WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

VOL. II.—No. 64.] SATURDAY, JUNE 7, 1890. [PRICE ONE PENNY.

HOW TO BUILD A TRICYCLE HOUSE.

BY H. B. P.

I SHALL endeavour in this article, and by the aid of the accompanying drawings, to make it an easy task for readers of this paper to construct a tricycle house or shed for themselves at much less cost than having to buy one.

It has been my aim to make it as portable as possible, compatible with strength. When once built, it can be taken to pieces and refitted easily within the hour.

When asunder, the separate parts of the shed consist of only eight pieces: viz., the two sides, the two transverse stays above and below door, the back, the floor, the roof, and the door, the whole being held together by eight bolts and nuts, with the exception of the roof, which is held in position by four hard wood catches.

For the convenience of those who may not be able to understand the drawings so easily, I have marked each of the eight parts, as well as the pieces composing those parts, by block letters, so that it can be seen at a glance to which part of the shed the pieces belong if the drawings do not show it distinctly.

The right-hand side of shed, seen from the front (as shown in Fig. 1), is marked A; the left-hand side, B; the top transverse stay above door, C; the bottom stay, D; the back, E; the floor, F; the roof, G; the door, H.

The dimensions shown on the drawings are of a house originally built for a light Humber roadster with wheels 40 in. diameter, but having since got a Safety bicycle, I find I can, by removing one wheel from tricycle, place the two-wheeler in as well. The first thing to be done by the builder is to take the extreme width, length, and height of his machine, and work from those dimensions. Should the size of shed shown in drawing be found large enough, it will be found a very convenient size. Do not cramp it much if there is plenty of room for it to stand in, as there are sure to be extras to be placed in it besides the machine. If the house has to be much larger than the one shown, the scantlings must be increased in section.

All the scantlings are $1\frac{3}{4}$ in. × 3 in., the roof and flooring boards $\frac{7}{8}$ in. thick, butt-jointed. The boarding for the door, sides, and back of the shed are $\frac{1}{2}$ in. planed: that is about $\frac{7}{16}$ in. thick, grooved and tongued.

To proceed with the building of a shed as shown on drawings: commence with the sides, which, being similar, except that one is right hand and the other left, if we describe one it will be sufficient. Take a scantling 6 ft. 3 in. long, equal to the total length of the shed: this is for the bottom horizontal stay. Now cut two others, 5 ft. 2 in. and 4 ft. 2 in. long, for vertical posts at

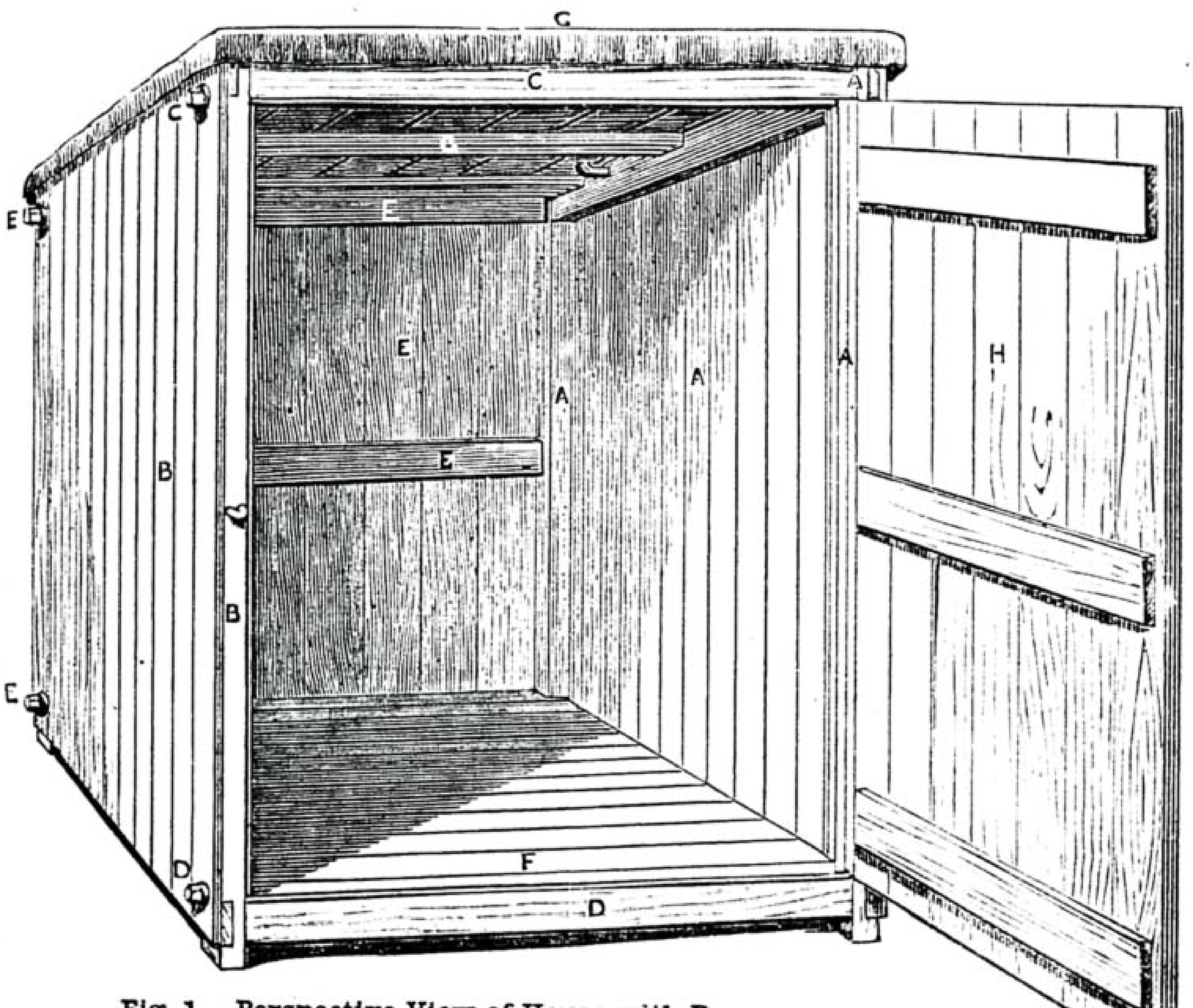

Fig. 1.—Perspective View of House with Door open, showing Interior.

Fig. 3.

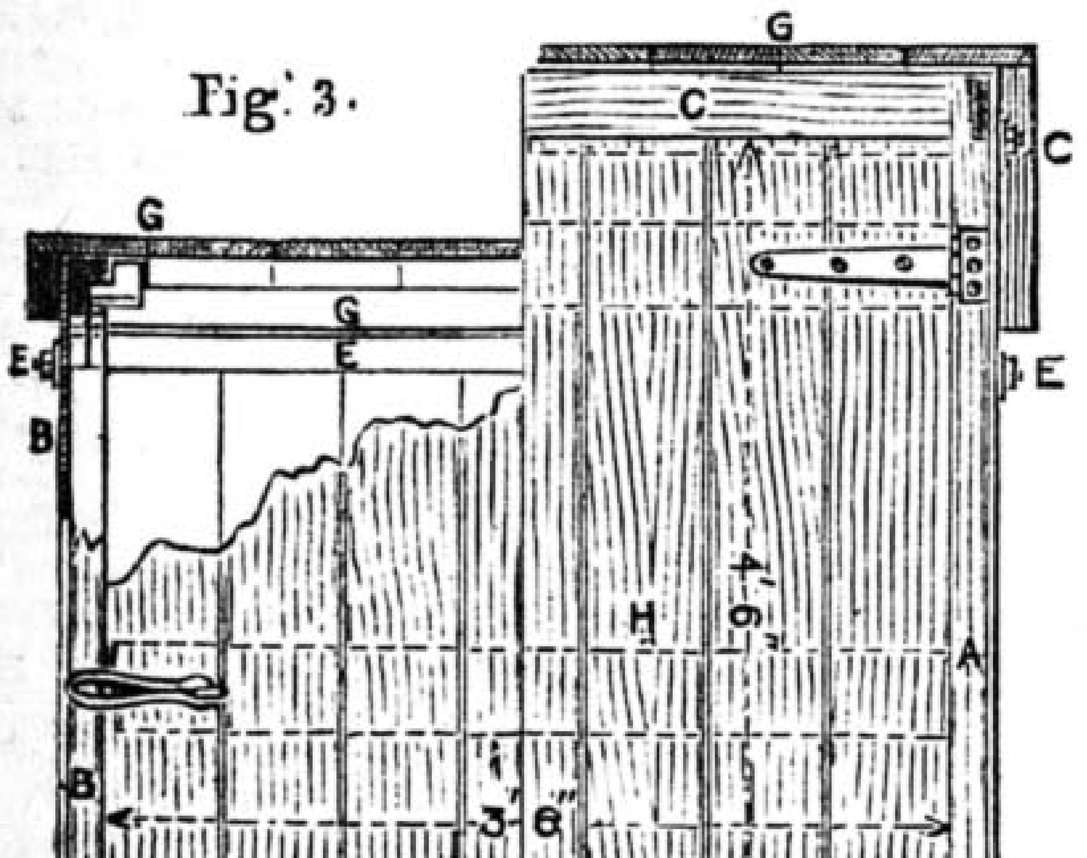

Fig. 2:

