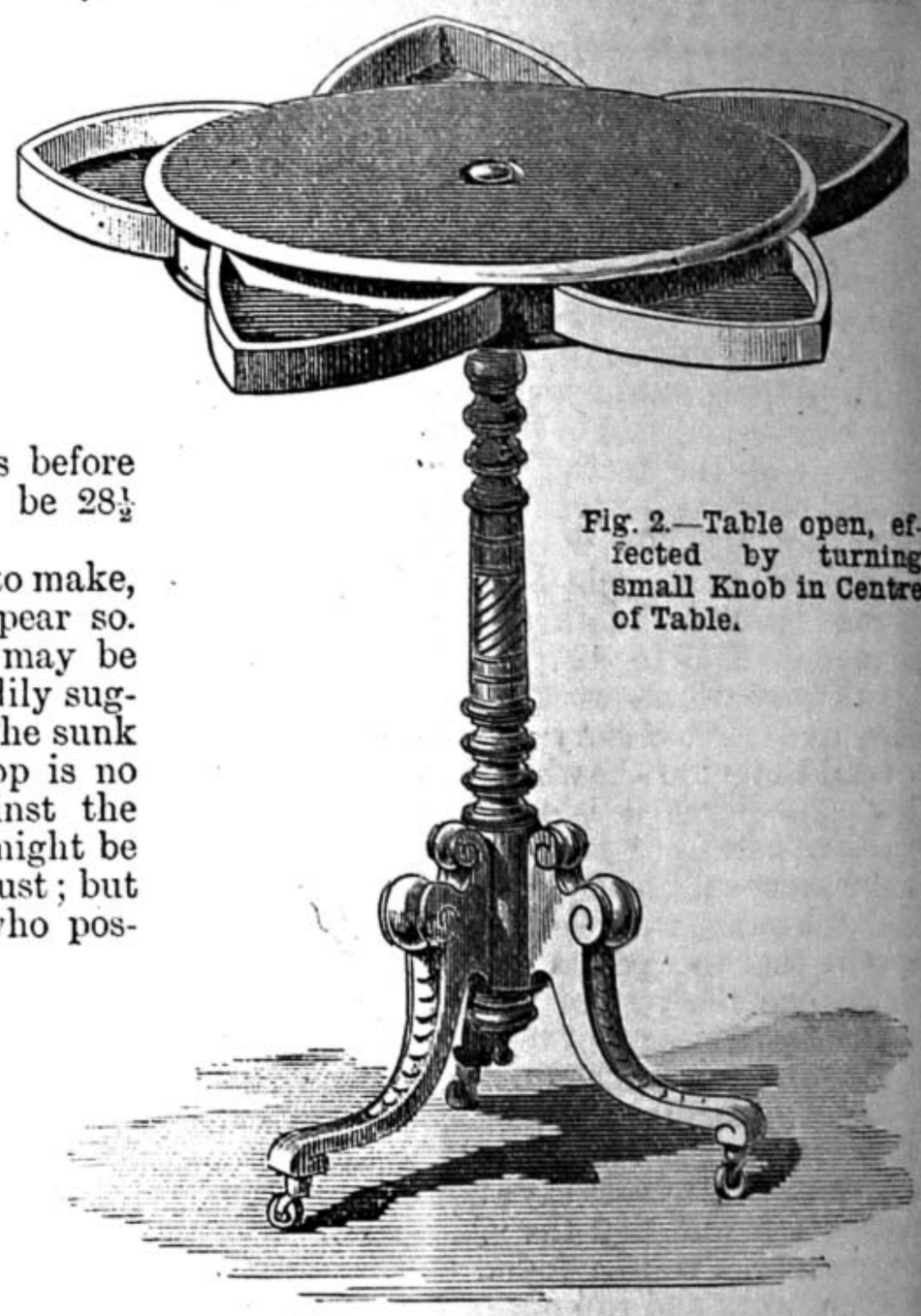


Fig. 2.—Table open, effected by turning small Knob in Centre of Table.

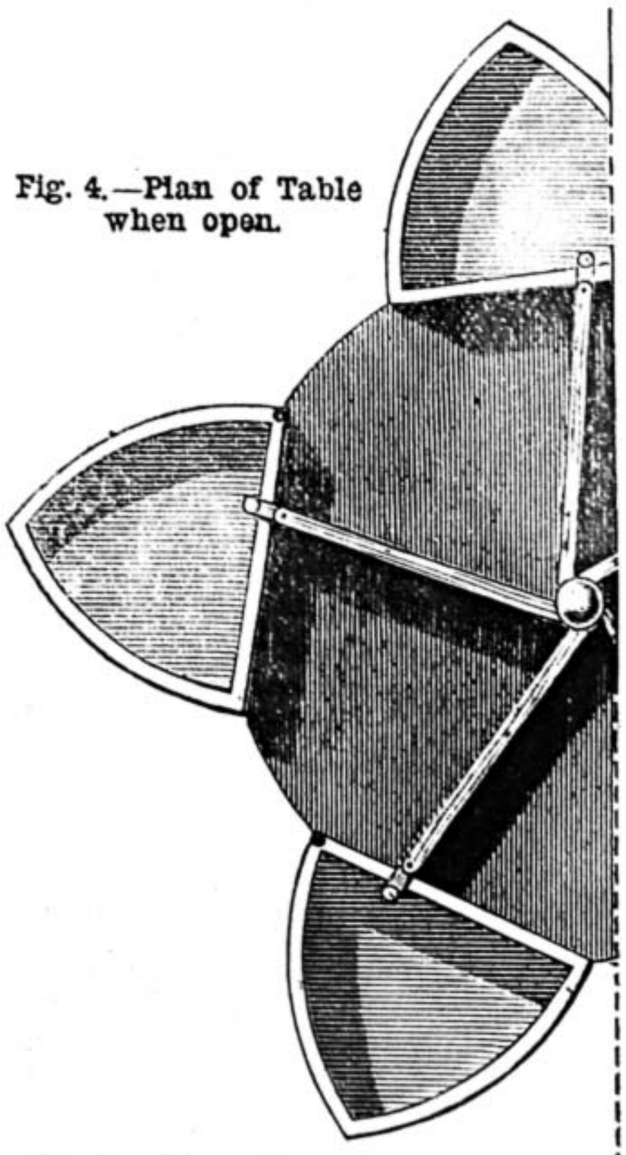


Fig. 4.—Plan of Table when open.

Fig. 3.—Plan of Table when closed.

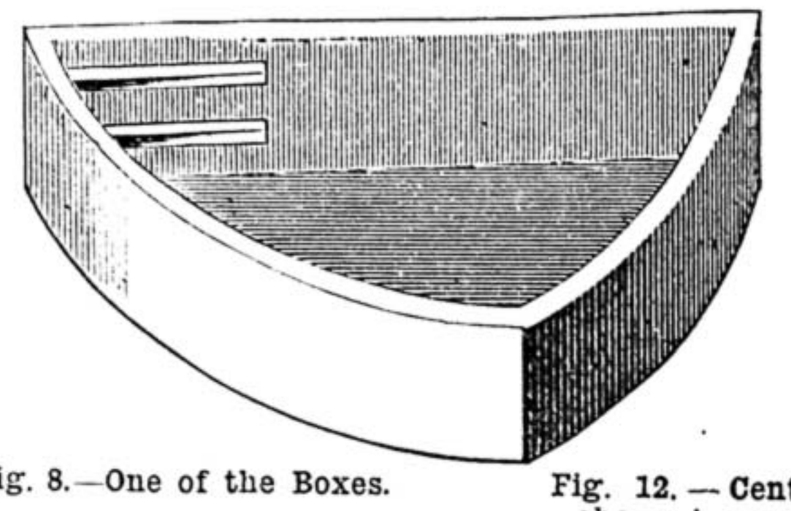


Fig. 8.—One of the Boxes.

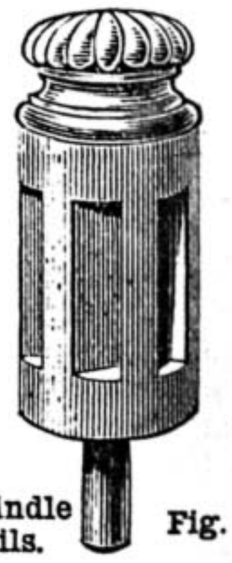


Fig. 12.—Centre Spindle shown to receive Rails.

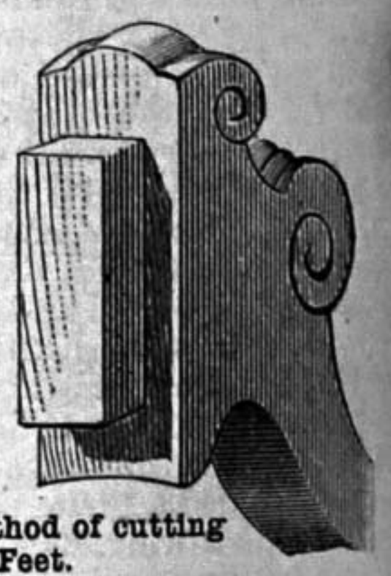


Fig. 5.—Method of cutting Feet.

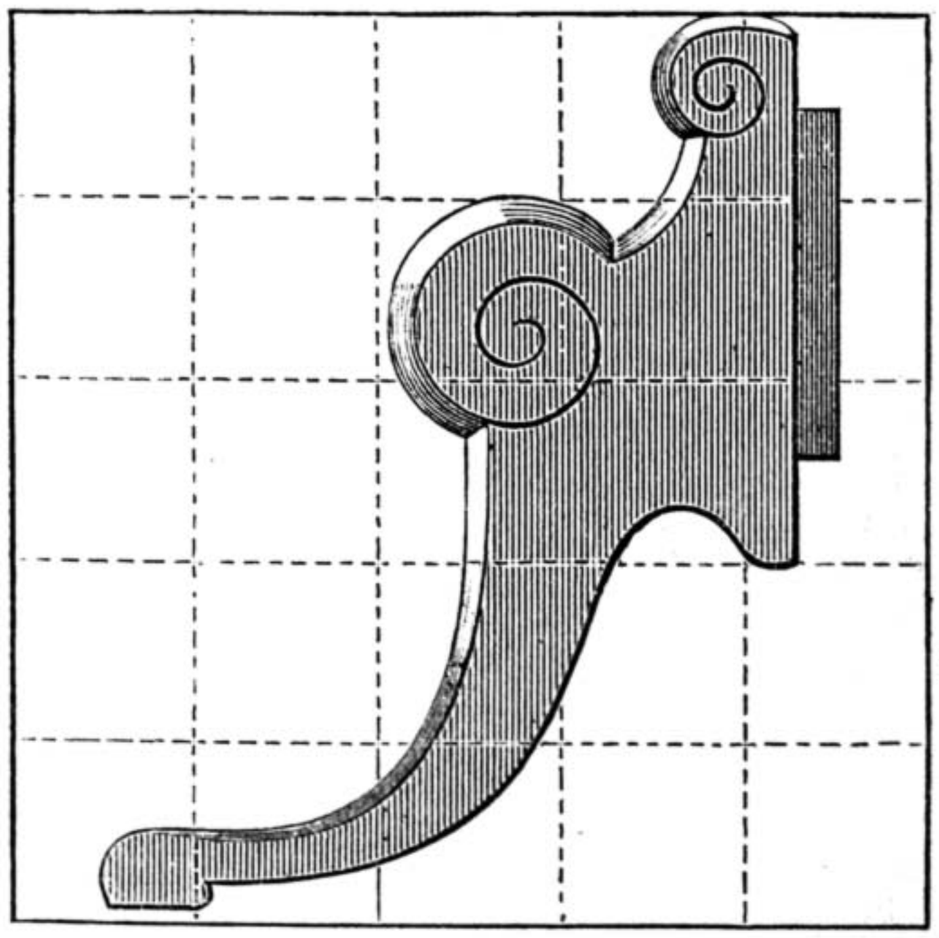


Fig. 9.—View of one of the Feet drawn three times smaller than actual size.

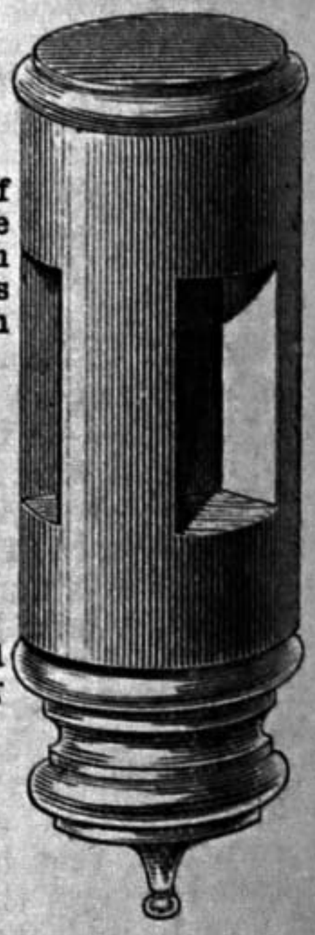


Fig. 6.—Method of cutting Pillar Block.

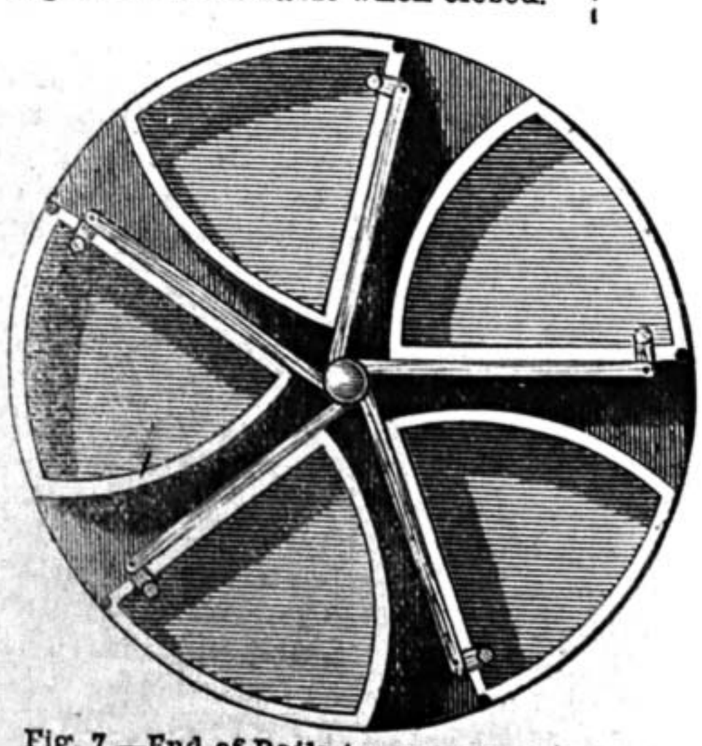
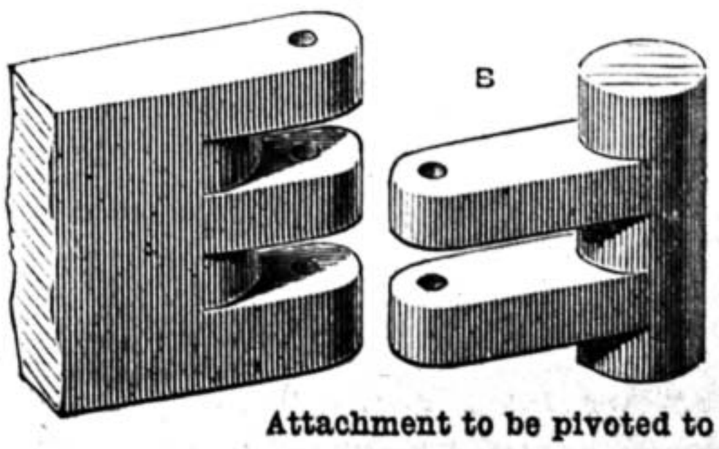


Fig. 7.—End of Rails to open Boxes (A) and



Attachment to be pivoted to Ends of Rails (B).

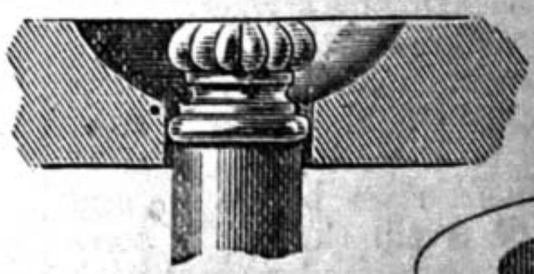


Fig. 10.—Section showing how to bring Knob flush with Table.

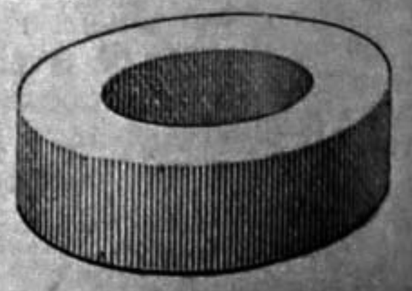


Fig. 11.—Block to secure Top of Centre Pillar.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

QUEEN EXCLUDER—SECTIONS—SECTION RACKS—PLANING TROUGH—COMB BOX—COMB STAND.

ASCENDING from the brood-nest, the first piece of apparatus we meet is the queen excluder. This differs from that which I can be for about eightpence per square foot, or in sheets 8 ft. by 3 for ten shillings. The two things to remember in making an excluder diaphragm, are that space should be left for the bees to run over the frames, and that it should fit exactly over the brood-nest. It is evident that, if a larger space than the holes in the excluder is left, the queen will soon find it out, and the object we have in view will be defeated.

which will give the ⅜ of an inch bee-way over the frames.

The only difficulty in making it arises from the weakness of the woodwork, which should not be thicker than ⅜, but I never find it a very hard job to make it pretty firm with two nails at each corner and glue. Fortunately it does not require to be very strong.

The next thing in order is the section

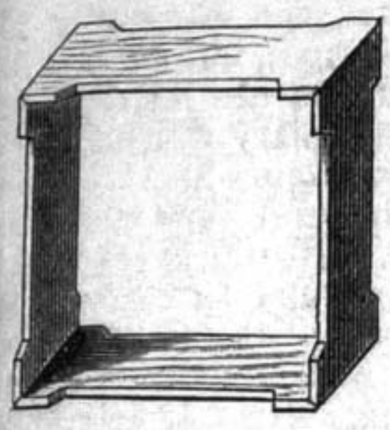


Fig. 3.

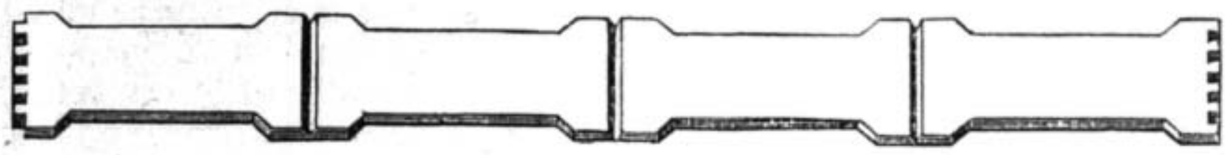


Fig. 2.

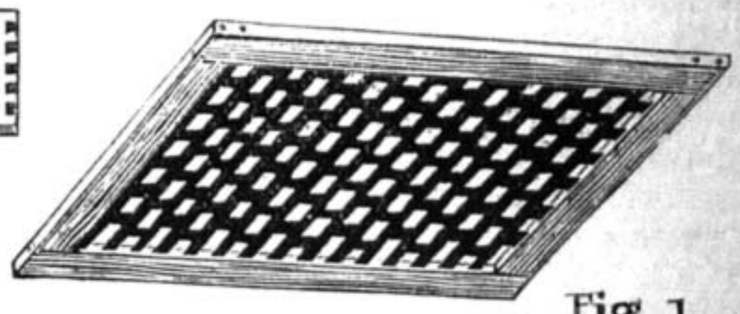


Fig. 1.

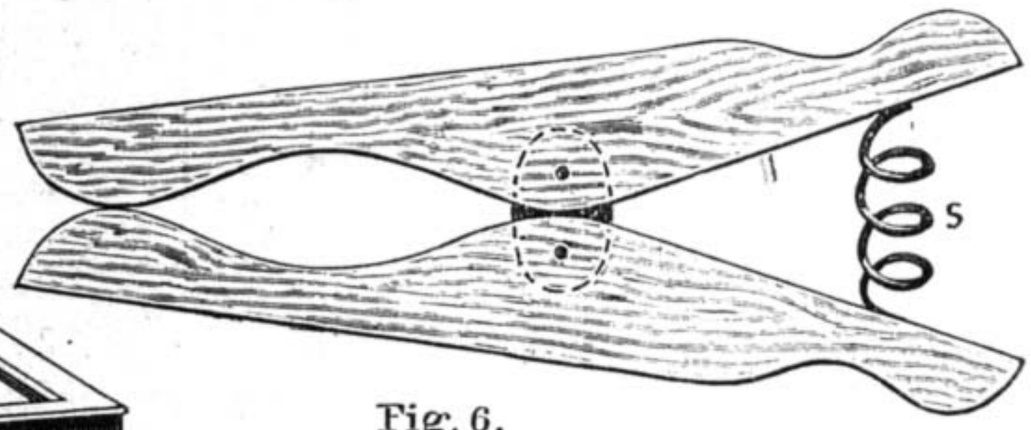


Fig. 6.

