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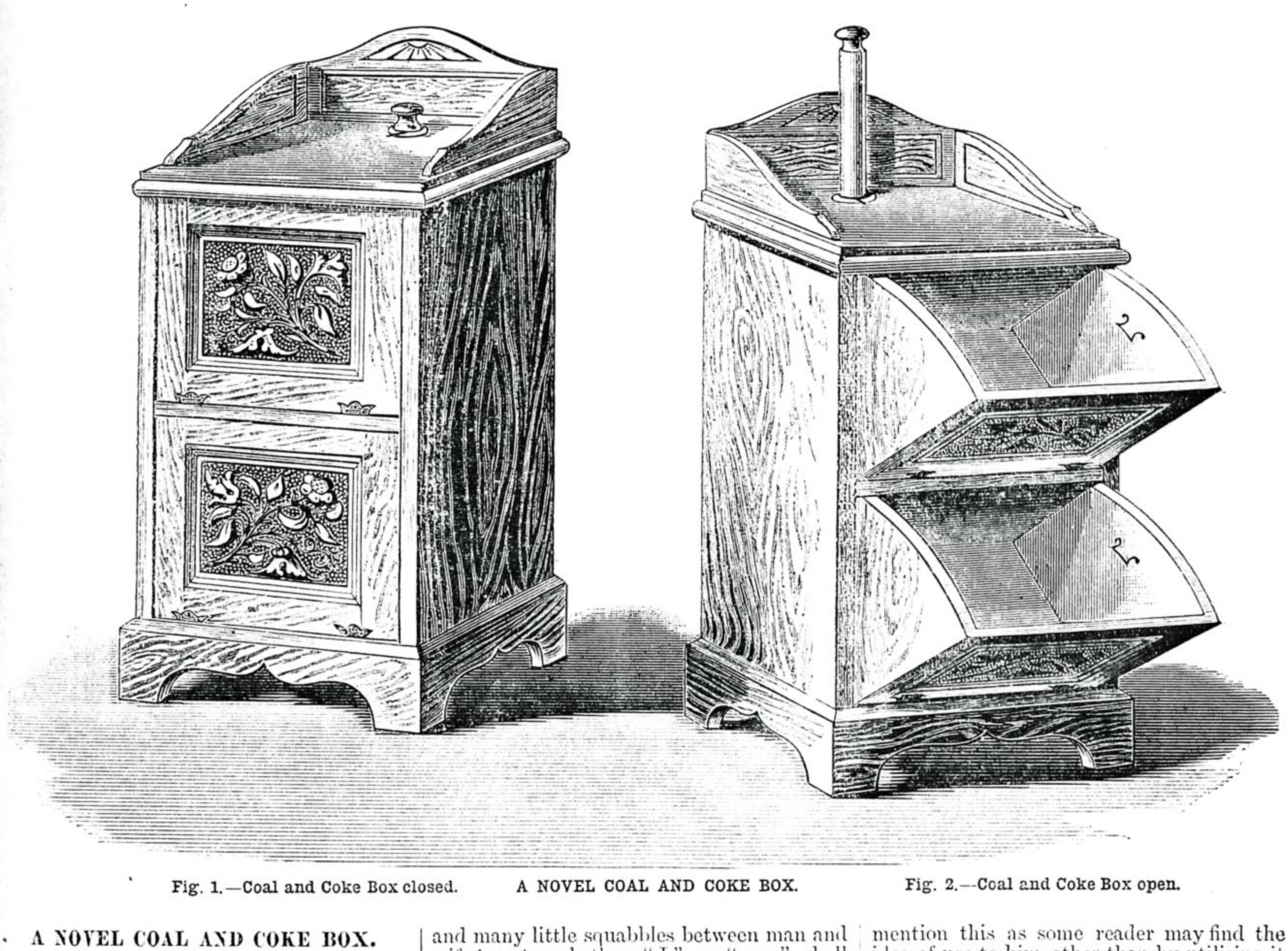


Fig. 1.—Coal and Coke Box closed. A NOVEL COAL AND COKE BOX. Fig. 2.—Coal and Coke Box open.

A NOVEL COAL AND COKE BOX.

BY JAS. SCOTT.

How seldom one sees a coal box (grandiloquently called vase) in any of the homes one may chance to visit! What is the reason for this? Certainly not on account of the cost of such articles, for they can be bought cheaply; and just as certainly not because they are useless, for in the winter time they are among the most useful things for an apartment. I will leave the answer to be arrived at by someone more philosophical than myself. Very few houses have coal cupboards in all the different rooms; and the inhabitant of either of them has, perhaps, to leave the warm apartment to gather sufficient "diamonds" in a shovel with which to replenish the dying fire.

I am very far from inclined to encourage idleness, but I think that by having to leave the room for such a purpose a less number of times the fire would burn the brighter, and many little squabbles between man and wife, as to whether "I" or "you" shall fetch the coals, be prevented.

"But why," it may be asked, "have I designed this article to have *two* compartments?" Well then, for answer, I may say that coals in one, and coke or wood and paper in the other, will utilise it as I intended it to be. It may be considered better still, however, to have one compartment filled with coals and the other reserved for ashes, for it will very often be found convenient, when a shovelful of coals are put on the fire, to take up some of the ashes previously raked out.

It will doubtless have been observed that *both* boxes open and shut together with the same movement of the hand—that of pulling up and pushing down the column at the back. A compartment may be added on top; another wing (as shown in plan at Fig. 12) added, with one or two boxes in each wing; or even two or three wings added to it—all to work with the same movement. I mention this as some reader may find the idea of use to him, other than by utilising it in a coal-box, where it would be a decided advantage to open several compartments at once. Nothing more, then, but particulars as to construction need be said.

This one is intended to be about 30 in. high to the top board, 15 in. wide, and 16 in. from back to front. We shall not want much wood for it. The carcase consists of a backboard 23¼ in. long and 14 in. wide; two sides each 23½ in. long and 15 in. wide; a bottom board 15 in. long and 14 in. wide; a top board 16 in. long and 15 in. wide; and a shelf in the middle (which must not come into contact with the backboard) 15 in. long and about 8 in. wide. The top and the bottom boards must have a hole at the back part to allow the pillar and tube to penetrate them. To the bottom board is screwed a plinth, similarly constructed to the one in Figs. 5 and 6. The boards for this plinth will be two 16 in. long and 6¼ in. wide, and two 15 in. long and 6¼ in. wide, with

the inside framing of any size. The top edges of it should be canted towards the outside, while inside a little depth is allowed for the insertion of the bottom of the carcase. If the plinth is shaped as I show in Figs. 1 and 2, something after the arrangement in Fig. 6 must be attached, on the bottom of which will rest the tube; but if it is made quite plain, only a board at the extreme bottom will be necessary.

The boxes *must* be a quadrant of a circle in shape—Fig. 7 shows one of them. As ornament, the fronts might be panelled and carved. A circular board, 22 in. in diameter, cut into quarters, will give us the sides for them. Each will have a front and bottom board 13 in. long and 11 in. wide. A metal box, similar to that in Fig. 8, with two handles, and painted black inside, will fit into the wooden ones, and can be taken out and refilled without necessarily moving the whole article. To keep the metal box within the wooden one, it will be necessary to have a narrow strip of wood along the back of the latter, as in Fig. 7. One thing in particular concerning the boxes must not be lost sight of: I have allowed them to be opened more than half-way so that the metal boxes can be taken out; but some reader may reduce the length of the pieces connecting the boxes with the pillar, to prevent the boxes opening quite so far. If this is done it will be impossible to extract the metal boxes.

The pillar, etc., now claims attention. A metal or wooden tube, about 3 in. in diameter, is fitted at the back, the top of it coming flush with the top of the job. Along the whole distance of the front of this tube, and at the back for a distance of about 12 in. from the top, are grooves, in which work two small bayonet catches, which catches prevent the boxes falling either backwards or forwards when they are opened, so that the hand is not obliged to be on the article at all during that time. The front groove is also necessary on account of the connecting rails (B in Figs. 10 and 11) which are attached to the column. When the pillar is pulled up the proper height it can be turned, when one catch will come *above* the top board and one *under* it. The pillar, with the small black squares indicating the bayonet catches, can be seen in Figs. 3 and 4. The extreme length of it is 32 in. or 33 in. long, and it is made to work freely up and down the tube. Two rings, as A in Fig. 9, are placed, *not joined*, to the pillar, and each is kept in position by a pair of rings (B B in the same diagram), which *are* joined to the pillar. On to the fronts of the rings, A A, are hinged the connecting rails shown in Figs. 10 and 11, which are 5½ in. long, and about 1 in. wide by ½ in. thick, and should be very strong. The other end of each of these rails is connected with the back of a box. It will be found necessary to cut a small piece away from the back of the bottom of each box, in order to hinge the connecting rails to them. In Figs. 10 and 11, A represents the back of the boxes, B the connecting rails, C the tube, D the movable rings (A in Fig. 9), E the pillar, and F the fixed rings (B B in Fig. 9).

A small pediment, with a fluted panel, and two side pieces, will give a better effect to the article, which I think will look best in dark wood, as light wood will be liable to show smears, etc.

In the sizes I have given, I have allowed quite sufficient for the various joints. The top board I have intended to be ¾ in. thick, the remaining boards ½ in. thick.

Perhaps I ought to say a few words with regard to the hingeing. Hinge together the boxes, connecting rails, and pillar first; then fix the front hinges to the shelf and bottom board; and finally hinge the boxes to them. Ornamental hinges should be used for this latter part, as one half of them will show on the fronts of the boxes.

If the connecting rails are inverted, they will work in a similar manner. It would not necessitate having so deep a plinth as we are obliged to have in the present case, but it would be found that they would cause some trouble, and in the end be far from as convenient and useful as the present ones.

If any reader should consider that too much space is lost by having the metal boxes the shape of Fig. 8, he can utilise the whole space by carrying out the following instructions. Have the complete front of the wooden boxes detached from the circular parts, and hinged in front in precisely the same manner as in the present case. The metal boxes will then be the *same* shape as the wooden ones. When required to be refilled, the front of the wooden ones can be lowered and the inner ones taken out. To keep the fronts and the other parts firmly together when required, a hook might be attached to each side of each box, to secure the front, in the thickness of which a pin has previously been driven. It will be necessary to cut away a small portion of the sides of each box to allow for the thickness of the hooks, but this need not disfigure the fronts of the boxes, as the pins for the hooks can be driven into the back part of the thickness; if this method is adopted, it will be better to have a much thicker board for the front of each box than I have mentioned above. The bottom board will not be attached to the front one, but the connecting rails and the side hooks will prevent it falling out of its place.

This idea admits of several modes of adoption, and of several improvements, but I will leave both—should he not approve of my design—to the reader's ingenuity.

[Figs. 3-12 are placed on the opposite page, a position which is more convenient for the reader when reading the paper and referring to cuts.]

CLEANING AND LACQUERING OPTICAL BRASSWORK.

BY CHAS. A. PARKER.

LACQUERING—LACQUER BRUSH—HOW TO MAKE THE LACQUER—OPTICAL DEAD BLACK, VARNISH, AND CHEMICALS.

HAVING described the various methods of finishing and preparing the brasswork, we will now turn our attention to the process of

Lacquering.—The article should first be heated by being placed on a stove, or, if not possessed of a stove, it may be laid on an iron plate and held over a clear charcoal fire or any other source of heat, provided it is protected from the naked flame, care being taken not to touch the bright surface with anything that would be likely to stain it. It must now be heated until just too hot for the hand to bear, and yet not sufficiently hot to bubble the lacquer, or, in other words, as near the temperature of boiling water as possible. If the article is allowed to get too hot it will be apt to burn the lacquer, and if it is too cold it will not set. When the brass has been heated to the correct temperature a flat ¾-in. brush (which should be clipped and trimmed if necessary) is dipped into the pot containing the lacquer, and scraped against the side to get rid of the excess of lacquer, or it may be wiped across a string stretched over the top of the pot. The brush should now be laid on the work as light as possible, with a slightly curved motion at the beginning of the stroke, in order that it may miss the sharp edges, which would otherwise cause too much lacquer to be pressed out of the brush and thus spoil the surface. The brush should be drawn rapidly, but not hurriedly, over the surface of the brass, and lifted off the instant that it reaches the other edge, and it must always pass over the metal in one steady sweep, never being allowed to go over the same spot a second time while the surface is moist. When lacquering flat irregular surfaces the great danger to be avoided is the lacquer collecting around the edges or spreading in irregular quantities. In order to avoid the mishap, some workmen first coat the work with alcohol or very thin lacquer. If the brush is passed a second time over a spot where the lacquer has only partially set, it will result in an unpleasant brown stain; but if the lacquer has been laid on too thin, the article may be heated again and the process repeated with fresh lacquer until a good even body has been laid on, it being simply a matter of practice to lay one coat over another without dragging the previous one off. Should the surface become spoiled by any mishap the lacquer may be cleaned off by boiling it in a lye of potash, as before described. Screws are lacquered by being arranged in rows along a strip of wood. It should be remembered that small thin articles part with a considerable amount of their heat in laying on the lacquer, whereas bulky work remains apparently unaffected. It will thus be seen that it is necessary to make small articles somewhat hotter than larger articles previously to lacquering, *experientia docet*. When the work has been satisfactorily lacquered it should be exposed to a gentle heat for a short time, in order to evaporate the alcohol and harden the lacquer, causing any slight unevenness of the surface to disappear and greatly improve the appearance of the lacquer. A small cooking stove will be found very useful for heating the work, care being taken that the heat shall never exceed the temperature of boiling water, otherwise the lacquer will be apt to get burned.

In lacquering tolerably broad surfaces a brush the same width as the work should be used; but for very large work, or when there are a great many screw-holes, an ordinary brush is unsuitable, the best kind of brush for the work being made in the following manner: Cut a strip of wood just a trifle broader than the surface to be lacquered, and shape it to the form of Fig. 5 (see page 36), afterwards sawing a slit with a thick saw through the edge of the wider portion. Now take a strip of clean flannel about a couple of inches wide, and of the same length as the width of the wood, and fold it lengthwise; then fold a strip of white nankeen cloth over the flannel, afterwards wedging them both into the slit in the wood with the folded edge outwards, securing them in position by means of some small screws driven through the side of the wood. Before screwing them up tight it will be found advisable to put a piece of straight wire through the bow of the folded cloth, in order that it may be pulled tight, and thus be left smooth and straight. This brush must not be dipped into the lacquer, but should be fed by means of an ordinary brush, with which the lacquer is dabbed on

to the nankeen. The woollen cloth holds the lacquer and the nankeen prevents it from flowing too freely, and also presents a smooth surface to the article to be lacquered, preventing any particles of wool from coming in contact with the lacquered surface. With a brush of this kind it is a simple matter to successfully lacquer large surfaces.

It will not, as a rule, be found an economical plan for residents in large towns to make their own lacquer, as it can generally be purchased cheaper, and sometimes better, than it can be made in small quantities at home; but for the convenience of those of our readers who may wish to make their own lacquers, directions are here given for the preparation of a golden lacquer: Take of ground turmeric, ½ oz.; saffron and Spanish annatto, of each ½ drachm. Mix these in a bottle containing 5 oz. of highly rectified spirits of wine, and put it in a warm place, with occasional shaking, for about a week; then strain it through clean, coarse linen into a clean bottle, and add ¾ oz. of coarsely powdered seed lac, putting it again in some warm corner, and shaking it frequently the same as before, for about a fortnight, or until the lac has entirely dissolved, when it may be again strained and put in a clean bottle ready for use. It is not wise to use more seed lac than the quantity given above, as it has a tendency to prevent the lacquer from laying as evenly as it should.

Sufficient having been said to enable the reader to lacquer equal to an optician after a little practice, it only remains to conclude by giving directions for the production of the optical dead black with which to provide the interior of a lens tube, the hood, and cap, etc. For ordinary common work or the interior of lens tubes, a dead black composed of spirit varnish and vegetable black will be found to answer very well. Obtain from an oilman a pennyworth of vegetable black, or lampblack, and twopennyworth of ordinary spirit varnish. Mix some of the varnish with methylated spirit, and then add a small quantity of the black, grinding it up with a stick of wood in a small saucer, carefully breaking all the lumps, and adding sufficient black to form a varnish as thick as cream. If a brushful is now tried on a piece of bright brass it can be ascertained whether it is fit to use, as it will dry in a few moments. If it dries shiny, a little more black or spirit must be added; and if it is too thick, a small quantity more spirit and varnish. To apply this varnish to the interior of a lens tube, pour a small quantity inside the tube, and then quickly turn the latter round, in order that it may completely cover the surface, the superfluous black being poured back into the saucer. If properly mixed and applied, a splendid dead black can be obtained by the above simple plan, which is hard, quick drying, and not liable to rub off with a little friction. A good chemical dead black for the lens cells, stops, etc., may be made in the following manner: Pour ½ oz. of nitric acid into a wide-mouthed bottle, and into this drop as many strips of copper wire as the acid is capable of dissolving, placing the bottle out in the open air in order to avoid the fumes of the gas. When the acid refuses to dissolve any more copper, carefully pick out the remaining portions by means of a forked stick, and then add another ½ oz. of acid and 1½ oz. of clean water. To use this solution hold the article to be blackened on a hook of brass or copper wire and plunge it into the nitric acid solution, which should previously be poured into a saucer or similar suitable receptacle. The article is allowed to remain in this solution for about a quarter of a minute, when it should be taken out and held over the flame from a Bunsen burner, or over a charcoal fire, until the colour changes from green to a good dead black. The brass first becomes coated with a thin green film of nitrate of copper, but this changes by prolonged heating to black oxide of copper. When the article is cold the surface black may be brushed off with a blacklead brush. When required, the liquid may be applied to the surface of the brass by means of a camel-hair brush with equal success.

The following are two more chemical dead blacks which may be employed in place of the above, if desired: (1) Make a couple of strong solutions of the nitrates of silver and copper, mix them together, and dip the article in this mixture, afterwards heating it over a gas flame until the required degree of dead blackness is obtained. (2) Prepare the following mixture:—

Sulphate of iron	1 part.
White arsenic	1 ,,
Hydrochloric acid	12 ,,

Immerse the article in this solution until

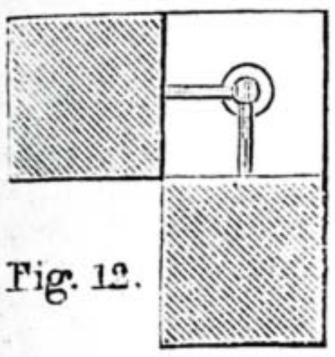


Fig. 12.

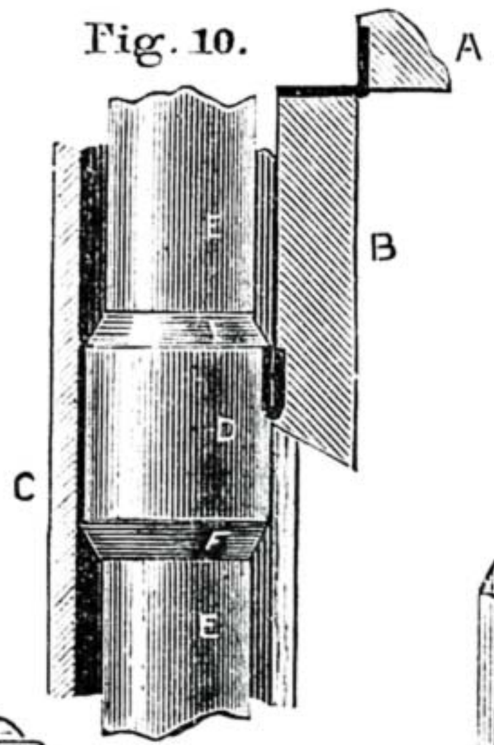


Fig. 10.

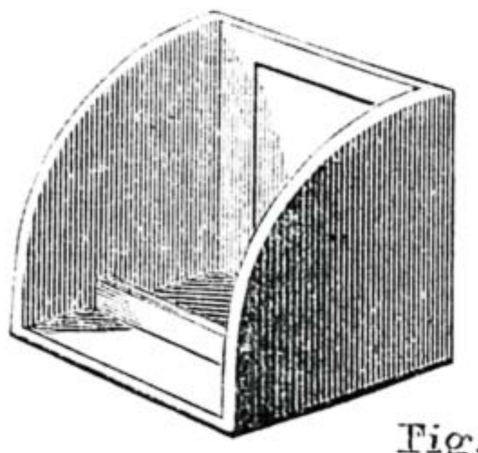


Fig. 7.

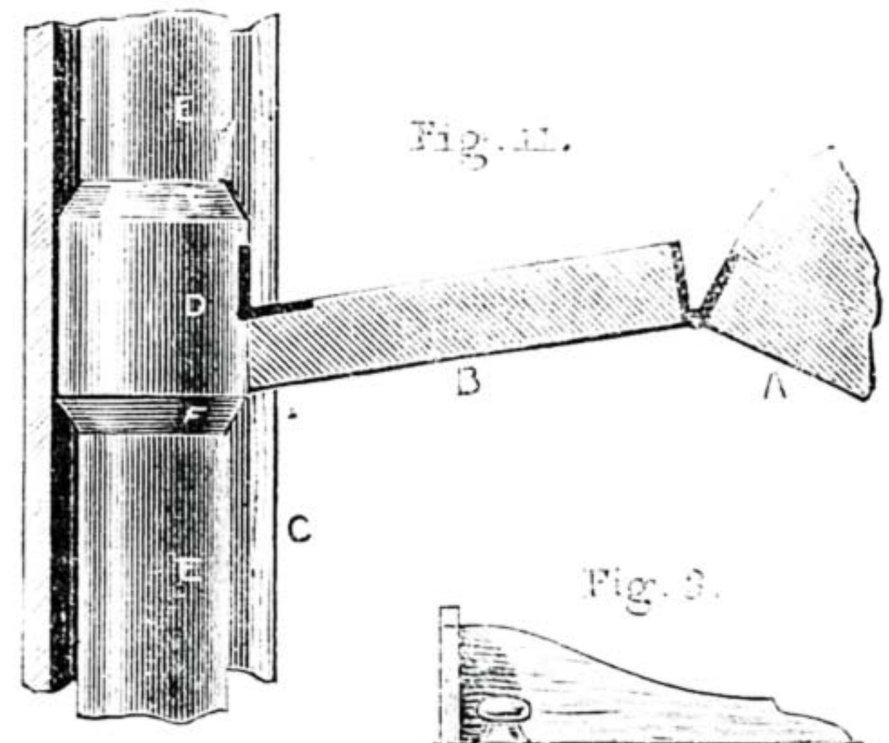


Fig. 11.

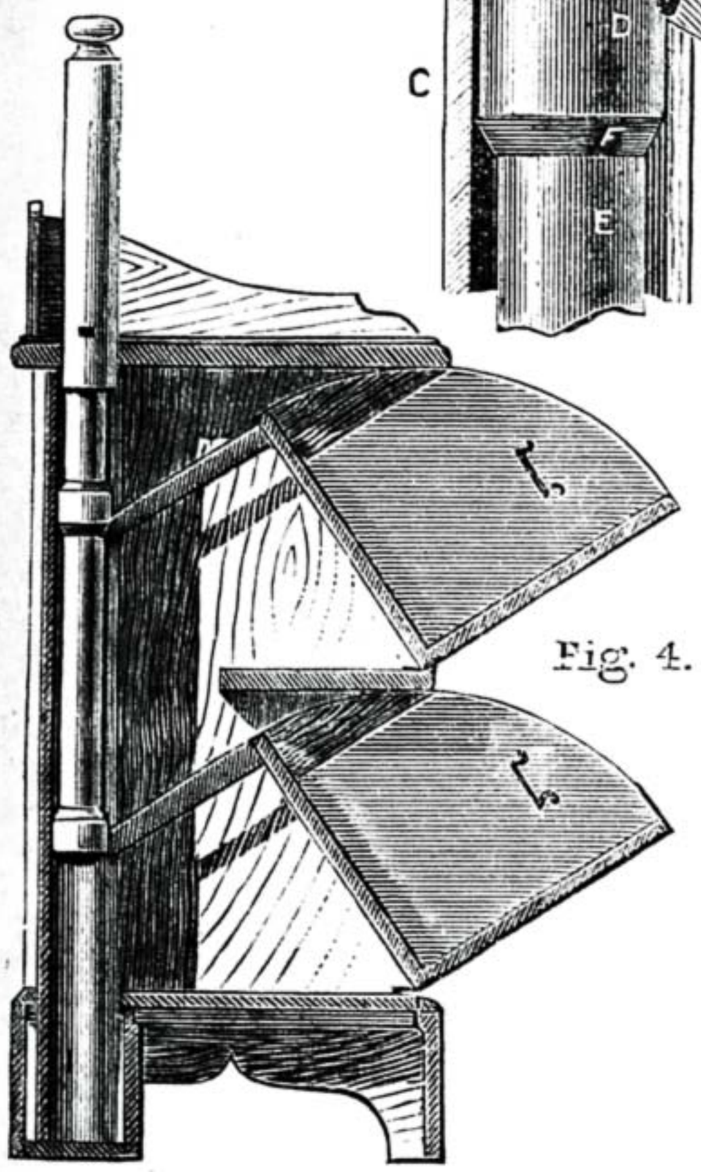


Fig. 4.

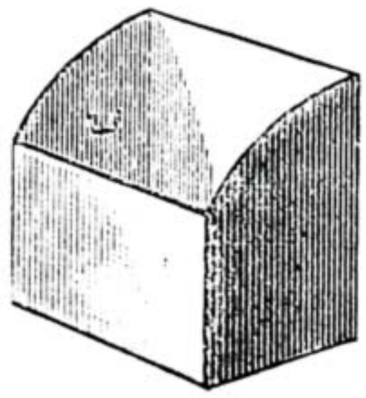


Fig. 8.

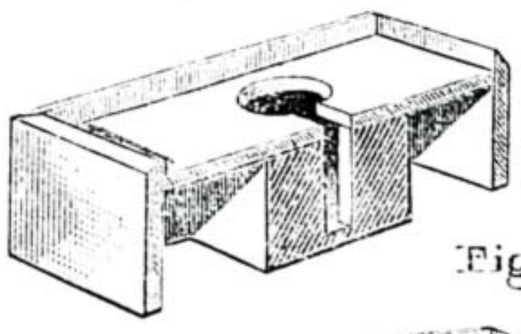


Fig. 6.

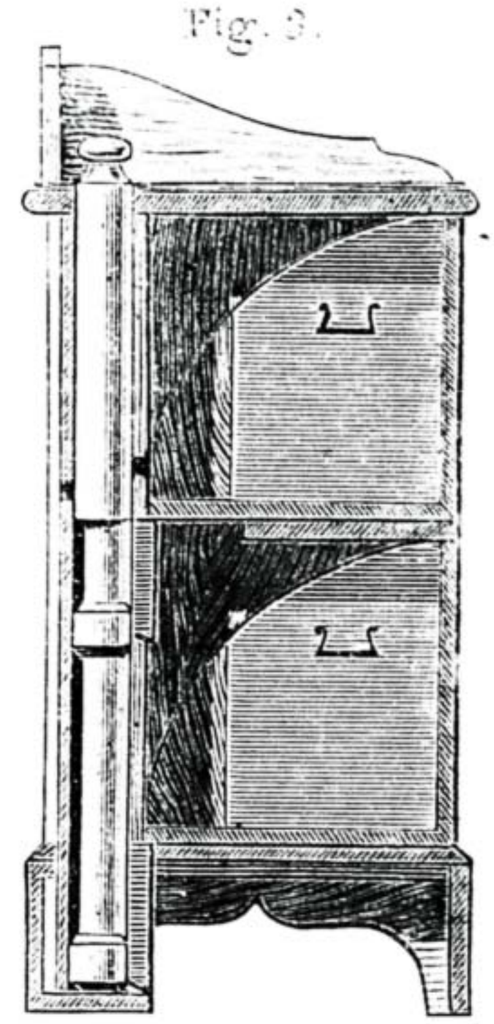


Fig. 9.