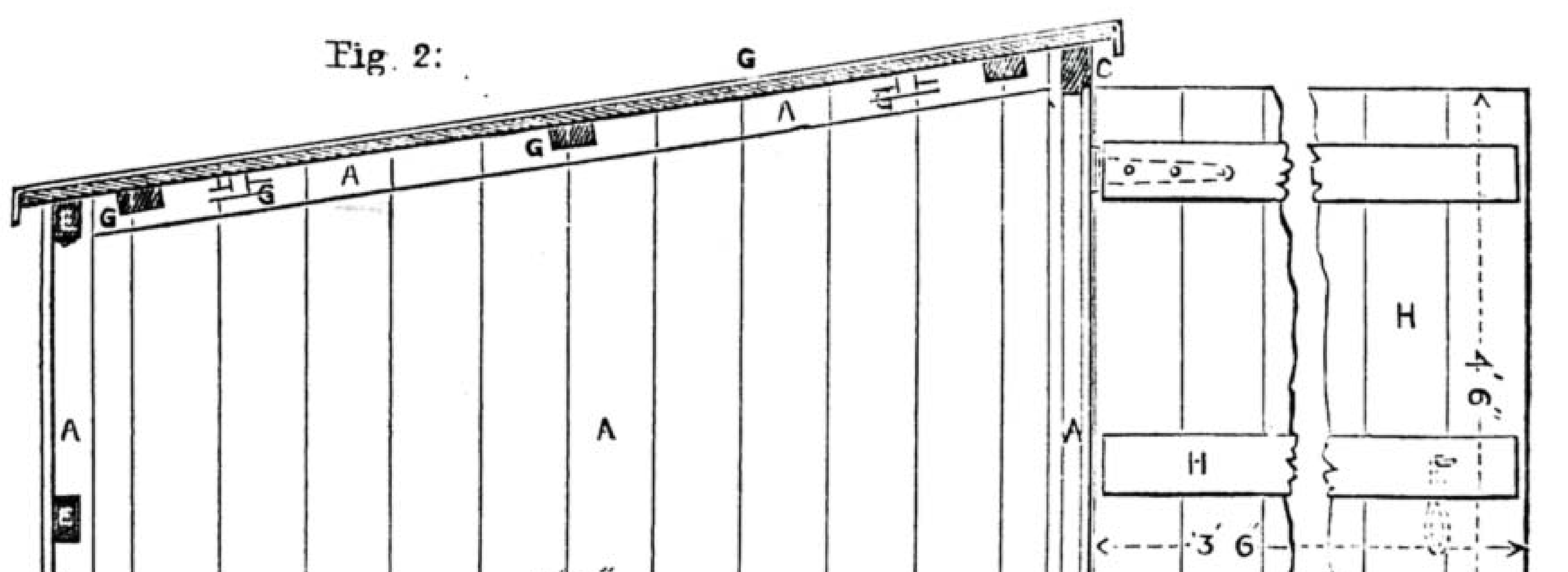

Fig. 2.—Longitudinal Section through *a b* in Fig. 4: for Joint in Upper Right-hand Corner at G, see Figs. 8, 9, 10; for Details of Construction in Upper Left-hand Corner, see Figs. 5, 6, 7. Fig. 3.—Front Elevation, partly in Section. (Scale of Figs. 2 and 3, $\frac{1}{2}$ in. to 1 ft.)

front and back respectively. These must be fitted by means of half-lap joints to the ends of the horizontal stay and at right angles to it; not forgetting to leave the two inches below stay for feet. Remember also that the half-lap of the horizontal stay comes outside or against the boarding when fitted up. Having fitted these and fastened them temporarily in position, the sloping stay on which the roof rests can now be measured. It must be fitted in a similar manner, the half-laps of stay again being outside. Three recesses, $1\frac{3}{4}$ in. × 3 in., can be now cut in the top for the roof scantling to rest in; also two slots on the inner side for roof catches to turn in. The positions of these can be wide, by 3 in. deep. A slot must now be cut in the vertical post of side to admit of this tongue, and that the front of stay and vertical post are even, as shown in Fig. 10. The left-hand top corner joint can now be done in the same way.

The two front corner joints below the door are similar to preceding, with the exception that the lower longitudinal side scantlings are horizontal, and not inclined. When the joints are completed, cut in this bottom stay facing the interior of house and 6 in. from the vertical side posts two recesses, $1\frac{3}{4}$ in. long by $1\frac{1}{4}$ in. deep, and $\frac{3}{4}$ in. from the front. These are to carry the two floor beams (as shown in Figs. 2, 3, 4). in the vertical posts, and not held by bolts or nails. It is to strengthen the back and prevent the boards being knocked out should the machine be pushed in too vigorously. Having cut all the recesses in the side frames, they can now be nailed together thoroughly and then boarded; the boards, $\frac{7}{16}$ in. thick, grooved and tongued, should be flush with the top and bottom scantlings and side posts, the boards covering up the ends of the recesses in top scantling, thus preventing roof working sideways.

The bolts (Figs. 13 and 14) can now be screwed to the ends of transverse stays. In the case of the top stays, back and front,