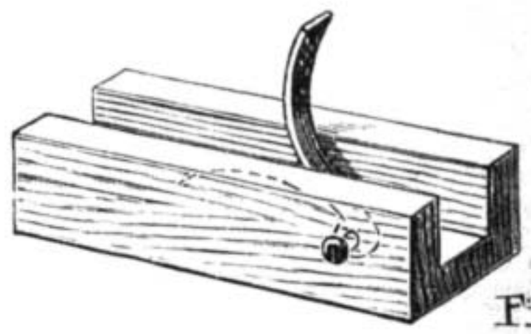


Fig. 5.

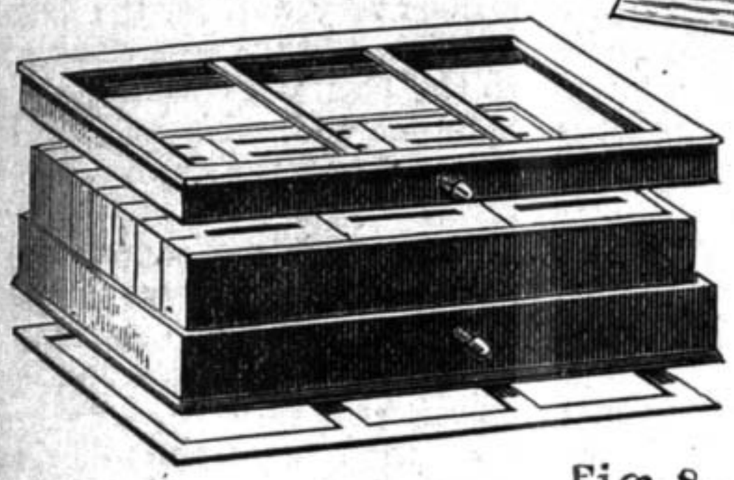


Fig. 8.

Fig. 9.

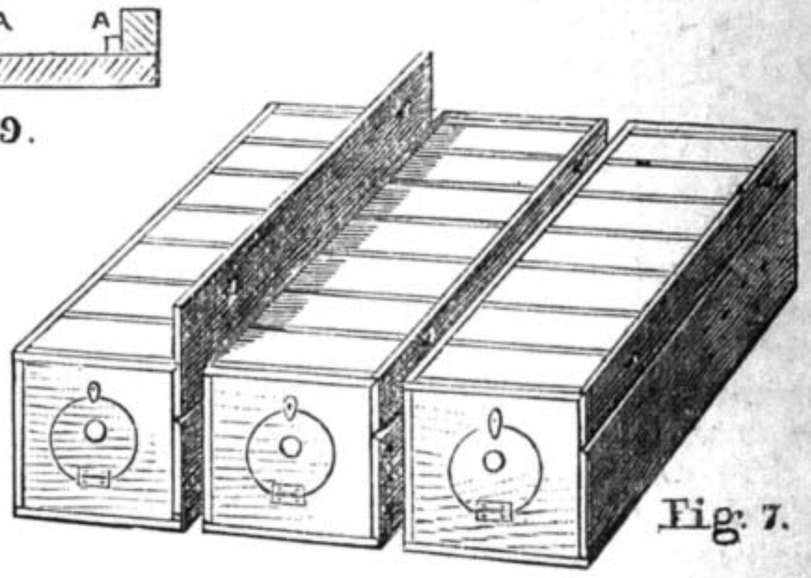


Fig. 7.

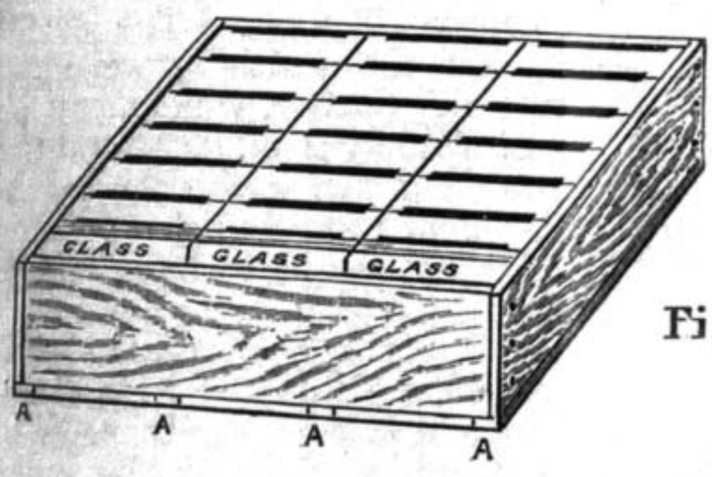


Fig. 4.

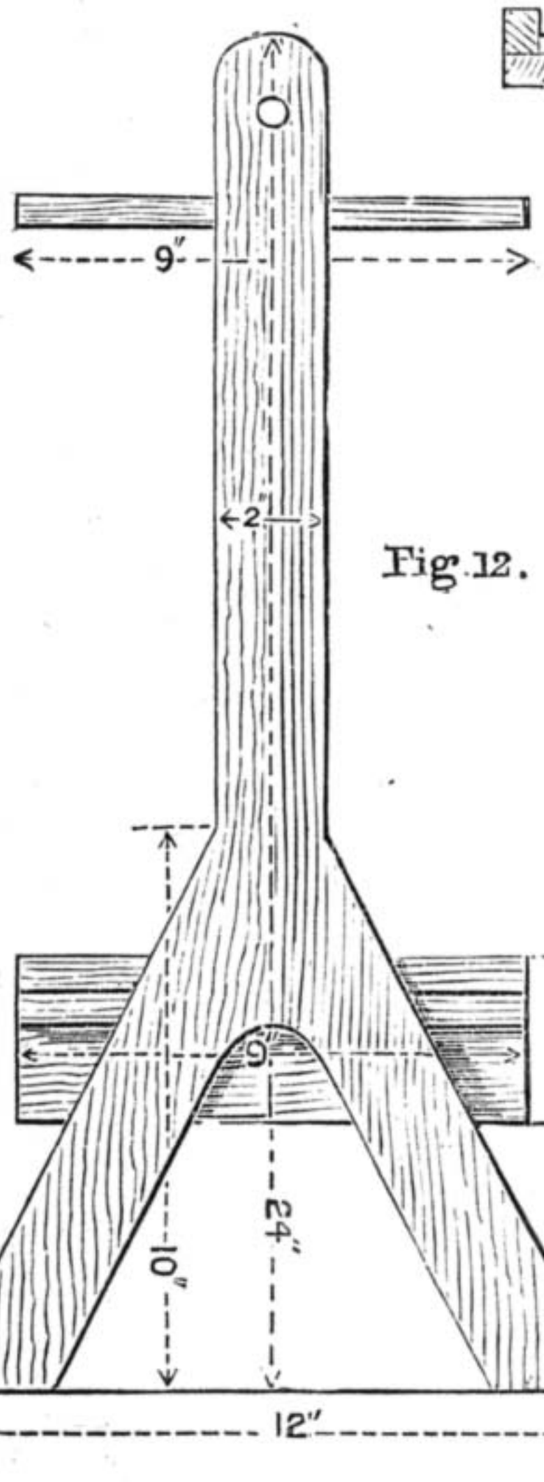


Fig. 12.

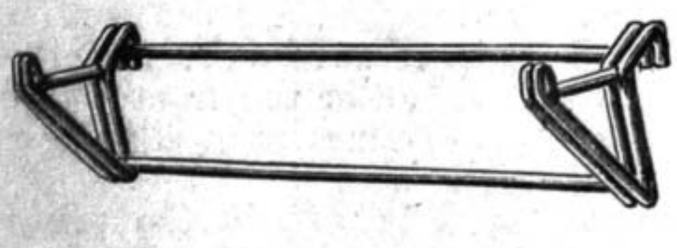


Fig. 13.

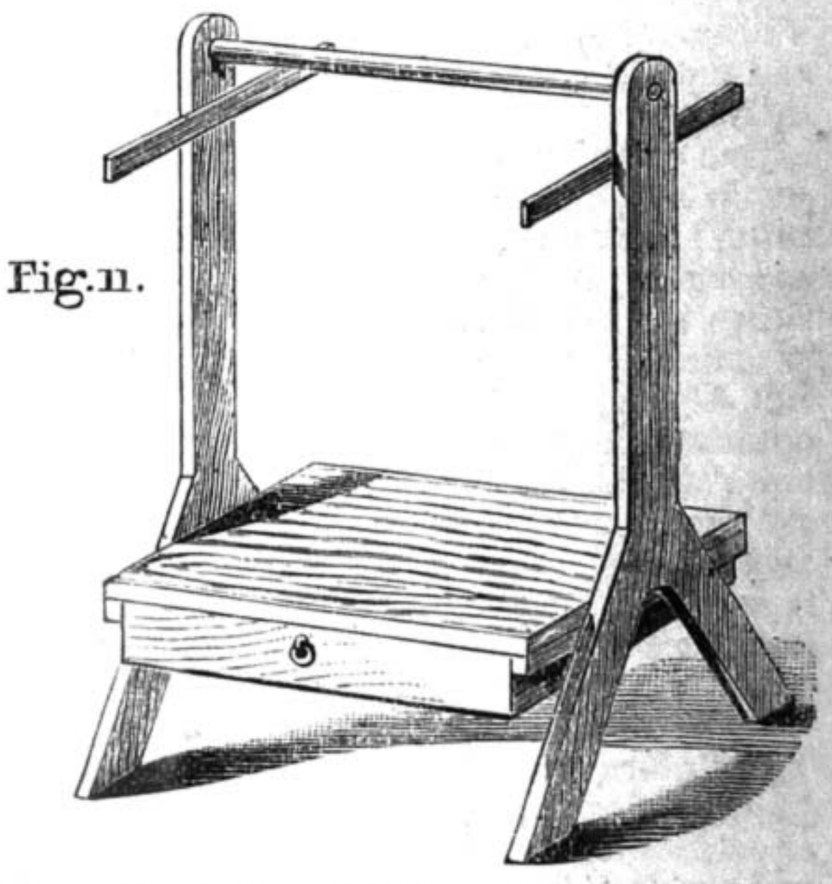


Fig. 11.

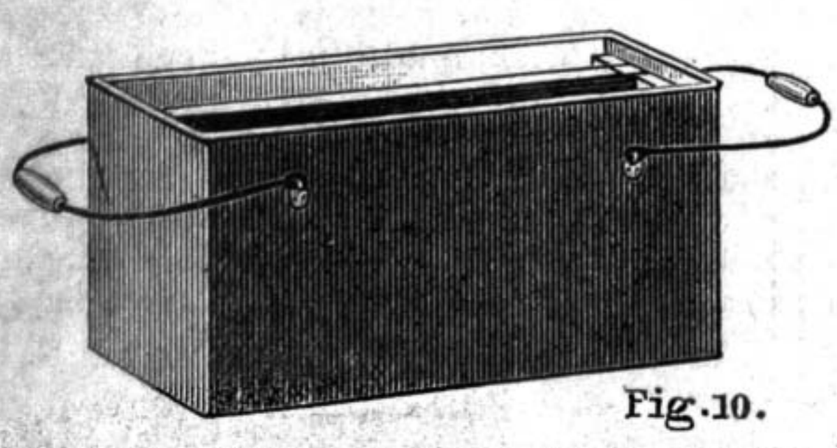


Fig. 10.

Fig. 1.—Queen Excluder for use over Brood-Nest. Fig. 2.—Section in Flat. Fig. 3.—Section made up. Fig. 4.—Section Rack. Fig. 5.—Spring for Section Rack. Fig. 6.—Clothes Peg Substitute. Fig. 7.—Raynor Section Rack (Divisional). Fig. 8.—Neighbour's Invertible Crate. Fig. 9.—Section of Planing Trough—A A, Gauges. Fig. 10.—Frame Box. Fig. 11.—Comb Stand. Fig. 12.—End View of Comb Stand. Fig. 13.—Comb Holder to hang on Hive.

formerly described in that its object is to prevent the queen from getting up and laying in the super, where the surplus honey is to be stored. Many bee-masters never use the excluder over the frames, asserting that the queen seldom ascends to those elevated regions; and, if there is plenty of room underneath, I believe she seldom does. My object, however, is to describe not alone the appliances which may be managed with, but everything which the amateur is likely ever to require. It certainly would not pay to make one's own perforated zinc, and so I will suppose that it is purchased, which it

We should make a frame of ⅜ in. wood which is just 17 in. square outside measurement, and 13 in. by 15 in. or thereabouts inside. On one side of this the piece of perforated zinc is to be tacked with gimp pins, and the job is done. If the hive is of a different size, the external dimensions will be varied to fit it so closely as to prevent any bees ascending except through the perforations. If necessary, one or two little slips of wood may be tacked across to prevent the zinc sagging in the middle. In Fig. 1, I give a diagram of such an excluder. It would be laid on the frames zinc uppermost,

crates, and here let me say a few words about sections. They are the little boxes which are filled with comb honey and look so charming on the tea table. It certainly would not pay to try to make them, as they can be bought for half-a-crown a hundred, most perfect in every way. In Figs. 2 and 3, I show them in the flat and folded. A touch of thin glue along the V-cuts before folding would make them very much stronger, and prevent their being pulled asunder as they sometimes are.

As the dimensions of the crates will

depend upon those of the sections, the class of sections to be used should be decided on before the crates are made.

For sections 4¼ in. × 4¼ in. × 2 in., the crates I shall describe are intended, but by varying the dimensions to suit, any other sizes may be used.

Fig. 4 shows one of the simplest and best section crates that can well be designed. It is a plain box of wood without top or bottom, nailed—or, better still, dovetailed together. Its internal width is just sufficient to accommodate three sections—that is, 12⅞ in.; the depth of the sides is 4¼ in., and in length it will hold seven 2 in. sections plus thin wood separators between each, plus a bit of glass at the end, plus a space for a spring to jamb the glass, about 15¾ in. in all. The wood for its construction may be ½ in. or ⅝ in. stuff, but the latter is to be preferred. Four slips are to be nailed to the base, one at each side, and two between in such a position as to cover the line made by the juncture of the sections, and at the same time to support them. These slips are to be ¾ in. wide and ⅜ in. thick, so as to form a bee-way over the excluder, or, if it is not used, over the frames.

If the crate at this stage be filled with twenty-one sections together with separators, it will be found that a space about 1 in. wide remains between the glass, which is usually put at the end of each row, and the end of the crate. This would afford too convenient a passage for prospecting bees to visit the roof of the hive; and so it must be stopped up with three pieces long enough to fit between the slips already nailed on, and ⅜ in. thick. At the other end similar pieces will be nailed on, but they need not be so wide.

The class of springs usually used to press the glass against the sections and keep all tight is shown in Fig. 5; but I find clothes pins (Fig. 6), at sixpence a dozen, do just as well as anything—in fact, a cork cut to length and pushed down has served my turn more than once.

One end of this section crate is sometimes cut in two, and the upper half can then be turned back on a couple of nails which act as hinges. A piece of glass is inserted between the sections and this end; and when it is desired to see whether the sections are full, the end may be turned down and a peep obtained through the glass. The top of this crate should be flush with the sections, so that another similar one would fit over it, and thus have only the bee space resulting from the slips nailed to its underside. Open racks are sometimes used to hold the sections, but they have nothing to recommend them except that they spare a little wood. Their sides are 2¼ in. the short way, and 1⅛ in. the long way, in depth. The sections, of course, stand well over them, and are cold and comfortless for the bees.

The late Rev. G. Raynor invented the divisional rack, which is extensively used and very handy. Its advantage is that seven sections can be taken off at a time, and, if the outside row is not as advanced as the centre, they can be changed.

Fig. 7 shows three of these racks as they would be placed on the hive, with the exception that one of them has its wedge raised.

A plain box 14½ in. long, 4⅝ in. wide, and 4¼ in. high, inside measurements, is nailed together, having one of its sides only 2 in. high. Another piece is prepared ⅜ in. thick, and the length of the box to wedge the sections tightly in place.

Strips are nailed on the under side to provide bee-way as in the other rack, the one at the wedge side being much wider than the other, at least wide enough to support the sections; and the job is done—at least, it only requires to have finger holds cut with a gouge in the wedge to assist in disengaging it. I always make what I call the wedge, a wedge in reality, having it thinner at one edge than at the other; this assists in putting it in place as well as in clamping the sections tight.

Before the crate is nailed together it is usual to cut a peephole at one end. This can best be done with a fret saw, and if it were cut smaller inside than out, as a person would do for inlaying, the same piece could be attached to the crate with a small hinge and act as door or shutter; a little button would be necessary to keep it closed, and a ring as a handle to open it with.

Invertible supers are now very often experimented with. In Fig. 8 I give a view of Mr. George Neighbour's invertible crate. It is in two parts, having slips, half a bee space in depth, nailed to the outside of each; a couple of thumbscrews force the follower, or loose wooden end, against the sections, and keep them tight while the inverting is going on. When another similar crate is placed over one of these, the two half bee spaces coming together form an entire bee space; but when one is placed over the frames, only half a bee space will intervene: a light frame, half a bee space in depth, must, accordingly, be provided to be laid over the frame under the rack—this is clearly shown in the figure. It is not difficult to make this piece of apparatus: two boxes are made of the dimensions given for Fig. 4, but only half the height; the slips, $\frac{3}{16}$ in. thick, are nailed to the top and bottom, as shown, and the ends are provided with thumbscrews. The kind used for fastening window frames, which can be bought at a cheap rate from ironmongers, would do excellently.

A useful tool for getting these thicknesses accurately is a planing trough; this consists of a piece of inch pine planed quite true and flat. Slips of the same wood, 1½ in. high and 1 in. wide, are screwed along its entire length, which may be 2 ft., more or less, and so far apart as to let the trying-plane slip between them, say 3½ in.; thus, in a 10 in. board, there would be two troughs 1½ in. deep and as wide as the sole of the trying-plane. Fig. 9 is a section of such a trough. Slips of wood A A are placed in the corners, and these are planed truly parallel, and just slightly higher than the thickness which they are required to gauge. Its action is evident. The pieces which require thicknessing are packed in the trough between the gauges, and the latter will prevent the plane from going too deep; a stop tacked across one end prevents the pieces from slipping forward. The two troughs are for different thicknesses, but the gauges could be made removable, when one would do for all. We shall require gauges ⅜ in. for full bee-way, and perhaps $\frac{3}{16}$ in. for half bee-way; also, if it is desired to plane the frames, gauges to accommodate them.

Another very useful piece of apparatus is a set of blocks for removing full sections from the crate. If they are pulled out with the fingers, the bottom and a good deal of the honey are sometimes left behind sticking to the bars of the crate. To avoid this, the sections should be pushed up from underneath, and this can be done by laying three pieces of wood 2 in. square and 13½ in. long on the table, 4¼ in. apart centre to centre, and putting the crate full of sections on them, the middles of the sections resting on the square blocks. A firm pressure on the crate will push it down and make its contents stand up most convenient for handling. As it is not very easy to place these blocks exactly in the proper position by rule of thumb, I nailed them therefore to two strips of wood, so that they are a permanency and always correctly placed. It will scarcely require a figure to explain this.

I have now concluded the description of the hive and its appendages, but my task is far from complete. There are many other tools to be found in an apiary which I must not neglect to mention; one which is almost entirely made of wood and very useful is a frame box (Fig. 10). Its object is to hold combs while extracting, and to carry them to and from the hives in. It can easily be made of deal, ⅛ in. thick, and of internal dimensions 17 in. × 9 in. × 9 in. It may have a bottom and, if preferred, a lid, but a cloth thrown over it does very well for the latter. The handles seen are of wire, ⅛ in. thick, and are attached to the box with four staples; we must not forget to nail a ledge inside upon which the ends of the frames are to rest.

A somewhat similar piece of apparatus is the comb stand. I give a view of mine, which was made from the diagram in Cowan's book, in Fig. 11; and an end view with dimensions in Fig. 12.

It is made of inch stuff, the pillar and one leg being cut from the same piece of wood, and the second leg attached with glue and a couple of nails. The entire height is 2 ft., and the width between the pillars 15½ in. The drawer, which may be omitted, is 9 in. wide by 2 in. deep, and the slips of ½ in. wood nailed inside the pillars to support the combs are 9 in. long. This will be found very useful to hang combs on while examining a hive.