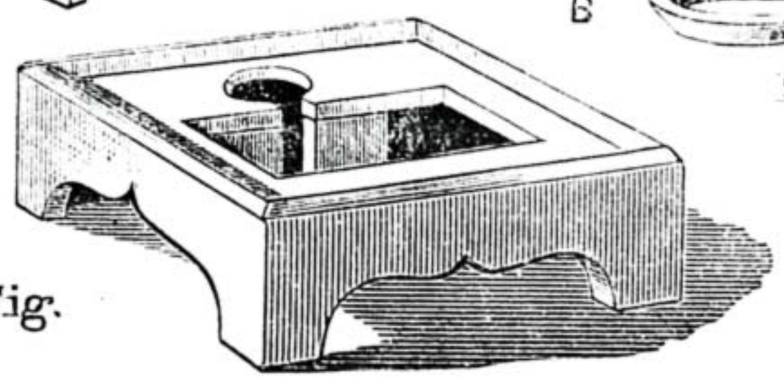


Fig.

Fig. 3.—Section of Boxes closed. Fig. 4.—Section of Boxes open. Fig. 5.—Plinth. Fig. 6.—Back Part of Plinth, so made in order to receive Bottom End of Back Tube and Pillar. Fig. 7.—One of the Boxes. Fig. 8.—Metal Box to fit into Fig. 7. Fig. 9.—Rings (any thickness) to fit on to Pillar (Figs. 10 and 11). Figs. 10 and 11.—Diagram showing Pillar and Connecting Rod when Boxes are open and shut. Fig. 12.—Plan of Corner Box.

it turns black, then remove, and rinse thoroughly with clean water, afterwards drying it in sawdust and polishing the surface with blacklead.

CANOE BUILDING IN WOOD.

BY AN OLD OARSMAN.

STOCKS—KEEL—STEM AND STERN POSTS—PLANKING—GARBOARD STRAKE—MARKING PLACES OF TIMBERS—ROOVING-IRONS—RIVETING NAILS—FITTING AND NAILING TIMBERS—CROSS TIERS—DECK BEAMS—STRINGERS—STEP AND TRUNK FOR MAST.

THE first thing in proceeding to build a canoe is to make the stocks on which to build. The usual manner of doing this is to place a plank on edge, some 14 to 16 ft. long, 9 in. to 1 foot deep, and 2 in. thick. This must be fastened to the floor by struts, which are driven into the earth if the floor is unpaved, and screwed or nailed to the planks if of wooden flooring. The top edge of the stocks should be about 18 in. above the floor, as shown at Fig. 1; the keel formed of red pine, oak, mahogany, American elm, or other suitable wood, about 2½ in. deep, 2½ in. wide, and 12 ft. long, carefully selected, so as to be free from shakes and knots. This is cut away on each side until a section in the middle would be as in Fig. 2. It is worked in this shape to form a hold for the nails when the garboard strakes are nailed to it, as in Fig. 3. But a groove or rabbet should be cut into the keel on either side, as in Fig. 4, to let the edge of the garboard strake enter and get a firm hold in it. This rabbet is continued along the keel up both stem and stern posts. The keel, stem, and stern posts are fastened in two ways, as shown at Fig. 5: by making a long scarf and nailing them together with strong copper nails, or a wedge-shaped joint, as in Fig. 6, a small tenon being cut in the stem, which enters the keel, and prevents any inclination to twisting. The joint is covered by a piece of oak or other strong wood, which is nailed or screwed into both the stem or stern post and keel, forming a strong solid piece of work, fit to take the endless bumps and blows certain to be met with in a canoe journey. The keel and posts being fitted together, the keel is nailed with three nails to the upper edge of the plank or stocks, taking care that the posts are perfectly perpendicular (they can be tested by a bradawl being driven into the top of the post and a plumb-line attached to it), and they are kept in their places by pieces of wood nailed to them and any beams above or at the side, and a long straight piece of wood or plank, a couple of inches wide and an inch thick, is nailed to the top of stem and stern post, along the centre of the boat. This is also useful to hold the moulds in place, and enable any strut to rest against and thrust out a plank to any desired position.

In drawing the midship section of your canoe to the proper scale, arrange how many planks should be on each side; you make an exact mould or template of what the midship section will be when finished, and prick down its sides the width of each plank, and the same thing must be done on stem and stern post, also on any other moulds or sections fore or aft of the midship one. The next step is to cut out and prepare the planking, beginning with the garboard strake. The way is to mark the intended breadth in the middle and at either end, and then, having drawn a line graduating from the centre to the other end, you proceed to saw out the plank, and then surface it with the plane. Should your plank not be long enough, it should be cut out in two pieces and neatly scarfed by cutting in a scarfing machine, the nails being roughed on the *inside*, only the heads being *outside*. When finished, if this has been properly done, the plank will be quite as strong as if cut from a single piece of wood. After the garboard strake has been put on, the following planks are cut in a curve, by holding the plank to be cut against the edge of the garboard—or, better still, pinning it with bradawls to the mould, stem, and stern posts—and marking on it where the plank will be when nailed in place. The keel has the T form in which it is cut graduated fore and aft from amidships, the effect being that the form of the canoe fines or narrows as the floor springs; the garboard strake, from being nearly flat amidships, gradually rises on its outer edges until the two ends come flat against the stem and stern posts, and their ends, being nearly perpendicular (from the planks being twisted), the ends are chamfered off, so as to fit close and quite watertight into the rabbet or groove cut in the stem to receive them, when they are neatly and firmly nailed with copper nails about half an inch apart. The planks in most canoes are made of six cut stuff worked (if of spruce)—*i.e.*, a deal cut into six planks and then planed on both sides, the outside being finished with a smoothing plane. It is always better if the garboard strake is a little thicker than the other planks—say ⅛ in.—as, from being the bottom plank next the keel, it may have more rubbing and bumping, and so should be a little stronger than the rest of the skin. The garboard strakes having been fixed in their places, the edges on the outside of the plank should be chamfered off with a plane, so as to form the angle at which the next plank will be when nailed along the edge (as in Figs. 7 and 7A), and so on, plank after plank, to the upper strake. The first thing, when the garboard strakes are nailed or screwed to the keel, etc., the intended places of the timbers should be marked with chalk on the inside of the plank, and continued up to the gunwale as each plank is fixed in place. The most correct way of doing this is by taking a line and fixing it with a nail to the centre of the top of the stem, then, holding a piece of chalk between thumb and finger, and holding the line firmly in the hand, a mark is made on the planks on one side, and then, immediately opposite, on the other, then by shifting the hand along the line to the next place selected for the position of a timber. If this is done with care, the timbers will come into place exactly opposite each other and at the proper distances along the boat. In nailing the planks together, the nails are usually placed about two inches apart, and the holes for them having been made with a bradawl, the copper nails are driven through from the outside with a moderately heavy hammer, all being kept steady by holding a roughing-iron against it. There are various sizes of these roughing or rooving-irons used. They are steel-faced tools, about six inches long, having a flat end to hold against the plank, timber, or other part whilst driving a nail; and the other, or conical, end is furnished with a small hole large enough to admit the end of a nail, as in Fig. 8. This is for the purpose of driving on the roughs or rooves, which are put on as soon as the nails have been driven all along the plank. The roughs are small round or square pieces of copper, rather less in size than the top of an ordinary pencil, with a hole in the centre (see Fig. 9). In making this hole the metal rises in the centre like the holes in a pepper-box or nutmeg-grater. The nail having been driven home from the outside, a rough is placed on the point of the nail, the cup part on the point, and the roughing-iron being placed on it, the hole ready to receive the nail, and held with a firm pressure, a smart blow being at the same time given with the hammer on the head of the nail, the rough is forced along the nail close down to the plank. This done, the projecting part of the nail is seized with a pair of pincers and twisted off close above the rough, leaving an end somewhat rough and jagged. The roughing-iron is now held with its flat end against the head of the nail outside, and the hammer is used with a smart tapping action on the projecting rough end of the nail, riveting the end of the nail over the rough. This makes a remarkably strong holdfast as shown in Fig. 10. This roughing is so secure that it rarely gives. Sometimes nails are used without rooves, the end being cut off and turned down, as in Fig. 11.

The planks being now fitted and nailed or screwed in place, you proceed to fit and nail in the timbers. Great attention must be paid to the proper fitting of the timbers, as, if they do not fit correctly against the planks, they will be drawn out of shape, causing the outside of the canoe to look wavy and uneven, probably influencing her progress through the water, and causing her to steer badly.

To fit in the timbers, a piece of oak or other timber, about half an inch thick, is cut to the curve of the canoe side, and whilst it is held firmly against the planks, a pair of compasses, fixed with a screw at a distance of about half an inch to an inch from point to point, is drawn along the timber, one point resting against the plank, and the other marking a line along the timber at an exactly equal distance from the plank, showing the precise angles at which the timber must be cut to fit close to each plank.

It is usual to commence by placing the cross tiers or timbers which cross the keel, and fix or tie the first two or three planks on each side (Fig. 12). Before fixing, these cross timbers have a small piece cut out of them close on each side of the keel. This is done to let the water flow easily from end to end when the level of the canoe is altered by any one getting on board, or from any other cause. (See Figs. 12 and 13.) The rest of the timbers generally start from the centre of the garboard strake across all the planks up to the gunwale, being cut off at a slant, so that the deck may rest on them and thus have a support. A small piece of one corner of each timber is cut out next the plank (Fig. 14), so that when the canoe is turned upside down, any water in her may flow easily to the lower end, whichever may be in that position. To the tops of these timbers it is usual to attach the deck beams, by some termed carlines, but incorrectly so, as carlines are the fore and aft pieces which are fitted between the deck beams to support the deck fore and aft. These deck beams (Figs. 15 and 15A)—which are usually from forward and from aft of the well, with the longitudinal beams let into them, that part where the mast-hole comes being wider, to admit of the hole being cut, and to be stronger, so as to take the strain of the mast when under sail; the fore and aft beams which bound the well

are made of oak, and are deeper and stronger than the others, so that the inner edge may be chamfered away, to give room for one's legs when the feet are placed under the decks—must be perfectly shaped, as on them the deck comes and takes its shape. The curves must be correct, and so graduated about one inch and a half wide, running the whole length of the boat, being nailed along its upper side to the plank. This adds wonderfully to the strength of the canoe. To this stringer the deck is usually screwed or nailed. When this stringer is nailed in place and all the timbers secured, the bow put in place. This is made of oak or other suitable wood, cut to fit over the keelson and on the planks on each side, and is firmly nailed to the keel and garboard strake, a hole or step being cut in the centre for the lower end of the mast to enter and be held firmly when sailing, etc. (see Fig. 18). A

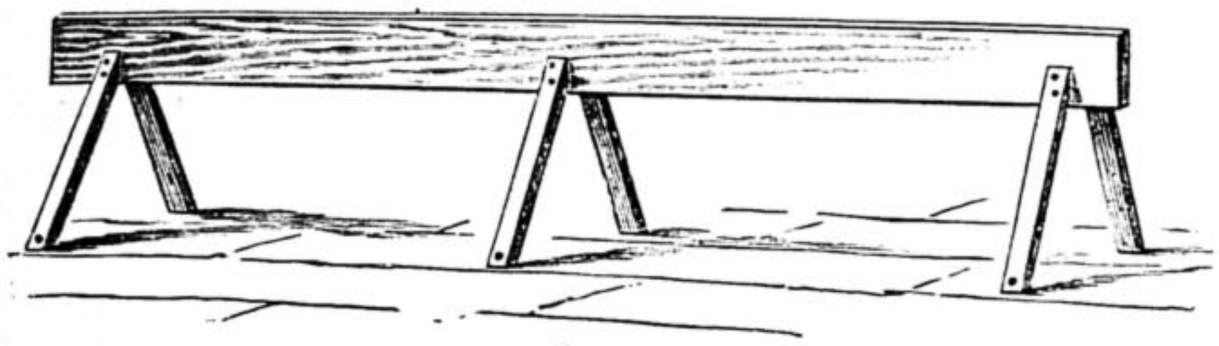


Fig. 1

Fig. 2.

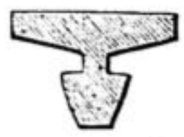


Fig. 4.

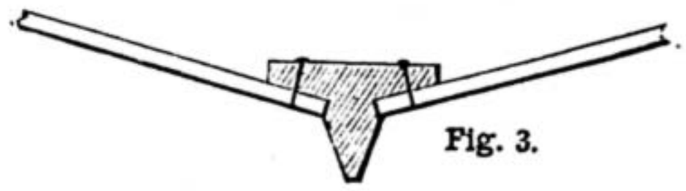


Fig. 3.

Fig. 9.

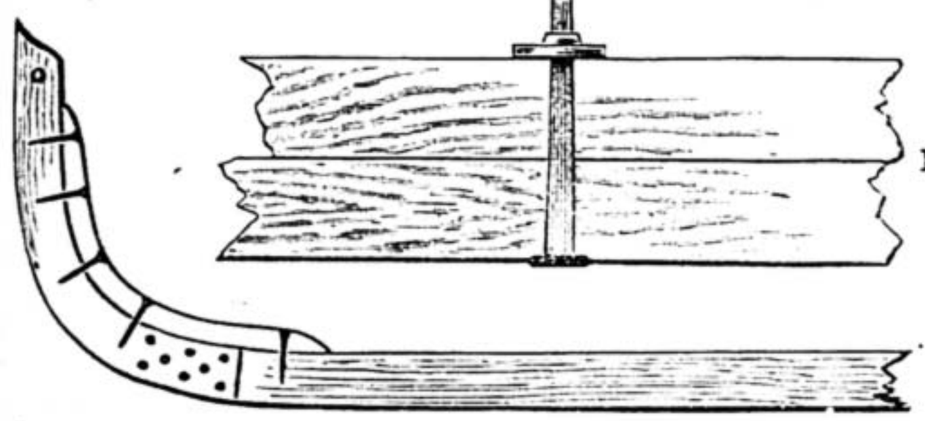


Fig. 10.

Fig. 5.

Fig. 8.

Fig. 7 A.

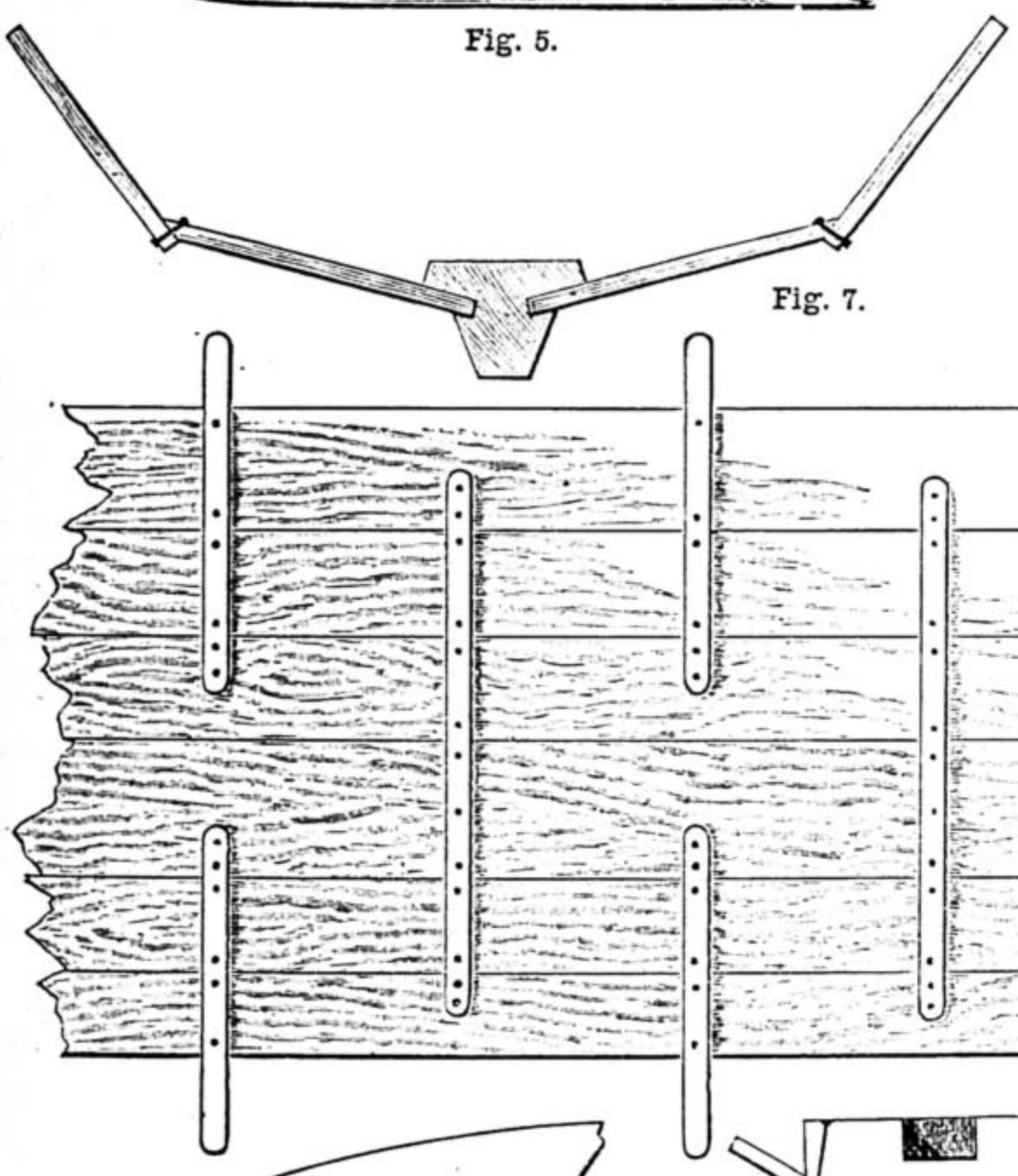


Fig. 7.

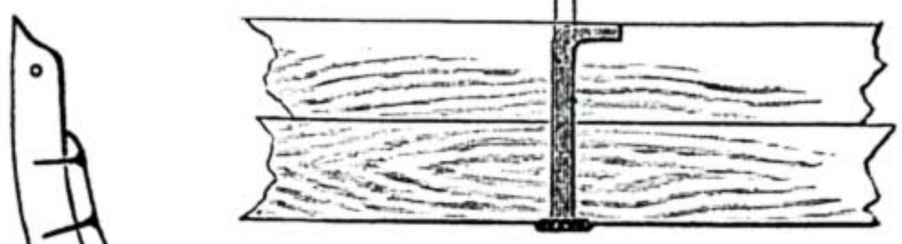


Fig. 11.

Fig. 6.

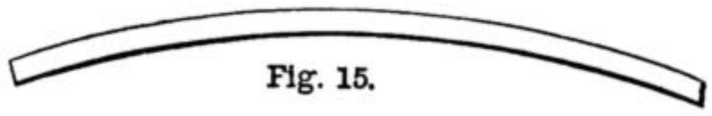


Fig. 15.

Fig. 13.

Fig. 12.

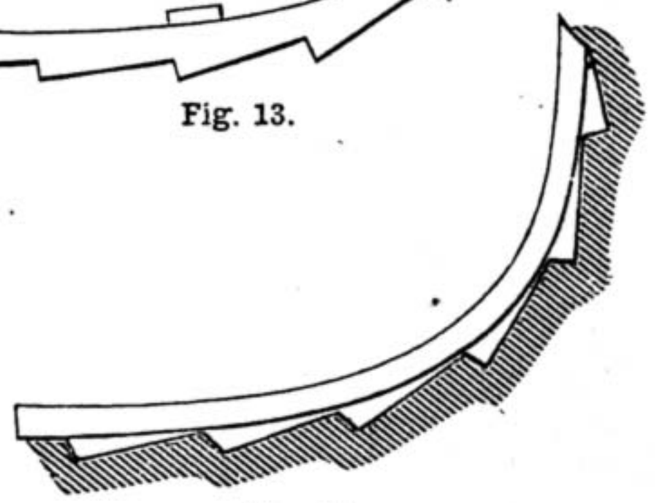


Fig. 14.

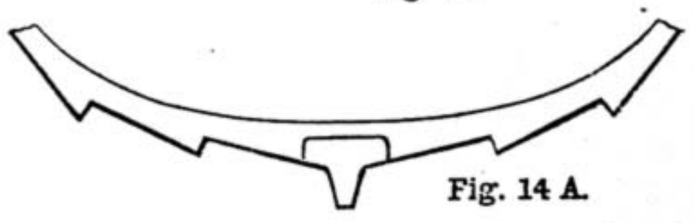


Fig. 14 A.

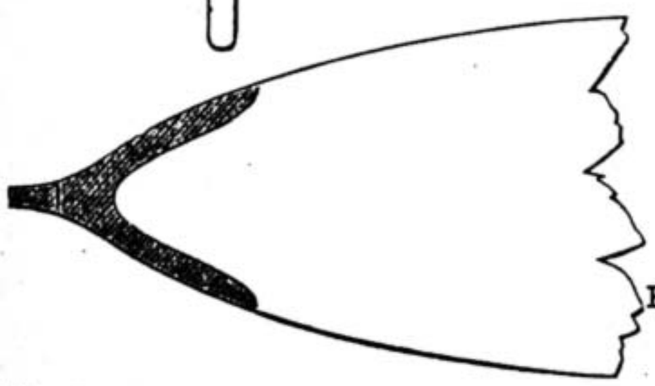
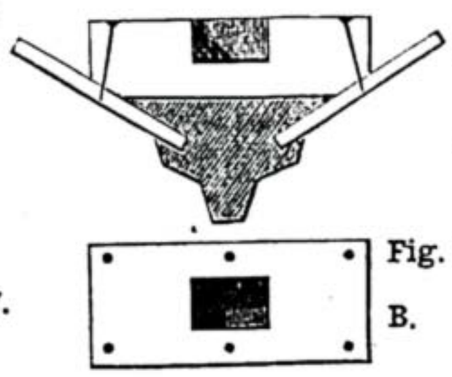


Fig. 17.



A.

B.

Fig. 18.

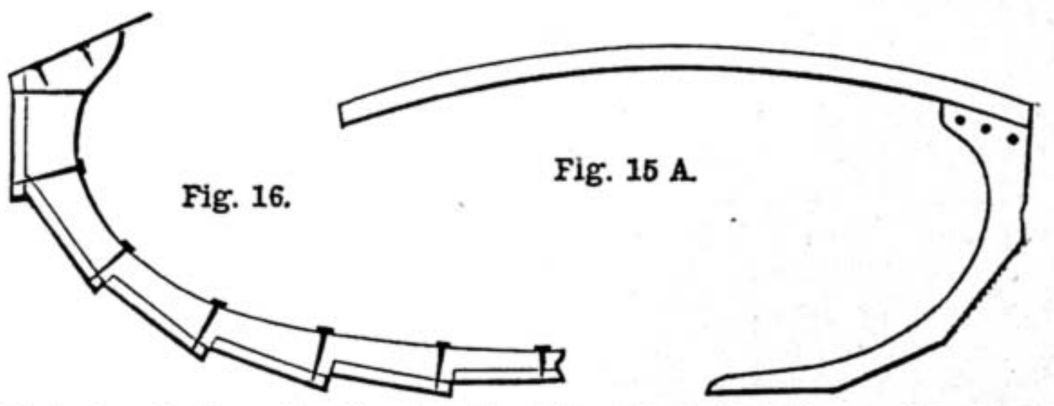


Fig. 16.

Fig. 15 A.

Fig. 1.—Stocks. Fig. 2.—Section of Keel. Fig. 3.—Garboard fixed to Keel. Fig. 4.—Rebate for Garboard. Fig. 5.—Scarf for Keel and Stem. Fig. 6.—Scarf or Sloping Joint for Keel and Stem. Fig. 7.—Chamfer at Edge of Planks. Fig. 7 A.—Chamfer of Plank on larger scale. Fig. 8.—Rooving-Iron or Anvil. Fig. 9.—Burr or Roove. Fig. 10.—Nail with Roove on. Fig. 11.—Nail without Roove. Fig. 12.—Diagram showing how Timbers and Ties should be put in Canoe. Fig. 13.—Timber shaped to Planks. Fig. 14.—Timber ready for Marking. Fig. 14 A.—Timber cut on each side of Keel for Drainage. Fig. 15.—Deck Beam. Fig. 15 A.—Deck Beam fastened to Top of Timber. Fig. 16.—Timber cut to fit Deck. Fig. 17.—Fork or Crutch at Stem. Fig. 18.—Step of Mast and how to fasten it, shown in Section (A) and Plan (B).

that their centres can be touched all along by a straight edge from stem to well, and from aft side of well to stern post. The beams are nailed or screwed to the timbers, the nail or screw being driven from the upper side right down into the timber, and then another nail is driven from the outside of the gunwale into the beam (Fig. 16). The upper plank is strengthened by a stringer, which is a piece of thin planking and stern are strengthened by a fork or mast-hook made of oak (see Fig. 17), being screwed or nailed inside, abutting on the stem and stern post. This keeps the gunwale in shape at either end, and obviates the danger of the planks or deck being started by any sudden and severe shock, such as running against any barge, boat, or quay wall. When all is ready for the deck to be put on, the step for the mast must be trunk, made of wood or metal, down which the mast must pass, should be nailed or fixed firmly from deck beam to step. This prevents the mast getting out of the step and bursting up the deck, and possibly causing an upset, a danger which has occurred. This trunk should, in all cases, be square, and the edge on deck finished with a brass ferrule or plate, fixed by screws to the deck and under beams.

THE ART OF GRAINING.

PRACTICAL PAPERS ON PAINTED IMITATIONS OF WOODS.

BY A LONDON DECORATOR.

Graining Oak in Oil Colour.

In the preceding paper upon this subject I considered the necessary qualities of both "grounding paint" and "graining colour," and also briefly indicated the preparatory work required to new woodwork which is intended to be grained. The main working principle embodied in the art of graining—namely, the manipulation of a transparent graining colour over an opaque and solid surface of paint, whereby two distinct processes are used to obtain one complete colour-effect—was also therein explained to the reader; whilst the possession of good samples of the woods to be imitated was urged upon the student as a matter of the most primary importance.

The tools required for graining oak in oil colour were shown in the illustration accompanying the previous introductory paper. I do not purpose herein to occupy ourselves with the whole of the brushes represented in the above, lest the quantity and variety should confuse the learner, but prefer to make the student familiar with the tools as the occasion shall arise for their use. Assuming, therefore, that the practically inclined one has procured a good specimen of English oak, and also a suitable piece of painted deal or pine upon which to practise, we will turn back to the engraving of grainers' tools, and I will particularise those required for present needs, and further, briefly advise as to their size and cost.