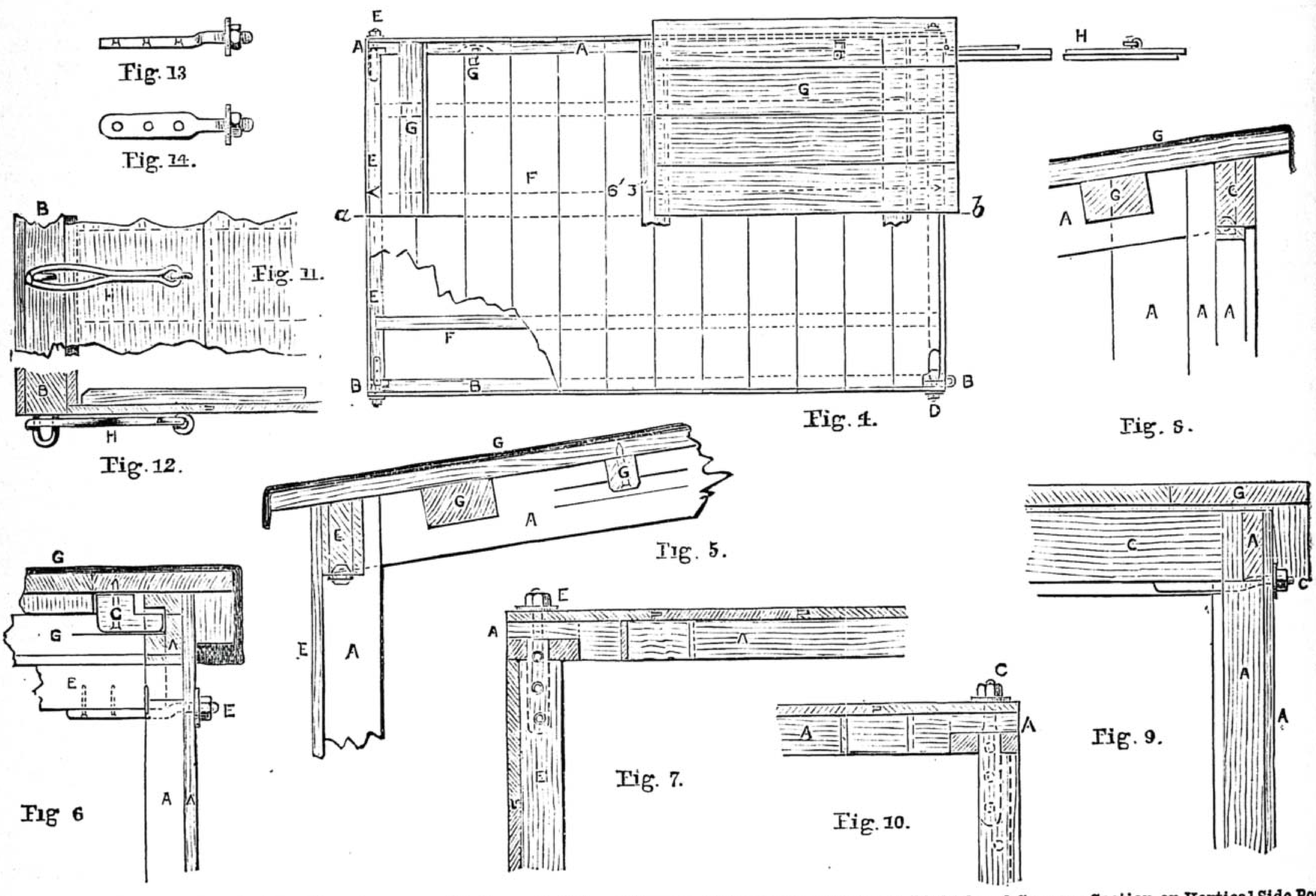

Fig. 4.—Plan of House, showing Roof Boards removed in Upper Left-hand Corner; Felt removed in Upper Right-hand Corner; Section on Vertical Side Post in Lower Right-hand Corner; Floor Boards broken to show Scantlings to carry them in Lower Left-hand Corner. (Scale, $\frac{1}{2}$ in. to 1 ft.) Figs. 5, 6, 7.—Longitudinal Transverse Sections and Plan respectively of Top Right-hand Corner of Back of House. N.B.—Lower Joints at Back are similar, except that Longitudinal Side Stay is square, not sloping. Figs. 8, 9, 10.—Longitudinal Transverse Sections and Plan respectively of Top Right-hand Corner of Front of House. N.B.—Lower Joints are similar, except that Longitudinal Side Stay is square, not sloping. Figs. 11, 12.—Elevation and Plan of Door, showing Fastening Arrangement. Figs. 13, 14.—Bolts for holding Shed together. (Scale of Figs. 5 to 14 inclusive, $1\frac{1}{2}$ in. to 1 ft.)

measured in Fig. 2, or in the larger scale details. Having done this, the other side can be made exactly similar, but the opposite hand to the first.

We must now calculate the length of the transverse stays. The door in this case is 3 ft. 6 in. wide; this gives the distance between the vertical side posts, back and front; but in order to keep the stays solid we must allow $\frac{7}{8}$ in. at each end for letting into vertical posts of sides. This gives us a length of 3 ft. $7\frac{7}{8}$ in. Cut five scantlings to this length, two for front and three for back. The front and back joints vary slightly; we will therefore describe the former first, taking as example the top right-hand joint above door first (in Figs. 8, 9, 10). Cut out from end of stay a piece $\frac{3}{4}$ in. deep by $\frac{7}{8}$ in. long (see Fig. 10). This leaves on the end of stay a projecting piece $\frac{7}{8}$ in. long, by 1 in. They are placed near each side, so that they will support the two large wheels of cycle.

Having completed the four front corner joints, there will be no difficulty with the back ones. In cutting out the recesses for stays, allowance must be made for the boards, which in this case are flush with the outside of the vertical posts (see Fig. 7). The tongue on end of stay in this case is not flush with one side, as in front ones, but more in the centre of end of stay. Having cut these tongues on the ends, the corresponding recesses must be cut in the vertical side posts, allowing, as I mentioned before, for the boarding to come flush with the end. The four back joints are similar, so there will be no difficulty. In the bottom stay, at back, the slots must be cut for carrying floor beams as in the front one.

The middle stay at back is simply recessed the bolts are underneath the stay. In the bottom ones they are above. Holes must now be bored through the sides, and the recesses slightly enlarged to allow bolt to pass: this should be done carefully, to allow as little play as possible. The bolts (shown in Figs. 13, 14) are drawn to scale, and are $\frac{1}{2}$ in. diameter, flattened out and drilled for three screws.

When the bolts are fitted through the sides the nuts and washers can be put on and screwed up, not forgetting to put the middle stay at the back in its place. When screwing up, care should be taken that it does not produce any warping.

The back can now be boarded, using the same kind of boards—namely, grooved and tongued boards— as used in the sides.

The two beams, $1\frac{3}{4}$ in. × 3 in., for carrying floor, can now be inserted, and the boards forming the floor can be nailed down, care being taken that the nails only enter the two longitudinal beams inserted for that purpose, otherwise the house could not be taken to pieces without some trouble.

Commence boarding from the back. The first board will have to be fitted over the bolts, and the last board also, which must stop $\frac{7}{16}$ in. from the front of house. It will thus act as a jamb for the door when closed. Strips of wood 1¼ in. wide by ½ in. thick can now be nailed up the two front posts and across the top stay, to act for the same purpose: each end of top strip to be cut out for bolt.

For the roof, cut three beams 1¾ in. × 3 in., to drop between the side boarding into the recesses already cut in the top longitudinal scantlings, the tops of same coming flush with the top of sides. The roof boards, ⅝ in. thick, can now be nailed on, allowing them to overhang the sides and ends 1¾ in. Four hard wood catches (seen in Figs. 2, 3, 5, and 6) can now be cut and fastened by wood screws into roof, in such positions that when turned the tongues on same will catch into recesses on side scantlings. When the house is permanently fitted, these screws can be tightened to prevent catches working round and roof being carried off.

Felting should now be nailed on the roof boards, allowing it to hang over the sides and ends, as shown, to prevent the drippings falling on the woodwork. It should now be well tarred, to make it impervious to rain.

The door hardly needs any description, being composed of $\frac{7}{16}$ in. boards, grooved and tongued, and held together by three battens, ¾ in. × 4 in. The size and style of hinges are clearly shown in Fig. 2, and the arrangement for fastening door, when closed, to a large scale in Figs. 11, 12, front elevation and plan respectively.

The whole can now be well painted to any colour to suit the builder's taste; a good slate colour will be found serviceable.

The house can be placed in a yard just as it is. If on earth, a brick should be placed under each foot.

BRICKLAYERS' WORK.

BY MUNIO.

CONCRETE.

CONCRETE is a mixture of ground lime or Portland cement with broken stones and gravel, and is used to form an artificial foundation on soft ground, or on ground that is not of one uniform hardness.

It was formerly the custom to tip it from a high staging, as it was supposed to be more solid when thus tipped; but it has been found that this system causes all the rougher parts to run to the outside, leaving the finer in the centre, and consequently the material is not so strong. It is now nearly discarded, and the concrete is either run into the trenches, or tipped from as low a level as possible.

In commencing the concreting of foundations, a level platform of 3 in. deals should be laid down; the lime, as it is received from the kilns, is ground in a mill till of the requisite fineness, and must be kept dry after being ground; the stones must be broken to pass through a 2 in. ring, and should be sharp, angular pieces—smooth round pebbles are not suitable; the gravel should have the fine sand screened out of it; a box of suitable size without top or bottom must be provided; this is laid on the platform and filled four times with broken stones, then twice with gravel, and once with ground lime; the whole is then pulled down, and thoroughly mixed together; water is then sprinkled on, and the whole turned over and mixed till it is thoroughly incorporated. Too much water must not be put on, but every part must be wetted: if broken bricks are used, they will take more water than hard stones. It is then wheeled into the trenches, and tipped to the full depth at one operation: when up to the top it is levelled over and well rammed down.

In leaving off for the night, three or four feet are laid in at half the full depth to form an overlapping joining for starting on the next day.

If Portland cement or lias lime be used, they are mixed in the same manner as described; the proportion of broken stones and gravel is varied to suit different circumstances; in some cases a less quantity is used, and in some more—as much as ten to one of lime or cement; but the proportion given will make a fair average concrete which will set in a day or two.