A simple arrangement, however, is shown in Fig. 13. As there illustrated it is made of wire, but it could also be easily made in wood, triangular pieces forming the ends, which should be attached to a flat back and hooks of hoop iron screwed on to hang it to the hive with. A nail in the front corners would prevent the frames from slipping off by any mischance.

I have confined myself, in the present paper, as much as possible to those pieces of apparatus which entail in their construction only woodwork. In my next I hope to treat of Parker's machine, Woiblet imbedder, smokers, etc., all of which will entail more or less of metal work. In the meantime, if any one finds a difficulty in following my instructions, I shall always be most happy to give further assistance in "Shop."

SHEET METAL WORK.

BY R. ALEXANDER.

THE WORKSHOP—THE WORK BENCH—MATERIAL, POSITION, AND HEIGHT OF SAME—TOOLS AND MACHINES USED IN THE TRADE.

The Workshop.—In the preceding papers on "Soldering," etc., no mention has been made of the workshop, as none of the operations were such as to require anything more than is usually within the reach of those who do a little work for themselves, either in an amateur or professional way. Most amateurs manage to rig up a bench of some sort on which to perform their various manipulations, and I think that most people who have the room like to have a workshop

of their very own in the back garden or somewhere where they will be out of the way of all interference, and where they also will be out of other people's way. This latter condition is perhaps very desirable in the trade of which I am writing, some of the operations that have been already described being not altogether suited for being carried on in the house, notably the brazing and tinning, though, excepting these, I think anything else mentioned could have been done in a room or washhouse by those possessing no better accommodation. For real work, however, a properly arranged workshop is desirable. My ideas on the subject are as follows:—The workshop should be roomy—18 feet by 12 feet is not too large for a tinman's shop, even if only one man is employed; and I have had even larger workshops than this, and also some much smaller, one that I worked in in Oxford Street, London, being not more than 12 feet by 8 feet, and underground at that, with some big machines in it, so you may guess there was not much surplus room; but such small shops as that are not very desirable, as, besides being unhealthy, only small work can be produced in them with any degree of comfort or facility. It is also important that the workshop should be well lighted, the bright work and the fine lines employed in marking out being very trying to the eyes in a bad light; skylights are very desirable in a workshop, as by them a light is shown direct on to the floor where a large portion of the marking and setting out has to be done, and if the light is wholly from the side of the shop a shade is cast on the floor close to the bench, thus rendering marking out a tiresome job, especially on dark, gloomy days; so by all means go in for plenty of light in your workshop. It should also be of a fair height, not only for health considerations, but in order that wire, patterns, etc., may be kept on hooks fixed to the joists, this being, in my opinion, the best position for such accessories, though in many places they have to be hung on the walls; but this is inconvenient in many ways, and if the patterns and bundles of wire are hung systematically from the ceiling or joists, what is wanted can be seen at once and reached down without trouble by means of a "long arm" which can be easily made by fitting a ferrule on a broom handle and driving in a piece of ¼ in. rod and bending it to the required shape, Fig. 1; this is a humble tool, but, like many other apparently insignificant things, it is very useful, saving a lot of jumping up and down on the bench, etc.

The floor of the shop should be boarded, as there is not the danger of fire as there is in a smiths' shop; and as there is a great deal of work done standing comparatively still, a brick or earth floor would be cold and uncomfortable.

The Work Bench.—This is one of the most important items in the shop, and special care should be taken both with regard to its material and fixing. No better material can be used than good sound beech, though, of course, any tough, hard wood will answer the purpose, but beech is my choice. The softer woods—such as deal or pine—are no use at all for this kind of work, as they will not stand the pulling and straining that the bench gets at times when used for heavy work, so by all means go in for a good piece of stuff for your bench. Its thickness for general work should be 3 in. (thicker will not matter, but less than 3 in. is not desirable); the width from 2 ft. to 2 ft. 6 in., the latter preferable. In the length you will, of course, have to be guided by circumstances, but by all means have it as long as your shop will allow or your purse will permit, as the longer your bench is, the better and more convenient for working on. I have mentioned the width of the bench as being 2 ft. 6 in., but this need not mean that the whole of the bench is to be of the thickness of 3 in. It is usually the plan to have the front half (in which are cut the holes or mortises for the tools, and on which all the hammering, etc., is done) of the thickness I have mentioned, and the back half much lighter, to avoid unnecessary expense—say, 1 in. or 1¼ in. board for the back part. This makes a very good bench, though if any one likes to have it solid right through, so much the better, but get the price first.

I remember, in my early days, a fellow apprentice telling the master that his bench was worn out, and receiving permission to go to the timber merchant and select another, thinking, no doubt, that he simply wanted to replace the front half. He availed himself of the permission, and selected a slab of beech 10 ft. long, 2 ft. 3 in. wide, and 4 in. thick. It was fixed and the holes cut in it, and made a splendid bench, the admiration of all beholders; but didn't he catch it when the "governor" saw it. I think, if memory serves me rightly, that bench cost, without fixing, £2 10s.

Height of the Bench.—This will vary a little with the height of the workman. Thus, if you are a tall man, you require a bench to be higher than a very short man, or a stoop in the shoulders would be the result; and, on the other hand, a short man would not like a high bench, as it would be arm-aching work to use the tools; but the average and usual height of the bench is 30 in. For a tall man, one inch higher will be enough; and for a short man, one inch lower will be sufficient.

Mode of Fixing.—If the bench is a short one, it will only require to be supported at each end; but if over 8 ft., it will want support in the centre. It must be fixed very strongly, or it will soon be loose and shaky with the knocking and pulling about of the heavy stakes and tools. Stout posts fixed to the floor, with pieces running from the posts to the wall, and let into and fixed to the same, is as good a way as I know of. The bench is then laid on, and nailed or screwed down. A short return end is very useful on the right-hand end of the bench. The folding machine is often fixed here, and it comes handy to lay tools down on, or to put work aside temporarily. It need not be so thick as the other bench, or so strongly supported.

From 4 ft. to 6 ft. is a useful side bench. A couple of drawers are a useful accessory to the bench, one to keep odd fittings and materials and the odds and ends that rapidly accumulate in a workshop, and one for small tools, etc., that require to be kept with more care than others. Some square holes have to be cut in the bench for the stakes, etc., to fit in, and I would advise that they be as few as possible. Four ought to be enough if judgment is exercised in cutting them. Do not cut them till you have the tools to fit to them. Cut your first hole to the size of the foot of your largest stake but one; this hole will then do for, perhaps, three different stakes. Then proceed the same with another hole, making that do for several stakes. Then one for the smaller stakes, and one for the stock shears alone will be quite enough; and if you ever want more, they can be cut; but, in my opinion, a bench full of holes is a bench spoilt, as small tools, etc., drop through and get lost in the cuttings under the bench. These holes should not come nearer the edge of the bench than 1½ in., nor should they be further back than 2 in. Some, after the holes are cut, put plates of iron on the bench with square holes cut in, the same size as the holes in the wood, in order to prevent the tools wearing away the bench. It is, doubtless, effective for this purpose, but I dislike iron on my bench, and prefer to leave the holes as they are. I mention the plan, however, so that those who care to adopt it can do so. I may as well say here, as I forgot it before, that the way to cut the holes is to mark them out square on the bench, find the centre by drawing diagonal lines from corner to corner, and bore a hole with a Jennings' or Gedge's bit a shade smaller than the square is to be, and then cut out the corners with a joiner's chisel. Let the holes be 6 in. apart from each other.

Having disposed of the question of the bench, the next thing to consider is the selection of tools and machines. I will mention here those most in general use; others will be noticed as we proceed farther with the subject, or I will give any information I can on special tools through the medium of "Shop."

The Burring Machine or Jenny (Fig. 2).—This is one of the most useful machines in a tinsmith's shop. It is used to "edge" bottoms and bodies, round or oval, to "crease" and edge covers, funnels, etc., put in wires, and many other things. Fig. 3 shows the same machine in a different form. This kind is used in a machine standard (Fig. 4, A, B, C, D, shows several forms of them). It can then be used in any part of the bench without the necessity of there being a hole there, which is at times desirable. The ordinary shape (Fig. 2) is made in three sizes, known as small size, regular size, and for iron work; the two former are the same price, £1 12s. 6d. The diameter of their top rolls are 1½ in. and 2 in. The large size, for iron work, is 3½ in. diameter, and the price is £4 10s. The particulars and prices of these, and other machines and tools that I shall mention, I am kindly favoured with by Messrs. Rhodes & Sons, Wakefield, Yorks; and having proved their goods, I can testify as to their quality.

Bending Rollers.—These also are almost indispensable. Before their introduction the work had to be turned on a tool called a former; and in old-established shops they may still be seen lying about under the bench, or in some out-of-the-way corner. I expect some of the young hands of to-day hardly know their use. Fig. 5 illustrates them. They were made in various sizes, and though good work has undoubtedly been done with them, the rollers have knocked them out of time. Fig. 6 shows a pair of tinman's rollers, for tin goods, stove pipe, etc.

It consists of two cast-iron standards held together by two tie rods, and three rollers: two in front one over the other, and one at the back. At the left-hand end of the two front rollers are two cog pinions which communicate the motion. The top roller works on a bearing that is lifted up or pressed down by means of the thumbscrews, A A. This roller regulates the pressure.

The back roller lifts up and down in a somewhat similar way, except that, instead of having thumbscrews, it has two cranked screws, B B. The reason of this is that the

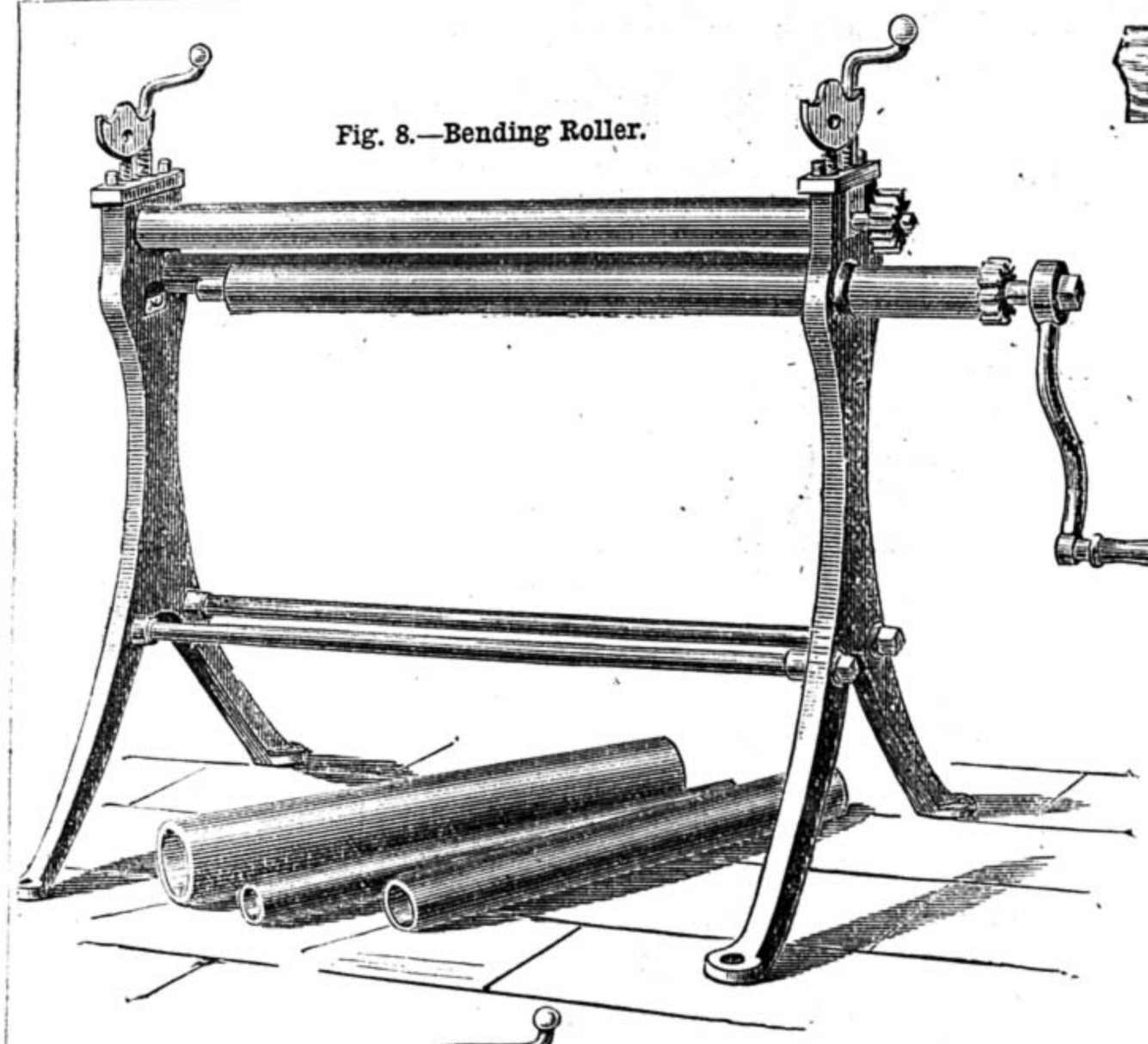


Fig. 8.—Bending Roller.

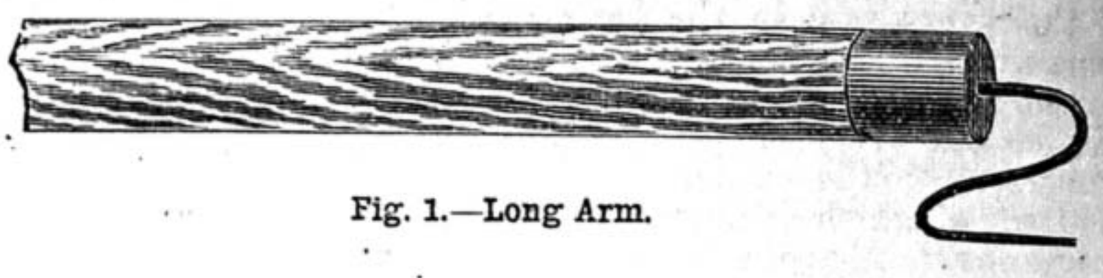


Fig. 1.—Long Arm.

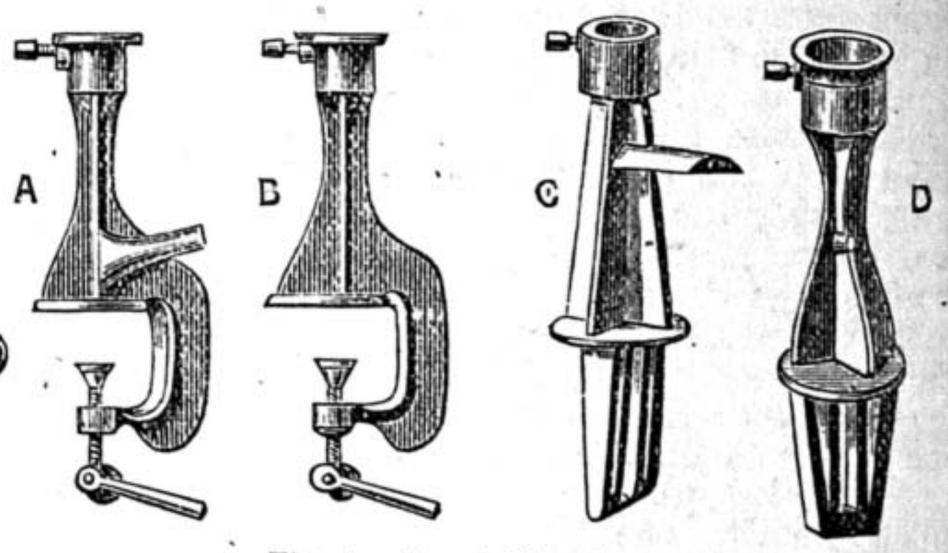


Fig. 4.—Bench Standards.

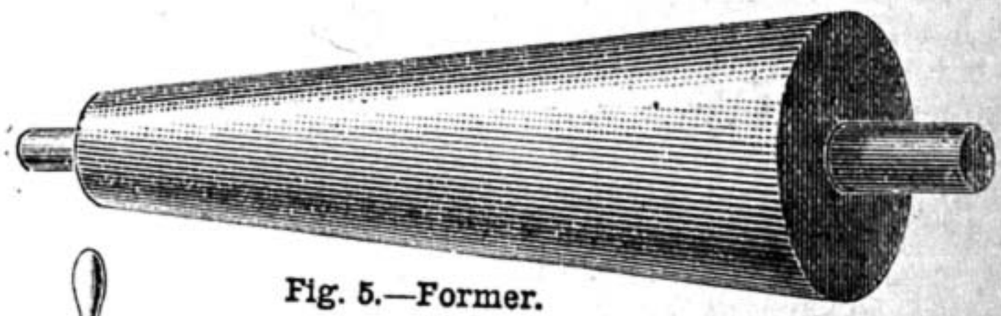


Fig. 5.—Former.

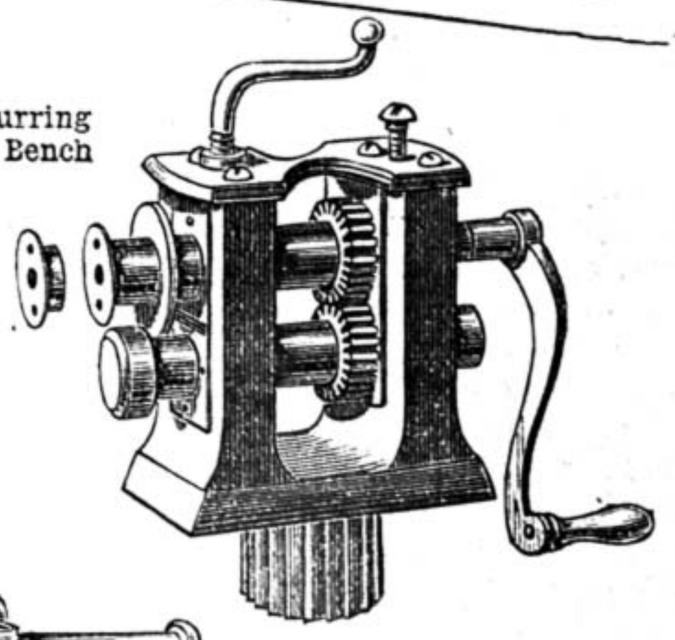


Fig. 3.—Small Burring Machine for Bench Standard.

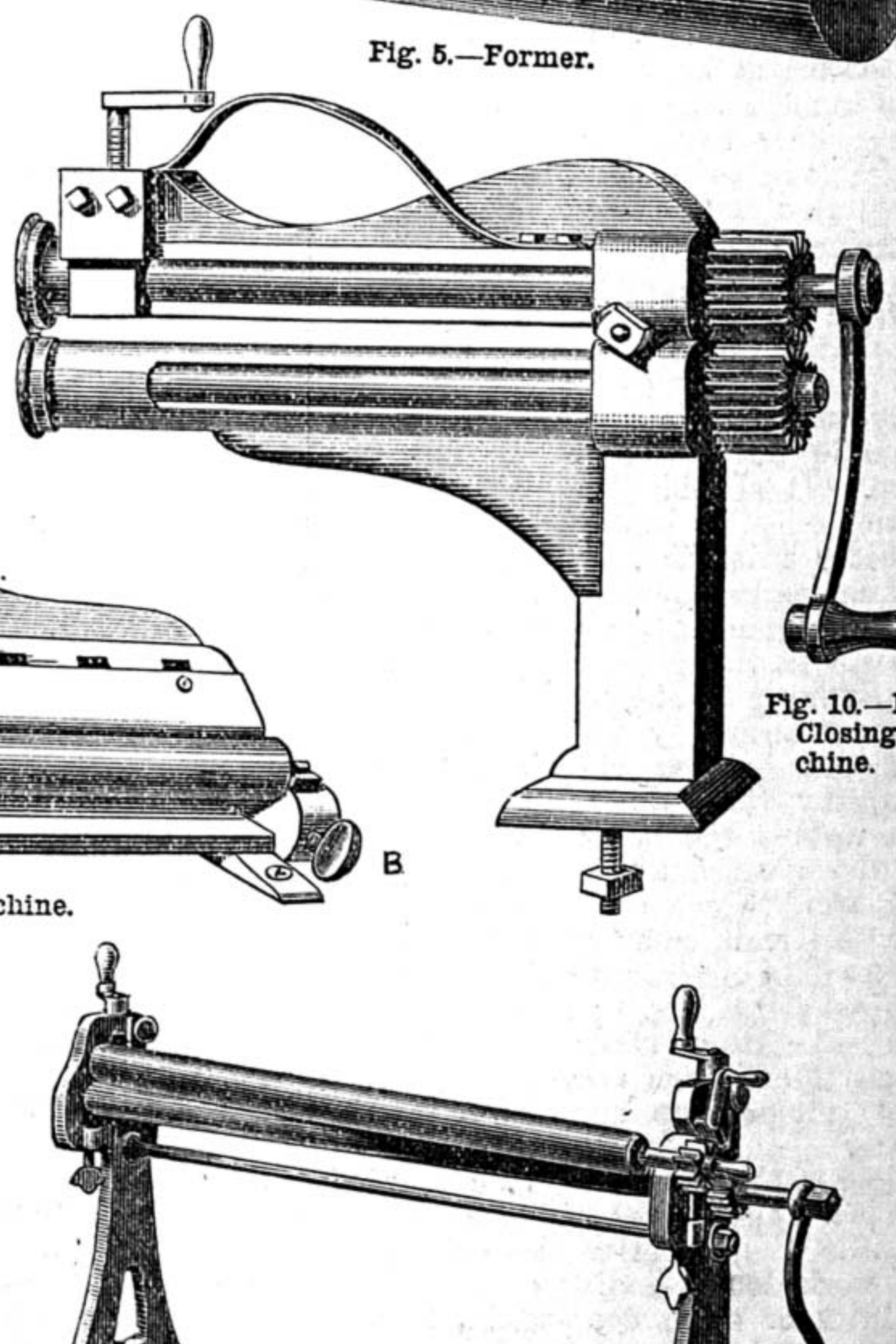


Fig. 10.—Bottom Closing Machine.