A variety of *steel combs* is indispensable to graining oak, and these can be purchased either separately or in a set of different sizes and degrees of coarseness. They are sold singly, by the inch, in sizes from one to four inches in width, and are made with six, nine, twelve, and fifteen teeth to the inch. The sets, as usually retailed, consist of three combs of one, two, three, and four inches, and each size is made up by coarse, medium, and fine combs. They are retailed in a shut-up tin case at 3s. 6d. and 4s.; whilst 1½d. and 2d. per inch, in width, is charged for loose combs. As a good set of steel combs will last a lifetime, I advise the purchase of such in its entirety; where, however, the cost stands in the way, let the learner invest in four-inch combs of three varieties and a couple of small sizes. The second description of comb I have depicted is of leather; these also can be obtained in varying sizes and degrees of coarseness. India-rubber, gutta-percha, and even suitable pieces of cork, can be utilised for cutting graining combs; but, although all of these materials have special characteristics which an experienced grainer can readily turn to practical account, the learner is advised to content himself with machine-made steel combs and two or three coarse leather ones. These latter can be purchased at any large dealer's, and the price is about the same as for the steel kinds. Comb Fig. 3 takes a more familiar shape, and although not absolutely indispensable to graining oak, it is advisable to invest 4d. or 6d. in this article. They are purposely made for dividing the long hair of a thin overgrainer (Fig. 13), when charged with water colour, into separate fine divisions. Turning to the brushes, one of the most expensive of the grainer's tools, the *badger hair softener*—or "badger" it is usually termed—must be noticed. Like a good set of combs in the hands of a careful worker, this brush will also last, if not exactly one's lifetime, a great number of years. This is a serious item of expense, and one which cannot be substituted by a cheaper article. A 3½ or 4 in. badger of the *finest* quality costs from 12s. to 15s., and the cheapest reliable quality of a good maker's badger is marked from 6s. 6d. to 7s. 6d. for the above sizes. The latter sum should procure a sufficiently good article for his purpose if the learner is careful to purchase from a good firm, such as G. B. Kent & Co., Hamilton & Co., or Crowden & Garrod. One word of warning here: do not be tempted by a retailer of German rubbish into buying so-called badgers, the stocks of which are ebonised, and with a thin ornamental plate of white bone next the hair. These goods are sold at about half the cost of a good badger-brush. The hair in them, which is comparatively little, has scarcely any "spring," is of varying length, and they are practically useless for "softening" graining work. Whatever they are made for, there is one purpose they fulfil capitally—I personally recommend them to lady clients for dusting the *bric-à-brac* of their drawing-rooms. A couple of *overgrainers* of three or four inches in width, as shown with Figs. 13 and 15 in illustration (see page 40), will be a further very useful present investment; and a *thin hog-hair mottler* (Fig. 17), about two inches wide, will complete the equipment of graining brushes proper. The careful cultivation of the thumb-nail of the right hand has nowadays been substituted by a piece of thin bone of similar shape, termed a *thumb-piece* (Fig. 7). This, when covered by a piece of soft linen rag, is far more pleasant than one's nail to work with, and the "lights," as the cross-markings of the oak figure are called, can be wiped out as naturally and cleanly with the thumb-piece as by the earlier and more primitive method. The cost of the overgrainers will be from 1s. 6d. to 2s. each, the thickest kind (Fig. 15) being the most useful for oak. Fig. 17, the thin, or *chisel-edge mottler*, which will be very useful later on for graining mahogany and satin wood, will make a call for another 1s., or thereabouts. The "thumb-pieces" are made in several sizes, costing but 2d. or 3d. each. Besides grainers' tools, the student will require a brush to spread his oil graining colour. A medium size English paint tool will answer best for the practice-board; but a nicely worn-in paint brush and tool are necessary when any quantity of work has to be covered.

The mixing of "graining colour," and the nature and proportion of its constituent parts, will here require some consideration; and as this portion of my paper will bear equally upon mixing all shades and colours of graining paint, it requires the learner's careful attention and study. The pigments, or material colours, used with fluids in compounding oil graining colour are of a transparent or semi-transparent nature, the chief of which are known as *Terra-di-Sienna*, or *Raw Sienna*, *Burnt Sienna*, *Raw* and *Burnt Turkey Umber*, and *Vandyke Brown*. These colours are prepared, finely ground, in linseed oil, and can be purchased at any colour shop. Linseed oil and oil of turpentine are mixed with the pigments, and the addition of a drying agent—used in proportion to the natural drying qualities of the pigment and the circumstances of the work—completes the process.

The megilphing of oil graining colour is a matter here requiring some attention. Any person who knows the meaning of the word "graining" is also aware that the combs I have previously described are used for imitating the grain, or pores, of the wood. Now, to ensure that when the work is combed the effect thereby obtained shall be permanent, some means must be adopted to counteract the spreading nature of the linseed oil. Notwithstanding such a recommendation may be bad from a theoretical point of view, I may say that the action of a drying agent alone, used in excess of the amount required to *dry* the mixture, is sufficient for the purpose of megilphing graining colour. This is the plan adopted with the bulk of all ordinary and cheap oak graining. Thirty years ago, when a journeyman painter's wage was about a guinea a week, a couple of hours spent in mixing a pot of graining colour—preparing and dissolving beeswax, mixing lime-water, soft soap, or such like articles—was not considered "unnecessarily long"; but to-day the worker is expected to "knock it up" as quickly as a pot of white paint. Mr. Ruskin's tirade notwithstanding, there are still occasions when a thoroughly good and enduring piece of oak graining is demanded, such as may be required to stand for half a century, and in the execution of which neither pains, time, or material need be grudged. In such an instance the addition of a proper megilph is a decided advantage. No assistance would accrue to the student were I to detail herein the many different preparations which have been used for this purpose. That which is generally acknowledged to be most convenient and satisfactory is a preparation of beeswax. A few ounces of the genuine wax—not the paraffin-adulterated article—should be scraped into shreds and thoroughly dissolved and mixed, by the application of heat, in linseed oil. This quantity will be ample for five or six pounds of graining colour, or, as the mixture is more a fluid than of a solid nature, the subjoined *proportions* may be most conveniently stated:—Add to the dissolved beeswax one pint of each linseed oil and oil of turpentine, about one gill of "terebine"—liquid drier—and the pigments, ready-ground in oil, which are required to stain the mixture the desired colour. When wax is used for this purpose, the worker must take every care to thoroughly mix it with the fluid, otherwise, excess of wax on any portions may prevent it properly drying. It should always be remembered that the province of this substance is not to dry the mixture, but solely to make it more amenable to the dividing and wiping-out action of the combs. Patent, paste or liquid, drier must still be added for oxidising the linseed oil, and where Vandyke brown is used a *double* proportion of drier to that given above should be taken, since this pigment is a very slow—or, as it is termed, "bad"—drier. The best umbers, on the other hand, are good drying pigments, and require less drying agents, whilst the siennas require the full proportion I have given.

Graining colour for ordinary purposes is best made with about equal parts of oil and turps, one-eighth, of the whole bulk, of paste driers, and the addition of pigments; burnt umber usually suffices to obtain the desired depth and tone of colour. In a subsequent paper I hope to give instructions for mixing "grounds" and "graining paint" for every *colour and shade* of oak. The above are considerations applying chiefly to the *nature* and mixing of all oil graining paint; whilst, when describing the imitation of the many varieties of oak *colour* now in use, it will be necessary to notice more fully the pigments previously enumerated.

The reader being now, to an equal extent, familiar with the tools required and the preparation of the "ground" and "graining paints," we will turn our attention to a definite description of imitating the grain and figure.

To Grain Light or Wainscot Oak—a specimen of which, it is presumed, the student, as well as the writer, has before him—we require a light buff or cream-colour grounding paint. The only pigment necessary for staining our white lead paint to the desired tint is *yellow ochre*, ground in oil, sufficient of which is added to make the paint a *decided* cream colour. Some half a dozen distinct depths of light oak can be well imitated upon grounds made from white lead and yellow ochre alone; but beyond a certain range of colour, the ochre gives somewhat raw and crude effects. The best pigment for staining the graining mixture we are going to use over our light oak ground is *raw Turkey umber*. If the raw umber cannot conveniently be obtained, ordinary burnt umber will do. The former gives results nearer in colour to the new-looking oak, for which burnt umber is usually too "warm." Having prepared our colour according to the previous directions, and using plenty of driers therein instead of megilphing it, it is necessary now to well "work in" the paint tool we use for spreading—that is, by stirring and scraping across a knife, to get the colour properly into the brush. As our graining colour, if properly mixed, is scarcely thicker than a "wash," very little is necessary to cover the practice-board—which we will suppose is about 24 in. by 11 in. The tool is therefore well scraped out, and then our panel is spread. Care should be taken to rub the colour out comparatively *bare*, and the learner should rather try how little he can use of his colour to "rub in" the board, as it is termed, than *vice versâ*. Graining colour is always "laid off" the way of the grain, and it naturally follows that when a door is being covered the figure and grain should always be in keeping with the constructive divisions, and therefore such as we should find in a good solid oak door. Although careful and even spreading and proper "laying off" with the paint brush is sufficient for all ordinary work, it is often advisable to get the colour more perfectly distributed by finishing with the "stippling" process. As the student must *aim* at first-class work only, we will stipple the practice-board with the "badger," and obtain a coating free from any brush marks. But here, a few words of theory.

In all branches of imitative work, and notwithstanding *perfect* imitation is thereby implied, a certain degree of conventionalism is usually apparent even in the best examples. This is the case with graining, since a "master in the art" will often execute a grained door the *figure* and *arrangement* of which may exhibit more symmetry and balance in its entirety than many doors of the solid wood will show. There is no pretence of "teaching Dame Nature her business" thereby, but simply this: the grainer produces an imitation of that which, as he has learned by studying and copying the natural principles of the tree's growth, *may* be found in reality. The worker in wood, however, although he appreciates the beauty of its grain and figure, cannot sacrifice every other consideration to that, and use only those portions of a tree which will make an ideal door—hence, although perfect in construction, it may be, as suggested, inferior in some respects to the imitation. My reason for this digression is to impress upon the student that a solid oak door is not *always* the ideal to work up to, but that, whilst we are imitating, let such imitation contain as much beauty of growth and balance of parts as may be found in the best specimens. This will further explain matters should the learner fail to see the exact interpretation in his own specimen of my written instructions; the natural characteristics of both sources will, however, be identical.

To return to the practice-board, and which we will treat as a door panel, now ready for "combing" and "figuring." A little study of the real wood will show that there are two features to be copied: the grain which runs lengthways and the figure, or "lights" of oak, as it is termed, which crosses the former. A little more observation will teach us that the "grain" consists of an arrangement of dark pores of the wood, some finer and closer, and others long and coarse, and that where the figure is there are no dark pores, but a very fine grain, which seems to underlay the whole effect. A good panel of real oak will show according to its growth a coarse grain upon the one side, which graduates into a finer and then into the figured portion. To imitate this, we take a 3-in. coarse comb, preferably leather, and placing the edge against the left-hand side, draw it firmly once down the panel. A medium steel comb is then used next to that we have already wiped out, and this is carried about half-way across the width. If carefully done, we have now a graduated series of regular lines from which the graining colour has been drawn off. But this is not much like the grain at present. We now take a fine or medium wide steel comb, and starting at the same edge, we cut the lines into "pores," as it were, by either of two methods: we may draw the comb at a slight angle regularly across the coarse combing, or we may, and very successfully with practice, make the comb execute a cross, "wavy" action, and obtain a similar effect. Having cut the first combing up into pores, or grain—hence "graining"—we carry the fine combing across the panel, but keep it, upon the right-hand portion, quite subdued in effect. This completes the "grain," a few hints concerning which must be given here. Combing must always be cleanly and carefully done: the work must start right at the top and be carried quite to the bottom—simple enough on the practice-board, but not so easy on a moulding-framed panel. Wipe the combs, as they are used, in a piece of old rag, free from "fluff," and practise to get a full and regular pressure over the wide comb, which will ensure clean combing.

Now for the *figure*. We take a piece of old linen rag and double into several thicknesses; our thumb-piece is now put within it and then under our right hand thumb—projecting from it sufficiently to occupy the place of a long thumb-nail. With the left hand the ends of the rag are held away from the panel, and this also serves to steady and guide the right hand. Starting from the top, we wipe out the figure, putting in its coarsest markings and broadest lights nearest the right-hand edge of the panel, as it would be in reality. From this side the figure is imitated in varying degrees of coarseness, until its markings, gradually getting smaller and closer, are intermingled with the strong combing of the left-hand side of the panel. No attempt is here made to describe the figure, but rather to accentuate its chief points. The real oak panel or a nicely grained specimen alone can teach the growth of the "lights" of oak. To wipe them out naturally and cleanly is, I believe, the most difficult process the learner of graining must master. In manipulating the thumb-piece and rag, the broad top of the former enables us to take out the thick and "set" lights, and with the thin edge to make the small ones; whilst all the irregular veins of varying shape are made by a combined action of both. In a good panel of oak the strongest figure is never crowded, but nicely balanced throughout. When the figure is completed to this extent, we have to put in "half-tones" of colour, found between the veins. To effect this, a clean piece of rag is made into a pad about two inches long, and the graining colour surrounding the figure is carefully, but not cleanly, wiped or softened out. This process must never be worked close up to the "lights." The desired effect is this: by wiping away a portion of the colour to obtain a more transparent appearance, and whilst "softening" the figured part of the panel, we still further help the contrast of the clean-wiped lights by the shade portion surrounding it. It is only advisable to put "half-tones" between the most prominent "lights." Both in wiping out the lights and the half-tones, the surface of the rag is, of course, continually changed; clean wiping is very dependent upon *clean rag* as well as the practice of the worker. We now, finally, take the *thin hog-hair mottler*, and slightly soften off the veins with a downward touch; this, if successfully done, will give a delicate "woody" appearance to the "lights," and assist them by strengthening the under shadow. The work is now allowed to dry ere it receives the subsequent "overgraining" process. In my next paper I hope to "grain a door," and will endeavour to assist this subject by an illustration of working methods of graining oak in oil.

A SIMPLE WRITING CABINET.

BY R. F. HILL.

In the accompanying sketch will be seen a very effective, useful, and simple writing cabinet, suitable to stand on any side or occasional table. So simple, in fact, is the construction, that it is impossible for any amateur, reading instructions and carefully following sketches at the same time, to make any mistake.

The first thing will be to find out, or rather for me to tell you, how much wood and brass work will be required.

There will be, of course, four uprights, D, each to be $\frac{3}{4}$ in. square by 15 in. long. Four pieces for the doors and back, 15 in. by 10 in., $\frac{1}{2}$ in. stuff; two 15 in. by 5 in. for the side flaps of writing fall—these also to be $\frac{1}{2}$ in. thick. The bottom board, C, will be 1 in. stuff, 12 in. by 12 in. The top, B, 12 in. by 12 in.—this only $\frac{1}{4}$ in. thick. For the moulding, about 8 ft. 6 in. of 1 in., pattern as shown at A; that to go round front fall, as shown at Fig. 1, with $\frac{3}{8}$ in. astragal moulding. Then there will be wanted a board of 9 cut or $\frac{1}{8}$ in. full stuff; this will be for the stationery boxes, F, and pen rack, G, etc.

The brass work:—Five pairs of $1\frac{1}{4}$ in. butts, one small lever lock of the ordinary drawer pattern, two small flush bolts for the side doors, one catch and eye to fasten side flaps of writing fall when closed.

Having got, cut, and cleaned up to the

sizes given, you will be ready to start fitting and fixing same as follows :—

The bottom board, C, to be laid on the bench if you have one; if not, wish you had. Don't let this discourage you—use the kitchen table; it won't be the first time, no doubt, it has been used for a similar job. In my case it has been used more often than the bench, being minus that commodity myself. But this is not getting to work. The top, B, to be laid on this; the edges being got exactly square, fix them with two or three brads so that they shall not shift. Then take one of the uprights, D, and stand on one corner of boards, exactly quarter of an inch from either edge, as shown at H, and mark round with pencil. Having done this at all four corners, you will find there will be ten inches between each square, being the space required for doors, front fall, and back. Keep the top and bottom together; bore with your $\frac{1}{4}$ in. bit a hole right through the two, exactly in the centre of each square, as shown at H. The uprights, D, will also require to have a hole bored in either end about $1\frac{1}{2}$ in. deep (with the same bit) to receive dowel pin; this should be slightly over the $\frac{1}{4}$ in. Having well glued dowels, force them into the holes in uprights, leaving about $1\frac{1}{2}$ in. out, as shown at E. While the glue is setting, take the top and bottom apart and well glue the holes in the latter, in which the dowels in uprights should be forced. The ends (about $\frac{1}{2}$ in.) that show through should be sawn off, and if dowels do not fit tightly, a wedge driven in before the glue has set will be the best thing. Treat the top, B, in exactly the same manner, putting three or so brads through into uprights to keep same square and strong, as there is a pretty good strain on them when the side doors are hung. Now take the piece selected for back, glue all round edges, fit in and fix through top and bottom with brads; this when set will keep all secure for the next job—that is, cutting in and screwing butts on to doors, and side flaps for fall, the lock on top of front fall, and the flush bolts on side doors. The catch and eye can be left until everything else is fitted. The tray shown in Fig. 2, and again in the section as I, will be cut through to receive ink bottles (the shape depends whether you happen to have any by you, or on what you are able to get), and also to form a tray for pens, etc. This will be made from the 9 cut, and ought to be cut large enough that when fixed on the side doors shut against it. The stationery boxes, F, should be 5 in. wide, 2 in. deep back to front, and 8 in. high; this will be found a very convenient size for note paper, envelopes, cards, etc. This, like the pen rack, G, should be made of the 9 cut. The moulding on top will be mitred round, and glued on, thus forming a 1 in. gallery all round.

The bottom board, C, having the edges left exactly square, the moulding (same as that used at top) can be mitred round and glued on; a brad or two will not hurt in this case, as it is apt to get a knock now and again. The astragal moulding for the front fall should be cut and glued on about $1\frac{1}{2}$ in. from the edge all round. The side flaps having been hinged on to fall, if you are going to line same, you will have to run a slip of veneer $1\frac{1}{2}$ in. all round, thus leaving a sunk space deep enough to receive leather, plush, or whatever you may fancy. The stationery boxes being screwed on the side doors, these may be hinged on and the holes made for flush bolts. The screws for fixing front fall to bottom board should be as long (say $\frac{7}{8}$ in.) as you can get, and yet thin enough to go through holes in hinges. Having these, and fixed on same, cut in the hole and fitted on plate to receive catch of lock, your task (let's hope it has been a pleasant, and not a weary one) is done.

In commencing my paper, some of my readers doubtless noticed that I made no mention of the sort of wood to be used. Mine is in American whitewood enamelled, as this one was really an experiment that, for a wonder, turned out a success. But should I ever make another, it would be in American walnut, this being a wood that always does you justice, if you take a little trouble in the finishing. Nevertheless, in materials there is always great scope for choice, and it may be desirable to make choice of a wood which would harmonise either with the material or colour of the surroundings. Another effective mode of treatment would be to overlay the front panel and the sides and back with fretwork cut in thin wood, either in the same or a different wood. This would impart the effect of carved or inlaid work with little trouble. Again, the surface ornamentation known as "chip carving" might be applied with good effect to the enrichment of the cabinet, or the front and sides might be painted with light and pretty floral designs in the Japanese style.

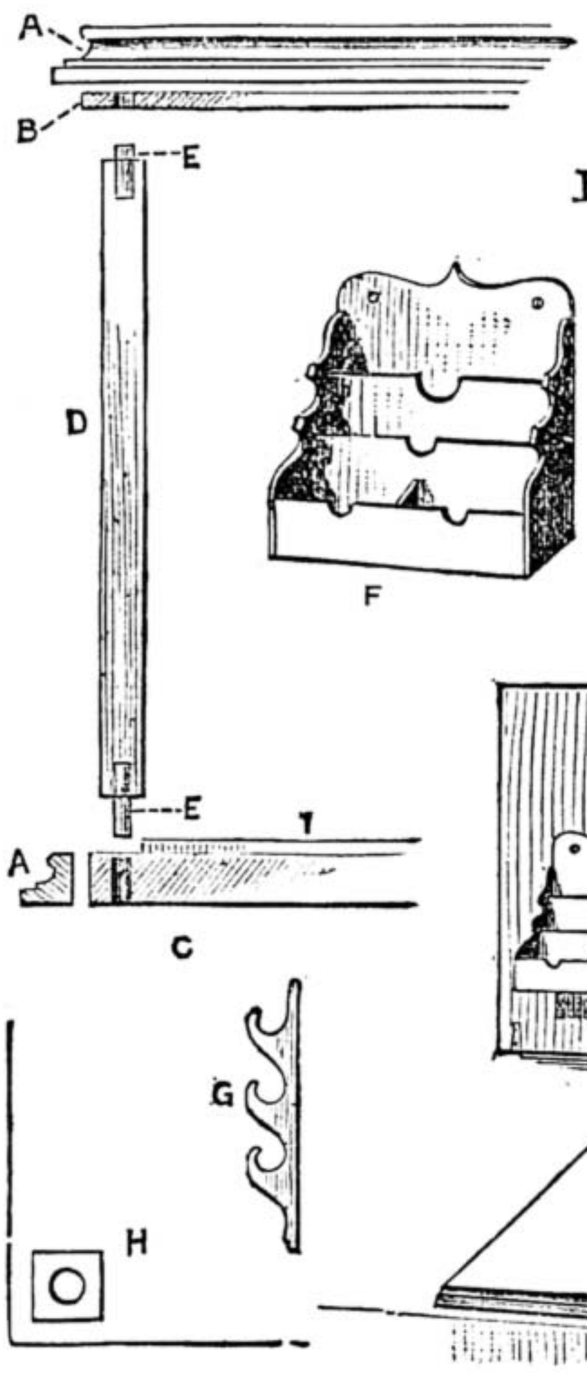
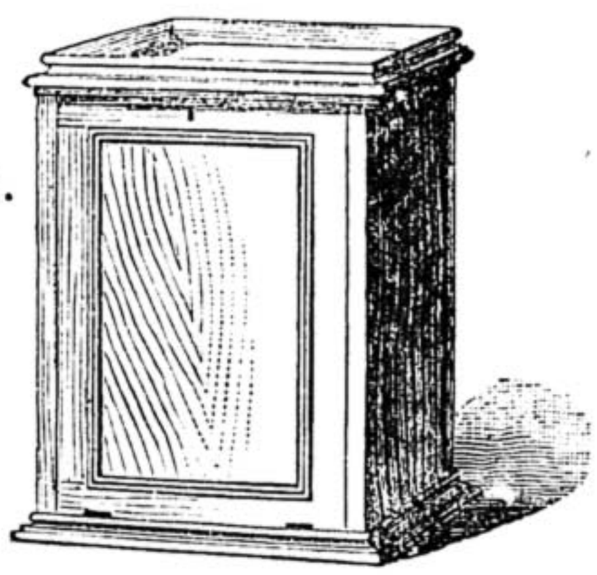


Fig. 1.



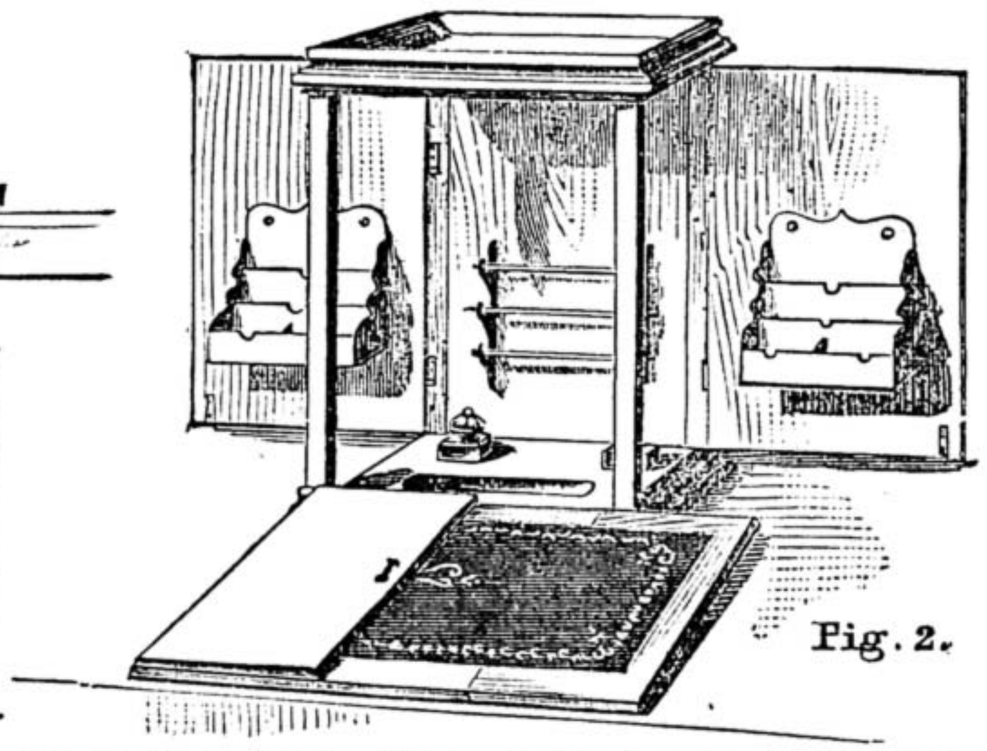


Fig. 2.

Fig. 1.—Simple Writing Cabinet, closed. Fig. 2.—Cabinet open—A, Moulding; B, Top Board; C, Bottom Board; D, Upright; E, Dowel Pin; F, Stationery Box; G, Pen Rack; H, Plan of Sockets for Dowel Pins.

A NOVEL USE FOR JAPANESE FANS.

BY OMADAUN.

FROM the straw bottle-cover upwards there is nothing which in these days is too insignificant to be adorned with art draperies or enamel paint, and so utilised for wall decorations, and we can almost imagine the disgust of the old family china when it finds itself in such company, and can fancy the willow pattern plate casting a contemptuous glance at the wooden spoon which it finds at its side, gaily decked with ribbons, and give an involuntary shudder.

But the Japanese fan stands higher in the social scale of art decoration, and could hardly be objected to by even the most fastidious piece of old Dresden; it is in itself always a pretty and effective decoration, and the addition of a bracket, upon which a vase or other small ornament can be placed, adds greatly to its artistic effect, and is, moreover, a novelty, I think.

The general effect of these Japanese fan-brackets, as they may be called, will be seen from the sketches given. Almost any of the flat fans (not the folding ones) may be used, though some adapt themselves for the purpose more readily than others; and there is such a very large choice, that individual taste must be left to decide upon a suitable pattern and design.

Fig. 1 is an ordinary fan having a cream or white ground, and the shaded part being either in red or blue. The bird was not painted on this fan, but stuck on separately, so that with a little care it could be removed and was replaced to suit the position of the bracket.

Fig. 2 shows another pattern often seen. A small bracket can be placed as shown, and adds greatly to its effect.

Fig. 3, having a suitable design, was utilised as a frame for a carte de visite photograph as well as for a bracket, and when done had a very pretty effect. This fan had a pale blue ground, the design was executed chiefly in black and white, which was lightened with a little water-colour paint, the apple blossom being touched up with pink and gold given to the centres, the bird also being touched up with the same colours, a little gold being given to the wings and head, and the tail painted red instead of black. The gold used was ordinary leaf, being put on with gold size; but bronze powder would no doubt answer the purpose, though it would not perhaps look as bright. A suitable vase for bracket on Fig. 3 is shown at Fig. 3A, which for economy of space is placed within the containing lines of Fig. 6.

In Fig. 4 a suggestion is given for the arrangement of two brackets on one fan, which in that case would have to be rather larger than the single ones, and the back should be a little stouter, so as to admit of larger and heavier ornaments being used.

With these suggestions any one will be able, I think, to select a suitable fan to work upon; so we will now proceed to the construction.