When concrete is laid in a stream or running water, it is mixed dry and filled into bags which are tied up and sunk, the bags preventing the finer parts of the cement from being carried away before it is set.

The system of packing in concrete, which consists of laying large stones in the mass, is not looked on with favour, as although in some cases, if the packing is solidly bedded and evenly distributed, it might be adopted, yet there is such a temptation to put too much in, that its use is now generally forbidden.

When lime is used for concrete, it should be grey stone lime, fresh burnt, and ground as soon as received.

MORTAR AND CEMENT.

The mortar used by the bricklayer is composed of one part of grey stone lime to three parts of clean sharp sand; chalk lime is not suitable for building purposes.

As the lime is received from the kilns, it is turned over and sprinkled with as much water as will slake it, and covered up with sand to keep the steam and heat from escaping; when cool, it is mixed with three parts of sand to one of lime, and put through a fine screen or riddle; it is then mixed with water, and turned over and beaten to a proper consistency, or it may be ground in a mill till of the requisite fineness and consistency. The proportion of sand varies with different limes, some not carrying so much as others.

For damp situations, blue lias lime is used; it is mixed in the same manner, but does not carry quite so much sand. Lias lime is obtained principally from Aberthaw in Wales, and Barrow in Leicestershire.

Portland cement is used in damp situations, and where great strength is required. It is manufactured in various parts of this country; it is mixed with three parts of sand to one of cement, generally, although for different purposes the quantity of sand is varied; the less sand that is used, the quicker the cement sets. It should not be mixed in larger quantities than can be used in one day, as it soon stiffens, and when remixed with water is much weaker. Good Portland cement should weigh about 112 lbs. per bushel, and should bear a tensile strain of from three to four hundred pounds per square inch. It is generally tested by a machine, but an approximate test may be made as follows:—Mould a bar of cement, say 2 in. square, and when thoroughly set, suspend it by one end; then fix a box to the other end, and gradually fill it with sand till the bar is broken; the weight of the box and sand, divided by four, will be the breaking-strain per square inch.

Portland cement expands in setting, and this quality should be taken note of in using it.

Roman cement is similar to Portland cement, but sets quicker; it will set in running water; it is not much used now.

Parian, Keen's, and Martin's cements are used by plasterers for skirtings, mouldings, and other inside work.

DRAINS.

In commencing to lay the drains from a house, the depth of the outlet into the main sewer should first be ascertained, and the trenches cut to a uniform fall; if this plan is not adopted, some parts will have a great fall, while other parts have scarcely any, which soon causes them to be stopped up; the pipes should never have less fall than ¼ in. to the foot; the bottom of the trenches should be neatly sloped, and a hole made for the socket of the pipe; the joints should be made with puddled clay, and should be made perfectly watertight; sometimes the joints are made with Portland cement, but where junctions occur it is advisable to use clay, as if a pipe should have to be taken up, if the joints are cemented, the pipes will have to be broken to get them out; whether cement or clay is used, care should be taken that none squeezes through the joint to the inside, or it will cause a stoppage; the inside must be left quite smooth and clear. No drains should be laid under the floors of a house, except there is no other outlet, and they should then be bedded and covered with cement concrete to prevent any possibility of sewer gas escaping, and an inspection chamber, or manhole, should be made outside the house large enough for a man to go down, and work a cleaning brush in case of a stoppage; the manhole should be lined with 9 in. brickwork, and should have a close fitting iron door on the top and a concrete bottom, with at least half a pipe depth formed in it with the concrete.

All branch drains should have properly-made junctions, and no pipe of larger size should run into a smaller. Various forms of drain pipes, junctions, etc., are shown in Figs. 8, 9, 10, and 11; a syphon trap (Fig. 12) should be fixed in the drain between the main sewer and the house, to prevent the sewer gas arising from the main sewer. All waste pipes should be trapped with a trap similar to Fig. 13, and all waste pipes and down pipes should deliver over a gulley trap (Fig. 14), fixed outside the house, and none of them should be connected to the drains. When the drains are laid in soft or wet ground, the pipes should be bedded on bricks or flat stones, and the lower half of the trench filled in with cement concrete, and well rammed down.

FOOTINGS.

In commencing to build brick walls, the lowest courses are built wider than the wall which is to come upon them, and are called footings; the courses should not be set back more than 2¼ in., as if set back 4½ in., if there should be any settlement, the ends of the bricks are liable to be snapped off, and thus destroy the object of the footings, which is to give a larger bearing surface to the walls. Fig. 15 is a section of footings for a brick and half wall; when a half brick

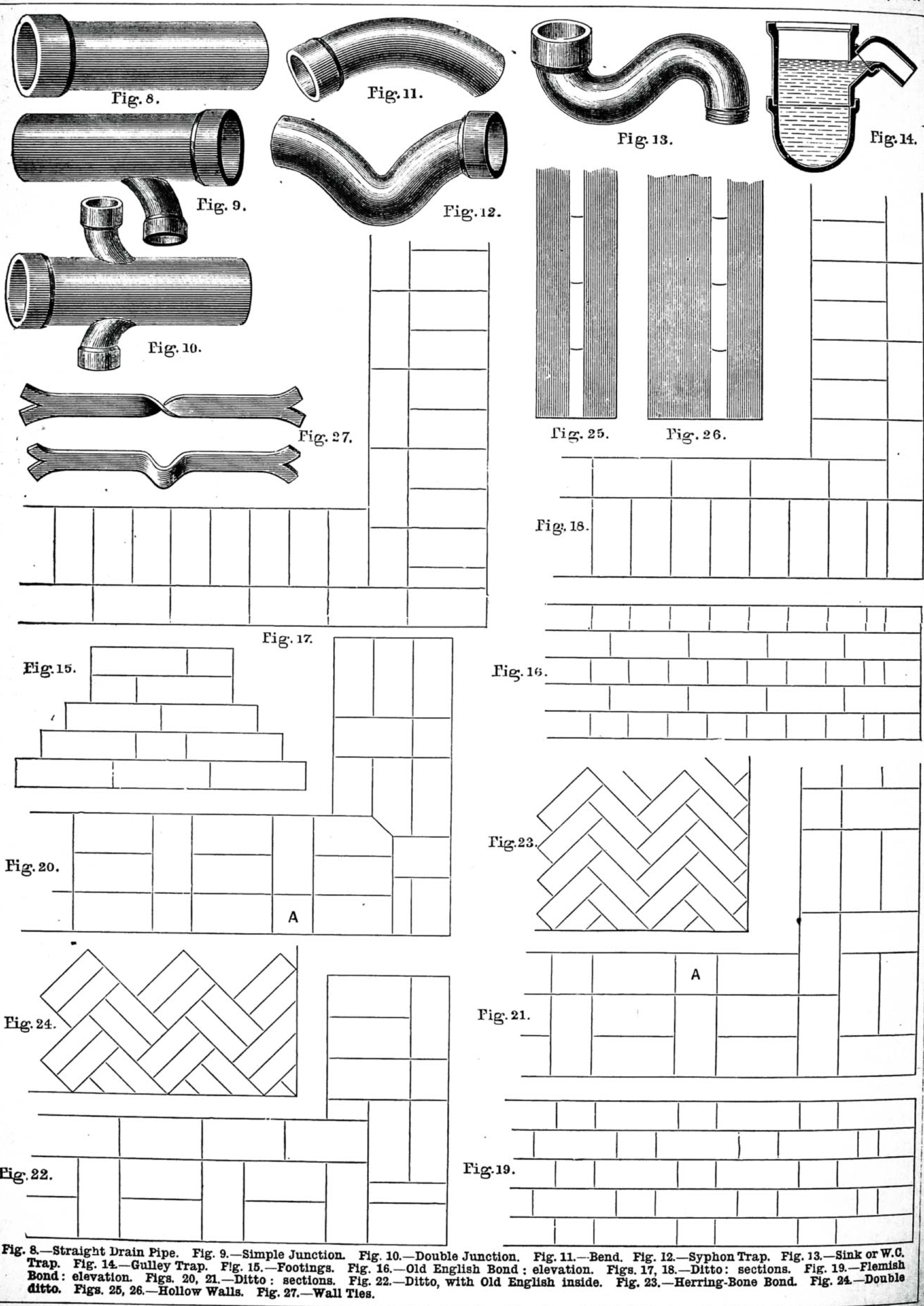

Fig. 8.—Straight Drain Pipe. Fig. 9.—Simple Junction. Fig. 10.—Double Junction. Fig. 11.—Bend. Fig. 12.—Syphon Trap. Fig. 13.—Sink or W.C. Trap. Fig. 14.—Gulley Trap. Fig. 15.—Footings. Fig. 16.—Old English Bond: elevation. Figs. 17, 18.—Ditto: sections. Fig. 19.—Flemish Bond: elevation. Figs. 20, 21.—Ditto: sections. Fig. 22.—Ditto, with Old English inside. Fig. 23.—Herring-Bone Bond. Fig. 24.—Double ditto. Figs. 25, 26.—Hollow Walls. Fig. 27.—Wall Ties.

occurs in the footings, it is laid in the centre of the wall. The footings should be at least 9 in. wider than the wall which comes upon them.