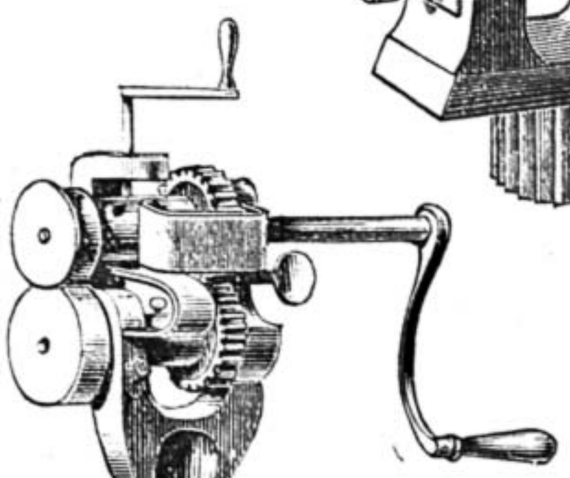


Fig. 2.—Burring Machine or Jenny.

Fig. 9.—Folding Machine.

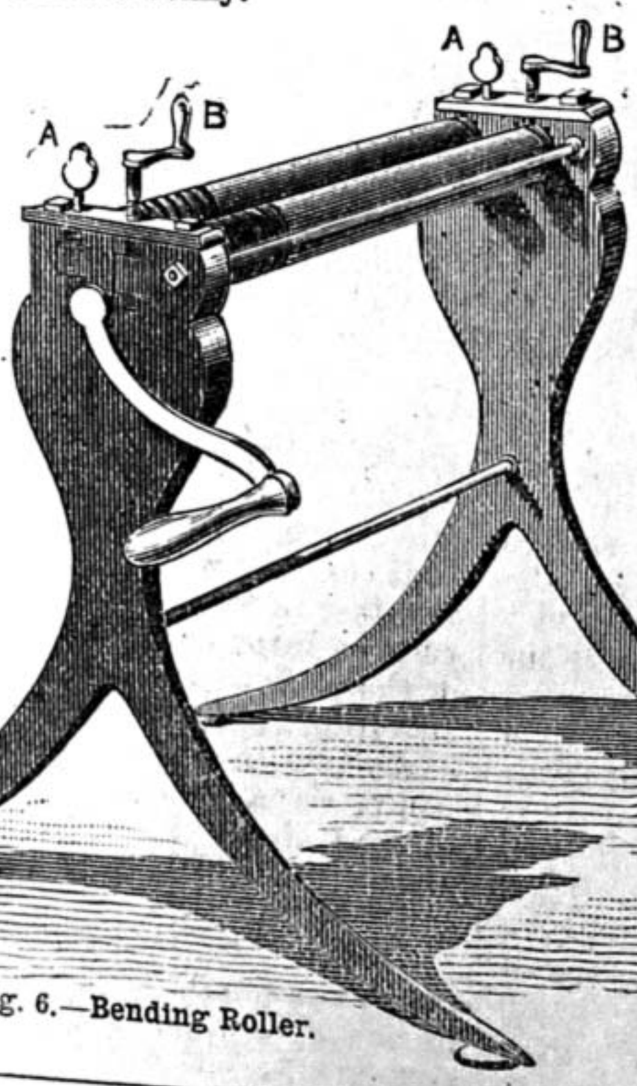


Fig. 6.—Bending Roller.

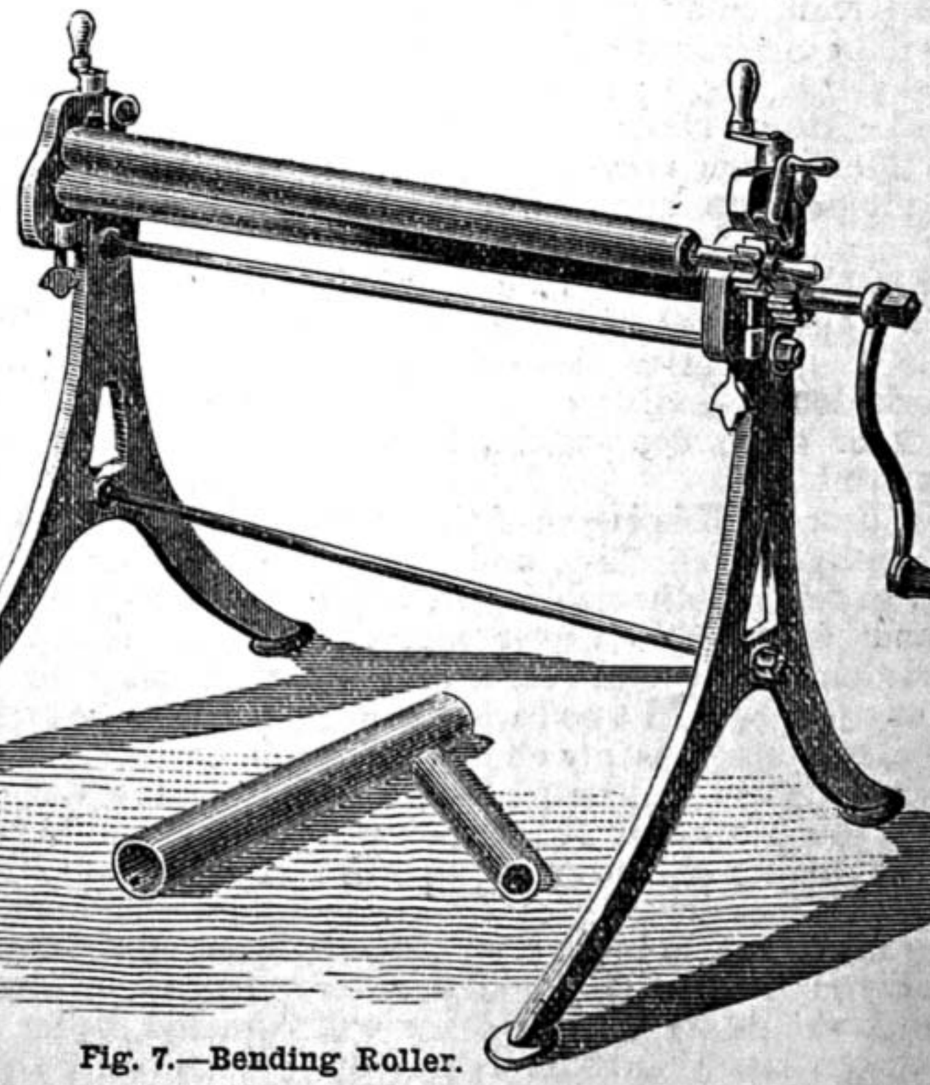


Fig. 7.—Bending Roller.

back roller is the one most in use, and requires to be moved up and down far more than the front top one; and the cranked form of screw admits of more rapid movement than the thumbscrew. This back roller is the one that principally regulates the size of the cylinder to be rolled. The smaller the article, the lower it is let down, and *vice versâ*. This form of roller is made in various sizes: the most useful are subjoined.

DIMENSIONS.

	In. long.	*In. dia.*
No. 1	25¼	1¾
No. 2	30¼	1¼
No. 3	36¼	2
No. 4	36½	2¾

PRICES.

	With iron rolls.	*Steel do.*
No. 1	£3 5 0	£3 15 0
No. 2	4 5 0	5 0 0
No. 3	6 0 0	7 0 0
No. 4	8 10 9	9 15 0

Larger sizes are made, but these are sufficiently large for all ordinary work. Mine is a No. 4, and turns 14 in. gauge iron as small as 10 in. cylinders, such as engine funnels, though I must say it is tough work, and takes two to pull it round.

Two very useful forms of rollers are shown (Figs. 7 and 8) for this class of work,—very heavy pipe. No doubt many others with myself have found a difficulty when rolling thick pipe of getting it out of the rollers; for instance: say a piece of pipe 9 in. in diameter, 16 in. gauge iron. If this is rolled round till the edges meet, it is a difficult matter to spring them open enough to clear the 2½ or 3 in. diameter of the rollers. In Fig. 7 it will be seen that this difficulty is met. The top right-hand bearing swings back, and allows the roller to be lifted partly forward, so that the length of pipe can be drawn off. In Fig. 8 the same result is obtained by drawing out the bottom roller. The reader will notice that in Fig. 7 the work will be rolled upwards, and in Fig. 8 downwards. The price of these rollers is £9 10s., either kind, fitted with steel rolls, 2 in. diameter, 36½ in. long. I have not restricted myself to the illustration of one form only, but have given three in order to meet the requirements of all professionals.

Fig. 9 shows the folding machine, another valuable labour-saving appliance. It is used for turning or folding the edges of tin goods that have to be joined together by the process of groving or grooving. This machine is screwed down to the bench by means of four lugs. The pieces to be folded are slipped over the front roller under the steel plate, P; the distance they are to be bent is regulated by the notched brass slide, S, which is moved by turning the regulating screw, A. By raising or lowering the front roller, a sharp or rounding fold is obtained

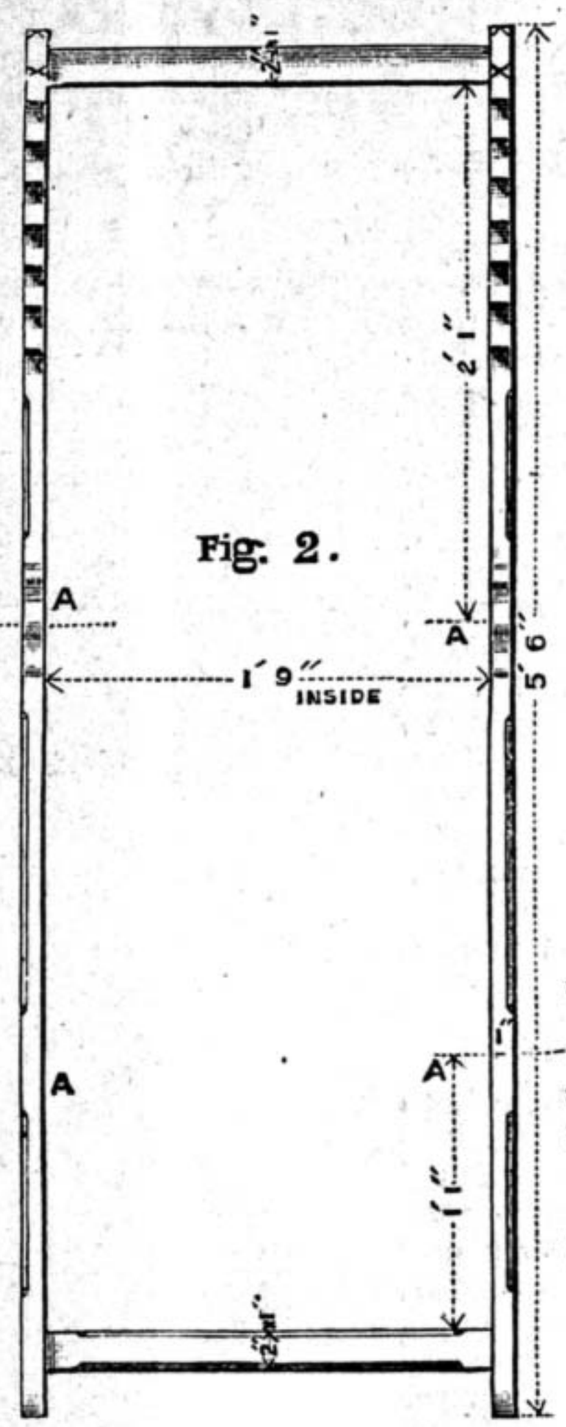


Fig. 2.

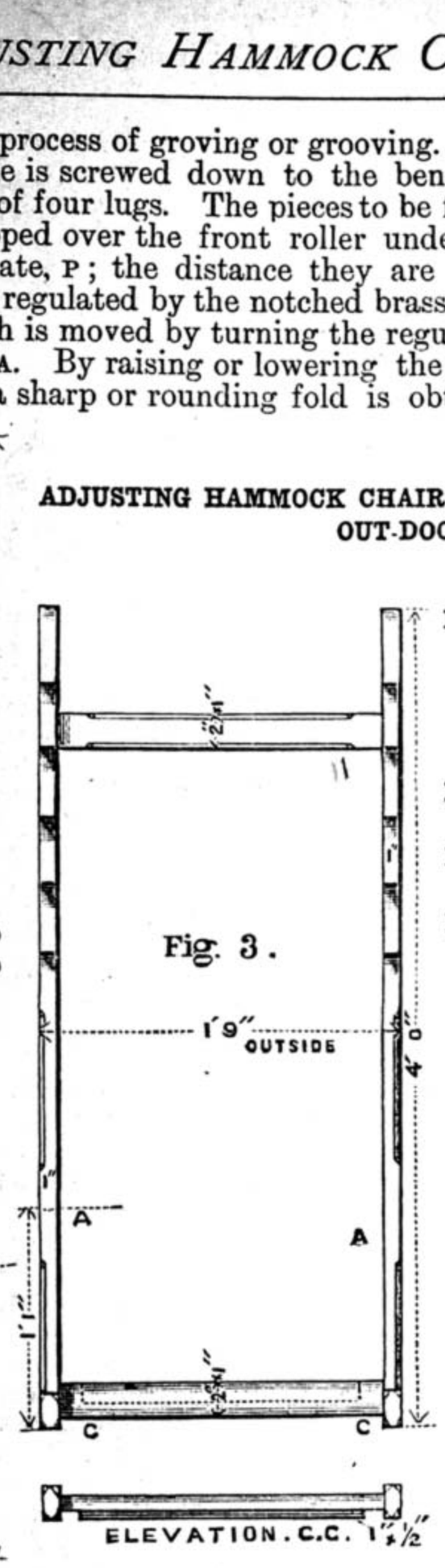


Fig. 3.

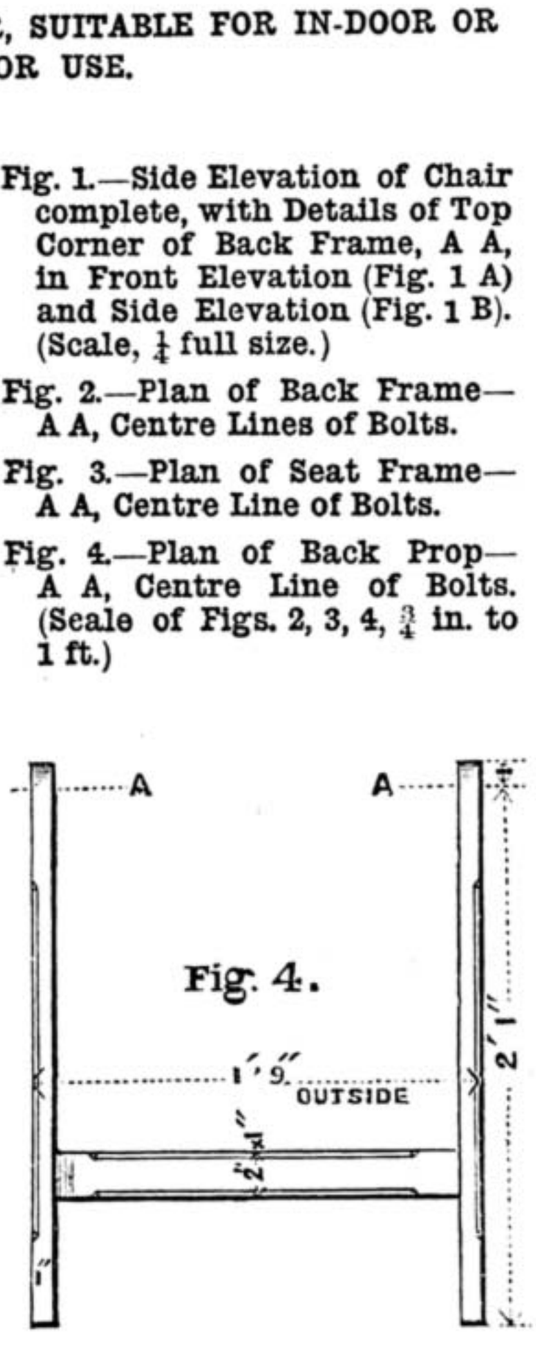


Fig. 4.

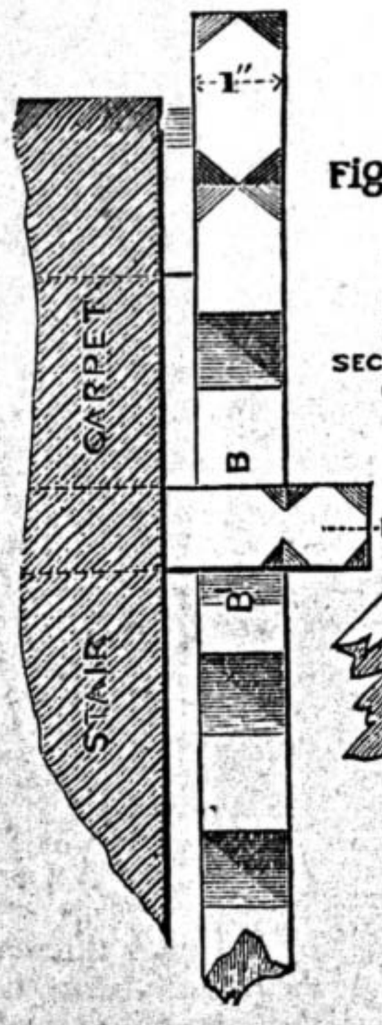


Fig. 1.A.

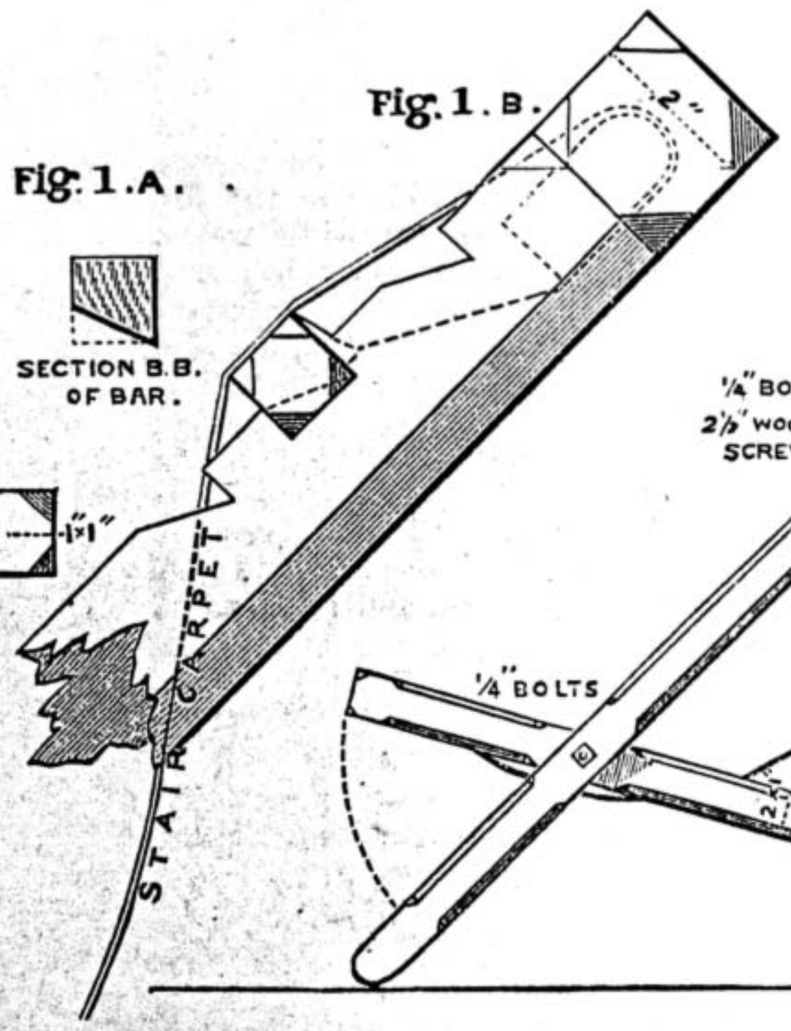


Fig. 1.B.