A piece of thin wood (the backing used for picture-frames will do, though it is best to have it a little stouter) must first be cut out the size and shape of the fan it is intended to use. This back must be covered with some plain white or coloured paper, which can be done best with a little paste and glue mixed; but ordinary paste will do, and care must be taken to cover the edge—that is to say, the paper must be cut larger than the wood, and turned over the edge all round. The back is then firmly glued to the fan, and the whole placed under pressure so as to get well set. We can now proceed to make our bracket. This may be of any suitable size or shape, and should be of about ¼ in. in thickness, or rather less, as they must not be made too heavy; but the thickness will of course vary with the size. The shelf and support of the bracket must be either glued or fixed together by fine gimp-pins, and the whole painted to suit the colour of the fan upon which it is to be placed. When the paint and glue have set, the bracket can be fixed in its place. This is easily done by means of three or four fine gimp-pins put in from the back, and through the fan. The position in which

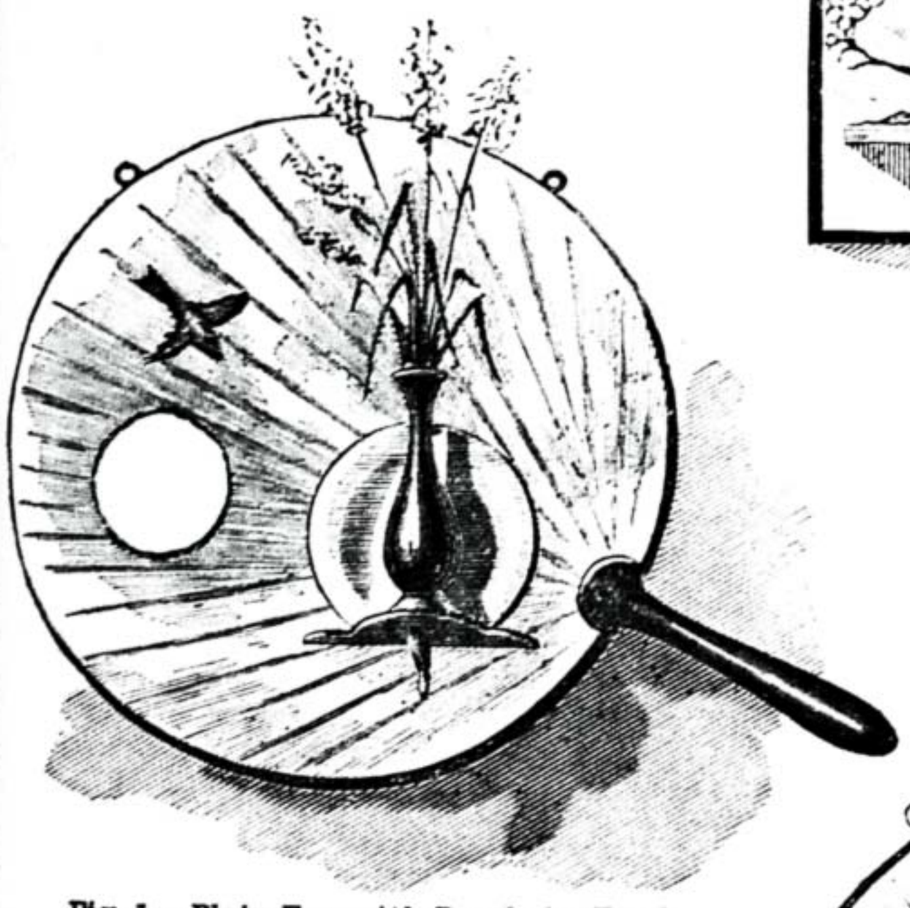


Fig. 1.—Plain Fan with Bracket affixed.

the bracket should be placed will depend very much upon the shape and design of the fan used. If it has no definite design upon it (as in Figs. 1 and 4), it is not very material where the bracket is placed; but in Fig. 3, for instance, the obvious place is at the foot of the tree, as shown in the sketch. The bracket having been fixed in the position decided upon, we have only to provide a means of hanging it up, and our task is completed. For this purpose we cannot do better than screw into the edge of the back two small rings such as are used for hanging up pictures, and here will be seen the advantage of having the back made sufficiently stout to admit of this being done without splitting. The two rings must be screwed in such a position that when hung up the *bracket* may be level, although the fan may not hang perpendicular, as in Figs. 1, 2, and 4.

We have now finished our work so far as a simple bracket is concerned; but if we can find a fan suitable, and desire to utilise it as a photograph-frame (as shown in Fig. 3), we must treat it a little differently. The position of the photograph having been decided upon, the first thing to do will be to cut a piece out of the fan so as to form a mount; this must be carefully done with a sharp penknife. In the fan shown in Fig. 3 an oval was cut, as adapting itself best to the design; but if the design admits of it, any other shaped mount might be cut.

Having done this, a back (of thin wood) must be made as before stated; but there must be a piece cut out of this to allow of the insertion of the photograph. Figs. 5 and 6 will show how this should be done—Fig. 5 being the fan, and Fig. 6 the back.

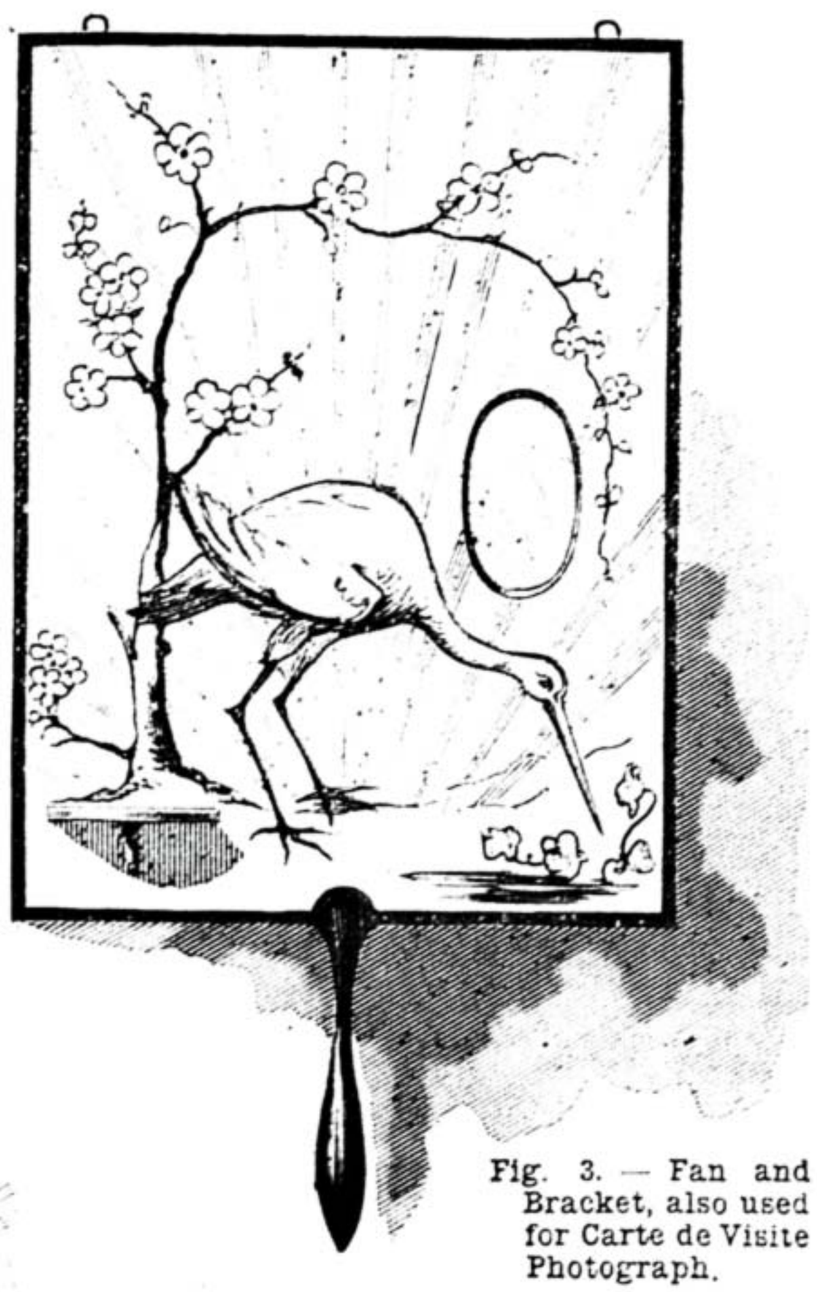


Fig. 3.—Fan and Bracket, also used for Carte de Visite Photograph.

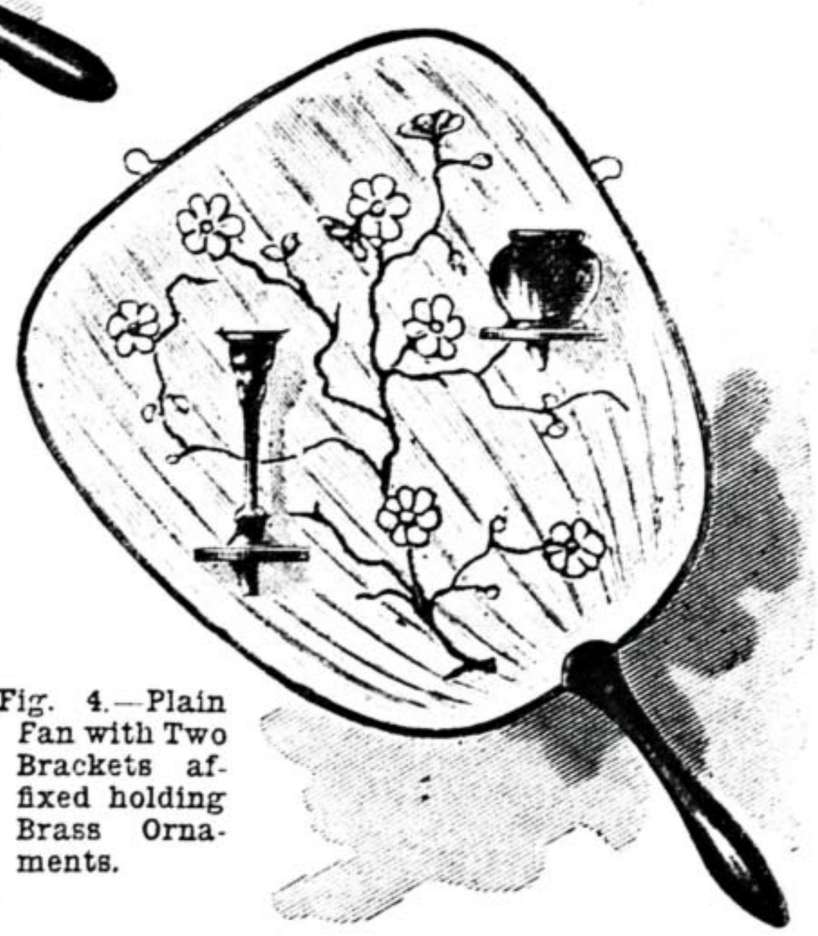


Fig. 4.—Plain Fan with Two Brackets affixed holding Brass Ornaments.

The piece cut out is shown at A, so that when placed at the back of Fig. 5, a rebate is formed (as shown by the dotted lines in Fig. 5), in which a photograph and glass can be fixed in the ordinary way.

The back is now ready to be covered and glued to the fan, and the bracket is fixed in the same way as before directed. The edge of the mount must be gilt—either by using gilt paper, or a little gold-leaf or powder.

The fans can be touched up, if it be

Fig. 2.—Another form of Fan with Bracket.

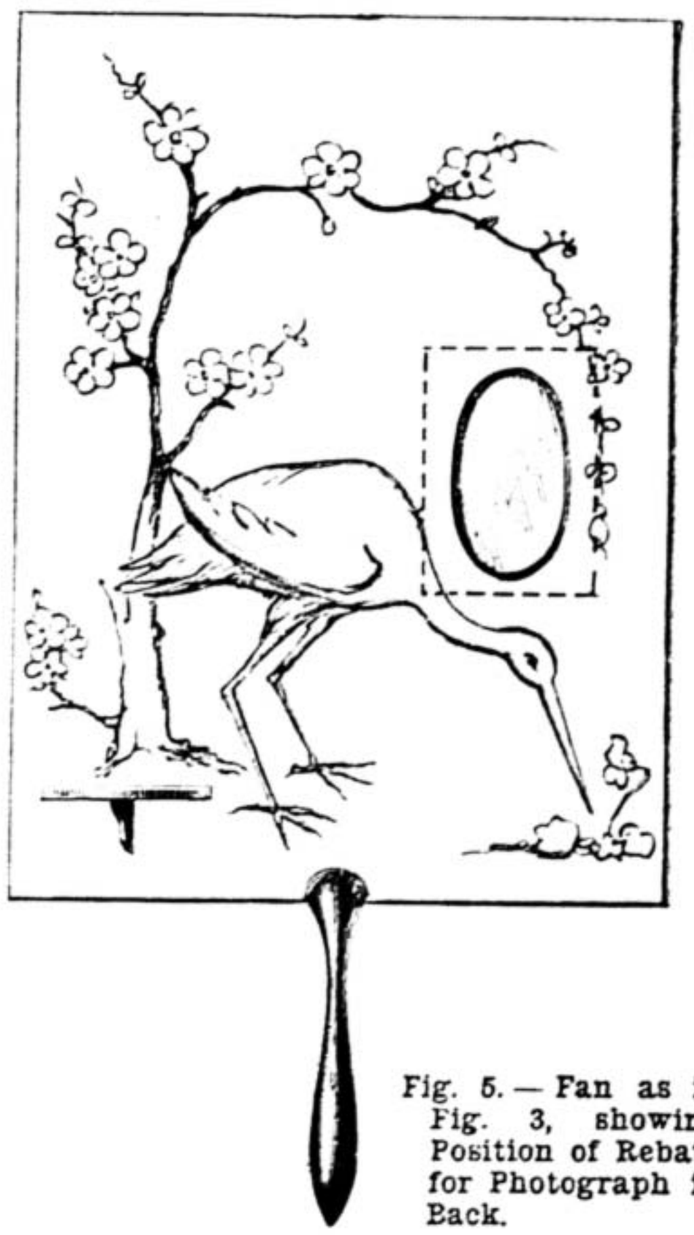


Fig. 5.—Fan as in Fig. 3, showing Position of Rebate for Photograph in Back.

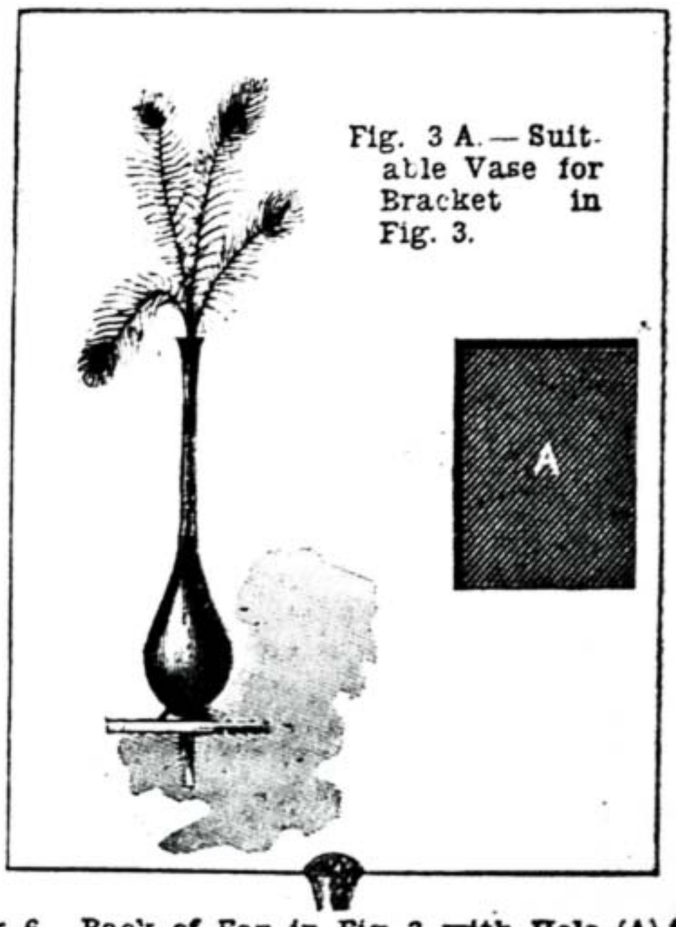


Fig. 3 A.—Suitable Vase for Bracket in Fig. 3.

Fig. 6.—Back of Fan in Fig. 3, with Hole (A) for Photo.

thought necessary, with a little water-colour paint; but this must be done carefully, as it is rather apt to run.

The sketches are given only as guides to those who may wish to make some of these little articles, and with the number of different fans now obtainable can be varied to an almost unlimited extent.

And now we have finished our work. Our little bracket is not very pretentious, but it has the merit of simplicity, and forms a very pleasing little decoration. It is easily made, and will amply repay the worker for the little time expended. The sketches shown in Figs. 1 and 3 have been taken from some which the writer has made himself, very successfully; and if any reader should find a difficulty in following these directions, he will be pleased to render any assistance in his power through the columns of "Shop."

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.*

8.—Hand Power Mortising and Boring Machine.

In building, cabinet making, joinery, etc., the old plan of cutting mortises with a mallet and chisel has been almost entirely abandoned in favour of hand or steam power machines. In Fig. 1 a representation is given of a very powerful Hand Power Mortising and Boring Machine, designed and constructed by Messrs. M. Powis Bale & Co., the well-known saw-mill engineers, of Appold Street, Finsbury, London, E.C., of which I am told that a very great number—amounting, in fact, to thousands—have been sold since its first introduction. The operation of the machine, which is made entirely of iron and steel, will be readily understood from Fig. 1. A reciprocating motion is communicated to the chisel through the medium of the hand lever, which is attached to the chisel spindle by means of links and a cross-head, and to the standard of the machine by a pin. The standard is slotted at the back, and, by slackening a nut, can be raised or lowered to suit the depth of the wood to be mortised. The wood is secured by means of a cramp on a compound table, which is arranged with horizontal and transverse movements, effected by the agency of a rack and pinion worked by the large hand wheel, and by a screw and nut worked by the smaller wheel. By this arrangement the wood can be brought under the action of the chisel at any desired point. It is claimed for the machine that, with ordinary attention, it is impossible to make a mortise out of truth. In fixing the chisel to start work, it should be pressed lightly up into its socket as near square as can be judged, and a light cut made; then reverse the chisel, and see that it falls exactly between the gauge strokes. If it does not do so at the first essay, it must be adjusted until it does. For wedging, it is simply necessary to raise one end of the wood and make the wedge cut before removing the wood from the machine. For boring, the chisel is replaced by an auger, to which a rotary motion is given by a pair of bevel wheels worked by the handle shown in the illustration.

9.—Handy Mitreing Machine.

In Fig. 2 is represented a handy mitreing machine, also manufactured and sold by Messrs. M. Powis Bale & Co. Its action will be readily understood from the illustration, and therefore no lengthened explanation need be given. It is a machine of what may be termed the "guillotine" class, and will cut mitres in wood up to 3 in. in width by 2½ in. in depth.

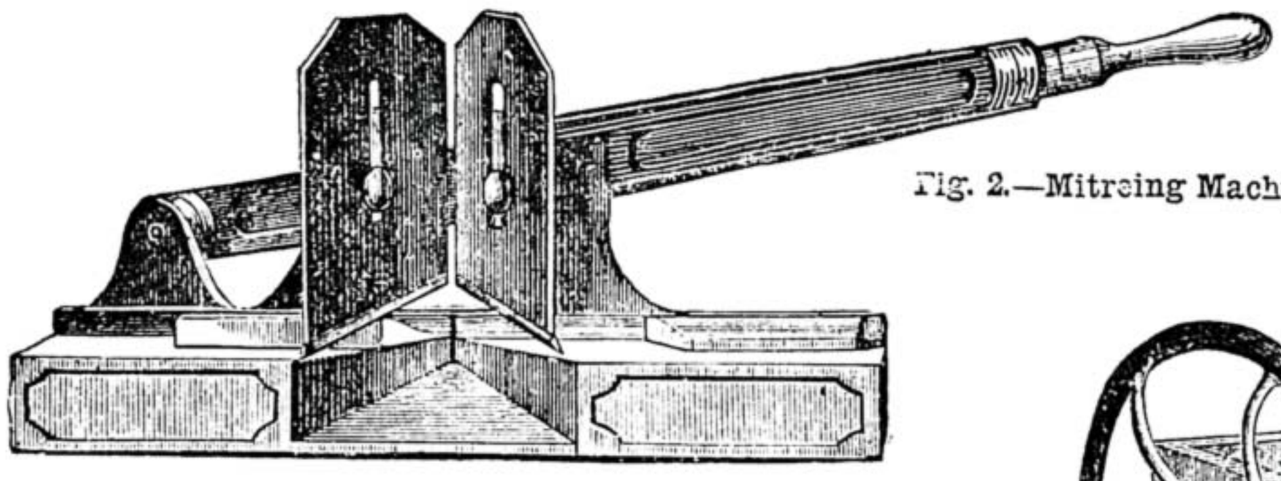


Fig. 2.—Mitreing Machine.

10.—Some More Useful Books.

Lockwood's Builders' Price Book for 1890.—This is a new and most carefully prepared edition of a well-known and highly-valued price book designed for the use of builders, architects, contractors, and engineers, and forming a comprehensive handbook of the latest prices of every kind of material and labour in trades connected with building. This edition for 1890 has been rewritten in great part, remodelled, and considerably enlarged, and has been edited by Mr. Francis T. W. Miller, Associate of the Royal Institute of British Architects. It is published by Messrs. Crosby Lockwood & Co., and containing, as it does, 600 crown 8vo pages, supplied free by post for 4s., it must be regarded as a very cheap book. Its varied contents have been brought up to date throughout, and much useful information has been supplied with reference to electric lighting, ventilation, and sanitary appliances, with recent improved methods of construction and every special feature of modern building. It is claimed, as a manifest proof of its utility and importance to those engaged in the building trades, that every price given has been carefully and thoroughly revised, those for measured work having been calculated entirely afresh. The tables and memoranda relating to each trade will be found most useful, and in the Appendix are given the principal provisions of Acts of Parliament relating to building and sanitary matters, and the various rules and regulations issued by the London County Council, the Corporation of the City of London, and other public bodies. As a reference book in all cases of legal disputes, no book, perhaps, will be found so useful as this.

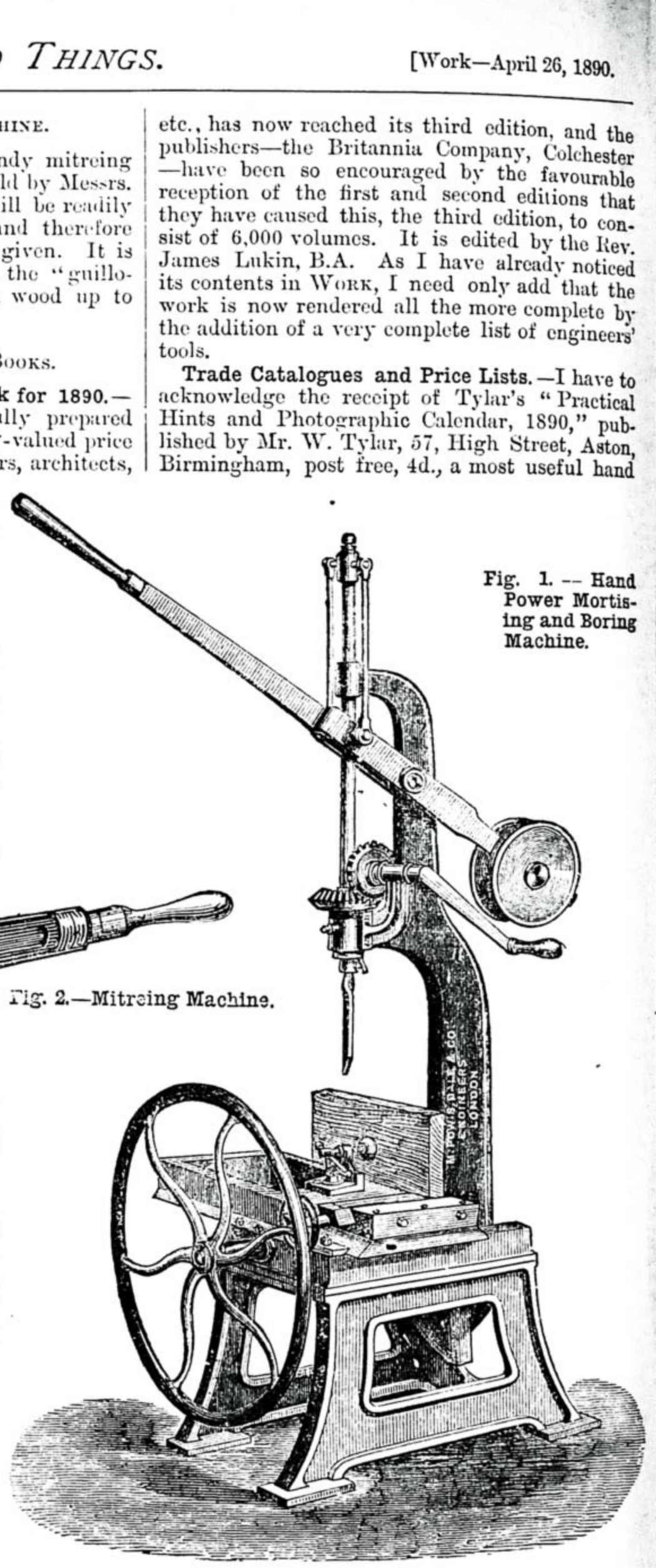


Fig. 1.—Hand Power Mortising and Boring Machine.

Reid's Patent Indexed Ready Reckoner.—This is a very handy and useful form of ready reckoner, showing the value of 1 to 50,000 articles at any given rate from $\frac{1}{16}$d. to £1, published by Messrs. Andrew Reid Sons & Co., Newcastle-upon-Tyne. Its value—and I think I may say its uniqueness—lies in the fact that its margin is graduated after the manner of a ledger index, so that any one who has occasion to make use of it can open the book at once at the table dealing with the price he requires, without the trouble and annoyance of turning over page after page in vain. Nothing can be better calculated for constant use on the tradesman's desk.

Turning Lathes.—This useful and well-written manual, well suited for technical schools and apprentices, and forming an excellent and handy guide to turning, screw cutting, metal spinning, etc., has now reached its third edition, and the publishers—the Britannia Company, Colchester—have been so encouraged by the favourable reception of the first and second editions that they have caused this, the third edition, to consist of 6,000 volumes. It is edited by the Rev. James Lukin, B.A. As I have already noticed its contents in WORK, I need only add that the work is now rendered all the more complete by the addition of a very complete list of engineers' tools.

Trade Catalogues and Price Lists.—I have to acknowledge the receipt of Tylar's "Practical Hints and Photographic Calendar, 1890," published by Mr. W. Tylar, 57, High Street, Aston, Birmingham, post free, 4d., a most useful hand book and *vade mecum* for all who are interested in photography; and the Trade Catalogue of Messrs. H. Binko & Co., Electric Light and Telegraph Engineers, 34, Leadenhall Street, London, E.C., which is equally desirable as a guide and price list for all who are interested in electric lighting and locomotion and telegraphy.

11.—Walker's Turning Patterns—Second Series.

I have very much pleasure in calling attention to the Second Series of Turning Patterns that have been issued by Mr. F. J. Walker, 41, St. Helen's Street, Ipswich. The Series, price 1s. 7d., post free, comprises four sheets and about thirty designs of different kinds, such as knobs for drawers, candlesticks, vases, tazzas, twine boxes, etc. Among them I may specially mention a series of spice boxes of pyramidal form, so to speak, in which each box, excepting the topmost one of the set, forms the cover of, and fits into, the one immediately below it. Any young turner who wishes to have some really good patterns at his command cannot do better than purchase Walker's Turning Patterns.

THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

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

TO OUR READERS.