Bond of Brickwork.

The bonding of brickwork is one of the most important parts of bricklaying; it consists in laying the bricks in such a manner that the bricks in each course cross or overlap the joints of the course immediately below them not less than 2¼ in. The bricks built with their ends into the walls are called headers, and those built lengthways are called stretchers; the proper method of keeping the bond right is to make all the cross joints run straight through the wall, and to commence the quoins or angles right. The young bricklayer should carefully study the proper method of bonding at first, as a bad method in this, as in anything else, is not easy to unlearn. The two principal bonds used in this country are Old English and Flemish bonds.

Old English Bond.

Old English is considered the strongest bond; it consists of alternate courses of headers and stretchers; Fig. 16 shows the face or elevation of a wall in Old English bond, and Figs. 17 and 18 sections of the joints in two courses of a brick and half wall. It will be observed that each heading course has a quarter-brick inserted at the quoin, and that the cross joints in the wall run right through; every brick, therefore, overlaps the joint of the brick below it by 2¼ in. For a thicker wall, the joints must be set out in the same manner, observing that the bricks are headers at one side of the quoin, and stretchers at the other side.

Flemish Bond.

Flemish bond consists of alternate headers and stretchers in each course; it is generally used for house fronts, but is not so strong as Old English bond; Fig. 19 is an elevation of a wall in Flemish bond, and Figs. 20 and 21 sections of two courses in a brick and half wall faced on both sides. It will be observed that every second course is commenced with a three-quarter brick, and the cross joints are carried through the wall; the cut headers, A A, are called snap headers, and do not break joint with the stretchers immediately under and over them, making three straight joints; the snap headers are laid at each side of the wall alternately to get a better bond; if two three-quarter bricks were used, instead of a whole brick and a half brick, the joint would be covered; Fig. 22 is a section of a brick and half wall, with Flemish bond face and Old English inside; in this case, snap headers occur, which is a source of weakness, and often more snap headers than are really needful are used, the facing bricks being of a superior quality to the inside bricks.

Garden Wall Bond.

This is generally used in walls one brick thick for yard and garden walls; it consists of three stretchers and one header alternately in each course; as the bricks vary in length, and the wall is faced on both sides, it is difficult to get headers all of one length; a smaller number are therefore used. Another kind of garden wall bond, which is not much used except in the north, consists of three or four courses of stretchers to one course of headers.

Heading Bond.

Heading bond consists of headers only in each course; it is generally used for the fire-brick lining of kilns, furnaces, etc., and sometimes in circular work; but for any quantity of circular work the headers and stretchers are moulded to the curve; the stretchers are called compass bricks, and the headers, which are narrower at one end than the other, are called bull heads.

Herring-Bone Bond.

This bond is used for filling in panels and under arched recesses; Fig. 23 is an elevation; the bricks are cut to a small set-square with an angle of 45°, and must be all of one length, the setting being regulated by a larger set square; Fig. 24 shows another form called double herring-bone bond.

Hollow Walls.

Walls are now often built with a 2 or 2½ in. cavity, to keep out the damp; Fig. 25 is a section of a one brick, or rather two half-brick, wall with a 2 in. cavity, making the finished width of wall 11 in.; the two portions of the wall are tied together with iron wall ties (Fig. 27); these should be of wrought iron, galvanised or tarred while hot to keep them from rusting; in building the wall, a lath the width of the cavity with a cord attached to each end is laid on the ties; this prevents the mortar dropping to the bottom of the cavity and filling it up; the lath is drawn up as the next row of ties are reached; the ties are fixed 18 in. apart longitudinally and 2 ft. vertically; the cross joints should be well filled with mortar. Fig. 26 is a section of a brick and half wall with 2½ in. cavity; the 9 in. work is generally built inside to give a better bearing to the floor joists.

CHIP CARVING.

HOW TO SET OUT PATTERNS, AND THE USE OF THE TOOLS.

BY M. E. REEKS,

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Chip carving has now become a popular pastime, especially among ladies; it has many things in its favour: it entails little expenditure either of strength or money, and it can be worked at an ordinary table, making neither noise or mess. I shall devote this paper to the description of the instruments and tools required, and to explaining the best methods of setting out patterns and the manipulation of the tools.

Patience is indispensable to the chip carver, and those who do not already possess it will find the pursuit of chip carving an excellent means of cultivating this desirable virtue.

Here is a list of implements required:—Two pencils, an H H for ruling with, and an H B or even B B for drawing in freehand lines, a straightedge or flat ruler, two set-squares, angles of 45° and 60°—for the benefit of those of my readers who have had no experience of geometrical instruments, I give a sketch of a set-square angle 45° (Fig. 1)—and a good pair of compasses; and here I should like to warn students against buying cheap compasses or cheap boxes of instruments: they cause no end of annoyance and waste of time; you will never regret giving a good sum for compasses. I am convinced that nothing worth having can be bought under 2s. 6d., and I should advise a 3s., 4s., or 5s. pair if the student can afford it. All these things can be purchased at any well-known artists' colourmen, such as Rowney and Co., Winsor and Newton, or Lechertier, Barbe & Co.

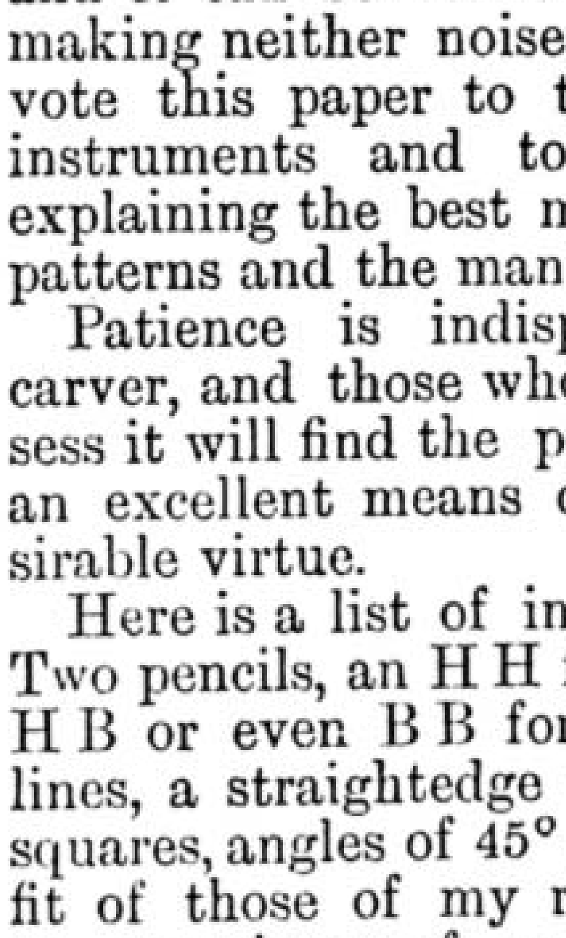


Fig. 1.—Set-square, 45°.

I now come to the tools: two are quite sufficient, although four different ones are sometimes used for the very elaborate patterns; an oil-stone and a strop complete the outfit; these last are for sharpening the tools when they get dulled with use, but at first it is better to have them ready sharpened; they can be obtained at the School of Art Wood Carving, the City and Guilds Technical Institute, Exhibition Road, South Kensington, for 1s. each; the whole outlay will cost about 8s.