Fig. 1.

respectively. These machines are made in various sizes:—

		£	*s.*	*d.*
No. 1	17¾ in. long	2	2	0
No. 1½	20¼ „	2	7	6
No. 2	26⅛ „	3	10	0

Of these No. 1½ is the most useful size for most ordinary work.

Fig. 10 is a bottom-closing or "knocking-up" machine. It is used for turning up the bottoms of saucepans, water-pots, camp kettles, boilers, and such goods, and it is

ADJUSTING HAMMOCK CHAIR, SUITABLE FOR IN-DOOR OR OUT-DOOR USE.

Fig. 1.—Side Elevation of Chair complete, with Details of Top Corner of Back Frame, A A, in Front Elevation (Fig. 1 A) and Side Elevation (Fig. 1 B). (Scale, ¼ full size.)

Fig. 2.—Plan of Back Frame—A A, Centre Lines of Bolts.

Fig. 3.—Plan of Seat Frame—A A, Centre Line of Bolts.

Fig. 4.—Plan of Back Prop—A A, Centre Line of Bolts. (Seale of Figs. 2, 3, 4, ¾ in. to 1 ft.)

a valuable accessory to the workshop. This machine is made in three sizes.

U. No. 1 to take articles up to 10 in. deep.
U. No. 1½ „ „ 12½ „
U. No. 2 „ „ 15 „
Price £2 15s., £3 10s., and £4 5s. respectively.

There are several other machines that I wish to describe; but I must reserve them, and also the hand and bench tools, for my next paper.

ADJUSTING HAMMOCK CHAIR.

BY J. BROX.

THE advantages of the chair shown in the drawing are—its simplicity of construction, its compact way of folding, and the adjustment of both the hammock seat as well as the angle of the back frame, to say nothing of the comfort obtained by its use.

There is a slight divergence from the more usual drawings in WORK on this occasion, for this one is a simple mechanical drawing, with no perspective view at all, done on the same principle as practised in an engineer's office. The cause for this is, that it has been observed that there are some in "Shop" who would like to be able to read (as it is called) a drawing, and there is nothing like beginning with something simple. There was also a little bit of advice given, not so long ago, that it is better to hammer out any little difficulty in reading drawings than to write right off to "Shop." This is confirmed here; and any of the younger subscribers might do well in making a model of this to scale, first for the good it will do them in drawing reading; and secondly, if they have no better use for it when done, to give it to some little lady who keeps dolls.

But as regards the chair itself, it is all cut out of English ash, 2 in. by 1 in., except the two pieces, one for the adjusting bar for the hammock seat, which is 1 in. square, and one for the strengthening piece, 1 in. by ½ in., under the bottom bar of the seat frame (shown at c c, Fig. 3). This bottom bar is rounded on the top both sides. All the bars are tenoned into the side pieces,

and the top bar of the back frame is rounded back and front on the top. It may at first sight be asked why there are blocks to carry the back prop, which are made fast by two good wood screws each, but this is to cause the prop to fold up out of the way of the seat frame when shut up, as by the dotted lines in Fig. 1, so that the whole may be as compact as possible. There are also one or two dimensions which must be regarded with care. The width of the frame, Fig. 2, encloses both the other two. Its width is 1 ft. 9 in. inside, and the other two are 1 ft. 9 in. outside, so that they fit inside Fig. 2 without any play. Then the distance from the bolt-hole in Fig. 3 to C is 1 ft. 1 in. This must be made slack, so that the bottom of the seat frame will pass the bottom bar in the back frame, whose inside measurement to the bolt-hole is also 1 ft. 1 in. The same thing applies to the prop and the top bar of the back frame.

The seat is simply a strip of stair carpet as near 1 ft. 7 in. in width as possible, and is well tacked under the bottom bar of the seat frame, C C, and brought round over it. The other end is sewn on to the adjusting bar, as shown in the enlarged details, as you sew the lath at the bottom of a window blind. This end, when the chair is finished, is thrown over the top bar of the back frame, brought round in front again, and the ends of the adjusting bar fixed into the nicks made for it. The weight of the person sitting in the chair prevents any chance of its coming out. The number of nicks, both for the adjusting bar and for the back prop, can be left to taste. The bolts and nuts used are the ordinary ¼ in.

As to decoration, that can be as you like. The one made from the above working drawing was in ash, chamfered as shown, the chamfers picked out with black, and the whole varnished. Of course, knobs and spikes, etc., can be added, but made as shown, and picked out with black, it looks wonderfully light, more so than in the drawing. Although it has no arms, there are some very comfortable corners inside it, and that is a great thing in any chair. Arms might be put on like those in use in railway carriages, but it must not be forgotten that they must be fixed on the upper sides of the back frame, so that they will not interfere with the closing of the chair. They should be slung with one eyelet hole each and a large-headed screw, so that they will always hang perpendicular to whatever angle the back frame may be set. Anything else about the subject can be got from the drawing, as it is all to scale with dimensions.

OUR GUIDE TO GOOD THINGS.

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

33.—Metal Screw Button.

The metal screw button shown in Fig. 1 in its separate pieces, A, B, C, D, and E, and then combined so as to form the two parts of which each button is composed, was once a patent article, but is so no longer, the time over which the rights of the patentee extended having expired. A correspondent (Mr. H. Reed, 5, Lovell's Court, Paternoster Row) has told me this, and thinks it as well that the readers of WORK should know that they are free to make these buttons for their own use if they are inclined to do so. The button is of a kind that, in an emergency, can be fixed quickly to cloth or any other textile fabric. A is an oval or other shaped washer, designed to allow the button to roll or revolve when in use; and B is a piece of wire cut with a screw thread. These two parts are soldered together to form X. Similarly, C is a round or other shaped washer, D a piece of tubing with an inner screw thread, and E an ordinary button head. These three parts are fastened together as shown at Y. To fix the button, a small hole is made in the fabric, B is pressed through, and C is screwed on to B, gripping the material on both sides, thus obviating the necessity of sewing where strength and rapidity in fixing are required. In any emergency it is fixed instantaneously, and can be taken off and replaced at pleasure.

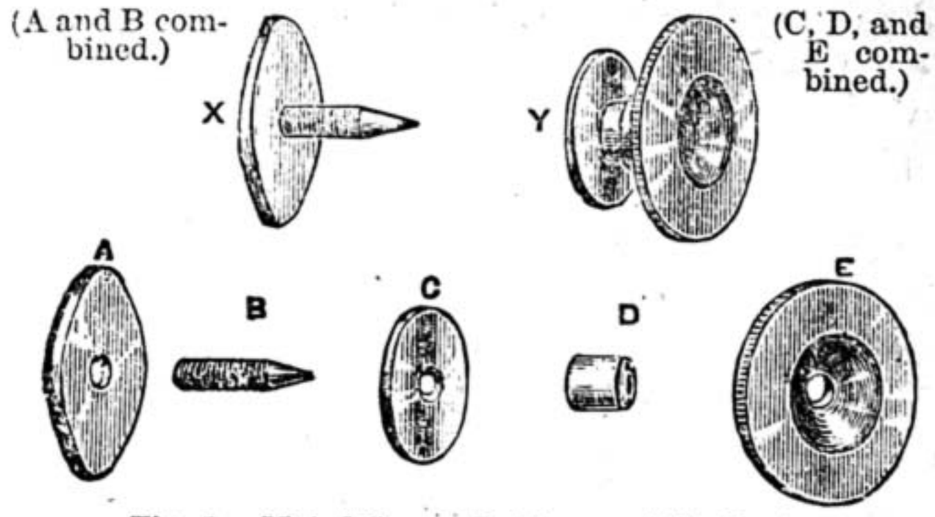


Fig. 1.—Metal Screw Button and its Parts.

34.—Bruce's Patent Hat Shaper.

Mr. George H. Bruce, Iverley Works, Helena Street, Smethwick, near Birmingham, the patentee and manufacturer of the "John Bull" Pocket Gauge, which was noticed in Vol. I., page 363, of WORK, has sent me a specimen of a new invention of his, which he calls a Hat Shaper, and whose form is illustrated and construction shown in Fig. 2. To use the shaper, turn the back of the hat towards you and hold the shaper in the left hand, placing the back wing in the back of the hat with the ledge resting on the rim; then place the two front wings to their required positions in length or width, and let the ledges of these also rest on the rim. Screw up with the coupling nut in the centre as may be required, and then hold the hat before the fire for one minute, and rub the rim, while warm, where the wings of the shaper are operating gently with the fingers, letting the shaper rest in that position till the hat is required for use. When the hat has been out in the rain, and is wet, the same treatment with the shaper will prevent it from contracting. The price of the shaper in brass is 5s., but when made in this material, it is intended for hat manufacturers and dealers. For ordinary household use it is made in bronzed malleable iron, and sold at 1s., or 1s. 3d., post free.

35.—Pike's Patent Bow-Guide, Music-Holder, and Mute.

Mr. W. H. Pike, of 212, West Fourteenth Street, New York, and of 19, Greek Street, Soho, London, W., calls attention to a patented contrivance of his for use with the violin, violoncello, etc., which acts as a music-holder, a guide for the bow, and a mute. Two forms of the music-holder are shown in Figs. 3 and 4, of which the latter is fixed, but the former is mounted on a rod, so that the music can be brought nearer to, or farther from, the eyes of the violinist as may be needful. This music-holder obviates the use of the ordinary music-stand, which causes the performer to resort to ungraceful bendings and contortions of the body at times in order to gain a position in which he may most readily read the music before him. The mode of fixing it is clearly shown in the engravings, and needs no description. When in this position it also acts as a bow-guide, by preventing the bow of the performer from going over the strings at any point below that part of it which rises at right angles to the surface of the instrument. The projecting points of the music-holder are divided transversely for the reception of the sheet of music, and it is thus made available for placing over the bridge, as shown in Fig. 3, in which position it acts as a mute. For price, etc., application must be made to the patentee.

THE EDITOR.

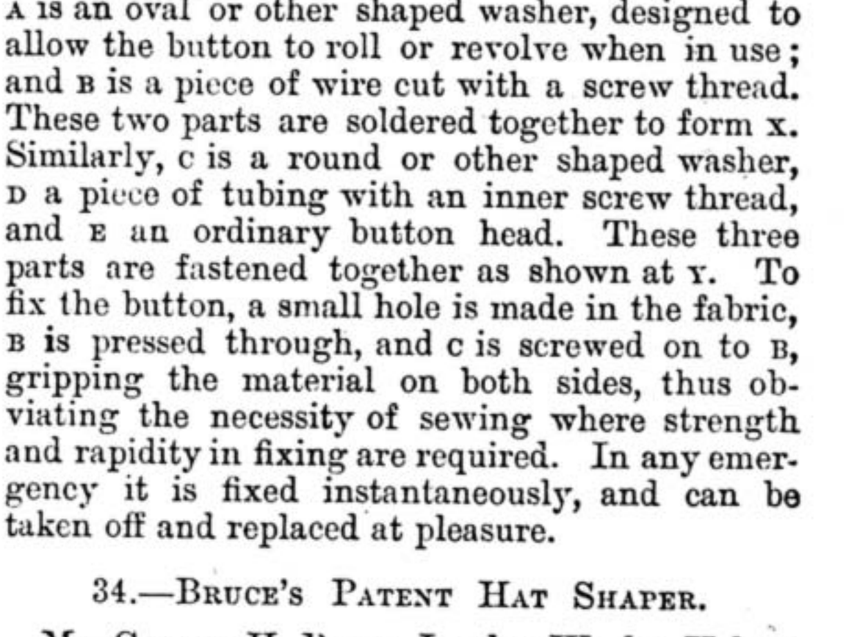


Fig. 2.—Bruce's Patent Hat Shaper.

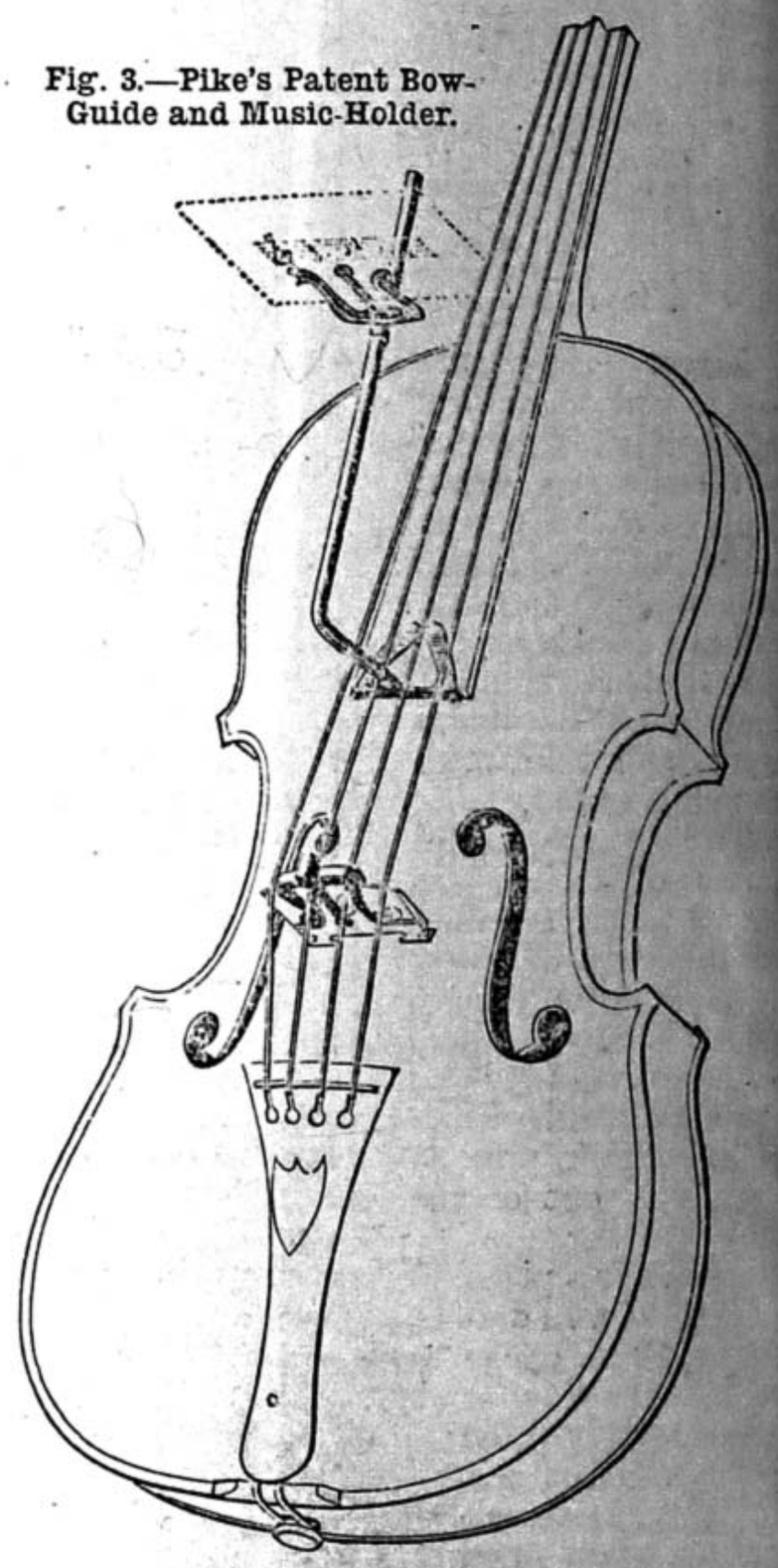


Fig. 3.—Pike's Patent Bow-Guide and Music-Holder.

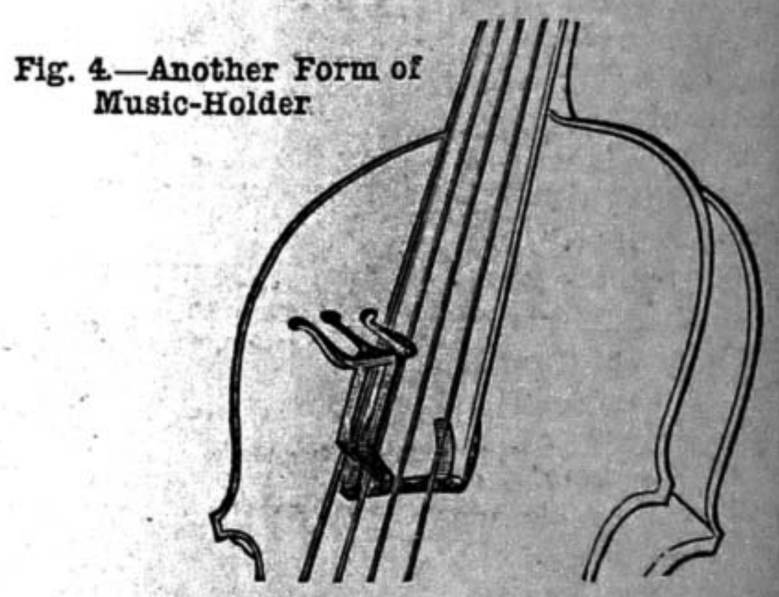


Fig. 4.—Another Form of Music-Holder

SHOP:

A Corner for Those who Want to Talk It.

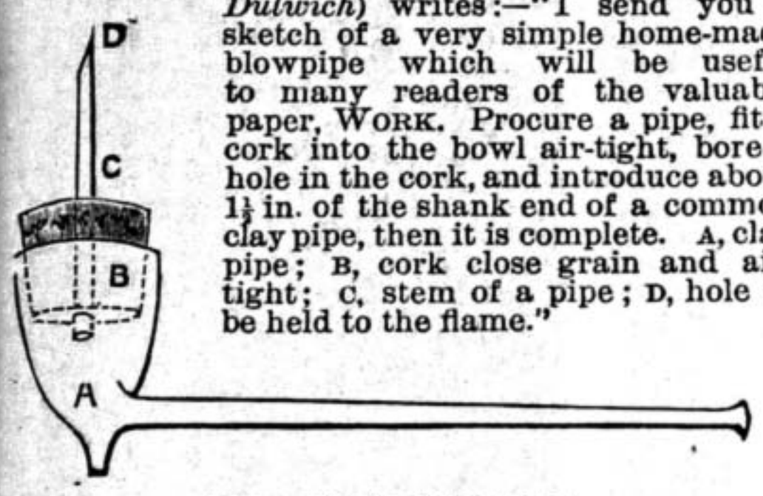
NOTICE TO CORRESPONDENTS.

*** *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.*

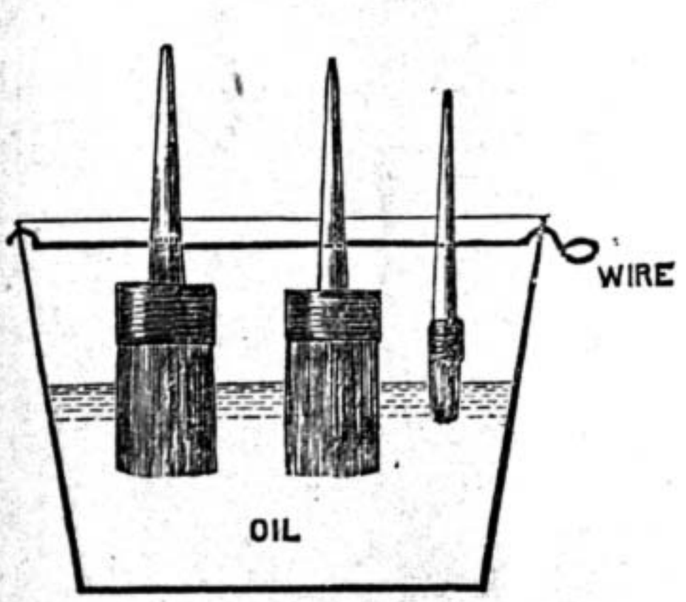
I.—Letters from Correspondents.

Home-Made Blowpipe.—T. W. A. (*East Dulwich*) writes:—"I send you a sketch of a very simple home-made blowpipe which will be useful to many readers of the valuable paper, WORK. Procure a pipe, fit a cork into the bowl air-tight, bore a hole in the cork, and introduce about 1½ in. of the shank end of a common clay pipe, then it is complete. A, clay pipe; B, cork close grain and air-tight; C, stem of a pipe; D, hole to be held to the flame."