In consequence of the very heavy demand upon the "Shop" columns of WORK, *and* in order to accelerate as far as possible the speedier publication of answers to questions in "Shop," *the publishers of* WORK *have decided to issue periodically,* and free of charge, *to our subscribers a Four-page Supplement, devoted entirely to "Shop." The first of these supplements is given with the present number.*

I.—LETTERS FROM CORRESPONDENTS.

Fret Machine.—NORTH JACK writes:—"I send a few rough drawings of a fret-sawing machine, hoping they will be of use to some of the readers of WORK. I think Fig. 1 will be understood. At A is shown spear rod; B, treadle; C, diagonal stay; D, driving wheel; E, guide; F, tension chain. Fig. 2 will explain itself. Fig. 3 is the end at which the sawyer sits and works the treadle with both feet; G is fly wheel, to be placed on right side: it is handy to start machine going, and should be about 2 lb. in weight. Fig. 4 illustrates bearings for top and bottom cranks: may be made of sheet brass, cut to the width first and then bent to the required shape and size in vice and between blocks of wood, and may be put on the machine with stout screws, or, better still, small bolts, with pieces of leather between them to allow for reducing when journals wear too small. Fig. 5 is the top crank slide, to be bolted under side bottom arm; it may either be made of iron or brass, with two short pieces of tube to hold them to the distance to suit thickness of crank pin. Fig. 6 shows parts of clamps for holding saws: the top part is shown in H 1 and H 2, the long jaw in H 3, the short jaw in H 4, the thumb screw in H 5; the end view of clamp complete is shown in drawing H 6; two of these clamps will be required. I should advise those that require them to buy a pair ready-made from any of the fretwork importers advertised in WORK. Fig. 7 shows top crank with section of small pulley, also showing a piece of tube to serve the purpose of collar to prevent shaft from playing sideways. On the long end a fly wheel, as shown at G, Fig. 3, which will serve to throw crank over centre. Fig. 8 represents a guide for bottom arm to run in, to keep it on crank when in motion. Two brass plates to be let in each side of bottom arm, to run in slide, as shown at E, Fig. 1. The crank is shown in drawing, Fig. 9, to carry a 12-in. driving wheel, and to be made of ⅜ in. iron. Fig. 10 is a thumb screw for giving the proper tension to saw when in working order. The whole of the timber work of frame I sized and stained walnut colour. If there is anything which cannot be understood, I shall only be too pleased to explain through 'Shop.' The following is a list of timber required to construct the machine:—2 deals, 2 ft. 8 in. long, 2¾ in. wide, 2 in. thick, for uprights; 2 deals, 1 ft. 4 in. long, 2¾ in. wide, 2 in. thick, for feet; 1 pine, 2 ft. long, 9 in. wide, 1 in. thick, for table-board; 2 oaks, 1 ft. 8 in. long, 2 in. wide, ¾ in. thick, for driving-wheel bearers; 2 oaks, 1 ft. 8 in. long, 1½ in. wide, ¾ in. thick, for fly-wheel bearers; 2 oaks, 2 ft. 2 in. long, 1½ in. wide, ¾ in. thick, for arms; 1 oak, 1 ft. 2 in. long, 2½ in. wide, 1 in. thick, for arm piece; 1 oak, 1 ft. 11 in. long, 1 in. wide, ¾ in. thick, for diagonal stay; 4 oaks, 4 in. long, 2 in. wide, ½ in. thick, liners for bearers; 4 oaks, 3½ in. long, 2 in. wide, ½ in thick, liners for top bearers; 2 oaks, 1 ft. 2 in. long, 5 in. wide, 1 in. thick, for treadles; 2 oaks, 9 in. long, 2 in. wide, ¾ in. thick, for table supports."

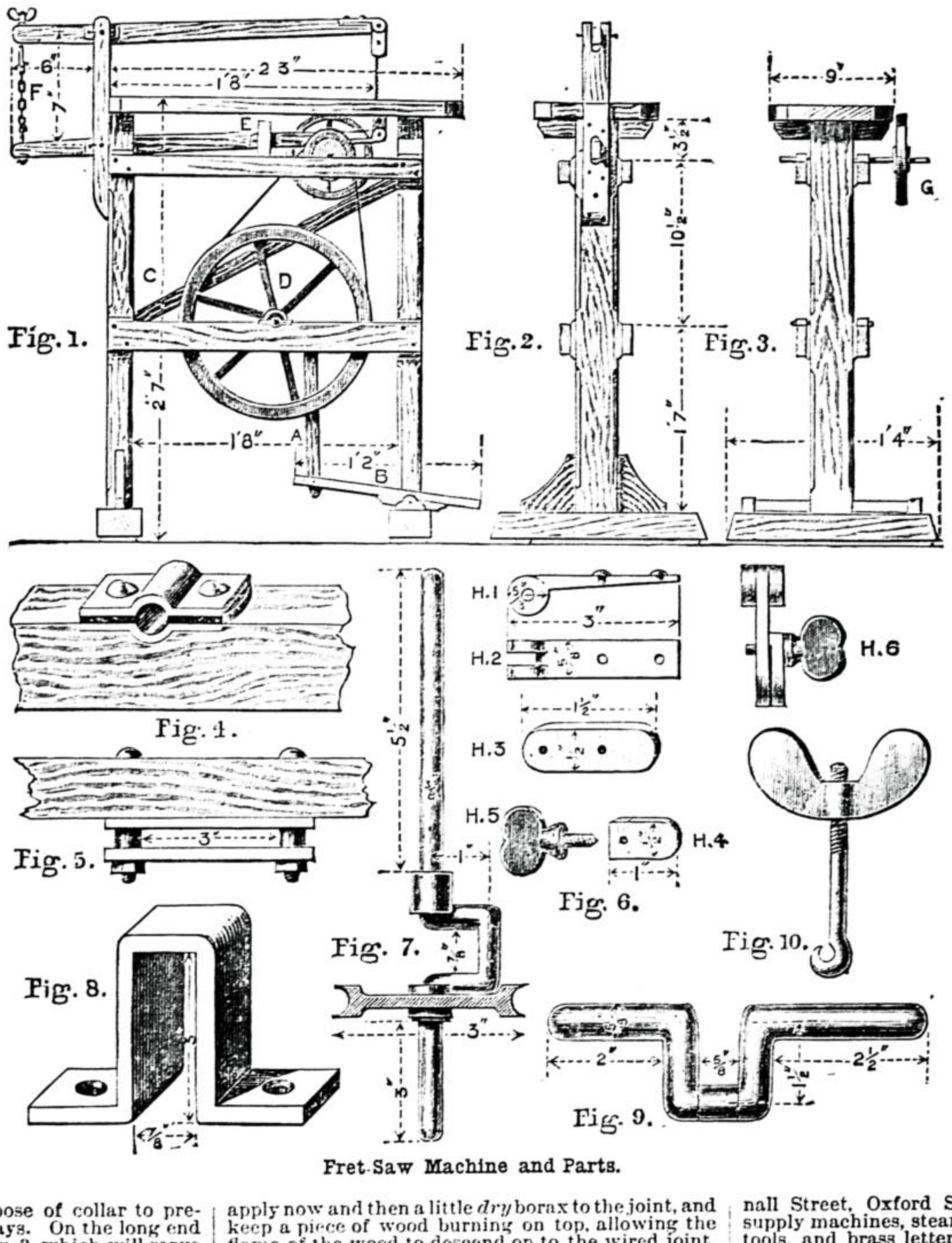


Fig. 1. Fig. 2. Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 10.

Fig. 9.

Fret-Saw Machine and Parts.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Brazing Bicycle Frames.—L. W. (*Manchester*). The most economical method of brazing bicycle frame is with charcoal fire. The blowpipe makes a cleaner job but requires to be large, and have a good force of gas, not less than ½ in. pipe inside diameter. I always use the charcoal fire with a small fan and foot lever for driving it. Borax and spelter, or soft brass wire, or both, are all the materials required for brazing. Bend bits of brass wire about ¼ in. thick round the joints to be brazed; put some spelter inside the tube along with some moistened borax, letting them run down the tube to the place wanted; heat the joint over the clear fire for a little, then apply some of the moistened borax round it at the wire; then place the job on the centre of the fire and keep up a steady blast, and apply now and then a little *dry* borax to the joint, and keep a piece of wood burning on top, allowing the flame of the wood to descend on to the wired joint. When the metal gets up to a red heat, the wire will dissolve, also the spelter inside. When this takes place remove gently from the fire, throw on a little more borax, afterwards some common salt, and scrape off any cinder or scale with a bit of iron, then leave it aside to cool. If there are any bored holes or screwed holes near the joints to be brazed, fill them with clay; this will preserve them uninjured by the fire. I am not aware of any work on brazing large work such as bicycles.—A. S. P.

Model Making and Tools.—J. W. R. (*Cockermouth*).—(1) Taking your questions *seriatim*, you can begin with a very few tools, because you can commence with very elementary tasks. As you develop skill you will find your tools increase, without involving any great single outlay. Model work involves the use of both wood and metal, and therefore tools suitable for each. I will enumerate some of the principal, which you can get one after the other, as you choose: a work bench; and for your lathe, prong and face chucks for wood, point centres, and a slotted face chuck or a dog chuck for metal, and drill chucks; to which you may add a cone plate, an angle plate, and an emery wheel or two; then you will get a few turning tools both for wood and for metal, some drills, and some files; you will want a vice, a cold chisel, a hack saw, a square, callipers, a bevel, scribing block, a scrape, and emery powder and cloth. Then there will be taps and dies, besides a few common wood-worker's tools. (2) To describe the making of a single action oscillating cylinder with its pattern, casting, boring, and fitting would require an article. You might take a hint or two from the cylinder drawn by F. A. M. in the copy of WORK for November 30th, and you can get Pocock's "Model Engine Making," but I would attempt something better if I were you, say a model of an actual slide valve engine. (3) You can get a screw plate and taps suitable for model work for four or five shillings, but die stocks with movable dies are more expensive, and the cheapest would be scarcely less than a sovereign. Drill chucks will cost from half a sovereign to five pounds each; for these you can consult the catalogues. (4) If you mean rods of iron and brass of ¼ in. or ½ in. diameter, you can make a little carrier for such out of a small nut blank, or small metal collar, by drilling a hole on one side and tapping a pinching screw in, but if you mean disc-shaped pieces, these must be variously clamped according to shape in the dog chuck or in the dogs of a slotted face plate.—J.

Metal Castings.—W. D. (*London, N.W.*)—Founders in various white metals are, Osborne & Co., 11, Great Gordon Street, London, E.—J.

Typewriter Ink.—TYPEWRITER.—I am not acquainted with the preparation of the ink used on typewriting ribbons. It is kept a close secret by the manufacturers. If you find the dyes you name are not permanent, but that your experiments are otherwise successful, why not use a carbon instead of an aniline pigment? I fancy you would find gas black durable enough.—D. A.

Staining.—MUSICIAN (*Laisterdyke*).—You cannot do better than use a stain composed of Vandyke brown, ammonia, and water to make your American white-wood walnut colour. Mix the brown with sufficient liquid ammonia to form a thin plate paste, then add water to liquefy.—D. D.

Gold Bevel-Edged Mounts and Cards.—C. T. D. (*Sheffield*).—The bevel edge on these cards is done by special machinery, and requires a special stamp and die for every shape. Nearly the whole of this work is done in France and Germany, and the English manufacturer cannot compete with his foreign rivals neither as to quality or price. Gilding the edges with gold leaf is a tedious process, and requires much practice and skill. Surely C. T. D. does not think of going in for home manufacture in these goods, he can always buy them in the finished state much cheaper. Gold blocking for window-ticket purposes, both in letters and figures, is done by Surflen & Clarke, 3, Bucknall Street, Oxford Street, W.C., who may also supply machines, steam and hand. For machines, tools, and brass letters apply to Kampe & Co., 78, High Holborn, W.C.; or Knight & Cotterill, 9 and 10, St. Bride's Avenue, Fleet Street, E.C.; and for embossing presses to Baddeley & Reynolds, 19 and 20, Old Bailey, E.C.—H. L. B.

Tempering Steel.—BLACKSMITH (*Liverpool*).—Get your steel to a low red heat, and quench it in water; then bring it to a purple colour and quench it finally in water. The first operation hardens, the second tempers, but the details of the process and the different shades of purple will vary with the size of the tool, its purpose, and the quality of the steel; and much of this can only be learned by experience. In by far the majority of cutting tools the cutting points only require to be hardened, the body being better if left soft. In all such cases the precise method adopted is as follows:—Say it is a cold chisel or a drill. At a low red heat the cutting point only will be plunged into water to harden it; on its removal, the tool being still held in the tongs, the smith observes the gradual change of colour in the point caused by the transmission of heat thereto from the shank. The latter not having been quenched, retains sufficient heat in its body to raise the temperature of the point to the precise shade of purple or straw required. Then the point is quenched again. If the shank still retains excessive heat the process may be repeated a second time, but usually in tools of moderate size the entire work is

plunged beneath the water. Now there are two or three cardinal points, little matters some would deem them, which affect results very materially. All scale left from the forge should be filed or ground off before hardening. Also, in taking a tool from the fire the slight film of oxide which then appears should be rubbed off with a bit of stone, and the point wiped with a bit of waste, so that the rapidly changing colours may be readily apparent. Also cutting tools should be plunged vertically, never diagonally, into the water. The steel should never be overheated, excessive heat will burn and spoil it. The fire used should be clear, and in small work it is better to make use of the heat of an iron bar, first made red hot in the fire; the temperature imported by this to the tools when laid upon it is more readily observed, and more under control than that of the fire, and is less injurious to small tools than the sulphurous fire.—J.

Small Wheels for Engines.—W. D. (*Scaforth*).—I suppose you mean fly wheels. If so, you can get them of any model maker, as Bateman, or Lee, both of High Holborn; Mills, of Sunderland; Stiffin, who advertises in WORK, and several others.—J.

Rubber Stamps.—W. D. (*Scaforth*).—You will have seen that an exhaustive paper on "India-rubber Stamp Making" appeared in No. 38 of WORK. The first step will be to fix the letters composing the name, or whatever it may be, in a small iron frame. By means of a soft brush, the type, as well as all the surrounding parts, should be well oiled. Then mix some plaster of Paris to a consistency of pap, and pour it over the type, and, with a stout brush, drive the plaster into all intricate spaces and interstices, until all details are thoroughly covered. After this the remaining plaster is poured in, until the frame is filled. In a short time the plaster will be sufficiently hardened to be removed from the mould. The plaster should then be baked in an oven for a period of from four to six hours. When taken out, give it a coat of shellac, to impart smoothness and strength. Then masticate pure indiarubber with from five to ten per cent. of sulphur, and place over the plaster cast. But as the caoutchouc has a tendency to return to its previous shape, it must be subjected to another process. The caoutchouc being pressed on the plaster should be subjected to a heat of from 250° to 260° Fahrenheit, for about half an hour. Remove it from the plaster and it will retain the impression, and be ready for use.—J.

Glasses of Telescopes.—A. C. (*Edinburgh*).—I can see no objection to your attempting to make the little Galilean telescope—for that is what it amounts to—and I will answer your questions *seriatim*. The principle of construction is, as you suggest, a double concave lens and a concave eye glass; but the best result would be obtained with a convexo-plane object glass and a concavo-plane eye glass, placed apart at a distance equal to the difference of their focal lengths. The magnifying power can be approximately ascertained by dividing the focal length of the eye glass into that of the object glass. Thus, if the object glass be of 4 in. focus, and the eye lens of 1 in., the power will be $\frac{4}{1} = 4$; or, with an eye lens of $\frac{1}{2}$ in. focus, $\frac{4}{\frac{1}{2}} = 8$. This will enable you to decide for yourself what combination of lenses will give you, taking all your desires into consideration, the greatest power. The diameter of the object glass in a Galilean telescope has nothing to do with the magnifying power, but with the field of view. If you can be content with a limited field of view, you may have a small object glass. There is no necessity for the eye glass to be greater in diameter than the fully distended pupil of the eye, but it should not be smaller. I should advise you to try your hand at a single little telescope first. I have seen one, such as you evidently want, so constructed as to shut up in the space of an ordinary watch; though if you have not a lathe, I fear you will find it almost impossible to connect the tubes. In ordering the lenses, be very careful to order them "edged and centred." So far as price is concerned, I cannot help you: opticians differ. If you write to H. & E. J. Dale, of Ludgate Hill, London, E.C., and tell them the focus and diameter of the lenses you want, they will, so far as my experience goes, assist you. The two lenses for a single telescope, non-achromatic, should not cost more than half a crown or three shillings. If the object lens be desired achromatic—which means better definition—it will cost more.—E. A. F.

Staining.—J. M. (*Gateshead*).—You do not state what wood the table you wish to stain is, but, presuming it is pine, you cannot do better than use Bismarck brown alone if you want a bright red mahogany colour. By adding Vandyke brown you can modify the colour to almost any extent. To get a really fine rich dark mahogany, the best way is to stain with weak walnut stain and then French polish with red polish. Do not attempt to make your own varnish, as you can buy it better and cheaper than you can prepare it.—D. A.

Polishing.—W. H. (*Ashton*).—See above answer to J. M.'s inquiry on "Staining," as it also replies to your question. Before using polish, go over the wood with a coat of size. This will be found a very good filler for pine.—D. A.

Staining Wardrobe.—J. R. (*Skerries*).—See answers to J. M. (*Gateshead*) and W. H. (*Ashton*) on staining and polishing.

Griscom Electro-Motor.—W. D. (*Leeds*).—A Griscom motor to drive a sewing machine should have a diameter of 6 in.; length of field magnets, 4½ in., wound with 1 lb. No. 18 d.c.c. wire, to form consecutive poles; length of armature 3 in., diameter 1½ in., Siemens H girder pattern, wound with three oz. No. 20 silk-covered wire. This will take the current from six large bichromate cells, gallon size, to develop enough power to drive a sewing machine. As you have never seen a Griscom motor, I should not advise you to make one, since I cannot now spare time, nor have I space at my command, to fully describe and illustrate such a motor. Even if I could do so, I am not sure you could succeed in making one, as every part of this machine must be well made, proportioned, and fitted by a skilled workman to render it at all effective.—G. E. B.

Converting Bicycle Bell to Electric Bell.—C. L. (*Glasgow*).—The gong or dome only of the bicycle bell could be utilised in making an electric bell. Directions for making all the other parts of the bell were given on page 180, No. 12, Vol. I., and page 279, No. 18, Vol. I. You should choose the dimensions for wire and parts given in the first line of the table on page 180 for a 2½-in. bell. On page 279, Vol. I., will be found full-size illustrations of the necessary parts.—G. E. B.

Process Block Making.—F. J. T. (*Bristol*).—No doubt F. J. T., if he is a careful reader of WORK, will have ere this seen our reply to J. W. S. (*Sheffield*) on this subject. We may add that process blocks, even when done by the very best workmen, are not to be compared with even cheap wood engravings, being devoid of artistic feeling and too shallow and hard for good printing.—J. W. H.

Fret Lead Glazing.—P. S.—(1) The best iron I have met with for soldering the above is one made by Fletcher, of Queen Victoria Street, London, and Warrington. I send herewith a rough copy from their catalogue. It is heated by an atmospheric gas burner; A is the flame, which is continually heating the copper bit; B, the tinned end; C, hook

Fret Glazing Iron.

for hanging up when not in use; D, inlet for air; E, wood handle; F, connection for indiarubber tube; so that all you have to do is to take off the burner from any ordinary gas bracket and pass the tube over the nose-piece and the nozzle at F, light the gas at A, and the iron will be ready for use when sufficiently heated. (2) Be sure that the points of contact of your lead cams are clean, and a dab of tallow will be all that you require in the way of flux. (3) As you only seem to require to do very small jobs, common black putty will be sufficient for stopping in the glass to prevent rattling.—E. D.

Phonograph, Where to Purchase.—PHONOGRAPH.—Edison's latest phonograph is not yet on sale, and it is extremely difficult to procure one. The European agent hires them out and generally sends a demonstrator with them. The hire is something like £20 or £30. I am pleased to see you take an interest in the phonograph. It is truly a wonderful instrument, and when the day comes when it will be in general use what a saving of time and labour it will effect to the merchant. By the way, do you want the instrument for experimental purposes? If so, why not make one, it is just the kind of work for workmen who have brains. I have made one, and will send, by-and-by, an article with working drawings (subject to the Editor's approval) for the pages of WORK.—W. D.

Cutting Edges of Books.—H. S. (*London, E.*).—There is no special tool for cutting the edges of books, unless we go to the bookbinder, who has machinery for the purpose; a sketch of a cutting machine would be useless for your purpose. If you are going to try and cut them yourself all you require is a shoemaker's knife and a straight-edge to cut against. You will find this operation fully explained in No. 17 of WORK. Any bookbinder will oblige an amateur by cutting his book-edges for a few coppers, and as this is really a difficult matter for the amateur to do himself, I would certainly advise him to get his books cut by a binder.—G. C.

Organ Building, Books on.—R. E. (*Derby*).—You will find useful works on organ building in "Practical Organ Building," by Dickson, 2s. 6d. (Lockwood & Co.); "Organ Building," by Wicks, 3s. 6d. (Ward, Lock, & Co.).

Weight of Iron and Steel.—R. N. (*Cornwall*). The weight of wrought iron 12 in. wide by 2½ in. thick is 100 lbs. per foot run, and steel of the quality used commonly for bridge work, 102 lbs., or 2 per cent. more. The crushing strength of *very short pieces* of wrought iron is about 18 tons per square inch of cross sectional area, but the resistance to compressive force decreases rapidly with increase of length, in accordance with the formula

$$f = \frac{18}{1 + \frac{r2}{3000}}$$

in which f is the breaking load per square inch of sectional area in tons, and r is the length divided by the diameter or least width. For very short pieces of steel the resistance to crushing will vary from 30 to 40 tons per square inch, according to the make of the steel. In taking out weights of wrought iron it may help you to remember that a square foot of iron ¼ in. thick weighs 10 lbs.; also bars weigh 10 lbs. for each square inch of section per yard of length. Cast iron is 2½ per cent. lighter than wrought iron.—F. C.

Darkening Mahogany.—C. Q. (*Bethnal Green*).—The process of darkening mahogany by ammonia, or as it is commonly called fumigation, is exactly the same as that adopted when oak is to be darkened by the same means. As you state you are a French polisher I presume you are acquainted with this, so that it is unnecessary for me to explain *my* process for darkening mahogany—in fact, I have not got one of my own. I am quite at a loss to understand your assertion that ammonia does not darken mahogany nor change the colour in the slightest degree, except sometimes making it slightly pink. Perhaps if you were to explain the process you and your unsuccessful friends have adopted I might be able to state the probable cause of failure. I daresay you are aware that some kinds of oak are not susceptible to ammonia vapour, but surely you would not on that account say that oak cannot be fumigated. I may also assume that you are acquainted with the difference between cedar and mahogany, and that you have not mistaken a piece of the former for the latter. Possibly your ammonia has not been strong enough, but if you get this in the Winchester quarts I can only suppose you have mistaken some wood for mahogany. Get a bit of good hard wood, not the soft colourless stuff which is so often used in your district by the makers, not stuff without figure which requires to be raddled before it is taken out on the "buzz," and subject it to the vapour of '880 ammonia, and you will soon see that it darkens. I may tell you of a plan I adopt as a test when I want to see if a piece of wood can be fumigated; I do not know that it is a new one, but the hint may be useful to you as a polisher, as I don't think you know much about fumigation. Get a piece of wood cleaned up on at least one side, take the stopper out of the bottle, and lay the wood over the mouth. The vapour of course will be strong, and if the wood can be darkened it will very soon show a patch of altered colour. A small bit of wood will do, anything large enough to cover the bottle's mouth. On a larger scale you can try by pouring some of the ammonia into a cup and covering the top in a similar way. Certainly mahogany can be stained and polished to exactly match the oldest wood, but you know that a liquid stain has some objectionable features, though I am not aware that I have ever endeavoured to inculcate the notion that they should never be used, and I think if you read the passage which you quote you will see that it cannot be construed as anything but a suggestion. We do not know how wood which has been artificially stained will look after a length of time, but it is only reasonable to suppose that it will not look the same as that which has darkened naturally. Something more will probably be said on this point in the forthcoming articles on polishing, as their author is well acquainted with his subject, so that the valuable space of "Shop" need not be further taken up at present. I cannot, however, agree with your assertion that as "the wood itself gets darker the stain fades out." It may do so to a certain extent, depending on the nature of the stain, but surely you would not wish one to infer that a wood whose colour has been changed by chemical means can revert to its original condition plus age. If the stain were of the nature of a paint, not chemically changing, but simply mechanically colouring the wood, and such as would become colourless and invisible, the case might be different, but I am not aware that our knowledge of stained wood goes sufficiently far back to enable any one to state positively how artificially darkened wood will look after the lapse of a century. It might be interesting to many others, and it certainly would be to me, to know within what period of time you have noticed the changes you say take place, with particulars of the stain and wood—perhaps you will kindly supply these particulars. Ask any questions you like about the sideboard, though surely, as a professional French polisher, you have sufficient acquaintance with furniture to enable you to overcome any difficulties of constructive details. A "professional" French polisher and an "amateur" cabinet maker in one person seems rather an anomaly. As the former you must have had so many sideboards through your hands that surely you know all about them; nevertheless, ask if you are in a difficulty.—D. D.

Emery Wheels, etc.—T. J. W. (*Swansea*).—You will find it best to buy your emery wheels; you are hardly likely to succeed in making them, and should one fly in pieces it might be awkward. The surface velocity should be 4,000 to 4,500 feet per minute, and for tools and small work the wheel should run in water to prevent over-heating, but the wheel should not be left in water when at rest, otherwise the immersed part may become soft. Crocus and similar polishing powders may be used with oil with advantage upon a wheel or lap made of lead and antimony in the proportions of 9 parts by weight of lead to 1 part of antimony. You can melt over an ordinary fire by melting the lead first and then adding the antimony, which, although requiring a higher temperature by itself, will dissolve in the molten lead.—F. C.

Elastic.—NERVINE (*Chesterfield*).—Your query is somewhat vague, since uncovered elastic is sold in different forms at toy-shops, but probably you will

be able to procure what you require if you apply to the India-rubber, Gutta-percha, and Telegraph Co., whose head office is at 106, Cannon Street, London, E.C., and who have a branch establishment at 64a, High Street, Sheffield.—QUI VIVE.

Currying Leather.—G. S. G.—The business of finishing or currying leather for shoes, harness, etc., is not one about which there is much to be told. The tanned hide, placed against a suitable support known as a beam, is pared down on the flesh side to the proper thickness with a currier's knife, in which the cutting edge is at right angles to the blade generally. It has then to be soaked in water, stretched on a table, and worked with a stretching iron. It is thus freed from lumps and such-like irregularities, and is ready to be smeared over both on the hair and flesh sides with tallow and fish oil, and is well worked with proper tools. Finally the colouring on the hair side is commonly given by laying on a mixture of lampblack, oil, and grease. We do not call to mind any useful text-book on currying. Possibly some reader of WORK may be able to help G. S. G. to the title of such a work.—M. M.

Book Cutter.—J. C. S. (*Upton Manor*).—I have already given a description of how a book may be cut with a knife and runner in WORK (see No. 17, Vol. I.), also sketches and detailed instructions to make a plough to be used in conjunction with the lying-press (see No. 45). If Samson reads these up he may be able to get what he wants.—G. C.