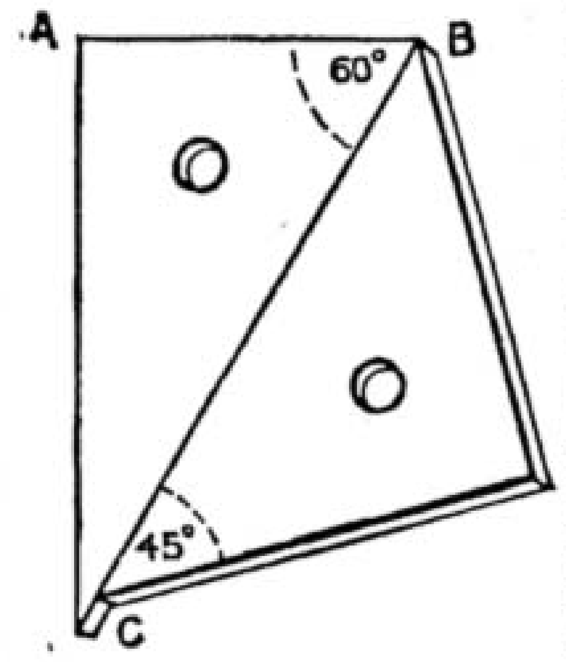


Fig. 2.—Diagram showing Mode of Using Set-squares.

I wish to impress strongly on students the necessity of setting out their patterns very carefully with pencil and compasses before beginning to cut with the tools; those who have learnt geometry, as far as the standard required for the second grade art examination, will have no difficulty in doing this correctly; but a great number of "would-be" chip carvers have never had to do with this kind of drawing, and find the setting out of their patterns the most troublesome part of the work. For their benefit I shall devote a large part of the present paper to the working out of a few simple geometrical problems, which will be found always useful, such as finding the centre of a circle, dividing a line into equal parts, dividing angles into equal parts, constructing an equilateral triangle, and making such figures as pentagons, hexagons, and octagons. And now, before I begin these problems, a word or two about the proper way of using the drawing instruments will not be amiss.

In using the set-squares, the longest sides should be placed against each other, as shown in Fig. 2. By holding them in this position, pressing down one firmly with one hand and sliding the other along its edge, you can draw any number of lines parallel to each other along the side marked A B, whilst lines drawn along A C will be at right angles to the former. By using the set-squares you can avoid the confusion caused by having to draw so many lines, as would be the case if you constructed lines parallel to each other, or at right angles to each other, by the geometrical method. Compasses should be held firmly by one hand only, and the hand should be placed at the top of the instrument, the first and second finger and the thumb being used (as shown in Fig. 3). Enough has now been said about the way of holding the instruments, and the student, after a very short time, will become quite at home with them. We now come to the problems.

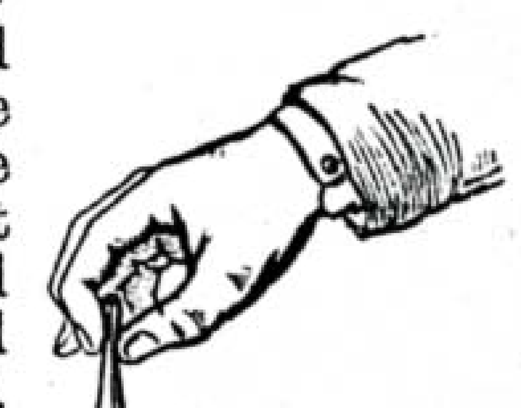


Fig. 3.—How to hold the Compasses.

Problem 1.—How to divide a line into two equal parts, or, to speak more technically, to bisect a given line. We will suppose that A B, Fig. 4, is the given line; from the two points, A and B, at each extremity of the line you mark off with the compasses two arcs or parts of circles (see Fig. 6): these circles may be any size, but they must be both the same, and also they must be larger than half the line; where these circles cut above and below the line, D and E, are two points; draw a line, connecting these, and it will cut the line, A B, into two equal parts at point C.

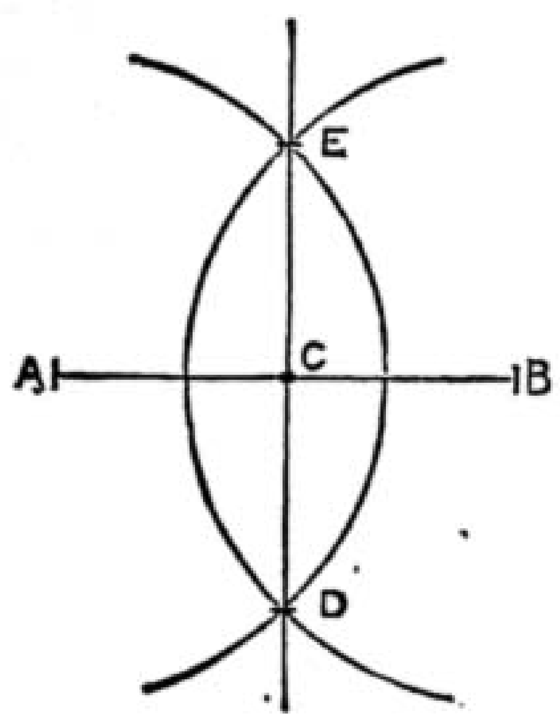


Fig. 4.—Bisection of Straight Line.

Problem 2.—To divide a line of a given length into any number of equal parts. A B is the line, and I will suppose it is to be divided into five equal parts; A B may be any length, from an inch up to any number of feet; it could always be divided in this way: From A or B—it does not signify which—draw a line, A C, at any angle to A B, then mark off along that line, starting from point A, the number of equal parts (five in this case) you wish A B to be divided into. The parts may be any size, but must be equal; join the fifth part to point B, and then with the set-squares (see Fig. 2) draw a series of parallel lines from the other points up to line, A B, and they will divide it into the number of parts required.

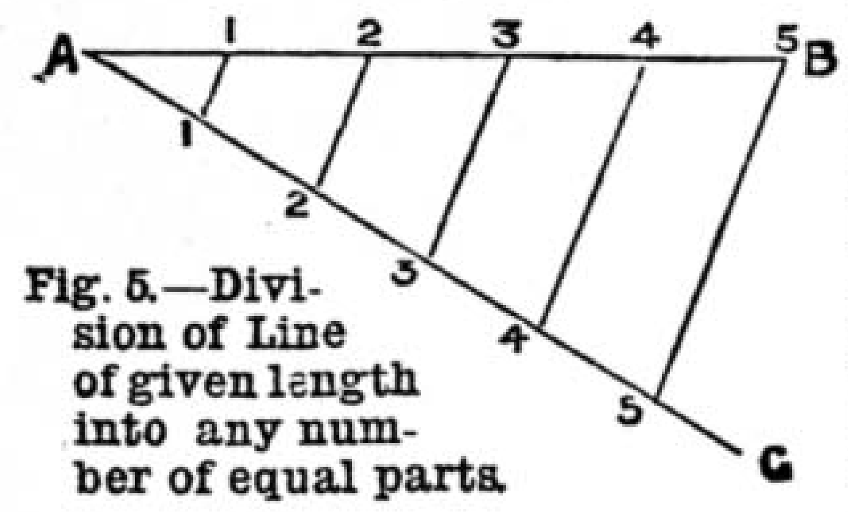


Fig. 5.—Division of Line of given length into any number of equal parts.

Problem 3.—I will now explain the different parts of a circle as far as is necessary for a chip carver. The outside or bounding line is called the circumference (Fig. 6). Any part of this circumference, as from point A to B, is called an arc; if you refer back to Fig. 4 you will see how the term arc is used. A line drawn right across the circle and passing through the centre is known as the diameter (C D, Fig. 6).

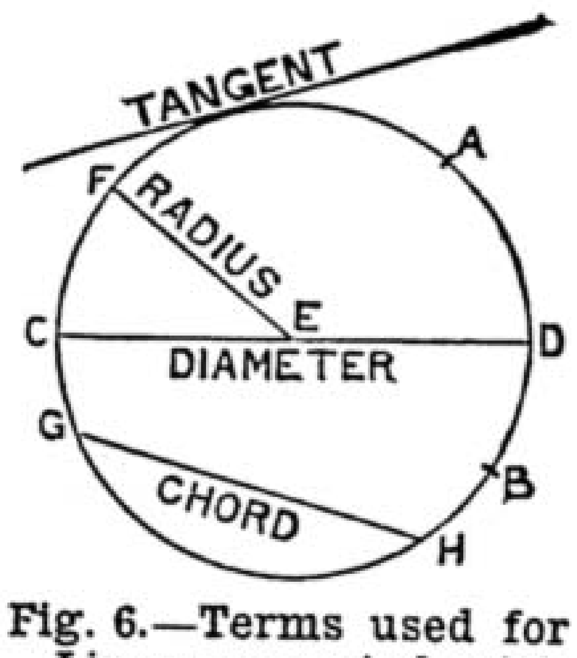


Fig. 6.—Terms used for Lines connected with Circle.