Home-Made Blowpipe.

Preserving Brushes.—T. W. A. (*East Dulwich*) writes:—"I send you another good recipe which I hope will be of some value to our readers of WORK. It is to preserve tools and brushes when not in use. Clean out the brushes well and make a hole in the handles to let the wire pass through,

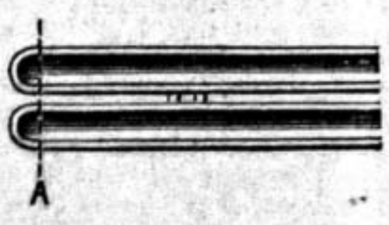


Preserving Brushes.

and to let them hang from the wire without touching the bottom; put them in paraffin oil or linseed."

Glasses of Telescopes.—E. A. F. writes:—"In my reply to A. C. (*Edinburgh*) (see page 92, Vol. II.), in line 6 of reply, please read for "double concave' 'double convex.'"

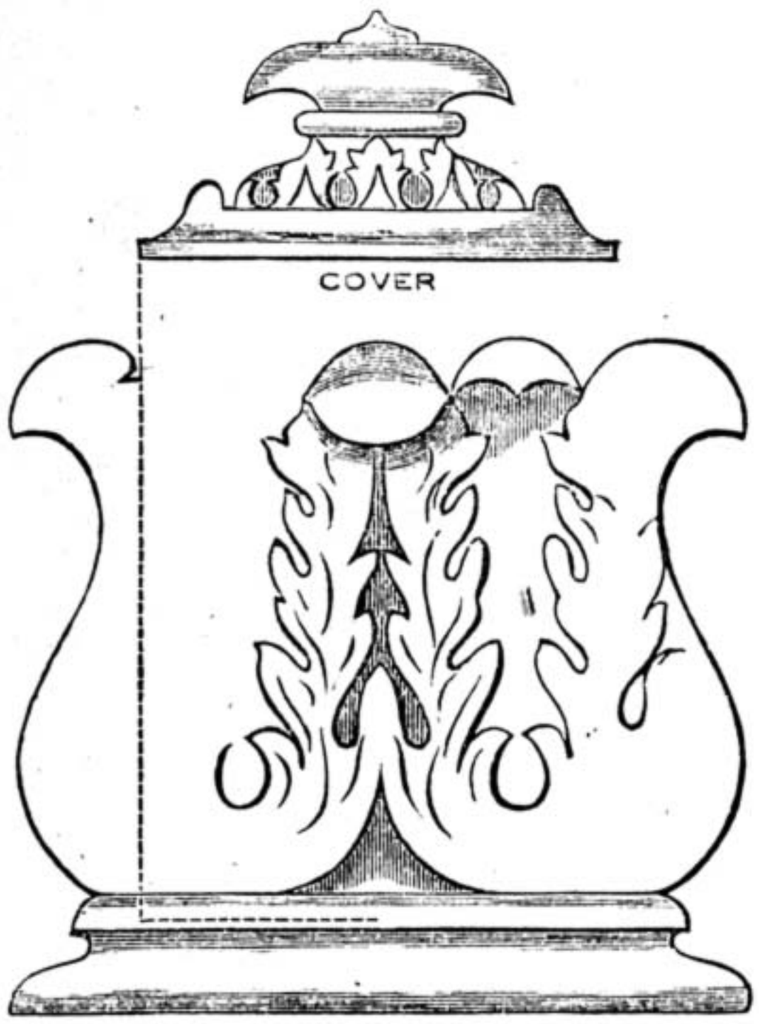
Cigarette Maker.—C. W. B. (*Plymouth*) writes:—"In my reply as to Cigarette Maker (see page 94, Vol. II.), I forgot to point out that the sketch on page 670, Vol. I., *must be* incorrectly drawn, as it shows domed end. Dotted line at A explains error."



Piano Tuning.—In reply to B. A. B. (*Hampstead*) T. E. writes:—"I think you have made an error in criticising my remarks on page 803, Vol. I., I did not attempt to show what a fifth or a fourth was, but I put in the simplest manner I could the remarks on tuning, so that the amateur to whom I was addressing my observations might be able to grasp the ideas."

Mandrel for Lathes.—W. D. P. (*Newnham*) writes:—"Some time ago I applied to one of our large firms for a small part of a machine, and was frightened at the price, but being recommended to an engineer, Mr. E. Leach, 52, Southampton Street, Camberwell, London, I obtained the articles at *just half the price.* Since then Mr. Leach has done many little jobs for me, and always satisfactorily." [This information should be regularly advertised by Mr. Leach and similar men in our cheap "Sale and Exchange" column.]

Carved Wood Tobacco Jar.—C. C. H. (*Northallerton*) writes:—"The accompanying sketches show a tobacco jar, to be made in any hard wood. The turning will be easy to any one who has had any practice at the lathe. It would do without the little carving, but it requires it to make the thing look really effective. The jar must be got out of wood that will finish 4½ in. long by 5 in. across. It must be securely fixed to a taper screw



Carved Wood Tobacco Jar.

chuck, or other chuck that will drive it without the aid of the back centre, as the inside can then be hollowed out at the time of turning. The dotted lines at the left side of the sketch show the inside dimensions. The cover should also be turned on a taper screw chuck, and should be made to fit moderately tight. When all is finished and polished, the inside of jar must be lined with tin foil, and the bottom (outside) covered with cloth, to prevent it scratching the table."

Combined Side Tools.—F. McC. (*Birmingham*) writes:—"I enclose sketch of combined side tools, with explanation. Fig. 1 is an end view; Fig. 2, top view as left-hand side tool; and Fig. 3, top view as right-hand side tool. The advantage this tool has over ordinary side tools is that one piece of steel will do for the two tools, and instead of having to take your side tool out and look for the other handed tool, you simply slack off and turn over

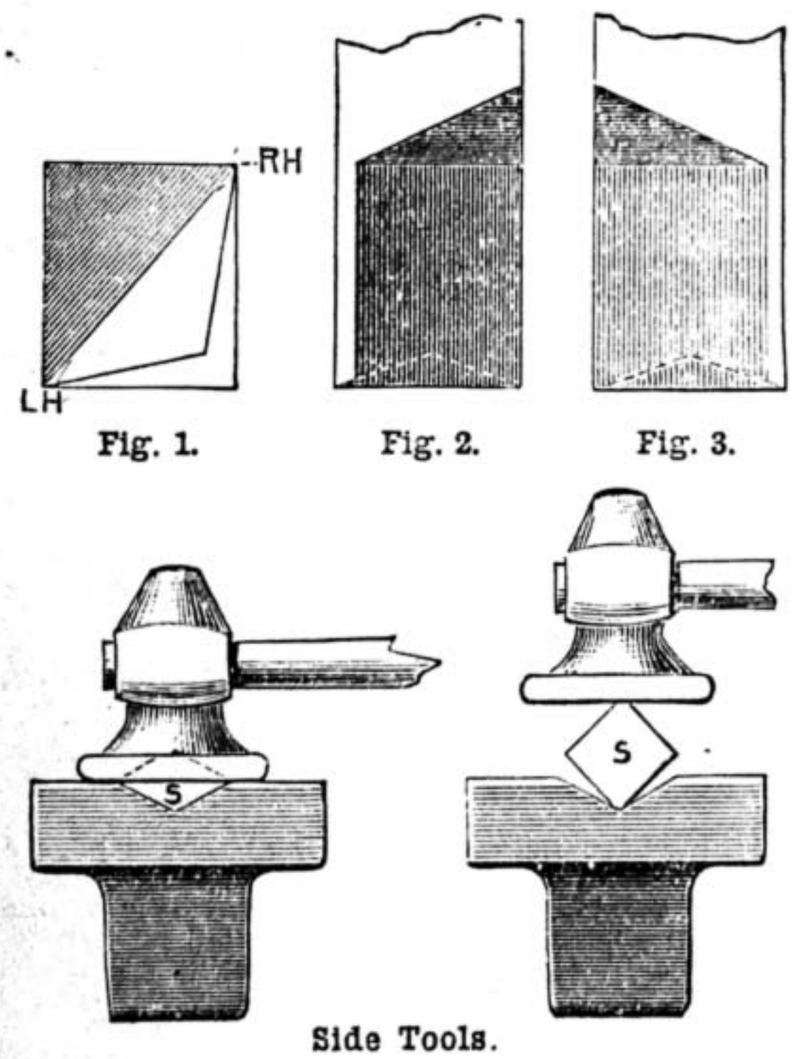


Fig. 1. Fig. 2. Fig. 3.

Side Tools.

the tool. These tools are stronger than the ordinary knife tool, but cannot be used in such narrow grooves. Here are instructions for making these tools. To forge them, take a piece of square steel and drive it with a flat swage into a bottom tool (Fig. 2) until it assumes the form shown at Fig. 3. The angle of the bottom tool should be a right angle plus the angle of relief doubled—that is, if the L of relief is 5 degrees, then L of block should be 55 degrees."

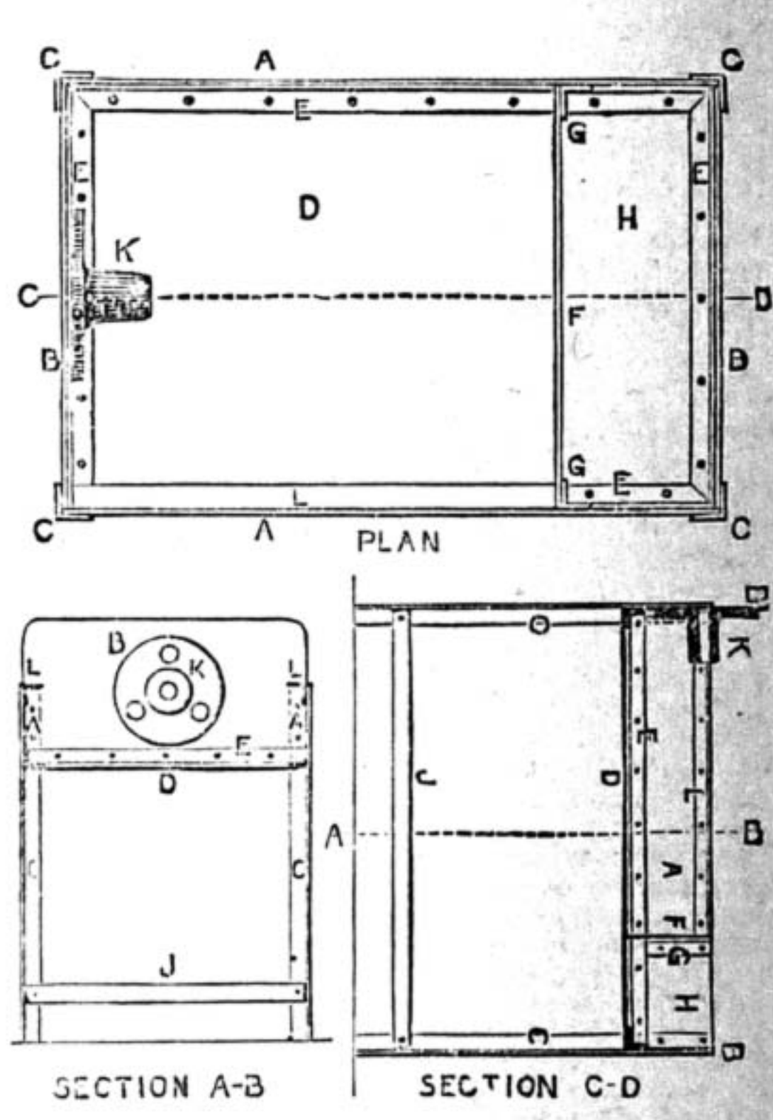
II.—Questions Answered by Editor and Staff.

Future Subjects.—EMIGRANT.—I am obliged to you for your suggestions. Papers on all the subjects you mention will appear in due course.

Polishing Paste for Hot Brass.—E. B. (*South Shields*) may try Joseph Pickering & Sons' metal polishing paste for polishing hot brass and copper, using a dry flannel, and rub firmly, and polish off with a soft dry cloth. If E. B. does not succeed with the above, and if the articles have been polished previously, he may try crocus and oil, applied with a coarse flannel or the leg of an old worsted sock, and finish with a leather and finely-powdered lime.—N. M.

Thinning Printing Ink.—J. E. (*Ebbw Vale*).—From the card you send as a specimen of your printing, the ink you used wants no thinning, but is far too thin. It is sold of the right consistency by the makers, in various qualities for various purposes. You would do well to get a good solid letterpress ink at about 2s. 6d. or 3s. per lb., and use as little as you possibly can on the face of the type (you have got six times as much on your card as you should have). Any colour can be had ready for use, but unless for machine printing it is rarely thinned. If you do require it not quite so stiff, mix a very little oil and printers' varnish with it, well mixing with a palette knife and afterwards with your roller. I think your roller is not in good order; it should be cleaned with turpentine and then slightly wiped with a damp sponge till it is softened a little; then let it hang for a few minutes to dry, when it will be found to have recovered its suction or "bite." Messrs. Stanbury and Co., of West Harding Street, E.C., will supply you with small samples in tins of any of their inks or varnish, if you write enclosing remittance.—J. W. H.

Small Forge.—MONTE.—Drawings of a forge are given below. It is made of sheets of iron, ⅛ in. thick, and angle irons about 1½ in. by 1½ in. A, A, are two sides; B, B, two ends; C, C, C, C, are four angle irons, to which these sides and ends are riveted, and which support the forge. D is the forge bottom, which is united to the sides and ends by the angles E, E, E, E. F is a partition secured with angles G, G, to part off the coal bunk H. J, J, are stretchers of flat bar-iron that keep the vertical angles, C, rigid, and at their proper distances apart below the forge.



Small Forge Parts.

K is the tuyere, a casting bolted to the back plate B. L, L, are angles bolted along the top edges of the forge, to act as stiffeners. I cannot go into the weight of these parts and consequent cost; you can easily reckon out the former, and the cost will probably be larger than trade prices, because you will want small quantities and will have to get them through a general ironmonger. I have drawn this to scale, making it 3 ft. by 2 ft., and you can scale the minor details, whose dimensions are not of much importance. A fan is preferable to bellows, and a blower is better than a fan, and is also the most expensive.—J.

Converting Brass Bushes.—J. S. (*Coschoe*).—No; you had better sell your brass bushes and buy sheet brass. Expensive plant is required for rolling. Small castings are easily made if you understand moulding, and if not, it would take a long time to describe properly. The subject will, however, be treated in a series of articles on moulding, now preparing. The best book is Spretson's "Casting and Founding," price 18s.—J.

Piping.—W. B. (*Highgate Hill*).—I append a sketch of the usual mode of forming a syphon in gas-fitting. A piece of barrel screwed into a T piece or other approved connection is all that is required, with a tap at the end to let out any moisture that may accumulate from time to time. The length of the syphon in your case should not be less than 2 ft. 6 in. Try to get a rise ever so slight in your service from the main; even if the meter is below it you might rise gently all along until you reach the meter and then drop down, and just before you connect up, insert a deep syphon as in Fig. 2. Always insert a syphon where the pipe goes from one temperature to another. Of course you can insert one anywhere along the length of your service. If your service is buried in the ground, and it is found necessary to insert syphons in it, I should advise you to use what are called "syphon boxes," Fig. 3. These boxes are made to hold from about one quart upwards, and to connect to any size barrel at A.

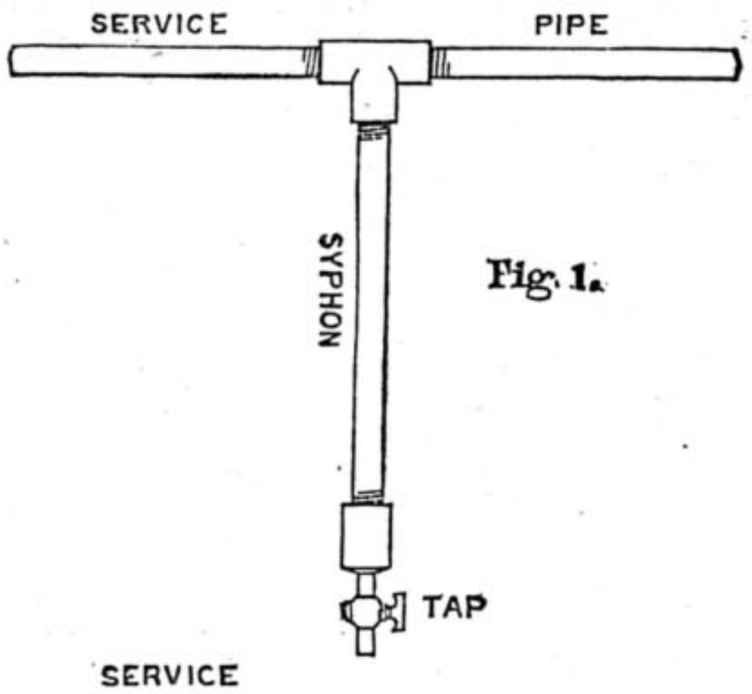


Fig. 1.

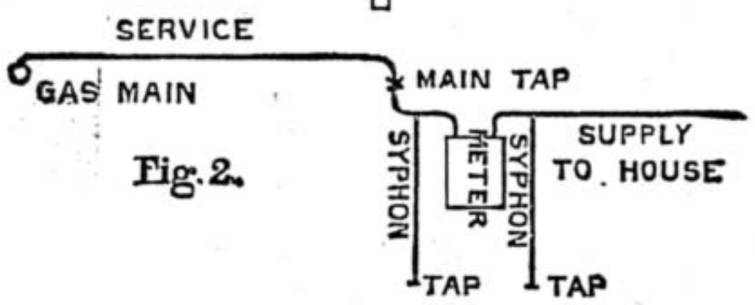


Fig. 2.

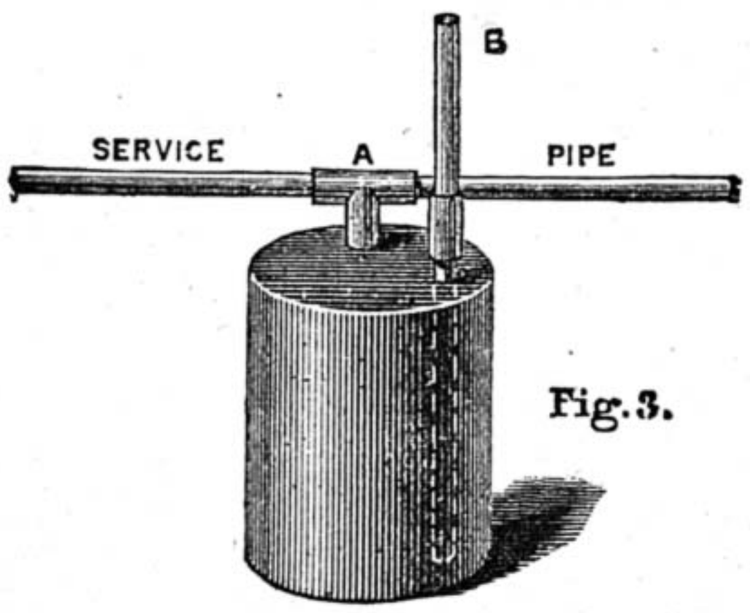


Fig. 3.

Gas-Fitting Syphon.

The pipe B, which goes nearly to the bottom of the box, can be carried up to the ground level, and plugged off, and covered with an iron flap and frame. The method of emptying the syphon is to lift up the iron flap, take out the plug, and conneet the end of a suction pump to the pipe B; this will enable you to draw off all the water that may have accumulated. The question of how many boxes to use and how large to have them, as well as the chances of your service being under the public road, of course must be determined by circumstances.—E. D.