Gold, Silver, Brass, and Copper Solution.—BRASSWORKER (*Birmingham*).—Full information will be given in WORK on how to make up gold, silver, brass, and copper solutions for plating on all kinds of metals, but the instructions will have to be given in separate articles, each dealing with its own special subject, as in that on "Brass and Brassing." Gold, silver, and amber lacquers are bought by us made up ready for use by men who have convenience for making them and know how to make them. If you will call on Messrs. J. E. Hartley and Co., 13, St. Paul's Square, Birmingham, they will show you a variety of excellent lacquers for lacquering gold, silver, brass, or any other metal. Their transparent Kristaline is a splendid article for lacquering silver-plated ornamental goods to protect them from tarnish.—G. E. B.

Phonograph.—PHONO (*Sheffield*).—To give a detailed description of Edison's latest phonograph would occupy more space than could be spared in this column. I would therefore advise PHONO, if he is particular to have a description of this special instrument, to go to the free library of his town and look up the volume of "Patent Specifications" for the year 1888. But I may say that the latest or "perfected" phonograph, as it is called, differs but little from the first instrument of this kind produced by Edison. The phonograph is intended to *record* and *reproduce* speech, and in the perfected instrument this is accomplished by means of *two* needles attached to their respective diaphragms or tympanums. The one needle cuts the sound waves in the cylinder, and the other, which is differently shaped, reproduces the vibrations, and consequently the sounds. It has a further difference of being actuated by a motor with a battery. The cylinder is also different, but what these cylinders are composed of it would be difficult to state definitely, as some accounts give paraffin wax as the material employed, whilst others have it "a hollow tube of cardboard covered with wax;" another description gives it as a soft substance composed of wax and resin. And whilst Col. Gourand was introducing this instrument to the British Association he said that "he had lately received a telegram from the inventor stating that 'wax was out of it,' and that another and better material had been discovered which was not affected as wax was by a change of temperature." As the phonograph, in its present perfect condition, is not yet on sale, but only let out on hire at a very high rentage, I think it would be a difficult matter to obtain the cylinders, as they are only made use of by those who rent the machines. But if PHONO cares he may write to Messrs. Mawson, Swan, & Morgan, Grainger Street, Newcastle-on-Tyne (who had one of these instruments on view during the sitting of the British Association in that city); they *might* give him the desired information on this point. I trust that this querist will not think me wanting in courtesy. I always endeavour to give all the information I can on any subject that comes within the range of my knowledge, but I have a natural aversion to describe "patented" articles—articles such as the one under discussion, which is, so to speak, covered from head to heel with patents. If PHONO only wants a phonograph for experimental purposes, or for the purpose of amusing an audience, he will find that the old form with the cast-iron cylinder covered with tin-foil will answer as well as the much vaunted perfected instrument. I hope to give an article shortly on this subject, and to supply working drawings which will enable any one to make a reliable phonograph for the above purposes.—W. D.

Cheap Home-Made Machine for Cabinet Makers.—ARTISAN.—I am sorry that space forbids your letter to be published in full, because the opinions expressed very closely coincide with my own, particularly those with reference to the tendency perceptible in some quarters to sink the individuality of the workman and make him merely an adjunct to a machine. I can't quite agree with all your views, but you write in such a manly, straightforward style that it is a pleasure to receive them. I cannot take such a gloomy view as you do of the commercial prospects for a cabinet maker who cannot avail himself of machinery. Certainly in making some classes of furniture this is being largely used, but then, even when it is, the skilled hand of the practised artisan is generally required to a very considerable extent. When all is said in support of your view the fact still remains that the vast proportion of furniture used in this country is not machine made, and certainly the best is not. Mouldings may be struck, and parts of the work done by the aid of machinery or appliances which, to a great extent, facilitate operations, but the great bulk of the cabinet making details depend on the craftsman. If there is any ground for fearing the decline of sound cabinet making, I think it is rather to be apprehended from the immense quantity of inferior furniture which is made in London and sold to dealers in the provinces. The chief merit of such furniture in the eyes of the public, the ultimate buyers to whom it is sold by cabinet makers (?) or house furnishers, is that it is low priced when compared with sounder work. The great majority of the public are utterly unable to judge of quality, and of course when they see two things equally pretty, or what they consider so, they naturally buy the lowest priced. Were they more discriminating they would realise that the low priced stuff, made as it is, cannot be of even proportionate value when compared with that made in a good, though small, provincial shop. I have met with many men in provincial cities who are under the impression that the low price at which some London furniture is sold—and much of it you are aware is quite as good as that made elsewhere—is owing to the use of machinery. Possibly this may be your notion if you are not personally familiar with the conditions under which the trade is carried on, or rather under which the goods are made, and I may explain for your consolation that the sole reason for any advantage in London value is because the work is so much subdivided. You probably are able to turn your hand to making anything, from a sideboard to a dining table, even frames (chair) perhaps, or at least most of the furniture required in a house, but were you working for the "trade" in London you would confine your attention to one class of article. You would, after a fashion, grow very expert in making these—though whether you would make them in the best way is another matter altogether—and of course you would make more of them in a given time than you can now, hence they would be lower in price. I think you will find, if you consider, that it is only in the production of the everyday run of stuff, say a 4 by 8 mahogany diner of the commoner class, that the small man who makes everything he sells in his own shop is handicapped by price, for out-of-the-way things, or even things of special design, can be made quite as favourably by him as by any so-called wholesale house. The great bane of the cabinet trade, therefore, is the demand for low priced rubbish by the public and the facilities with which they can obtain it. When buyers are able to recognise the difference between good and bad articles they will buy the former even if it be more costly, and I regard WORK as a powerful educator in this respect, and an important factor in elevating and maintaining our artistic handicrafts to a higher standard. As you say, I know the needs of the trade, and so long as I have the honour to be connected with this magazine my knowledge is at its disposal to the best of my ability, and you need not apologise for "buttonholing" me "on our mutual meeting ground, 'Shop.'" I have given my views at some length, but I fear I cannot help you in devising such a machine as you suggest. The bare notion of a contrivance which could be made by the user, not too costly, more speedy than hand labour, and capable of doing sawing, grooving, tonguing, rabbeting, chamfering, moulding, scroll sawing, boring, and turning, takes away one's breath. It might be desirable to have this, but I do not see its practicability nor how I can help you. There are comparatively inexpensive machines which will do several of these operations, though perhaps not on the same machine. For instance, there is the circular saw, etc., of the Britannia Co. of Colchester. This, with one or two other small pieces of machinery workable by hand or foot power, such as a lathe, would be a good outfit, and leave a good deal of change out of £100. The same company advise me they are just producing an appliance to be added to lathes for striking mouldings, and from what I hear it ought to be useful to you, but I have not seen it.—D. A.

Stencil Cutting, Sheet Metal Work, etc.—J. F. (*Elgin, N.B.*)—It is very good of J. F. (No. 33, page 524, Vol. I.) to say that he has nothing to say by way of correction of the method given by myself (page 361, Vol. I.). It would have been strange if he had, considering that it is the method usually adopted by practical men. With regard to the method J. F. puts forward as simpler and quicker, I maintain that it is neither the one nor the other. I will even go farther and say that it is utterly useless and impracticable for *general work*. With stencils of such small dimension that they can be placed over a *basin*, I have very little to do. The kind I am in the habit of making are those used by grocers, maltsters, brewers, hop merchants, farmers, etc., varying in size from 9 by 12 to 36 by 50, and even larger, some with designs or trade-marks in the centre, and perhaps thirty or more letters. With such as these J. F.'s method is impossible, which I will proceed to demonstrate. In both cases the letters have to be marked off first, as I presume that neither J. F. nor the ordinary average workman is sufficiently skilled to leave properly formed and spaced letters on a blank ground by painting round without some guide. Now this said painting or filling in is going to take a long time, as it must be done with great care, and the smaller the plate the more difficult it becomes; in fact, I very much doubt if any one not skilled in the use of a fine lining brush could do it at all. Now while this painting process is going on, any one used to the work would have cut the letters out, or very nearly so. So much for the quickness of J. F.'s method; now for the superiority of it. The corners have now to be turned up, and then soldered, and then comes the most ludicrous part of the whole affair, namely, the pouring in of a quantity of raw spirits and salts. Now let us consider for a moment the result. In the first place a waste of spirits; in the second place we have the fumes of the spirits, offensive to the nose and injuring everything they come in contact with; thirdly—ah! let us look at the plate after the zinc has been on a short time, and what do we see for thirdly? We see that, owing perhaps to the zinc being a trifle thicker in some places than others, or to impurities in the metal, or both combined, we see, I say, that two or three holes have been eaten in some part of the plate and let all the spirits out. What is to be done now? The rest of the plate not half eaten away! The only thing to do is to wash it out and finish in the ordinary way, which will take just as long as if it had been done that way at first. And even supposing that the spirits did eat it all out equally, when we look at the extra trouble of painting, turning up edges, knocking down again, cleaning off paint and the general "messiness" of the whole affair, I think it will be quite clear in the minds of all who can "read, mark, learn, and inwardly digest" facts, that J. F.'s method is no good for practical men or real work. With regard to the latter part of J. F.'s letter *re* "Sheet Metal 'Workings,'" as he terms it, the articles are framed on a plan suggested by our Editor, and considered by him and myself also to be the best for the general readers of WORK. J. F. says, "It is all very well those lessons on soldering for amateurs, but it won't do for those who have learned or are learning the art." Precisely so, J. F., but won't you give the amateurs a chance, and wait and see if anything will appear that is of use to yourself and others more advanced? Why it is even certain that when I have finished my subjects some one will have read them who knows as much as I do, as I do not profess to have any exclusive information. What I know I am willing to impart to the readers of WORK, and if J. F. does not find anything to learn in my articles, I am certain that many others will.—R. A.

Phonograph.—WAX CYLINDERS.—See above reply to PHONO given on this subject.—W. D.

Taking out a Patent.—J. S. (Patent Agent) is thanked for kindly pointing out an oversight in the above-named article. By a slip of the pen I referred to "Form A[1]" in a manner which might lead to the inference that upon it application might be made for protection in the colonies. It is not for this purpose. As J. S. obligingly points out, inventors in this country cannot obtain such protection through our British Patent Office. "To obtain protection in the colonies involves separate and independent applications to each of the British Colonies, and these have all separate patent laws differing more or less from each other, and involving of course separate modes of procedure." Form A[1] is a form of application for inventors in the Colonies or foreign countries who seek protection in Great Britain. J. S. is, moreover, apprehensive that what I have said with regard to the application of the word "Patent" to inventions which are only provisionally protected, may lead the inventor into danger. On this point I do not share his fears. The practice was plainly stated to be *illegal*; and all must know that an illegal act, however common, is only to be done at the personal risk of the man who does it.—C. C. C.

Maps on Linen.—S. C. W. (*Huddersfield*).—If you mean maps on tracing linen, you may use Indian ink and ordinary water-colours. Perhaps what you require are maps drawn or printed on paper and mounted on linen.—F. C.

Scratches in Violin.—B. R. B. (*London*).—It is very likely that your instrument has been covered with a varnish composed largely of resin, in which case the scratches will appear white. A coat of thin spirit varnish might make these nearly solid again.—B.

Lathe for Planing.—C. C. L. (*Birmingham*).—Yes, I think you would certainly get enough power with an ordinary lathe to do planing ¾ in. wide with a rotary cutter. I suppose you want to thicken a number of thin strips. Remember you require a high speed and sharp cutters. Ask an ironmonger to show you Churchill's catalogue and look at the cut of Barnes' foot power former, it will show you what can be done. A fly wheel of unusual weight would be of use if you cut short pieces, because it will store the power of your leg while you pick up the next piece of wood.—F. A. M.

Violin Varnish.—VIOLIN.—The answer to your first query, how to varnish a violin, will be given at the close of the "Instructions in Violin Making," which are in the Editor's hands. The "bass bar" is a very important part of the violin, both in regard to length, depth, thickness, and position, all of which will be given in the articles named. If you have had no previous experience, don't interfere with so vital a part of the interior of a violin. In future inquiries please give your name and address for the Editor's use, not for publication.—B.

Hot-Air Engine.—S. C. W. (*Huddersfield*).—There are several kinds of air engines; in some the whole of the products of combustion enter the working cylinder, but in others the air is heated in vessels separate from the furnace. Taking the latter class, we may assume that the bottom of the working cylinder is kept hot by a fire beneath it; then cold air being pumped into it becomes heated, expands and drives the piston up, after which it may be exhausted into the air, or for economy passed through a regenerator of wire gauze or thin plates to take up part of the waste heat; then this heat may be picked up by cold air passing to the working cylinder. The great disadvantage of the hot-air engine is the high temperature necessary to obtain any considerable pressure; to double the pressure, that is to raise it to 15 lbs. above the atmosphere, a temperature of 490 degrees Fahrenheit is necessary, a heat utterly destructive of packings, etc. To protect the interior of the working cylinder as far as possible from the heat, the piston is usually made with a prolongation passing down into a lower vessel and approaching its sides very closely, so that only a very small portion of the highly heated air enters the working cylinder itself, and that part against which it mainly acts can be lined with non-conducting material. Some thirty years since engines worked by vapour and air mixed were tried by a Mr. Gill, of Palermo, but with no great success; and although for some purposes small hot-air engines are now used to some extent, they do not seem applicable for high powers.—F. C.

Clock Case Designs.—(*Drury Lane*).—This is rather out of my way, for I am sorry to say I am a poor hand at inventing and designing, but I think there have been some designs in WORK for clock cases which you might alter to fit the particular size clock, and the makers or clock sellers of the American have on hand an assortment of iron stands to suit nearly all of them, and are very cheap and effective; you might copy some of those. I have seen them fitted up in grandfather's cases (small), also in cases similar to cuckoo clocks, and you might probably get some designs from the fretwork dealers that would suit you.—A. B. C.

Cardboard Models.—H. J. L.—I do not know of any one supplying cardboard models of mechanical motions, but printed sheets of such movements are sold by several London patent agents and others. In working out inventions, it is a very good plan to make card models of all proposed movements of a novel character; if this were done in every case we should not find so many impossibilities recorded in the archives of the Patent Office.—F. C.

Lettering Book-Backs.—J. S. (*Manchester*).—I do not think that you will be able to make a job of lettering your books with bronze powder; in fact, I would advise you to give up the notion of doing so, and letter them in gold instead. Bronze is never used for this purpose, and the stuff which would have to be used to make it stick is far too messy and dirty for books. Turn up No. 24 of WORK, page 381, and you will find instructions for lettering books, which if you follow out will make your books fit to be shown to your friends, which would not be the case if you did them in bronze. Of course it can be done, and I hope you will not think me disobliging for not giving the necessary instructions. You state that you can bind a book all right; well, then, by all means try and do the lettering in the proper manner. Rather than use the bronze powder, get Judson's gold paint, and write the titles on with a pen or brush. As you are only a novice, take the advice of a practical man and letter them in gold. You can buy alphabets of metal type from Messrs. George Royle & Son, 7, Lovell's Court, Paternoster Row, London, E.C.; for this purpose they must be made of brass. There is no book on bookbinding and lettering to be had that would be of any assistance to the amateur bookbinder that I know of, and that is one of the reasons why I have written a series of articles on this subject, and which will appear in course of time in WORK. It is a pleasure to me to be able to help you, and I am sure the Editor will be able to appreciate your remarks concerning WORK. I hope you will succeed in making a good job of your books; if at any time you come to a difficulty, I will try and put you right, so please do not be afraid to write.—G. C.

Model Steam Engine.—E. K. (*Eastbourne*).—The book you want is "The Model Steam Engine," 1s., Houlston & Sons, Paternoster Square, London.—F. J. C.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Chords for Organette.—R. B. (*Pallas Green*) writes:—"Having an organette, and so far succeeded as to be able to cut the tunes to suit it on paper, I find the notes of the subject (as I call it) are too poor by themselves without some chords to enrich them, and would be thankful for the way to add them on, and the rule for doing so, as I am informed there is such a rule. I hope some kind correspondent will enable me to complete the work."

Wooden Cakes.—BAYHAM CORNER (*Kent*) writes:—"Will any brother chip kindly favour by instructions through 'Shop' how to line out an 'excell,' better known in the country as a 'wooden cake?' If the instructor could, by giving a working drawing, I feel well persuaded that it would prove a benefit to me, as well as many others in the trade. I saw with much pleasure in No. 55 of WORK how to measure timber."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Book on Sheet-Metal Work.—ALIQUANDO writes:—"The book on this subject by Warn (not Warne), inquired for by L. P. (*Deal*) (see page 782, Vol. I.), was, I think, privately printed, not published in the ordinary way. It used to be frequently advertised, but I do not know where it can now be obtained, as I have not lately seen any advertisement of it. In WORK, 14th December, page 619, RODNEY (*Newport*) says that the book by Warn is the best he knows of, dealing exhaustively with sheet metal, and gives an address where he obtained his copy, but that was 'twenty years ago.' Let me, however, introduce to your notice, sir, as you are not acquainted with it (see page 318, Vol. I.), a book that is bound to supersede Warn's, and let me strongly advise ST. MUNGO and L. P. (*Deal*), that if they desire to make real study in pattern-cutting in sheet metal, to get and master 'Metal Plate Work: its Patterns and Their Geometry,' by C. T. Millis; 1887 (Spon). (No. I. of the 'Finsbury Technical Manuals.') This work reduces pattern-cutting to system for the first time, and is immeasurably in advance of Warn's book, which is merely an arbitrary collection of problems (with numerous errors) and constructions practically impossible for large work. Millis's book is as great an advance upon Warn's as Warn's was upon the—what may I call it?—pattern-cutting by tradition, that alone existed before his day. It has constructions for every case, and 'short radii' methods for all kinds of work; it is, moreover, cheaper than Warn's book."

Sheet-Metal Work Book.—J. B. (*Exmouth*) writes in reply to L. P. (*Deal*) (see page 782, Vol. I.):—"The 'Sheet-Metal Worker's Instructor,' by Rueben H. Warn, is published by Henry Carey, Baird, & Co., 810, Walnut Street, Philadelphia. I have one by Blinn, which is very good, published by the same firm."

Cigarette Maker.—In reply to C. W. B. (*Plymouth*) (see page 779, Vol. I.) THOMASO writes:—"My friend, you're all up a tree. I never said anything about leaving an opening along the hinge when the tube was shut. That is a little 'improvement' of your own, which has necessarily failed. But because your idea has failed is no reason why you should say mine is a 'complete failure' also. Just look at the fifth line from the bottom of my description on page 670, Vol. I., and you will see these words: 'The two halves should fit well together.' You say yours do not. There you have the reason of your failure. 'Oh, but,' you say, 'you show an opening along the hinge in your sketch.' Very true. If you stand your room door wide open, you will see an opening down the hinge of that about ½ in. wide; but there won't be any opening to speak of when the door is shut. The same with the tube figured on page 670, Vol. I. Although I show an opening along the hinge, the tube being open, if it was closed there would be no opening, provided the hinges were properly fixed on. My sketch is therefore perfectly correct. Take your tube back to the man who made it for you. Tell him to take the hinges right off both halves of the tube, and then put them (the halves) together, so as to make a perfect tube, without any opening down either join. Then tell him to bind fine wire round the halves, so as to keep them together while he solders the hinges on again. When that is done, take off the wire and the tube will be all right."

Re-waxing Meerschaum.—ALPHA writes:—"In answer to TOBACCONIST (see page 814, Vol. I.), meerschaum pipes are cleaned by carefully rubbing all over with soft rag wetted with methylated spirit and dipped in pumice powder, finishing with soft clean rag. To re-wax, place a small spirit lamp underneath the pipe, sufficiently near to melt a piece of white wax held against the pipe, which must be kept burning, so that the wax only touches the part to be coloured, and, when cold, carefully remove surplus with soft rag. Re-waxing is usually done in the lathe, by which means you get a more decided line round the pipe."

Strip Iron.—J. W. F. (*Mansfield*) writes in reply to TIM BOBBIN, J. P. S., and others (see page 830, Vol. I.):—"I have obtained strip iron and all necessary tools for bent iron work from C. Pool, whose address they will find in 'Sale' column, and who, no doubt, will be glad to send particulars."

Springs for Artificial Legs.—H. S. (*Birmingham*) writes in reply to R. F. (*Landore*) (see page 814, Vol. I.):—"If you will write to W. Tunbridge, 7, Jervoise Street, West Bromwich, Staffs., he would supply you with anything you may require in the way of springs."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—G. H. (*Middlesboro'*); GILDER; HARE'S FOOT; L. W. (*Wantage*); J. B. (*Londonderry*); C. E. D. (*Bradford*); ENQUIRER (*Alfreton*); M. R. D. (*Liverpool*); SECTIO; AMATEUR PLATER; H. P. (*Blackheath*); AN ADMIRER OF "WORK"; OPUS; G. R. (*London, E.C.*); J. S. (*Hammersmith*); PLATINUM; KILDONAN; T. D. (*Inverness*); J. J. (*Belfast*); CONSTANT READER; W. D. (*Newcastle-on-Tyne*); 3 C.; F. J. W. (*Ipswich*); Q. S. (*London, N.*); B FLAT; ROCK FERRY; A READER; J. O. (*Huddersfield*); EIKO (*United States of America*); J. S. (*Salisbury*); A. P. B. (*Walthamstow*); ÆOLIAN HARP; J. R. (*Newcastle-on-Tyne*); W. J. C. (*New Hampden*); M. J. T. (*Sunderland*); J. M. (*Bootle*); ECONOMIC; CARADOC; NAME PLATE; SCOT; CELT; A. O. (*Glasgow*); J. A. S. (*Liverpool*); W. A. (*Keighley*); W. W. (*Northampton*); C. E. S. (*Stoke Newington*); A. R. (*Fulham*); E. C.; SOMERSET; F. S. (*Islington*); H. W. (*Westminster*); J. P. O. M. (*Morpeth*); W. E. L. (*Bourneville*); GAMMA; J. B. (*Suffolk*); J. R. (*Skerries*); NEMO; W. J. C. (*London*); D. McK. (*Glasgow*); E. McM. (*Armagh*); E. R. S.; W. K. (*Cardiff*); M. D. C. (*Liverpool*); W. E. R. (*Cornwall*); P. E. (*Ebbw Vale*); WOODCUT; A. L. H. (*Liverpool*); A. W. (*Wakefield*); SEMPER FIDELIS; H. R. W. (*Ripley*); J. M. (*Glasgow*); SHOPMATE; JOINT; STONE FLOGGER; A METAL WORKER; H. J. (*Birmingham*).

Trade Note.

GUILD AND SCHOOL OF HANDICRAFT,
34, COMMERCIAL STREET, E.

I HAVE very much pleasure in calling attention to the following course of Six Lectures on "Architecture as the Language of the English People," which will be delivered during the next Summer Term in the workshop of the School of Handicraft, by C. R. ASHBEE, Esq., B.A., of King's College, Cambridge, Architect and Hon. Director of the Guild and School of Handicraft. The titles and dates of delivery of the lectures are as follows:—

1. Monday, May 5th.—"THE ARCHITECTURAL STORY OF ENGLAND."
2. Wednesday, May 7th.—"MEDIÆVAL ENGLAND."
3. " " 14th.—"RENAISSANCE ENGLAND."
4. " " 21st.—"PURITAN ENGLAND."
5. " " 28th.—"MODERN ENGLAND."
6. " June 4th.—"ARCHITECTURE AS A LANGUAGE. What it has Told us in the Past, what it is Trying to Tell us in the Present, and may Tell us in the Future."

Each lecture will commence at 8 p.m., and will be fully illustrated with Lantern Slides, Pictures, Drawings, etc. Tickets for the course—One Shilling, but free admission will be granted to the First Lecture, on which occasion the chair will be taken by the most Hon. THE MARQUIS OF RIPON, K.G. A full Explanatory Syllabus has been prepared to accompany the lectures. Price 3d. Application for Tickets, Syllabuses, and all particulars relating to the course, should be made to the Hon. Secretary of the School Committee,

H. LLEWELLYN SMITH.
34, Commercial Street, E.

I.—LETTERS FROM CORRESPONDENTS.

Case Hardening.—CONSTANT READER writes:—"In answer to the inquiry in WORK of March 22nd, 1890 (see page 14), *re* case-hardening powder, I beg to say that I have used Minns' case-hardening powder for years, and find it acts admirably, and would thoroughly recommend same to AJAX (*Edinburgh*) and others requiring it. Samples and prices can be obtained of Messrs. Sidney Minns & Co., Trafalgar Road, Dalston, London, N.E."

Wood Carving.—T. J. P. (*Dalston*) writes:—"It might interest some of the readers of your useful and instructive journal (especially those interested in wood carving) to know that we hold an exhibition of works of art of the Peoples' Palace at Essex House, before going to Kensington for examination. We have some excellent specimens of wood carving by our amateur students on view. Admission free."

Fairy Bells.—J. W. S. (*Walthamstow*) writes:—"I see R. F. writes in reply to SUBSCRIBER (*Bristol*) (see page 654, Vol. I.) about fairy bells. I have been a maker of them for fifteen years; also a player. I wish to point out that instead of making one with 8 strings, as shown in diagram, have 13 or 15, because you can play more tunes, and it does not take much more material, and the cost is very little more. I have one myself with 26 strings; it is 9 in. wide and 24 in. long, and has three bars on the back, and the strings are a ¼ in. apart. It is made to play on the table or rest on anything. Or if you have a large hand, it can be thrown about the same as the small ones. I also wish to point out that R. F. must make a mistake as regards size of wire used. I always use No. 9 and 10 to 8-stringed, and 8, 9, 10, 11, to 13- or 15-stringed, instruments; my own is 8, 9, 11, 12; the bass strings, or the last 4 or 6, are the best brass spring wire, size about 15 or 16, which give a very rich and powerful tone. I do not wish to find fault with R. F., but to use such heavy wire I cannot conceive how it will stand the strain without bars on the back. I shall be most willing to answer any questions on this subject, or give further explanations, as I consider the fairy bells a very mellow and sweet-toned musical instrument, if played as they should be."

Folding Chair Rivets.—To-Po writes:—"Iron folding chair rivets can be had of J. W. Roberson, Columbia Ironmongery Stores, 77, Virginia Road, E., back of Shoreditch Church; also of Hewett, Ironmonger, Shoreditch, close to the Church. Also at latter place, mail cart wheels and axle can be had for 5s., iron rims, and 6s. with rubber tires, 22½ in. diameter, the largest he keeps. Springs can be had for 7d. per pair, or, including iron legs for steps, 1s. 6d. Bolts are extra, but very cheap—about a halfpenny each, perhaps."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Connecting Alarum Bell to Calendar Clock.—TEMPUS (*Preston*).—If you are accustomed to the use of fine tools and such delicate workmanship as that required in the repair of clocks, the job need not present any insuperable difficulties. It will be necessary to drill a fine hole through the dial of the clock, outside the time dial near the figure VII., to receive the pivot of the alarum hand. The hole must be bushed with ivory or bone, if the dial is of metal, to insulate the pivot from the dial. The stem of the pivot must fit tight in a metal socket at the back of the dial, or in a metal tube in which it can only turn stiffly, much as the hour hand socket of a clock turns on its stem. This socket or tube must then be connected to a binding screw outside the clock by a length of No. 20 silk-covered copper wire, the ends bared of their silk covering, and clipped tightly or soldered to the socket and binding screw. The alarum hand may be made small and fitted to the pivot as the hands of a clock are fitted. To the end of the hand must be stiffly jointed a flattened length of No. 20 platinum wire, and this adjusted to make contact with the hour hand anywhere between IV. and VIII. I think this will help you over your difficulty.—G. E. B.