When you speak of a circle of a certain radius, you mean the distance between its centre and its circumference, as F E, Fig. 6, and all lines drawn from its centre to its circumference are called the radii. A line drawn across the circle from one point in the circumference to another, without passing through the centre, is called a chord, and divides the field of the circle into two segments (G H, Fig. 6). When a line or another circle touches the given circle without cutting it, it is said to be tangential to the circle.

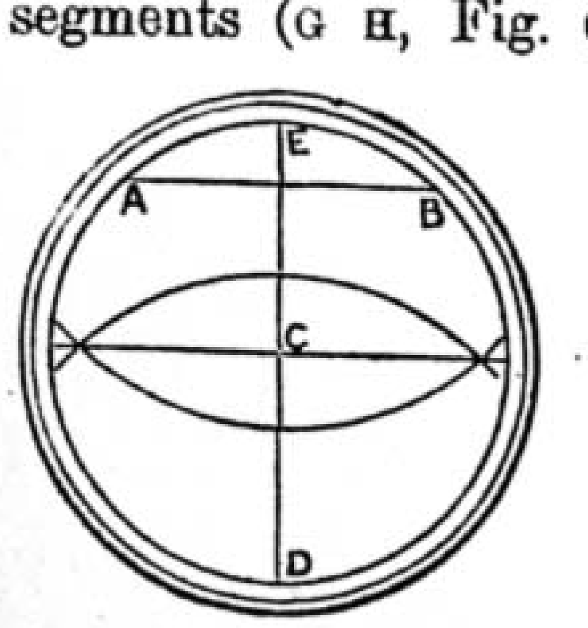


Fig. 7.—Mode of Setting out Table.

I will now suppose the student has to set out a pattern on the top of a round table, and as the table will not have the centre marked, the first thing will be to find it. Draw a line right across the table anywhere (A B, Fig. 7), then bisect it (see Fig. 4) by line, E D. The centre of the circle will fall on this line somewhere, but to find the exact spot, bisect this line, E D, and the centre of this line will be the centre of the circle and table, C; both these lines will be useful, as they form the diameters of the table.

Now I will suppose that we want our table divided into eight parts, and as it is very awkward to deal with the outside edge of the table, we first of all determine the size we wish to make the centre pattern, and describe this smaller circle; for if this is divided, and the lines drawn out to the edge of the table, the whole table will be divided. Bisect angles, A C B, Fig. 8, and D C B in the following manner:—From A and B and D describe four arcs equal in radius to each other; they will cut each other in points 1 and 2; then draw lines through these points and through the centre, continuing them right across the table, which will thus be divided into eight equal parts, making what is known as an octagon. It would be just as easy to divide it into six parts (Fig. 9); it could also be divided into five, though this perhaps is not quite so simple.

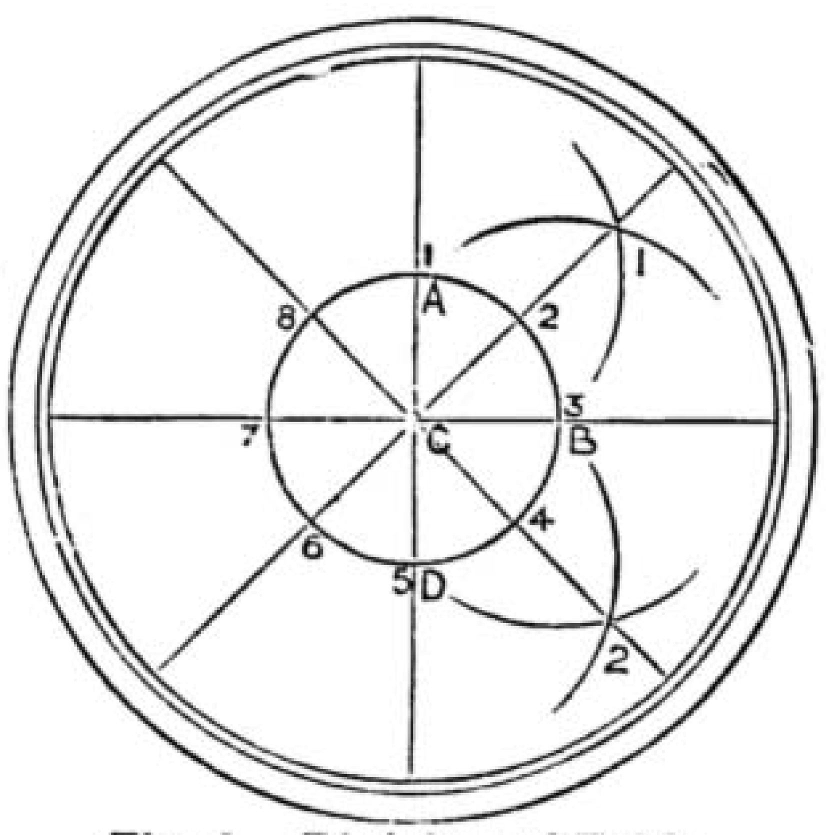


Fig. 8.—Division of Table.

Fig. 9 shows the method used for the division into six equal parts, or hexagonal division; but I have only shown the small centre circle, as the lines have merely to be extended to divide the whole table. From any point on the circumference mark off with the same radius as the circle a series of arcs, cutting the circumference in a series of points, which, if continued all round until you arrive again at the point you started from, will divide the circle into six equal parts.

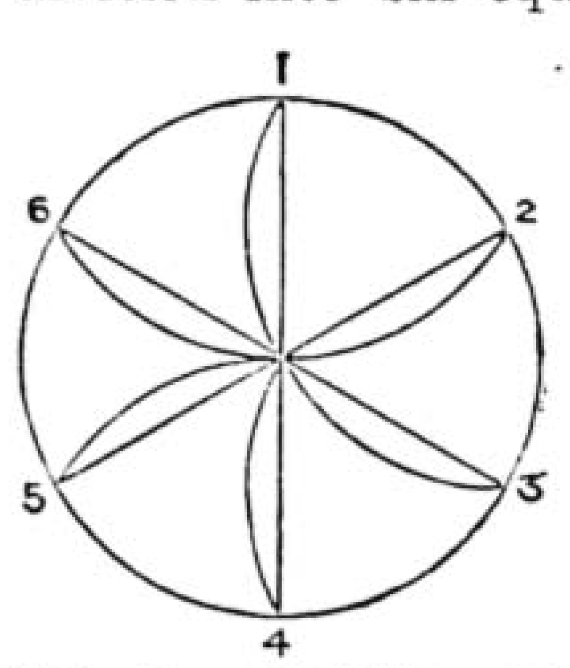


Fig. 9. — Division of Circles into six equal parts.

To divide a circle into five parts, draw one diameter (A B, Fig. 10), and at point A draw a line at right angles to it by the set-squares (as shown in Fig. 2), and make this line equal in length to A B; then (by the method shown in Fig. 5) divide line, A B, into three equal parts, 1, 2, 3; from C draw a line to point 2; this line will cut the circle in D. Mark off the distance, A D, along the circumference, and from these points draw lines to the centre, and these lines will divide the circle into five equal parts.