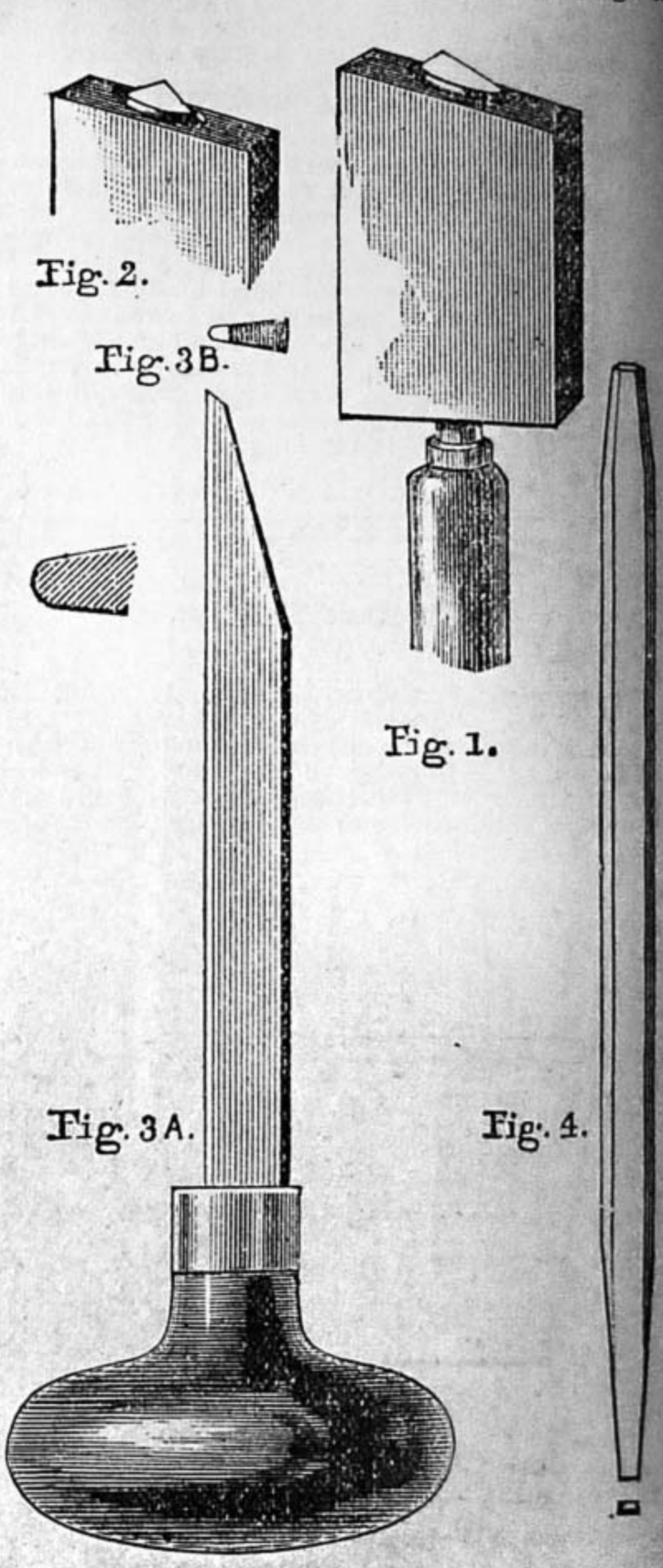
Tableaux.—BAILIE.—BAILIE asks for a few hints in "Shop" that will enable him to work the above at a little amateur concert without great expense. I am afraid the space in "Shop" is far too small for me to give full directions for this interesting amusement. It would take a fairly long article. What the Editor would say were I to commit myself so far I dare not contemplate. The best advice I can give BAILIE is to read an article on the subject which appeared in *Scribner's Monthly*, Vol. 21; it will give him all he needs in the way of information. But supposing the volume is not come-at-able, I will give a few hints. First, the stage. This must be raised above the audience; 3 ft. will not be too high for most subjects. Many houses in and about London have the two principal rooms separated by folding doors. Such rooms suit admirably for our purpose. The opening will form a convenient proscenium: one room for the stage; the other for the audience.—Atmospheric Effect: To make a tableaux effective we must avail ourselves of *black gauze*. If of tulle, two thicknesses will be required; if of tarletan, one may be sufficient. This must be stretched over the opening with the foot and head lights behind it or *on the stage side*. This produces a soft, mysterious haze over the subject, and being placed between the eye and the light will not be perceived by the audience. Wonderful effects can be produced by the arrangement of lights, above, below, and behind. Background and sky effects can be made with gauze of different colours stretched over frames with a different light shining through them.—Subjects and Make Up: In selecting a subject for representation, choose a person of typical face and pay no heed to complexion. For example: a person with a delicate complexion might have a decided Roman cast of countenance, yet might not strike an unobservant person because of his complexion. Paint and powder will easily give the requisite tone and produce a splendid Roman. Or again: a girl with a devout face would make a splendid nun, in spite of her plump rosy cheeks, by the aid of the same process. The three points to remember are, first, atmospheric effects to be procured alone by gauze; second, disposition of lights to give the request shadows; and, third, paint and powder and wigs. To give a list and description of set pieces would occupy too much room. If the hints given are acted upon, BAILIE will find his exhibition a wonderful improvement on the "living waxwork" exhibitions, which, as a rule, from an artistic point of view, constitute a "chamber of horrors."—O. B.

Broken Telescope Lens.—THETA must furnish more particulars. The diameter of the object lens in question should be stated and its focal length. This last can be roughly ascertained by drawing out the telescope to its full length and then measuring the distance between the object glass and the lense of the eyepiece nearest to it. At the same time the whole length of the telescope had better be given. As the broken glass formed part of an achromatic combination, the cheapest way for him to proceed, most probably, will be to put the remaining convex lens on one side, and purchase a new achromatic lens of the proper diameter and focal length. Most likely the optician who demanded ten shillings to repair it would have adopted this course. Achromatic lenses in ordinary telescopes are manufactured in quantity, and the finished lens could be purchased, in the right quarter, for much less than the sum which would be required to pay for the grinding and polishing of a special concave to replace the broken one. Is it absolutely broken, or only cracked into two or three pieces? I have assumed that the telescope is one used for ordinary sight-seeing and is not an astronomical telescope.—E. A. F.

Clock Materials.—HEXHAM.—When giving my advice or help to correspondents, I make it a point to give addresses, as far as I am able, where the materials may be got. The reason you have received no reply from Grimshaw & Co., of course I do not know; I have always found them ready to reply to me. Did you enclose stamps for reply, or send cash or card? if not, try again, enclosing stamped addressed envelope. Or try Haswell and Sons, 49, Spencer Street, Clerkenwell; a very good house for repairs, tools, and materials, as I have found many times.—A. B. C.

Wood Waste.—P. P. (*Withington*).—If P. P. is only an amateur, as his letter suggests, the best thing he can do with his waste is to light his fire with it; but if he is in the trade, and his waste of wood and dust is considerable, he may be able to turn it to profit by machinery. For instance, he could get a machine for making wood wool, and I am given to understand that a machine will turn out two tons to one h.p. per week, and as wood wool is worth about £4 per ton, this sounds all right; or if his waste is only sawdust and chips, he could mix it with resin and compress it for fire-lighters, which sell at two and three a penny. But unless P. P. can produce a large quantity, he had better use his waste for his own domestic purposes.—A. J. H.

Setting Glazier's Diamonds.—GLAZIER (*Edinburgh*) asks, 1st, How to find the point of a glazier's diamond, and to keep it (the point) until it is set in the brass? Secondly, How it is fixed. As to the edge, not the point, that is to be selected from the other edges. Much time in writing and in attempted explanation will be well saved if GLAZIER studies and compares the position the diamond is set in all those he can get to look at. It is so much a matter of experience and judgment, that it is found to be much the easier way generally to send it to a good maker of these articles. But here is the principle on which they are set, viz., the proper position of the exposed or cutting part of the diamond. This will be best understood by reference to Fig. 1, where the point is right at the further end. On no account is the stone to be set with the point in the centre, like Fig. 2. Besides this a good straight edge of the diamond should be selected, and great care must be taken to get this edge parallel with the long sides of the steel part. If after this you can decide on the edge that you will use to cut with, I think I can tell you how to fix it in the brass. There are two or three things we have to arrange for. 1st. We must have a hole in the brass deep enough. 2nd. It must be made as near as can be to the shape of the stone. 3rd. It has to be held in by hammering or pinching the edge of the brass over the diamond, or as some seem to do by soldering it in. If the former, see that you have the brass annealed before pinching or punching the metal over the stone. The first is not a difficult matter, this merely drilling a hole to the requisite depth. You are sure to be able to buy some drilling arrangement or other, that is, if you cannot get a jeweller or metal worker to do it for you. But what is the requisite depth? It would average ⅓ of the entire depth of the diamond. The second thing is to make the hole the exact shape and size of the under part, so that it will fit well and support itself in the exact position it has to be fixed in. The best single tool for cutting out the metal after drilling will be a medium size round scorper, about the size in section of Fig. 3 B, and ground and sharpened into the form of Fig. 3 A. Now comes a bit of a difficulty, and that is how are you to be continually trying it in the hole, in order to fit it well. You must have some means of picking it up, placing it in the hole, and removing the means of doing so, in order to look at your work. Now the best thing to use is what is called a wax-stick—that is, a piece of modelling wax (artist's, not dentist's) pinched into a point, and soft enough to



Glazier's Diamond.

pick a stone up with, but not so soft as to leave any portion of itself on the stone. If this cannot be obtained, try a piece of cobbler's wax, mixed with plaster of Paris. With this you can take up your diamond as often as you like—but you understand clearly that you must be sure of the front of the stone you have selected, else you will be trying to fit the wrong edges. Shortly, the foregoing is—make a hole to fit the diamond, and get the largest part under the top edge of the brass. If that is arranged all right we can proceed to fix it, either by solder (if spelter or silver, see WORK, No. 37, page 588, jeweller's soldering; but if lead, or pewter solder, then you know how to do it I expect) or by pressing the brass over the edge of the stone. This can be done either by pinching the metal or, as I recommend, by punching it in. For this method you will require a small steel punch, something like Fig. 4, and an assistant just to give you one or two smart, but not heavy, taps with the hammer (a chaser's hammer is best) until the stone is fixed, for you will most probably have to steady the stone with your nail. Once it is steady you can go on by yourself, and you will have to judge whether you should drive the brass down on to the stone or sideways, or both ways—it will depend on the way you have opened the hole. But, as I said at starting, it is a matter of judgment, practice, and experience.—H. S. G.

Book on Social Questions.—L. B. (*Upper Sydenham*).—Some of these are treated in "Subjects of Social Welfare," by Sir Lyon Playfair, price 7s. 6d., published by Cassell & Co.—F. J. C.

Cog Wheels.—J. F. K. (*Doncaster*).—I am glad to find that you made one of the lathes described by me in No. 17 of WORK, and that it has proved useful to you. Although I am not the "old hand" who wrote the description of tripods in No 29, yet, as your query was sent to me, I will endeavour to set you right about the cog wheels and racks. Amateurs, and professionals likewise, might well take note that beautiful cog and bevel wheel castings and racks are supplied by Richard Lloyd & Co., Steelhouse Lane, Birmingham, at very moderate rates. A rack 14 or 12 pitch, length, 15 and 18 in., and costing 1s. and 1s. 4d. respectively, would probably suit you. Cog wheels can be got to match; 14 pitch, from 15 to 24 teeth; any one for 4d.; the diameter will range from 1$\frac{1}{16}$ in. to 1$\frac{1}{2}$ in. 12 pitch, the wheels any size containing from 15 to 24 teeth, varying in diameter from 1$\frac{1}{2}$ in. to 2 in., will cost 5d. If I were making the studio stand referred to, I would order a rack 12 pitch, 18 in. long, and a wheel containing 18 teeth; total cost, 1s. 9d. I would bore a hole centrally in the wheel for a $\frac{3}{8}$ in. piece of Bessemer steel to

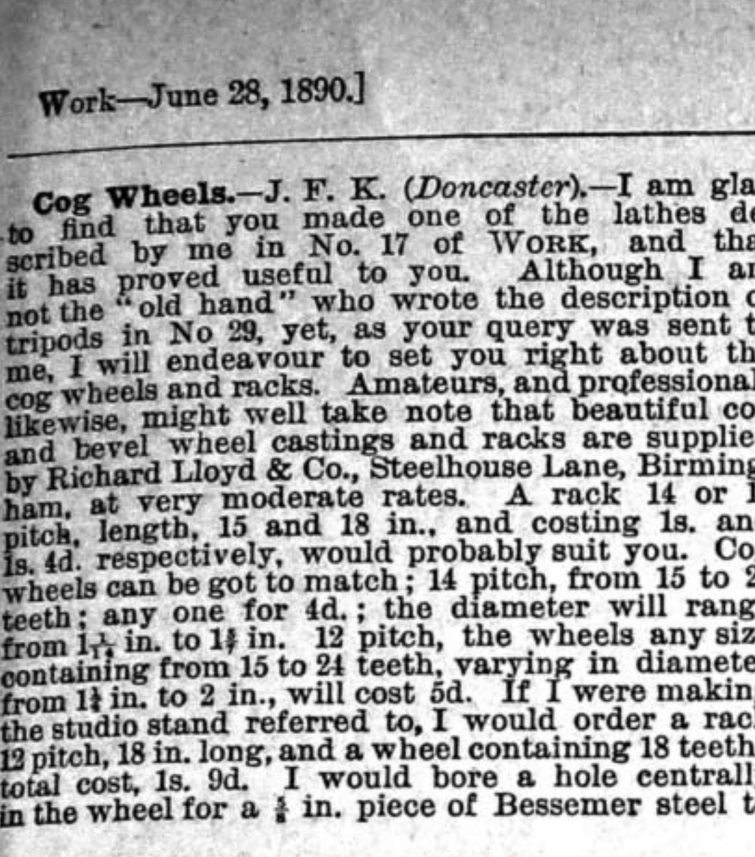


Fig. 1.

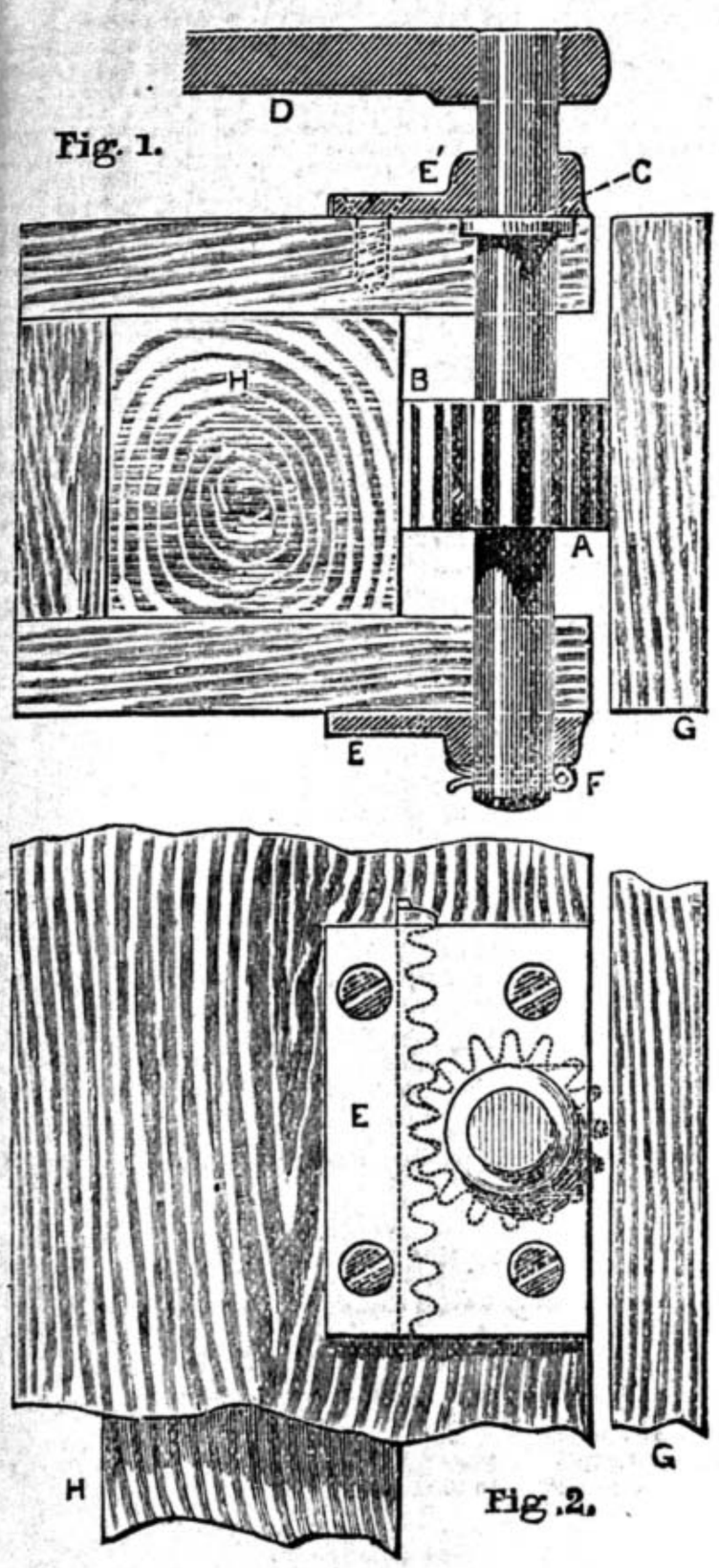


Fig. 2.

Cog Wheels.

pass through tightly, and key it on; the steel axle may be 5 or 6 in. long, and could also be procured from Lloyd. The casing for the pillar I would make 2$\frac{1}{2}$ in. by 3$\frac{1}{4}$ in., internal dimensions, having one of the sides loose, as seen in Fig. 1. The loose side could be fastened on with brass screws, and would always afford a ready means of examination in case the rack or pinion got out of order. Holes might be bored through the sides to let the axle through, but this would mean taking the wheel off every time it was taken out. I would therefore prefer to cut a way for it to go in, as is seen in the dotted line (Fig. 2). Stout brass plates should be screwed at each side for the axle to work in. If they were cast $\frac{1}{8}$ in. thick, with bosses another $\frac{1}{4}$ in. thicker, and the surfaces turned, it would be a good job. Some means must be adopted to prevent the axle moving endways. Pins passed through it at each end would do, but the most workmanlike plan would be to have shoulders inside the plates; I show a shoulder at one end and a pin at the other end in Fig. 1. I think J. F. K. can manage the rest himself, and I wish him all success. Beech, I should say, would be an excellent wood for the work, but mahogany would look better. Thanks for your kind words relative to WORK.—SELF-HELPER.

Back Numbers of WORK.—R. M. (*Bolton*).—Back numbers can be had from any bookseller or the publishers. Vol. I. bound is 7s. 6d.

WORK Volume.—H. W. (*Newcastle-on-Tyne*).—Each volume of WORK will contain fifty-two numbers.

Gilding.—LOWERFOLD (*Rochdale*).—The subject of covering surfaces with gold and silver leaf, and other imitations of metal, will in time be fully explained and illustrated in WORK. In the meantime the subjoined will materially aid you. Note also the answer to gilding in "Shop," No. 38, Vol. I., and reply to GOLD LEAF in recent issue. I know of no existing manual on all gilding processes, as the branch known as "water gilding" is seldom practised outside the ranks of professed gilders and carvers, and the majority of them are "society" men, and would hardly favour such a proceeding. In answer to your direct inquiry, you will require a little oil gold size, ready for use, which is spread upon the surface one day and gilded the next, applying the gold leaf with gilders' tip, or brush. The surface must, however, be non-absorbent ere rubbing on the size very barely. If the grain of the wood is to be preserved, coat with three applications of French polish or spirit varnish; otherwise, quick-drying paint is the best for stopping the suction of either wood or fabric. Gilders' brushes and cushion can be bought at any dealer in painters' brushes. The recently-published answer on steel bronzing will probably be useful to you respecting the urn. If gilded with freshly-procured silver leaf, quite free from discolouration, and then coated with the white shellac solution, I am sure it would answer every purpose as an ornament, and would not discolour. See index of Vol. I. for several other replies bearing on gilding.—F. P.

Mandrel for Lathe.—F. P. (*Heywood*) and a large number of other correspondents who offer to undertake the execution of small jobs in fitting, turning, and pattern-making, are informed that they cannot do better than advertise in the "Sale and Exchange" column of WORK.—ED.

Making Accumulators.—SEMPER PARARE (*Edina*).—Illustrated information on making accumulators will be forthcoming in the series of articles on "Model Electric Lights."

Rubber Stamp Thermometer.—J. P. (*Belfast*).—I regret that I cannot specify any particular shop where thermometers such as that described in my article on "Rubber Stamp Making" are sold. A spare one which I have was purchased at a shop in Leeds (Frank's, optician, Briggate), the price, I believe, being 5s. I would suggest that inquiry be made at some scientific apparatus dealer in your town. If you find any difficulty in getting the pattern recommended, you might use an ordinary chemical thermometer, so long as the graduations extend to about 300° F.; the only drawback to this form being the length of tube projecting from the apparatus; such thermometers cost from 2s. to 4s. each.—QUI VIVE.

Lenses.—W. R. (*Oswestry*).—Any double convex lens *may* be used for the purpose. The object glass of the telescope would be the preferable one; but, as in all probability the visual and actinic foci are not coincident, it will require adjustment in this particular before satisfactory results can be obtained. In all probability the focal length of the lens would require a camera very much longer than usual, for the size of image produced.—E. D.