Plumbers' Cloths.—D. A. (*Hampstead*).—Fustian or moleskin for making these cloths is easily obtainable. I should think you have not gone to the right shops. When you say you have tried a few good shops, what shops do you mean? linendrapers', ironmongers', or what? You can get it at any outfitters who make a speciality of workmen's clothing; and even if you cannot procure fustian, you can always get stout ticking anywhere, which is used by very many good plumbers in preference to fustian, though, of course, you would require to make your "wipe" of more thicknesses of ticking than if you used fustian.—R. A.

Clock Weights.—G. E. M. (*Leamington*).—The weight for thirty hour English clock is generally 10 lbs., those for eight day being 14 lbs. each as a rule, but I have sometimes replaced the 10 lbs. one with an 8 lbs. with advantage, and at times the 14 lbs. I have made 12 lbs. or even 10 lbs., at others as much as 16 lbs. To tell gold, get a testing stone from the tool (watch) shops, rub a piece of gold, the quality of which you are certain of, on the stone, also the gold you want to test and compare the colours, first testing it by the acid aquafortis, to see that it will stand it.—A. B. C.

Æolian Harp.—A. F. (*Barrow in-Furness*).—This interesting instrument is very simple, and also very inexpensive in its construction, costing but a few shillings. It does not require any actual knowledge of music to string the same, so long as all the strings are brought by their tension to produce exactly the same sound; any discord, as it is termed, may be at once detected by the ears of any average person, and corrected by tightening or slackening the strings until the desired effect is obtained. The mode of construction is as follows:—Procure a piece of ½-in. pine board, sound and well seasoned, 8 ft. long by 5 in. wide; this should be well planed up and the edges nicely squared. Cut this into two pieces of 3 ft. 6 in. each, and two pieces of 6 in. each; the ends of each piece should be neatly dovetailed to fit into one another, and form the sides and ends of a box measuring 3 ft. 6 in. by 6 in. Now take two pieces of perfectly sound, well-seasoned pine ⅜ in. thick, and 3 ft. 6 in. by 6 in; nicely plane this, and finish off well with glass paper. In one of these pieces at about 1 ft. from each end, and exactly in the centre, longitudinally cut with a fret saw, or sharp pen-knife, two holes about 1½ in. in diameter; this piece will form the sound-board of the instrument; it will, however, require strengthening to withstand the strain of the strings, which will be stretched along it from end to end. This may be done by cutting two pieces of 1-in. beech or similar hard wood 5 in. square, and affixing them by means of glue and thin screws from the under side on to the thin sound-board at the distance of half an inch from each end, and the same from each side. A reference to the annexed sketches will make this very clear, Fig. 1 showing half the sound-board as

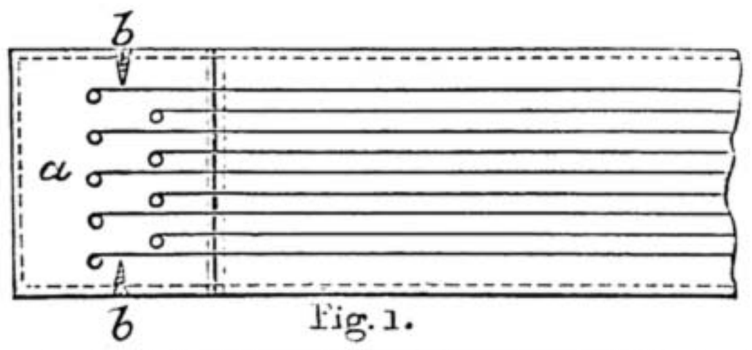


Fig. 1.

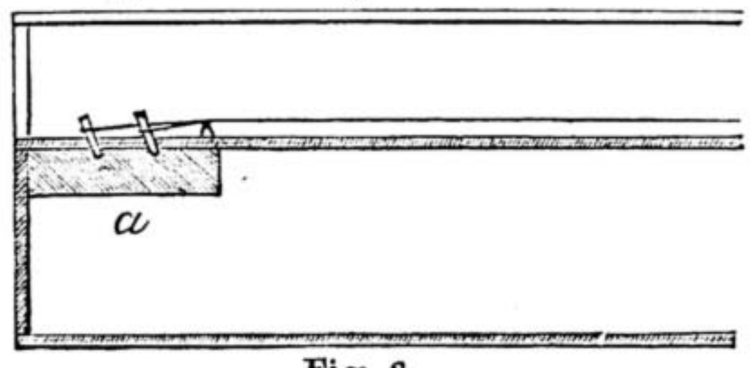


Fig. 2.

Æolian Harp. Fig. 1.—Half plan of top. Fig. 2.—Half section.

seen from the top, *a* being the block shown by dotted lines on the under side thereof; the other half of the board, being identically the same, is not represented. Now bore in the face of the sound-board, through into the blocks underneath, the holes for the reception of the pegs; the number of these is a matter of choice; half of them will be those used in stringing a pianoforte (iron), and half, wooden pegs, with a thumbpiece as used on a violin; the iron will be placed at one end, and the wood at the other; the position of the holes will be seen on reference to Fig. 1. You may now fasten this board on to the framework with glue and small screws, and to make it more firm and solid, run in a thin screw through the sides into the block as shown at *b*, Fig. 1. Affix the other piece of board on to the bottom in a similar manner, and the box is complete. Bridges will be required to stretch the strings across; these are made by taking two pieces of hard wood, 4½ in. long, ½ in. wide, and ⅞ in. thick; cut off two edges to make an apex along the centre, and glue one across each end of the sound-board just in front of the peg holes. Now to string the instrument. Procure some catgut—that known as violin first string E is most suitable; place this through the hole in the iron pegs, twist it round once or twice, carry it along the face of the board across the bridges to the other end, and twist it round the wooden pegs. The strings may now be tuned by turning the thumb pegs, thus straining the strings until they are in unison, producing the note A, which may be got from a tuning fork or piano. It would be a great improvement to make a cover which will direct the current of air across the strings; this is represented in section in the unshaded portion of Fig. 2, and is simply made of two pieces of wood 3 in. by 6 in. fastened across each end of a piece of thin board, 3 ft. 6 in. long by 6 in. wide; this will rest on the top of the harp as shown, and, when the instrument is placed on the window ledge, the window will close on to it. I trust these instructions will be lucid enough, and wish your excellent journal the success it deserves.—C. R. W.

Cabinet Plans.—CABINET (*Salisbury*).—Deal will do as well as any other wood for your cabinet. India or china matting will be the best material with which to cover the top. The cabinet, if made to your details, will do well enough, but the following suggestions may be useful to you. Be careful to arrange your hinges so that the door swings free of the corner upright of the cabinet. According to your Fig. 5 you would find that if the hinges are fastened with only the knuckles projecting the doors will not open. As no hinges are shown, perhaps you have already anticipated the difficulty. I think it would be an improvement to have either one piece of glass in each door, that is without the bamboo rail across the middle of each, or else to put another pine rail to which to affix the bamboo and use two pieces of glass in each door. I do not see how you can otherwise fix the bamboo rail securely. If the design is carefully carried out the cabinet ought to look well, and presuming you are an amateur, you are to be congratulated on your draughtsmanship. Mr. F. Westbury, Great Dover Street, Boro', London, S.E., gave me the prices to which you refer.—D. D.

Builders' Books.—ESTIMATOR (*Chepstow*).—I think you will find "Beaton's Pocket Estimator," published by Crosby Lockwood & Co., 7, Stationers' Hall Court, London, will suit your purpose, and "Equation Tables," by K. C. Richardson (Whitehead, Morris, & Lowe, 167 and 168, Fenchurch Street, London) will at once explain the difficulties usually met with in converting the St. Petersburg standard into the various scantlings used in England. In the event of the above tables not being what you require, I shall have much pleasure in acquainting you with other publications on receipt of further particulars. You will find that your local bookseller would be able to obtain any back numbers of WORK.—E. D.

House Plastering.—PLASTER (*Manchester*).—In answer to your query as to the probable cost of plastering the front of a house, a great deal depends on the rate of wages, price of materials, etc. You likewise do not state what you want it plastered with; if you wish it to last, I should say render it with Portland cement and washed sand. There are several cheaper materials, but you would find the cheaper you have this sort of work done the more trouble you buy. Then there is the class of work; are there many off-sets, cornices, mouldings, trusses, pilasters, sunk faces, etc. etc.? You must also take into consideration that you must either buy or hire all tools, plant, and scaffolding, get all your moulds, running and nib rules, etc., made, for I can assure you that there are a quantity of things requisite, even for such a thing as plastering, and which you would find very expensive, and be of very little use to you afterwards. Now, last, but certainly not least, what is the size of the house? I think you will gather from the above remarks that your question is rather vague. Your next query—"Could an amateur manage it? If so, kindly give directions"—conveys to me the idea that you certainly could not; and the explanation of tools, materials, plant, and method of working, would be far too lengthy to enter into in "Shop." Everything considered, the best thing you can do is to ask a local tradesman to give you a price for the job. But I should not advise you to have it done in the winter.—E. D.

Stencil Cutting.—CLIO (*Hull*).—The article on stencil cutting is concluded in No. 31.

Wood Sample.—LINDUM (*King's Lynn*).—The sample of wood sent is a species of teak, and is used for boxes, cases, etc., locally, but not imported into this country as timber. In future, in sending samples, do not put the linseed oil on, as it is easier to tell without it, as the oil alters the colour and deadens any natural smell in the wood.—A. J. H.

A Future Subject.—WELL WISHER (*Kew*).—A paper on such a craft as you mention is in preparation.

Sword Blades.—J. T. H. (*Sheffield*).—"If, in hardening, the blades warp or 'run,' how straighten them, or get back to the shape of the template?" Should it occur that a blade warps or "runs," it is a clear proof that it was not fit for tempering. Why, would be only a matter of conjecture on my part. The workman who forged the blade could best answer that question, which is far more important, in my view, than getting it back to the shape of the template, which, without remaking by passing through the furnace again, would be futile, or something worse: to warm, twist, and tap-hammer it true, and call it a sword blade. There is an inorganic vitality about steel that responds to operation it undergoes in working. Working "unfairly"—this seems a strange expression, yet every steel worker will understand it—that will cause it to "run" or warp; unequal heating, incautious cooling (one part more than another), or some other of the many unobserved chances of defective operation, may have caused the defect to become manifest in the hardening. It is not the hardening at fault that reveals an existing wrong, and critical attention to work will avert it.—J. C. K.

Filter.—M. T. (*Warbleton*).—A good cheap filter may be made with an ordinary flower pot partly filled with charcoal and sand in layers. The water in percolating through these is freed from its impurities, and drops through the hole in the bottom of the pot into any vessel placed below to receive it.—D. A.

Maize Treatment.—MAIZE (*Bridge of Weir*).—I am sorry I am unable to give such particulars of the preparation of cornflour on a small scale as are likely to be of much service to you. You seem to have read up the subject pretty fully. As you are about to proceed to a colony where maize is largely grown, does it not occur to you that you are much more likely to be able to pick up the information you require there?—D. A.

Staining and Polishing.—J. W. F. (*London, E.C.*).—From your question I do not understand whether you wish for a stain to make light wood the colour of mahogany or whether you wish to stain mahogany a darker colour. Directions for both have already been given in "Shop," as well

as fairly full directions for polishing. To make a mahogany stain dissolve Bismarck brown in methylated spirit and add water to reduce. To darken mahogany use a solution of bichromate of potash or of permanganate of potash in water. Articles on polishing will shortly appear in WORK, but you will gather many useful hints by looking over "Shop."—D. A.

Garden Chair.—T. P. (*Staffordshire*).—The chair you refer to cannot be made to fold, but I give you herewith a sketch of a folding chair with arms that may perhaps suit you. It is very portable, being on the campstool principle, and folds up flat. The long pieces for the back are 4 ft.; the short legs are 2 ft. long; the wood may be ash or any other tough wood that you can easily procure, and the size 1½ in. wide by ¼ in. thick; the arms are of the same width and thickness. There are rails at A, B, and C. These rails are ¼ in. square, and 1 ft. 6 in. long. A and B are mortised into the back legs at the top and bottom; C is mortised into the top end of the short legs. The legs are secured by a rivet where they cross. The top end of the arms is secured by a rivet to the back legs, the lower end being cut to fit on a stud at the top of the short legs; this stud, with the mode of

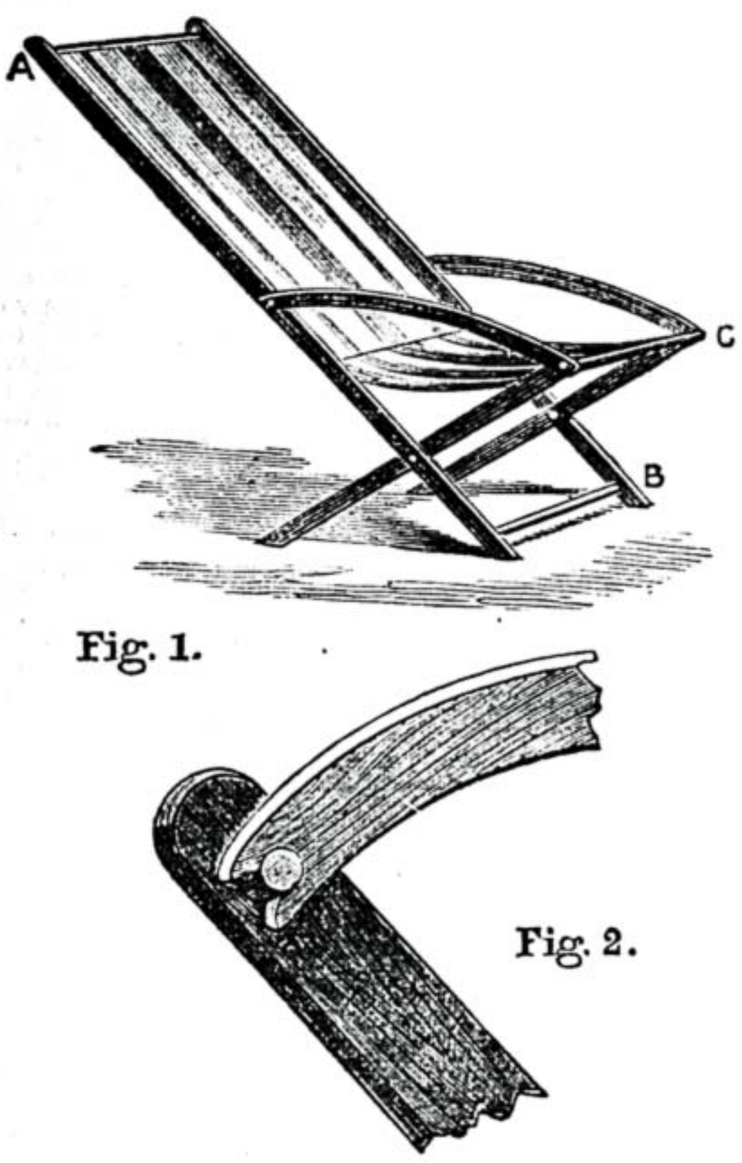


Fig. 1.

Fig. 2.

Garden Chair.

cutting the arms to fit it, is shown at Fig. 2. The seat is formed of a piece of stout carpet or canvas firmly attached to the rails, A and C, and long enough to allow of sufficient "sag" to form a comfortable seat. Of course you will, as a matter of course, give the woodwork three coats of varnish, preferably oak, and if you use brass or copper for your rivets you will have quite a presentable chair, and one that does not require much labour or skill to construct. I think you will understand from the drawing that to fold the chair the arms are slipped off the studs and turned upwards, the legs then closing up together. I hope that by the aid of these brief instructions you will be able to make a chair to suit your requirements, and in which you may enjoy many hours of quiet, rest, and comfort.—G. LE B.

Varnishing Sequoia.—DUMMIE (*Aberdeen*).—Californian redpine or sequoia is not a wood which I can recommend for work to be finished by polishing or varnishing. It certainly is not improved by treating in the ordinary way, but rather the contrary. The most satisfactory results, and they may be disappointing, can be got as follows: Body in with white polish, use no filling, and finish off with a mixture of glaze and white polish applied with a rubber in the usual manner. The wire fret saws you refer to do not seem to meet with much favour, and I do not know of any dealers, except Melhuish and Son, who keep them.—D. A.

Furniture Polish.—J. R. (*Elton*).—I do not want to contradict your assertion that you are a careful reader of WORK, but if you go over the "Shop" columns you will find that inquiries similar to yours have been answered giving all the information you ask for. It seems a pity to stain a piece of oak furniture to a mahogany colour, and I think it would be much more satisfactory were you just to darken it to resemble brown oak. Unfortunately you do not say whether your oak dresser is old or new, or whether it is still in the white, so that I am not able to direct you with any degree of certainty. If the oak is quite new and light you cannot do better than adopt the plan of staining it with the weak walnut stain which has so frequently been referred to in these columns, and then polishing it with red French polish. This is made by colouring the ordinary polish with Bismarck brown. A brighter mahogany colour may be got by simply using a mahogany stain (Bismarck brown), and then finishing with plain polish. I cannot advise you to make your own polish, but if you will, you may do so by dissolving shellac in methylated spirits. If your dresser is darkened by age or artificial staining, the process roughly indicated above must be modified accordingly, but without knowing full particulars I cannot direct you what to do. Papers on polishing will shortly appear in WORK. When they do appear, study them carefully, and also read the "Shop" columns, as many valuable hints on polishing have already been given. If you like to tell me something more about your dresser I may be able to help you further.—D. A.

Staining Chairs.—J. H. (*Liverpool*).—You do not state of what wood the kitchen chairs you wish to stain are made of, nor their condition, whether new or old with previous varnishing. Assuming they are "in the white," you cannot do better than go over them with resin varnish, which you may easily make by dissolving resin in ordinary French polish. If you use a dark resin, no stain or other colouring matter will be required to give your chairs a rich yellow colour. As regards your inquiry about making soda-water I hardly know what to say, for a good deal depends on what scale you wish to make it. If you want to manufacture it for sale I am afraid it would be impossible to help you satisfactorily in "Shop," but if you only want it in small quantities for home consumption you cannot do better than get a gazogène or seltzogène. They are to be had at Lewis's.—D. D.

Mitre-Cutting Machines.—HOCKAGE (*Bishopsgate*).—The mitre-cutting machine you mention I have found answer the purpose admirably for picture-frame making. You can set the adjusting screw to get any mitre you wish—a ½-in. moulding to a 4-in. moulding; in regard to corner cramp I suppose use is everything. I found the vice much better—can make my frame in half the time I am screwing it up with the cramp. A *fixed* vice permits one to drive a nail in the mitre without moving, and I can now after a few trials cut and make my frame ready for fitting picture in, etc., under a quarter of an hour.—G. R.

Cleaning Gold Frames.—A. J. C. B. (*Loughboro'*).—I am sorry I do not for the moment know of anybody in your immediate neighbourhood who would undertake the work, but perhaps some of our readers may notice this and help us. The following, I have found, is a good method for cleaning real good English gold frames: Take your picture out of frame, also glass and backs if they have any in; give the frames a good dusting with a brush so as to thoroughly remove from the ornaments, take a basin of soft boiled water (cold), wash carefully until the gold appears bright and clear of dirt; when all the parts are so done, let it dry, then resize with best strained vellum size, and your frames are as new again.—G. R.

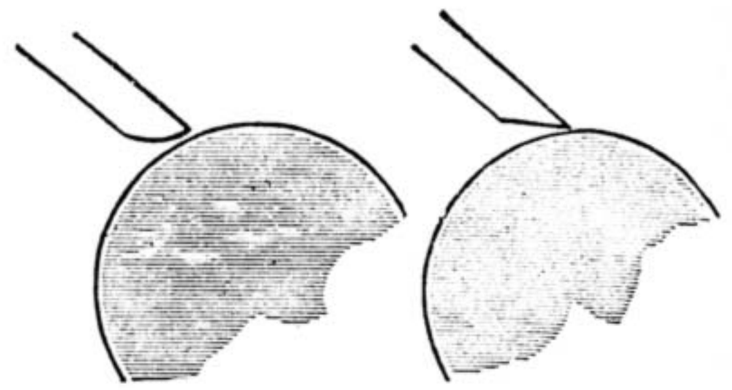
Hard Glue Brush.—W. O. D. (*Ipswich*).—I am not personally acquainted with water glue, but I presume there is no difficulty in keeping the brush in order by washing it each time after using. Try this, and if you do not find it satisfactory write to the agents or manufacturers.—D. A.

Polishing Bookcase.—NOLO (*Ruspidge*).—Questions almost identical with yours have several times been answered in "Shop." The walnut stain recommended is composed of Vandyke brown, a little liquid ammonia, and water. The polish is made by dissolving shellac in methylated spirits. After applying the stain and allowing the wood to become dry size it over. When again dry, the wood may be polished in the usual manner by first bodying in and then spiriting off.—D. A.

Overmantel, etc.—UNCO PHEC (*Surrey*).—It is a matter of opinion whether the shelves would be too heavy in appearance if made 7 in. wide, and you cannot do better than be guided by what is to be placed on them. There is no fixed rule for such dimensions. The same may be said of thickness. From these and other details you inquire about you may safely conclude that you may adopt any mode of construction which may be most convenient, and this of course a good deal depends on your skill, and what tools are available. I certainly think that lincrusta finished as you suggest would be a very suitable backing, and much enhance the appearance of the overmantel. It is just in such little details as this that a workman, whether amateur or professional, shows his taste, and the remarks accompanying the illustration were more suggestive than minute in order to draw out this faculty in our readers. I hope your overmantel will be a source of pleasure both in making and in subsequent contemplation. Thanks for information about water glue. The other subject you mention shall receive due attention.—D. A.

Oil Polishing.—F. P. (*Andover*).—An article on this will be given shortly, but the following hints may be of assistance to you in the meantime. Use raw linseed oil. Apply it to the wood with a rag and rub as much as you like. Repeat the process as often as you choose, for the more "elbow grease" you use the better the result will be. Do not saturate the wood with oil.—D. A.

Phonograph Parts.—E. B. W. (*Nottingham*).—The material used for making the diaphragm of a phonograph varies according to the ideas of various experimenters. Some use vellum or parchment, some wood veneer, some thin sheet iron, and some mica or other thin substances. Any of these substances may be used; and as the phonograph is even yet in the experimental stage, you might gain something by making a few experiments; perhaps you may be able to discover some material which will give better results than any of the above. The essential point in choosing a material for this purpose is to have it thin enough so as to be capable of vibrating beneath the sonorous waves which



Phonograph Needles. The curved line in both cases represents the cylinder.

impinge upon it through the funnel-shaped mouthpiece. The wax tubes which slip on and off the cylinder, and which receive the impressions, are made of paraffin wax (see recent replies on this subject). The needles, or styles as they are generally called, are made of a piece of fine steel ribbon. They may be made from the points of ordinary sewing needles. The proper shape is a difficult matter to get, and just as difficult to describe. The point of the transmitting style is shaped somewhat like a knife, while that of the recording style is more chisel-like. Perhaps the above diagram will make my meaning clear.—W. D.

Hat and Umbrella Stand.—F. H.W. (*Manchester*).—Designs of a hat and umbrella stand have already been given in No. 44 of WORK.

Japanese Fishing Rods.—F. J. C.—(*Maidstone*).—These may be obtained from or through almost any dealers in Japanese fancy articles and curios. I do not know the names of any dealers in Maidstone, but I think if you keep your eyes open you will soon find them. If not, apply to Messrs. Phillips & Co., King William Street, E.C. Prices vary according to size, but the rods are quite inexpensive.—D. A.

Tarnish.—D. T. (*Halifax*).—If the gilding is worn off there is no way of renovating except regilding. If, however, the gilding is merely dirty, it may be cleaned. I have lately done so with the gilt brass parts of a valuable grandfather s clock, using monkey brand soap.—D. A.

Rubber Letters.—J. H. W. (*Wakefield*).—As you will have seen, the manufacture of rubber letters has been fully treated in the paper published in WORK, No. 38.—QUI VIVE.

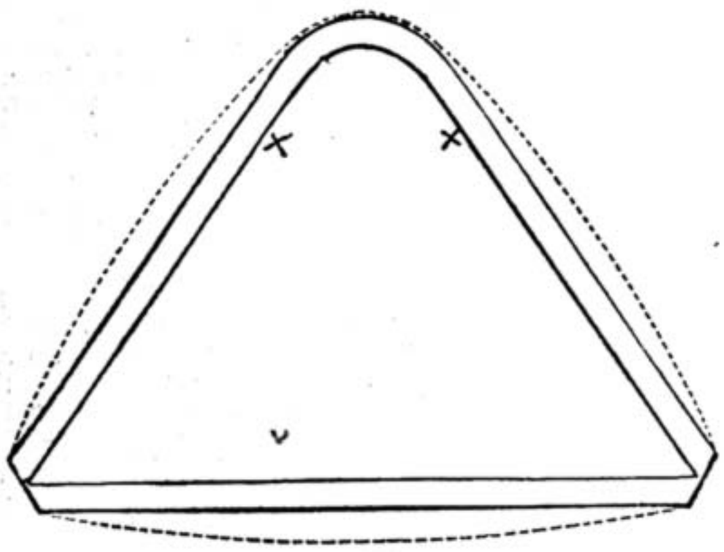
Modelling in Clay.—GOUGE (*Brighton*).—Being myself a carver in wood as well as a modeller, I can fully endorse the views propounded by GOUGE as to the value of modelling to the carver, whenever the design is to be in the round or in bold relief. I am unable to point out any sound practical book on the subject. Papers on this subject have already been commenced, and appeared in No. 53 of WORK.—M. M.

Taking Out a Patent.—G. W. (*Bournemouth*) will find the matter to which he refers fully explained in the answer to B. D. on page 97.—C. C. C.

Piano Making Questions.—W. B. (*Liverpool*).—You complain that the description of making the back of piano to your mind is vague. It is not expected that a person having no knowledge of a particular trade can simply read down a few columns of type, and grasp the details without thinking, although every detail may be as clearly written as words can express it. Yet it is necessary to read it thoughtfully and carefully, so that you may understand what it is the author's intention to convey. I cannot think that you have taken sufficient care in reading the article. You say you never heard of a wrest board; you will find that wrest plank is the term used, which is the technical name as it is known in the trade. I will answer as clearly as I can the parts that seem so vague to you. If you cut the veneer the width of your wrest plank until you have sufficient to cover its entire length, then it indicates clearly that this crosses the plank. If the strips of paper are glued over to keep it together, you would not toothe this off, as it would fall apart; and further on you may read that you glue the side of your veneer that is not papered, clearly showing that the paper remains on up to this point. Then again, take the sheet of veneer the length and width of wrest plank; it is obvious that this crosses the first veneer from end to end of wrest plank. While further on it states that the reason one veneer crosses the plank and the other is put on straight is to prevent the plank splitting, which shows that two veneers are used. As to gluing the back together, I cannot see any great difficulty with a friend to assist you. Warm one end first; while you are gluing this end, the other end is at the fire; then reverse the positions, and the end you have glued is being kept warm while you are gluing the other. You ask which side of wrest plank is glued to back. It is stated that the front veneer is put on straight, showing this is the front side of the plank. I hope that this will remove the doubts from your mind.

We always deem it a pleasure to enlighten our readers on any point that may not seem clear to them.—T. E.

Tin Foot-Warmer. — O. C. (*Hampton*). — The end of a foot-warmer, such as you describe, is what is termed "capped," or slipped on, as distinguished from knocked up, or double-seamed, as some call it. Make your body of good strong tin, or when you solder round the bottoms the body will buckle inwards and look bad. Lay the body on a piece of tin and mark round it; cut ⅛ larger all round. Now if you want hollowed ends you must cut a little different (see illustration). The inner line represents the body, the outer line the bottom—marked out to be put on flat—and the dotted line how to cut it for hollowing. The more you hollow the more curve



Tin Foot-Warmer.

you must give on the sides, and allow more margin. Notch off the two corners, and with a mallet, or the end of your crease iron, or anything with a square edge, turn up the bottom; now offer it on the body, and see if you think it wants any trimming; if not, then turn the other two sides as far as the place marked ×, on the same tool as before; then take a round end tool, or small half-moon stake; or, if you have nothing of the sort, then a piece of inch-round iron, with the end bevelled off and fixed on the vice, will answer. Turn up the rounding part on this; it will probably pucker. Lay on a flat tool and tap with a light hammer. Run round again on the tool to smooth slip on and solder.—R. A.

Hot Water Heating.—EXCELSIOR (*Kennington*). —As the system you refer to is Bacon's patent, I should advise you to apply there for a description.—J. S.

Classes for Plumbing.—EXCELSIOR (*Kennington*).—I know of no class for teaching plumbing in the district referred to. There is a book on plumbing by Davies, published by Bemrose.

The Laws of Chance.—CEPHAS.—This is quite out of my line; I cannot, therefore give an answer, but I may say there are *no laws of chance*. Probabilities of duration of life are determined by empirical formula based on observed facts, and used by assurance societies. The odds reckoned by betting men have no foundation in mathematics because there are no data to go upon; although they can give you a formula by which you *must* win, they never seem to make fortunes themselves. The question, though disguised, looks very like horse-race gambling, and, perhaps, comes from some youth who is taking his first step to ruin on the turf.—F. C.

Tools and Patents.—UNCERTAIN (*Liverpool*). If you wish to make and use patented tools, your best plan is to act honestly and obtain the patentee's permission, otherwise you may make yourself liable to the costs of an injunction to restrain you from using them.—F. C.

Taking Out a Patent.—M. T. (*Hawkhurst*).—The *Illustrated Official Journal* is published at the Patent Office Sale Branch, 38, Cursitor Street, Chancery Lane, London, E.C., every Wednesday. Price 6d., by post, 8d. Annual subscription, including postage, £1 15s. Annual subscriptions to date from Jan. 1st. Subscriptions not received for less than three months, commencing with the 1st days of January, April, July, or October. Payments (which must be in advance) may be remitted by postal or post office order.—C. C. C.

A Sweating Roof.—A corrugated roof cannot "sweat;" it must become moist by precipitating the moisture from the air in the building, the same as occurs upon the insides of window glass in cold weather. The remedy is to line the roof with some non-conducting material such as felt, or a thick coating of non-conducting paint.—F. C.

Microscope Lenses.—T. P. D. (*Glasgow*) complains that he has not been able to secure lenses from Lancaster according to the focal length given in my article on the microscope. I have a letter now lying before me received from Messrs. Lancaster saying they continue to supply all kinds of lenses to amateurs and others. Now it is just possible that lenses of the exact focal length were not in stock, yet the lenses sent may be equally serviceable. The focal lengths given in my article were *typical*, and there is no absolute need why they should be rigidly adhered to, as long as the principle is observed. I have placed in the hands of the Editor a short paper dealing with eye-pieces exclusively, and which, I have no doubt, will help T. P. D.; in the meanwhile, I will say that the focal lengths of the lenses must be as 2 to 1, and the diameter about 2 to 1. That is to say, suppose the field lens is 1½ in. focus then the eye lens must be ¾ in., and so on; whatever may be the focal length of the field lens, the other stands in the same proportion. They must be separated one half the combined focal length: for example, 1½ and ¾ added equals 2¼; they must be separated therefore one half that distance, or 1⅛ in. This rule must always be observed. The field lens will be about 1 in. in diameter, consequently the eye lens will be about ½ in. In a postscript T. P. D. gives measurements of the lenses. I presume he has secured eye lens 1 in. focus, field lens, 2 in. focus. Well, this will make a very good low power eyepiece; let them be separated 1½ in. As to O.G., well, that will depend on the length and strength of one's purse. Some years ago I had an excellent 1-in. O.G., foreign, from Mr. Lancaster, the price of which was 7s. 6d. T. P. D. further says, "I wish to say I am very pleased with the design, it has a very handsome appearance." I am grateful to know this. Several letters have come to hand stating the same opinion as to the design. I am always glad to know I am helpful to any one.—O. B.

Work on Slöjd.—W. J. B. (*Manchester*).—"Slojd" as a means of teaching the essential elements of education, by Emily Lord, foolscap 8vo, 6d. (Cassell & Co.), is such a book as you require.—F. J. C.

Straightening Wire.—W. G. (*Glasgow*).—Tinmen's rollers (not rolls) would be of very little use to you for straightening wire of such small ganges as you mention. The method shown by A. E. D. in No. 31 is as good an arrangement as you can have for long lengths. I should not use too many pieces of wire in the block, and not put them too much on the zigzag, or it will be harder work; for short lengths of wire, block of hard wood and a light hammer, assisted by the thumb and fingers, will do all that is necessary. Tinmen's rollers vary in price from £3 5s. and upwards to £15, and may be had from Rhodes & Sons, Wakefield; Fenn, London Bridge, and others.—R. A.

Shooting Board.—A NOVICE (*Clapton*). — An article will be devoted to this subject.—D. A.

Book on Organ Building.—YORKSHIRE BITE (*Liverpool*).—I am sorry that I cannot refer you to any books on organ building on the tubular pneumatic principle other than those to which you refer, and which will not suit your purpose. I am also unable to give you the names of towns in the United States (East), New Zealand, Australia, and the Cape of Good Hope, in which the trade of organ building is carried on. Perhaps some other contributor to WORK may be able to give this information.—M.W.

Taking Out a Patent.—A. B. (*Brockley Road*).—If A. B. wishes to determine his patent at any given time, he has only to discontinue his payments.—C. C. C.

Taking Out a Patent.—A. D. (*Bury*) writes:—"I think that the article, 'How to Take Out a Patent,' will be a means of greatly assisting a good many poor inventors. Having procured my own patent provisional protection, I can truthfully say the information is all that is desired; but if you had put at foot of article that a circular of information can be obtained at Patent Office, through post, free, it would have made it more generally known." I am glad to publish A. D.'s hint, and I may add that, so far as I can speak from my own experience, if one asks the Patent Office authorities for information on any point, the reply will come in the form of a pamphlet, post free, with the paragraph containing the information sought indicated by a mark in red or blue, though it should be noted that the Comptroller-General announces that he does not give legal advice or opinions on matters connected with the Patent law.—C. C. C.

Taking Out a Patent.—B. D. (Patent agent).—This gentleman I have to thank, as well as J. S., for kindly pointing out the oversight with regard to Form A¹. The error is not really of any serious consequence, as an inventor, applying at a post office for the form in question, under an erroneous impression, would at once be told by the postmaster, or would see from its heading, that it was not the thing required. But I am none the less indebted to B. D., since the criticism of practical men is the best and perhaps the only means of correcting such slips as are liable to occur in the most carefully-written book or article.—C. C. C.

Fret Designs.—H. W. (*Liverpool*).—Designs issued by the leading publishers in Germany and England can be got through their agents or factors in this country. For German designs apply to Messrs. H. Zilles & Co., Wilson Street, Finsbury, London, E.C. The Italian designs can be procured from Mr. Busschotts, Park Lane, Liverpool. Whether either of these firms will supply you at "wholesale prices" depends entirely on the quantity you are prepared to order. Small lots for your own use you cannot reasonably expect to get at wholesale quotations.—D. A.

Salt Melter.—J. R.—The only solid which will melt salt is ice. In winter, salt is scattered over ice to melt the latter, but the action is reciprocal, and the ice melts the salt as much as the salt melts the ice. But salt is so very soluble in water, 2½ parts of which will melt or dissolve 1 of salt, that if you moisten the salt with a few drops of water, it will probably melt the whole, forming a syrupy liquid. If you had mentioned your object in melting salt with a solid, I could have answered your question more usefully.—N. B. C.

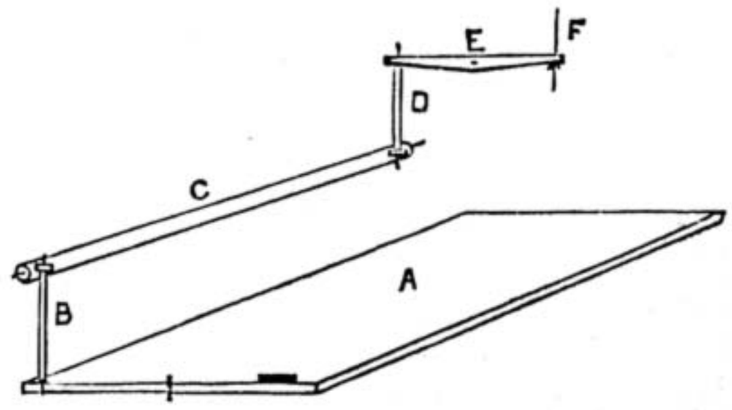
Wrought Iron.—A. S. (*Forest Gate*).—I presume you mean the bent iron work, which is now becoming a ladies' leisure occupation. This is very simple, as there is no heating or welding of the iron required. Small rods of rectangular section are employed, varying in width from ⅛ in. to ¼ in., and from ⅛ in. to ⅛ in. in thickness. These are bent with pliers into artistic curves, and united one to another with little hoops of iron. The effect is very pleasing, and the only difficulty is in bending round and making the loops quite secure, without which the articles would lack rigidity. You may either work out your own designs, or you may purchase a good selection from Miss Cheyne, 24, Barons Court Road, West Kensington, for 3s. 6d. Lamp brackets, stands for glasses, light fire screens, suspending lamp supports, lamp shades, hanging pots for ferns, candlesticks, lantern frames, and many others are designed and made in the bent iron. The iron work is finished and protected from rust by giving it a coat of Judson's artist's black, or a Venetian black, sold by Messrs. Powell and Sons, 22, Alfred Place West, South Kensington.—J.

Bamboo.—WOODWORKER (*Southsea*).—For such a small quantity of bamboo as you require, your best plan will be to obtain it from some local cabinet maker who deals in bamboo furniture. If you cannot obtain it in this way, Ellmore & Sons, City Road, London, E.C., might possibly oblige you. I cannot advise you about using up your broken glass. Your idea concerning it seems altogether impracticable.—D. A.

Gassner Dry Battery.—G. A. B. (*Ascot*).—The cells may be made of any size and in whatever shape you may choose. The shape and size will not in any way affect the power of the battery, the E.M.F. of each cell being the same for all sizes. The size of the cells does, however, affect the volume of the current. Large cells give a larger volume for a longer period than small cells. Make them 3½ in. square by 6 in. in height, of ⅛ in. zinc, and charge them with equal parts—by weight—of powdered gypsum and zinc oxide, sprinkled with a little chloride of zinc solution. Seal with pitch, or with marine glue, leaving two holes in the top for ventilation.—G. E. B.

Work on Engraving and Etching (for Beginners).—A. B. H.—We know of no really good work on this subject, except a most expensive work by our great English etcher, Hamerton. We hope, however, one day to give a few rudimental hints on this subject, which the present demand for our valuable space will preclude, we fear, for some time to come. Why not consult some copper-plate engraver?—J. W. H.

Organ Pipes and Connecting Action.—ORGAN BUILDER (*Macclesfield*).—The large pipes at the sides of the sound-boards of small organs are generally those of the lower notes of the manual, and are usually placed alternately right and left of the sound-board. Thus C C would be on the right hand, and C C sharp on the left hand. The action connecting the keyboard with these pipes is generally a roller action, of which a sketch is now given. The rollers are placed close together on a vertical board at the back of the keyboard, and each roller works in a stud at each end the same as the roller of a common roller window-blind. It will



Organ Pipes and Connecting Action.

A, Keyboard. B, Sticker to roller arm. C, Roller. D, Sticker from roller arm to backfall. E, Backfall. F, Pull-down of valve.

be seen that it can be made to carry the action of a key to any reasonable distance right or left of the keyboard. When the key is pressed down it pushes up the sticker, which, instead of being connected with the backfall, is connected with the arm of the roller immediately over the key tail. The arm at the other end of the roller is immediately under the end of the backfall connected with the valve of the channel supplying the pipe, and a sticker pushes the back end of this backfall up and thus brings down the front end, and with it the valve. Pipes brought to the front or sides (as show pipes) usually have the wind conducted to them from the channels by conducting tubes. The rollers may be of wood 1 in. in diameter, or of iron gas piping ¾ in. diameter. The arms are about 1½ in. long.—M. W.

Nickel-Plating.—G. B. M. (*London, W.C.*).—As a nickel-plating plant suitable to the purpose would cost at the least £4, and you can get the hoop plated at a cost of as many shillings, it follows that it will not pay you to plate it yourself. There are several shops in Clerkenwell where it can be done. I hope to describe the whole process of nickel-plating in a future number of WORK.—G. E. B.

Zinc Binding Screws.—G. A. B. (*Ascot*).—I cannot see any advantage in these over brass screws. On the contrary, zinc would be more brittle and more easily attacked by acid and other fumes. I may give illustrated instructions for making a model arc lamp in my papers on "Model Electric Light," but cannot do so here.—G. E. B.

About WORK.—J. B. (*Manchester*).—It would not be practicable for us to include any later numbers than at present in the monthly part. The requirements of wrapping, packing, and delivery prevent our doing so. The journal to which you allude in your letter can be produced considerably in advance of publication, but WORK, consisting of different material, cannot be so treated. Our "Answers to Correspondents," for instance, is a feature which necessitates our delaying going to press till the last moment.

Piano Keys.—SALFORD (*Stockton*).—You do not state whether your piano keys are ivory or celluloid. As each requires different treatment in the polishing, I had better give you both methods. As you have made them level with glass-paper, make a pad with flannel or light-coloured cloth, and put round a small piece of wood, that you can hold conveniently in the hand. If for ivory, make a paste on your pad with whiting and methylated spirit, and rub briskly to and fro, until you have got a polish, and finish with a little tallow on the palm of the hand and rub over them; wipe with a soft linen rag. For celluloid, make the paste of pumice powder and paraffin oil, and use as in polishing ivory. Celluloid may be known by being opaque, and warmer to the touch than ivory.—T. E.

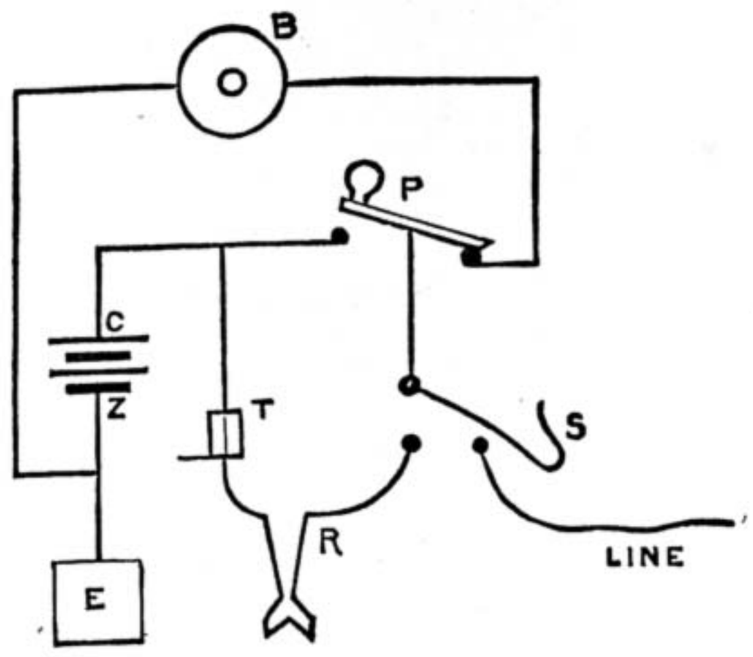
Enamelled Iron Signboards.—J. R.—The task J. R. proposes to himself is not only utterly beyond the scope of any amateur, but requires very expensive furnaces and other plant. If J. R. succeeded, he would probably find himself involved in two lawsuits: one for infringement of patent rights, and the other for interfering with the royalty of Willing & Co., King's Cross, who have the sole right to make these signs in the United Kingdom.—J. W. H.

Agglomerate Blocks and Electric Bells.—A. W. (*Glasgow*).—As the blocks you have seen in a Leclanché cell are made of crushed manganese and carbon, by machinery, and are consolidated by enormous pressure whilst hot, they cannot be successfully made by an amateur. Full illustrated directions on how to make an electric bell have been given in the series of articles on "Burglar Alarums," published in Nos. 12, 18, and 20 of WORK. Directions for winding the coils were given in No. 18, page 279.—G. E. B.

Inattention to Electrical Queries.—J. L. R. (*Stamford*).—If you sent a query to the Editor, it would have been forwarded to me, unless lost in the post between yourself and the office. If forwarded to me it would have received prompt attention, and have been registered. On looking over my register of letters I fail to find any bearing your name or initials, so think you must have made a mistake. Nickel-plating with a dynamo turned by hand would be equal drudgery to turning a grindstone all day.—G. E. B.

Type-writing Ink.—TYPE-WRITER.—(1) We have no information on the above subject. We believe, however, that if you will address Messrs. F. Stanbury & Co., West Harding Street, E.C., or Messrs. Fleming & Co., Leith, Edinburgh, both ink manufacturers of high standing, who employ chemists expressly to make experiments, you will find the article you want. (2) Any printed matter can be rendered copyable by dusting with a mixture of protosulphate of iron and gallic acid, well pounded in a mortar till a very fine, almost impalpable, powder is obtained. Dust over with a well-baked hare's foot, and take care the paper is perfectly dry, the ink "tacky," and that no powder is left adhering, except on the printed parts. The copying paper ought to be rather moist. Your black ink, as you admit, is not first-rate, but this, we think, is due a good deal to the use, at any rate in this case, of too hard-sized a paper. A soft-sized paper would give a much better result.—J. W. H.

Telephone Connections, etc.—E. M. (*Cheltenham*).—The reasons why I did not go fully into the subject of practical telephony in my article are various, the principal one being I had not sufficient time at my disposal to devote to that subject. Below I have given a sketch of telephone connections, which I think you will easily understand. It is only for one end of the line; in connecting the other end the carbon and zinc of the battery will have to be reversed. I have not reproduced your arrangement of switch-board and connections. About the electrical engineering I do not know how to advise you, as in one part of your letter you ask not to be referred to books, while in another you want to know what books to read. Now don't you think that is just a trifle inconsistent. And besides, an electrical engineer is quite different from "a man to take charge of a dynamo." If that is the height of your ambition it will be as well to stick to your present trade. However, as you want something to read up, try "Dynamo Electric Machinery," by S. P. Thomson, published by E. and F. Spon. When you have completely mastered that, if you write again I will give you the title of another—that is, if you are still determined to go in for electrical engineering. As I did not write the articles on the aquarium and fountain, I may be allowed to say that I consider the whole thing a very capital arrangement, suitable for any "drawing-room or dining-room." It would certainly be an ornament wherever it was placed. Your idea of making the fountain automatic is also a capital one, and would be very easily accomplished, if it

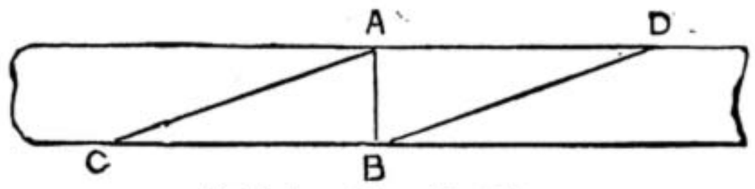


Telephone Connections.

S, Spring which is kept down by weight of receiver hung on hook. P, Press button with back contact. B, Bell. T, Transmitter. R, Receiver.

were possible for a man to carry himself round a room by the band of his own trousers. You need not apologise for writing. It is always a pleasure to assist amateurs.—W. D.

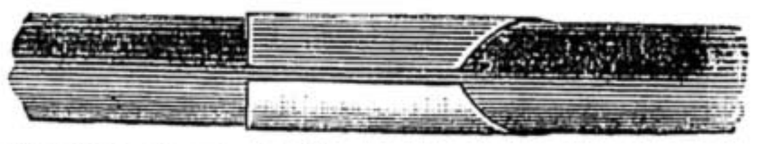
Splicing Bicycle Tire.—A. C. (*London, W.*).—The tire must be removed entirely from the rim, then with a sharp knife dipped in water make a clean even cut on the line, A C (see sketch), on the *outside* of the tire, that is the side that comes in contact with the ground. Make another similar cut on the line, B D, both cuts starting from the



Splicing Bicycle Tire.

cross line, A B; this will take in the tire two inches. Now to join them. Get a bottle of Snell & Brown's Octopus rubber cement, coat the two cut surfaces, and leave aside *not joined* for two or three hours, then join them carefully and evenly, pressing them well together; now you will not be able to pull them asunder. Snell & Brown's cement from any of the cycle stores about London, bottle 1s.—A. S. P.

Cutting Zinc Pipe.—H. Y. (*Sutton*).—You do not state the size or the thickness of the pipes that you are in the habit of cutting, but if it is thin zinc pipe such as used for rain-water pipes, etc., a saw is not the proper thing to use to cut them with, as it would hang and jag the metal too much; besides, a saw is of no use for hard metal pipes unless they can be held in a vice, and you cannot hold zinc pipe in a vice firmly enough to resist the pressure of the saw. I use for cutting zinc pipe a half round file, any convenient size, say 10 in., and never attempt to cut two pieces so that they will match as an angle; I find it less trouble to cut the pipe straight across, and then to trim it to whatever angle I require it with the snips; or I should, if making up the



Sketch to illustrate Gauge for cutting Zinc Pipe.

pipe myself, cut the angle out in the flat. To hold the pipe firm whilst cutting I slip it partly on a mandrel; this holds it sufficiently firm for the file to work against. If, however, you still wish to cut the pipe to an angle, I suggest that you make a kind of gauge of stout iron, say $\frac{1}{16}$ thick; get this to the angle that you want to cut your pipes, slip it over your pipe, have it sufficiently long to afford a grasp, and do not let it meet by $\frac{1}{8}$ of an inch, so that, when you hold it, it will clip the pipe tightly; you can then file round the pipe, keeping the flat edge of your file to the gauge; when cut in two it will be sure to match. The sketch will show what I mean more clearly perhaps. I trust this will be of use to you.—R. A.

Lenses.—A LOVER OF "WORK."—Your object glass is a double convex lens cemented with Canada balsam to a plano-concave, but without seeing the glass I could not speak with certainty as to the nature or cause of the spots you describe. If it has become cloudy in places through damp, I believe it is incurable, but possibly they are caused by air bubbles which have formed in the balsam. As object glasses are extremely liable to be scratched and consequently spoiled in inexperienced hands, by far the best way would be to send it to some practical optician such as Mr. Lovegrove, High Street, Slough; but, as you evidently wish to attempt their separation and repair the mischief yourself, you must first of all mark the edge of the combination with a cross, using the edge of a file moistened with turpentine for the purpose, so that on replacing them they will occupy the same relative position to each other. The balsam may be dissolved by immersion in benzole, after which the surface should be gently rubbed with chemically clean cotton wool, dipped in absolute alcohol, several pieces being applied in succession until all the balsam is cleared away and the surface of each lens appears bright and clean, the final polish being given with a piece of new and perfectly clean wash leather. To reunite the lenses, cut out a hole the exact size of the plano-concave in a piece of stout cardboard about 4 in. square, so that when the lens is mounted or inserted in it the balsam which oozes out all round will be prevented from reaching the plane face of the lens, which should now be laid on a piece of clean white paper, and a few drops of Canada balsam dissolved in chloroform or benzole applied to the concave side; then, to prevent the formation of air bubbles, dip the convex lens in turpentine, and, noting which is the inside face, lower it gently into its original position. It must now be put away in a warm place for a week to harden, when the cardboard and any balsam on the edge must be carefully removed with a knife. Should any balsam have reached the face of the lens, recourse must be had to the cotton wool and alcohol as before, but the smallest possible quantity of alcohol must be taken up at one time lest it attack the balsam in the joint. Canada balsam may be had ready prepared for use, as also the other chemicals mentioned, from Mr. W. Hume, Technical Chemist, 1, Lothian Street, Edinburgh, or any of the dealers in mediums for mounting microscopic objects.—T. R.

Telescope Dining Table.—W. T. A. (*Stockton-on-Tees*).—This subject will be dealt with in course of time, but I cannot say when, as there are so many articles in hand at present. To give all particulars with drawings is not possible in "Shop."—D. A.

Repairs to Chairs.—A. H. (*Mitcham*).—As I do not know the construction or kind of chairs which have become rickety, I am afraid I cannot advise you definitely what to do beyond telling you that your safest plan would be to submit them to some practical man accustomed to chair work. If you will let us know what kind of chairs yours are, if possible giving a rough sketch, I shall probably be able to tell you how to treat them. If they are valuable I can hardly recommend you to attempt to repair them yourself. Writing in the broadest sense, the only way to make a thoroughly good job is to rework the joints, but if the frames are only loose at the back legs you might "botch" them by running a screw nail through the feet into the framing. You will have no difficulty in perceiving that in either case you run a considerable risk of spoiling your chairs.—D. D.

Swiss Pine.—DICK WHITTINGTON.—I cannot find any yard where "Swiss pine" can be bought, but I am given to understand that American whitewood answers the same purpose, and this can be bought in most timber yards at the following prices, planed ready for use: $\frac{1}{8}$ in. 2½d., $\frac{3}{16}$ in. 2¾d., $\frac{1}{4}$ in. 3d., $\frac{3}{8}$ in. 3½d., $\frac{1}{2}$ in. 4d., and 1 in. thick unplaned from 3d. per foot. This can be obtained in High Street, Peckham, and the thinner sizes at Lothan's, Curtain Road, E.C.—A. J. H.

Clock Movement.—YOUNG WATCHMAKER.—I am afraid you will have some difficulty in getting a movement to fit the case as it is so narrow, for the dial work, with dial and hands, will take quite an inch unless cut too close to be safe; then there is room at the back, for the pendulum will require at least $\frac{1}{4}$ in., so that leaves $\frac{3}{4}$ in. for plates and trains. I don't think you can do it, to be at all certain of its going correctly; the only thing I can see would be to widen the case another 2 or 2½ in.; could you do that? if so, then you would have ample room. I don't like to crowd work if any way possible; if you can't do that, then I could only suggest a drum timepiece or clock, or you might squeeze in a French movement, or an American Echo timepiece, or one of the small striking clocks of Seth Thomas; or why not get the necessary wheels and make a plain timepiece to suit? or as a last thought a Vienna movement striking; you might do that with a short pendulum and a higher number scape wheel.

Composition for Raised Ornament.—H. S. F. (*Worcester*)—For raised ornament to be painted or gilded, probably the raising composition described on page 186, Vol. I., would be the thing required. It is made of whiting, with a little flake white, and mixed with gold size to the consistency of treacle. This is laid on with a brush. H. S. F. is warned not to attempt flat formal patterns in this unless he has time and patience to pumice his raised work to a level surface.—S. W.

Tar Paving.—W. B. (*Sussex*)—A *modus operandi* is as follows:—First ram the ground to an even surface, giving it any falls that may be requisite, and then spread over the ground a thin coating of heated coal tar, mixed with coke broken small. Next put on the top of this about two inches of sifted ballast, and on this the tar and coke as before, working it well between the ballast; the siftings of which may now be dusted on the top and the whole rammed.—E. D.

Cement Fastener.—O. R. (*Bolton*).—You will find that Le Page's "fish glue" mixed with a little zinc white will answer your purpose for fastening ivory on the keys of pianos, especially as you wish to stain the new ivory to match the old. A simple way to get the stain you require would be to boil the ivory in a strained decoction of the dry outside skin of an onion, finding out by experiment how strong the mixture should be, and how long the ivory must be immersed.—E. D.

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