Backs of Books.—G. H. (*Congleton*).—In binding books in cloth or leather limp, it is usual to use stiff paper for the backs. The method of procedure is as follows:—When the book has been sewn, end papers are pasted on. For end papers it is usual to get four sheets of paper twice the size of the book, and, after having folded them, they are pasted along the fold about $\frac{1}{4}$ in.; one of the sheets is now lifted and carefully laid on the book with the fold evenly flush with the back of the book. This sheet is now opened and another sheet placed inside, the folds in the two sheets coming close together. The outside sheet is closed and the other side of the book treated in the same way. The stiff paper to be used for the back is now pasted all over one side and laid evenly upon the end paper about $\frac{1}{4}$ in. from the back. This is done so that the book may have a joint and open freely at the back. The book, when both sides have been treated alike, is placed in the press and considerable pressure applied; this causes the backs to adhere perfectly all over. When dry, the book can be taken out and the cloth or leather cover put on. Cut the cover a little larger than the book to allow for turning in. If the cover is of cloth, it must be glued all over very carefully. The book is laid upon the glued cover with the front or fore-edge towards the operator; the other part of the cover is drawn tightly on to the book and the cloth rubbed briskly with the open hand. The edges of the cover are now turned in, and both sides of the book rubbed very carefully to ensure the cloth sticking perfectly in every part. If this is done in the manner described, there will be no danger of cracks. When the cover is perfectly dry, the first leaf of the end papers is pasted all over with the brush, first one side of the book and then the other, and the book is again placed in the press and allowed to dry. I trust you will be able to understand the above description. Some articles on bookbinding have appeared, so do not cease to continue taking in WORK. In regard to your second question about staining new oak to make it look old, I should think that Stephens's stains for wood would suit your purpose. But you can also use vandyke brown, mixed with glue and water. It should be applied hot. You could experiment upon a piece of wood until you have obtained the desired tint.—G. C.

Toy Balloons.—J. T. J. (*Manchester*).—I hope I am right in supposing that you refer to miniature balloons made of tissue paper, and rendered buoyant by inflation with heated air. They are the only "toy balloons" I know of, except the indiarubber bladders so common as advertisements, which are not, I assume, alluded to by you. The toy balloon to which I refer is made of tissue paper, and is of the shape suggested by Fig. 1. The size may vary from about 18 in. and upwards in height; but as the buoyancy of the heated air, with which the balloon is filled, must exceed or overcome the force of gravity in the materials of which it is composed, any smaller size than that just mentioned will not prove satisfactory. The balloon is composed of a number of sections shaped something like Fig. 2. In fact, if you can imagine an *orange shaped* like a pear, it will help you greatly to understand the construction. In such a case, Fig. 2 would represent the portion of rind covering each section of the orange. The dotted lines show the narrow margin on each side of the sections which overlap each other, and which are to be gummed together in

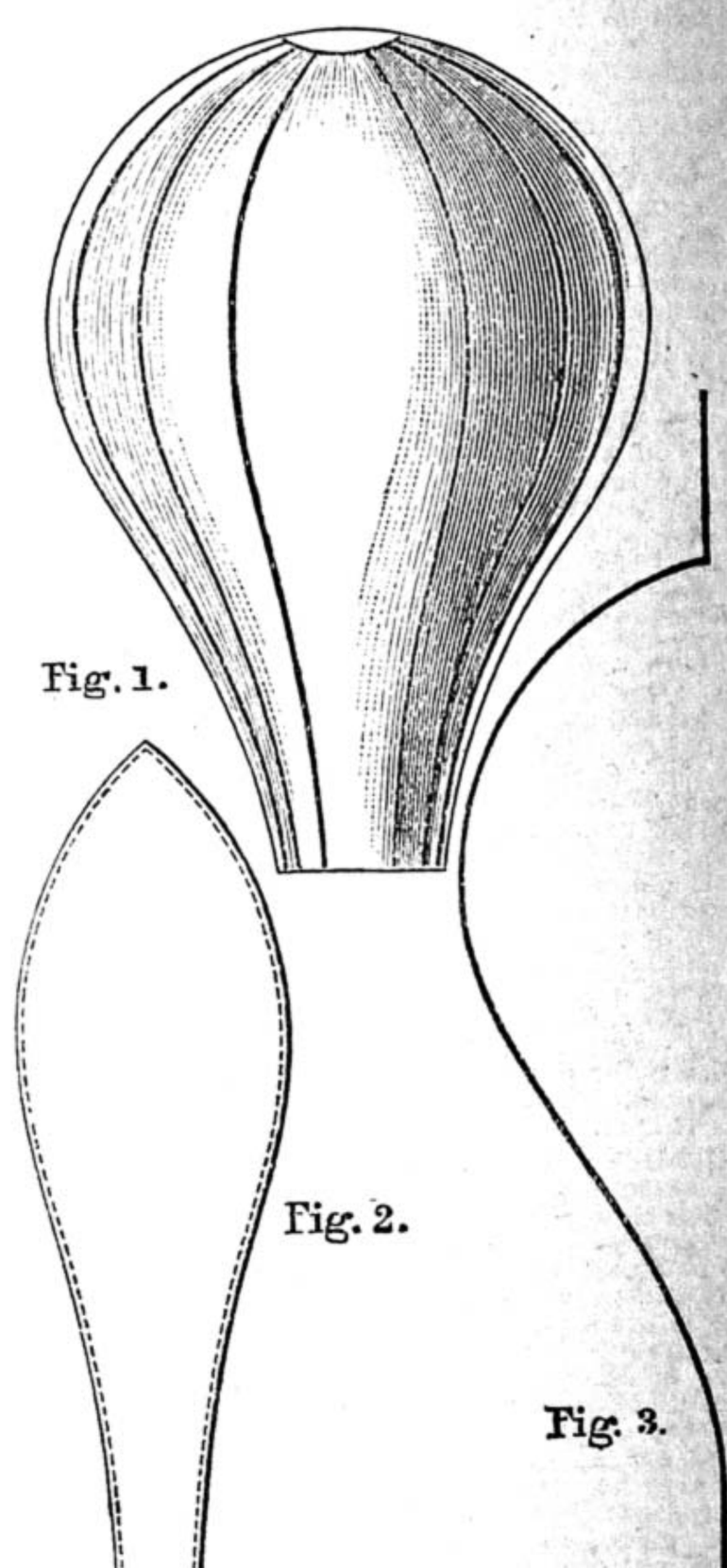


Fig. 1.

Fig. 2.

Fig. 3.

Toy Balloon Parts.

their entire length. This is the most difficult part of the work, and calls for great patience and neat fingering. Good strong gum should be used, and as one side of each section is gummed to the depth of about $\frac{1}{8}$ in., it is applied to the ungummed edge of another. The difficulty lies in getting the curved edges together so that they shall lap evenly, and without wrinkles or puckers; to overcome this, bend a piece of ribbon iron to the shape shown at Fig. 3, which will form a sufficiently solid support for the edges. This template should be, as nearly as possible, of the shape of half the *contour* of the balloon; and if an inch or so at the top end of the sections be left ungummed, so that the template may pass through, it will expedite matters, and the opening may be closed by gumming a circular piece of tissue paper on the apex of the balloon when all the sections are closed. As to the number of sections, there is no limit; but eight sections, 24 in. long and 6 in. wide at the widest part, will make a fair-sized balloon. The lower end should be, for this size, from 4 in. to 6 in. in diameter, and should be finished by turning the ends of the sections round a piece of thin wire, and securing with gum. Now fix two wires in the form of a cross in the mouth of the balloon; and in the centre fix a piece of cotton-wool or sponge, also attached with a piece of very thin wire. Saturate this with methylated spirits; and holding the balloons perfectly upright, set fire to the spirit, and in a few seconds you will have the satisfaction of seeing your balloon mount upwards either to the ceiling or the skies.—OPIFEX.

Transmitter. — A WOULD-BE ELECTRICIAN.—The drawing of the transmitter given on page 572, Vol. I., of WORK would not do to communicate between the two points mentioned by you; nor, in point of fact, between any two points. But a transmitter made like the drawing on that page would do very well if you had a receiver at the other end. The carbon pencil does not fit tightly into the carbon blocks; it must have room to shake, making only a feeble contact by its own weight, so that it will take up the vibrations of the diaphragm and set up a disturbance in the electrical circuit. You will require, if you are going to set up two telephone stations, besides the two transmitters, two receivers, two call bells, and two batteries, and a little more electrical knowledge than you seem to have. The Morse key is of little use in telephone work. If your wire is insulated with gutta-percha, you can run it under the floor. I am sorry to have to tell you that you cannot set up two telephone stations for business purposes or convenience without making yourself liable to prosecution for infringement of patent rights. You may, of course, set them up for experimental purposes, and there would be no harm in having them made against the good time coming, when we can make and use any form of telephone we choose. Your drawing is all wrong, but if you watch the pages of WORK you will get the proper method of connections, as I have already given them. I have no idea what a phonograph would cost; they used to be sold long ago for 20s. each, but now they are only let out on hire. So if you are dying to have one, I suppose there is no help for it, you must just die, but choose an easy way; do not attempt to hang yourself, for you might break your neck. I expect that shortly there will be an article on the phonograph in WORK, so if you are not in a hurry to die you might wait. —W. D.

Winding Gramme Dynamo.—J. KENNEDY.—As you altered the armature and made it 1¼ in. larger than the size specified in Mr. S. R. Bottone's book, you should also have made the carcase proportionately larger. Your F. M.'s are now proportionally too small to allow you to balance fully so large an armature. You do not say the exact amount of No. 18 wire you have got on the armature, but Mr. Bottone thinks you have probably something between 4 lbs. and 6 lbs. Had you made the armature the right size, 25 lbs. of No. 24 would about balance it as a shunt machine; now, 35 lbs. to 40 lbs. would be nearer the mark. But you will now be obliged to do with less, and probably 20 lbs. of No. 24 is as much as you will get on the F. M.'s. If you read carefully at page 113 of Mr. Bottone's book on "Electrical Instrument Making," you will see that the ratio between the armature and the F. M. wire resistance should be as 1 to 400. A 6 in. armature should have a coarser wire than one of 4⅜ in. You must now run the armature at a lower speed to avoid injurious heating. The F. M.'s must not be insulated from the standards. The machine will not work if the cores do not hold a little residual magnetism. Mr. S. R. Bottone, Carshalton, supplies all parts of dynamos.—G. E. B.

Gesso Work.—N. W. (*Clapham*).—You have not seen the first article on "Gesso Work" which appeared in WORK, No. 25. Gesso composition is sold by the Society of Artists, 53, New Bond Street, W. This composition is easy to use, as it is prepared in a manner that prevents its hardening before ample time has been allowed for modelling the subject in hand. In using plaster of Paris and glue, or whiting and parchment size, there is always the difficulty to contend with of the mixture hardening too quickly. It needs experience to get the right consistency. For this reason alone I recommended beginners to employ the ready prepared composition mentioned above. If you make your own gesso, the finest plaster of Paris must be used, and glue made from parchment. Warm the glue in a jar or pipkin; add the plaster of Paris. Stand the jar in a saucepan of hot water so that the gesso will get warm without boiling. Or warm some parchment size and scrape into it with a knife sufficient whiting to make a batter; warm as before. If required very hard, a little powdered resin is added. One part linseed oil to six of size is used for fibrous gesso. The cotton-wool is dipped into the composition, being first pulled into little pieces, then it is laid on the design where high relief is required, and modelled. This has already been explained in the articles in WORK. Fibrous gesso is also used for statuettes, as I may perhaps call them, to distinguish them from figures in high relief on a background.—E. C.

Air Gas Mixtures.—J. H. C. (*Stockton-on-Tees*).—The ratio of air to gas in gas engines is commonly obtained from a measurement of the gas consumption alone, the air being reckoned as the volume of the piston displacement, less the measured amount of gas. In engines of the Otto type it is about seven to one when the engine is working most energetically, but it varies with each engine, and, besides this, the gas supply is generally so arranged that more or less gas can be consumed as required. —F. B. C.

Magnetic Belts. — W. C. (*Dukinfield*).—Magnetic belts in themselves alone are useless as agents for the cure of dyspepsia. This complaint is caused in most cases by wrong food, or bad habits of living. A complete reform of these will effect a cure in time. I shall hope to give illustrated descriptions of these apparatus in my article on "Coils."—G. E. B.

Hard Wood Merchants.—AN OLD SOLDIER.—There are plenty of hard wood merchants in and around Old Street, E.C., who could supply you with all you require. For names of firms, please refer to back numbers, as similar replies to your inquiry have been given several times. If you do not live in London, write to me, through the Editor, stating exactly what you require, and I will try to get it for you.—A. J. H.

Heating a Bath.—S. A. R. (*South Shields*).—I am afraid you would find it quite impossible to heat the bath by means of a heater placed in the water, but if (as your letter seems to imply) you have any idea of your own you wish to work out, I shall be pleased to assist you. If you will send a rough sketch, showing relative positions of bath and wash-house, and also say if the bath is on a higher or lower level than the pot or boiler you speak of, I may be able to advise you. Have you gas laid on that would be available?—T. W.

Carrier for Lathe. — J. T. (*Northampton*) wants to be told how to make a carrier for the lathe, described in No. 17 of WORK. The simplest form of carrier that he could well use would consist of two pieces of tough wood about 1 in. square and 4 in. long, coupled together with a pair of ¼ in. bolts of a suitable length. This is a form of carrier that I frequently use for wood-turning. I give a side view of it in Fig. 1. The bolts there shown

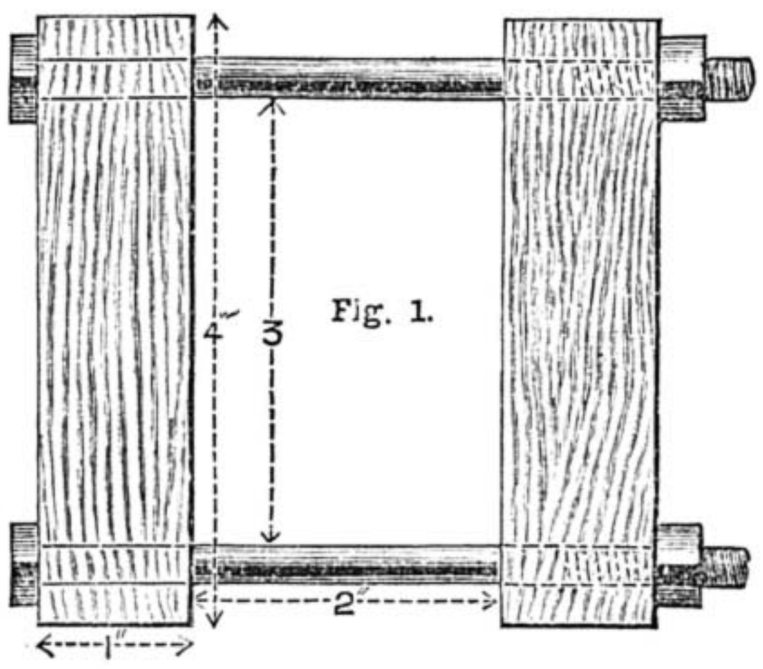


Fig. 1.

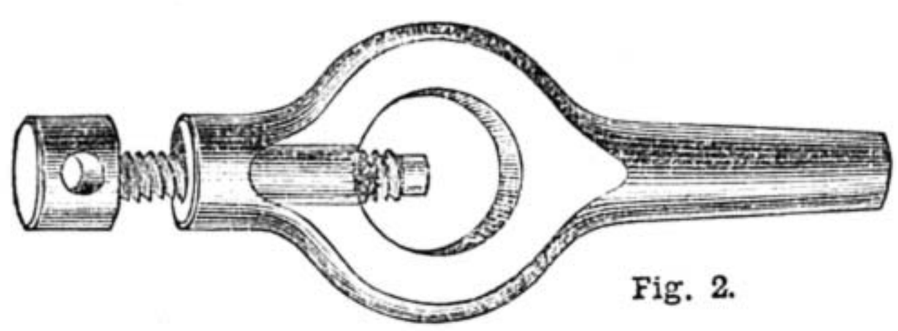


Fig. 2.

Carrier for Lathe.

are 4½ in. long, and would embrace a piece of wood from 2½ in. to 1½ in. thick. If it is required to turn a smaller piece, shorter bolts could be substituted, or a pair could be screwed for a long distance. As they can be bought for sixpence a dozen, I usually keep a good number on hand. I also prefer to have various carriers rather than trouble about changing the bolts. So will J. T. soon, if he uses the lathe much. For metal turning, this plan is sometimes used, but iron must be substituted for the wood at the sides. Stronger bolts too should be used; ⅜ in. or even ½ in. thick. The sides would not usually require to be more than ¾ in. square iron. The usual form of carrier for metal work, however, is shown in Fig. 2. The body of this may be forged, but malleable cast iron is now largely employed. The screw, which is proportional to the size of the carrier, is steel with the point hardened. Castings may be obtained from Richard Lloyd & Co., Steelhouse Lane, Birmingham, at the following prices:— ½ in., 3d.; ¾ in., 4d.; 1 in., 6d.; 1¼ in., 9d.; 1½ in., 1s.; 1¾ in., 1s. 4d.; 2 in., 1s. 9d. The finished carriers will cost for the same sizes:—1s. 3d., 1s. 6d., 2s., 2s. 6d., 3s., 3s. 9d., and 4s. 9d., respectively. The sizes above are those of the rod which the carrier will take. I wish J. T. all success.—SELF HELPER.

Ivory. — C. W. (*Ilfracombe*). — Apply to any worker in ivory, but if you do not know of any, Grew & Bridge, Summer Row, Birmingham, will probably be willing to supply you. As ivory is costly, I may recommend xylonite as a very good substitute in most cases.—D. D.

Silkworm Keeping.—H. M. (*Wolverhampton*).—When in the silk districts of Spain I have watched winding from the cocoons. They were placed in a shallow tub of warm water and stirred with a bundle of twigs to loosen the ends of the silk. A single thread, as spun by the worm, being too fine to wind off alone, several ends were twisted together so as to form a thread of moderate strength. This was passed through a hole in a piece of agate, and the silk of the several cocoons then reeled off together. Passing the thread through the hole in the agate is, of course, to remove impurities. I believe that sometimes a metal hoop is used for the purpose. The "Silk Supply Association," of which the address is, or was, Castle Street, Holborn, London, furnishes eggs, though for the quantity H. M. would require he would probably get them better through the medium of our advertising columns. I question whether he will be able to make silkworm keeping a "profitable pastime." English-grown silk, so far as I am aware, has little or no commercial value. The food on which the worms are fed in this country does not appear to contain a sufficient quantity of that glutinous material in which the mulberry leaves of warmer countries are rich. In England it is not probable that silkworm culture will ever be anything more than an interesting amusement for schoolgirls.—S.W.

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Lathe Mandrels.—NUTRIX writes (see page 159, Vol. II.):—"If J. T. (*Walworth*) will send me his address and a sketch of what he requires, I will make him any ordinary foot-lathe size mandrel of manganese steel for 12s."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. G. B. (*London, N.E.*); E. L. H. (*Liverpool*); CONSTANT READER; D. U. J. (*Portsmouth*); H. S. (*Stoke Newington*); L. G. U. (*Islington*); J. J. D. (*Carnarvon*); J. W. H. (*Sharrow*); TELEPHONE; J. R. M. (*Walton*); AMATEUR; CLOG IRONS; THOMASO; W. B. (*Wigan*); BETA (*Derby*); A WORKING MAN; IN DOUBT; A. T. (*Blackburn*); R. M. (*Glasgow*); J. O. (*Huddersfield*); STUFFER; J. S. (*Crieff*); J. P.; W. A. B. (*Salford*); A GLASGOW BOY; A WELL WISHER; C. H. C. (*Pimlico*); D. B.; U. C. W.; P. C. N. (*Shrewsbury*); EXILE; PHILIPPA; CHEMIST; PENKNIFE; B. BROS. (*Dublin*); A YOUNG ENGINEER; J. W. (*Homerton*).

Trade Note.

THE project for a railway from Jaffa to Jerusalem seems at last likely to be realised. The concession has been acquired by a French company, and the engineers have already proceeded to Jaffa to begin operations. The line is expected to be very acceptable to tourists and pilgrims, but as regards goods traffic it is a matter of little importance. Meanwhile a Constantinople paper states that the convention with M. Moutran for the construction of the Damascus tramways, and of the steam tramway from that city to the Hauran, has been signed, the concessionary having presented to the Porte a Franco-Belgian Company of sufficient financial competence. The centre of the tramway system of the town will be the square in which stands the residence of the Governor-General, and five lines will radiate from that point to serve the principal traffic routes thence to the outskirts of the city. The tramway to the Hauran will be worked by locomotive engines, and covers a distance of fifty English miles. The capital for this undertaking being ready, formalities fulfilled, and documents exchanged, there is apparently nothing to prevent the works from being pushed forward.

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