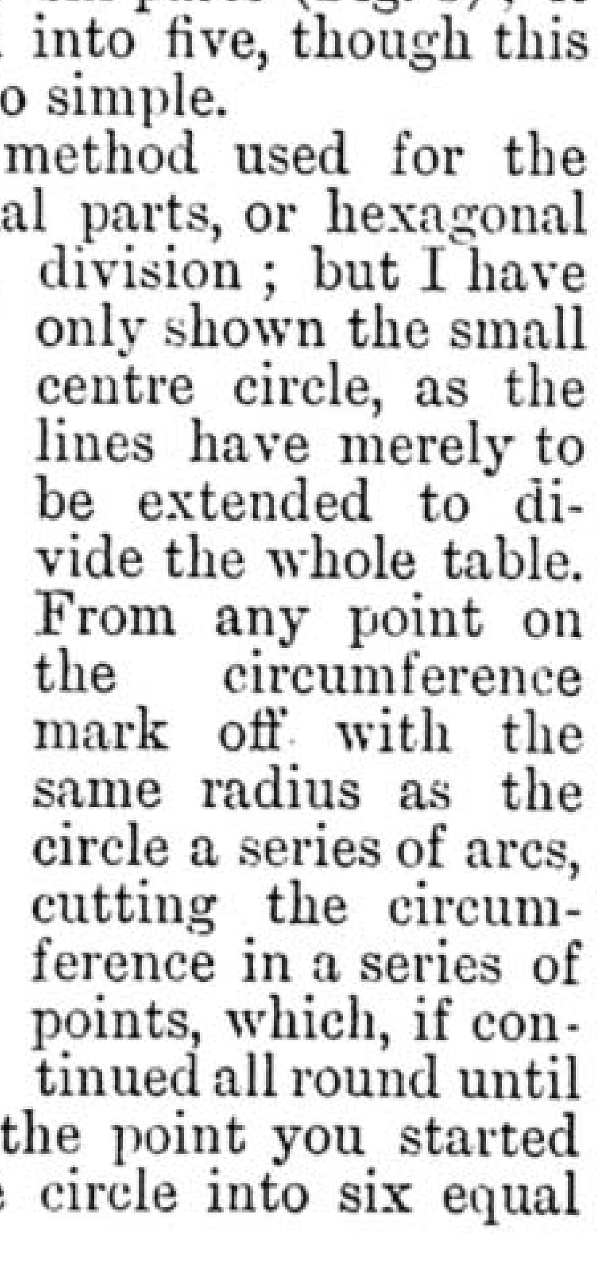


Fig. 10. — Division of Circles into five equal parts.

Triangles play such an important part in chip carving that I shall devote a little space to their description; every single chip that is cut is triangular, though not always equilateral.

To construct an equilateral triangle, after determining the size you wish the side to be—say ½ in., as A B—from the two extremities, A B, describe two arcs with A B as radius; and where these arcs cut each other will be the top or apex of the triangle, and lines drawn from this point to A B will form the two other sides of the figure. The centre of the triangle will always be required, but as the triangles are usually so small, I think it better to judge of this by the eye instead of using the geometrical method of getting it; of course the point we require will be at an exactly equal distance from each of the three sides. Draw lines from A, B, and C to this point, and these lines will divide the triangle into three equal parts; it is these sections of the triangle or pocket that form the little wedge-shaped chips of which chip carving is composed. What I have said about equilateral triangles applies equally to all triangles, except that the other kinds do not have equal sides. When two sides only are equal, the triangle is known as an isosceles, and when neither of these sides are the same length it is a scalene triangle. The only other geometrical figure I need explain is the square, and this is such a well-known one that it will not be difficult to understand. It has four equal sides, and to find its centre we have only to draw two lines, which are called diagonals, from one corner to the other, and here again we find the triangles appearing. I give the geometrical way of constructing a square, as occasionally—though this seldom happens—it is impossible to use the set-squares. Let C D be a given side of a square; from point D or C describe an arc of any radius, cutting C D in 1, then from point 1, with the same radius, cut this arc with another in point 2; from this point again, with any radius, describe another arc cutting the first one in point 3, then from point 3, with the same radius as the last, describe another arc; and where this arc cuts the one made from point 2 will be a point through which a line is drawn from D; this line is then made equal to C D, and forms the second side of the square. From point, B, with C D as radius, describe an arc, and from point, C, with the same radius, another, cutting it in point, A; lines drawn from B to A and from C to A form the other two sides, and complete the square, of which A D and B C are the diagonals.

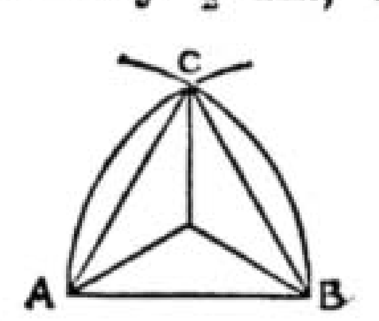


Fig. 11.—Construction of Equilateral Triangle. (Sides, ½ in.)

Fig. 12.—Isosceles Triangle.

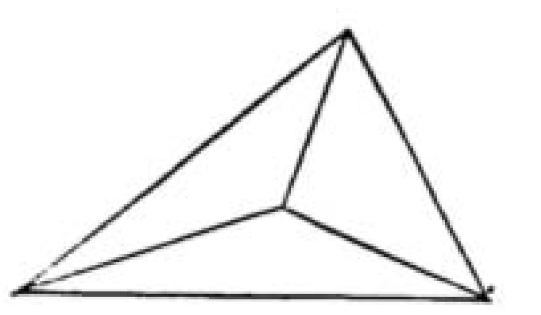


Fig. 13.—Scalene Triangle.

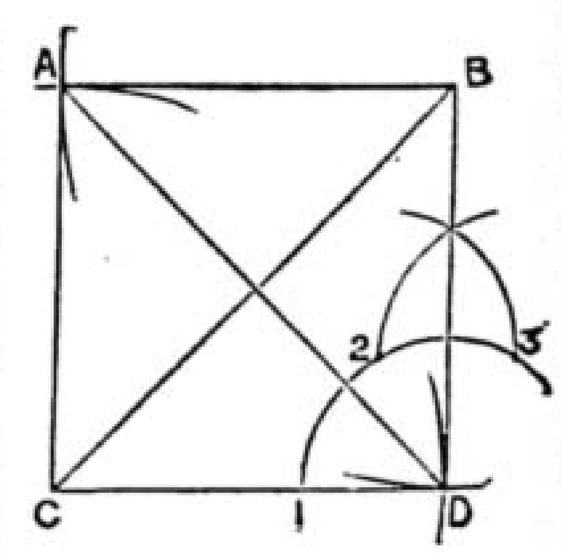


Fig. 14.—Construction of Square.

I have now finished all that it is necessary to say about the setting out the single geometrical figures, which, when combined, form the immense variety of patterns open to the chip carver, and will turn my attention to the tools and their manipulation. Two tools are sufficient for all patterns with only straight lines, and by clever hands even the slightly-curved ones can be managed with the chisel; but if the student can afford one more, I should advise what is known as a flat $\frac{3}{16}$ths of an inch in width: it is very like the chisel, but is only sharpened on one side, and very slightly curved.

The chisel and this other tool are used in the same way, except that the chisel is for straight lines and the gouge for curved ones. The best kind of tool is a "spade" or "fish-tail," $\frac{1}{4}$ in. across the top. Then we have a tool known as a "veiner": it is a very small gouge, and if held quite upright the mark it makes is thus U. The tools must be very sharp and ground thin, so that they may glide easily under the chip they are cutting, and leave no scratch on the surface below the chip.

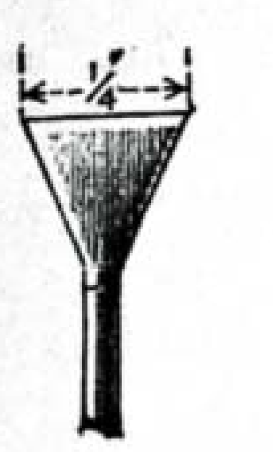


Fig. 15.—Spade or Fish-tail.

The "spade" tools are used in the formation of the "pockets," and the "veiner" for marking in the outlines of the pattern, and also sometimes making what are known as notches or "nicks," which I will explain later on, although these are generally made with the chisel. It is always advisable to mark the pattern in with the veiner before beginning the pockets, as the pencil very soon gets rubbed off. The student will find the veiner difficult to use at first, especially along the curved lines; it must be held firmly in the right hand, and pushed gently along, whilst the fingers of the left hand are kept on the blade very near the point, guiding it in the desired direction. Do not let the tool slip through these fingers, but move them with the tool; keep your eye not on the tool but on the line you are about to cut, a little in front of the tool, as you will find your hands will follow the eye. Always use both hands, as shown in Fig. 16, or you will not have any control over the tool, and grasp it firmly without pressing too heavily; do not hold it in a very upright position: let it first just "bite" the wood, and then draw it up until you have it at about an angle of 20° to the surface on which you are cutting.

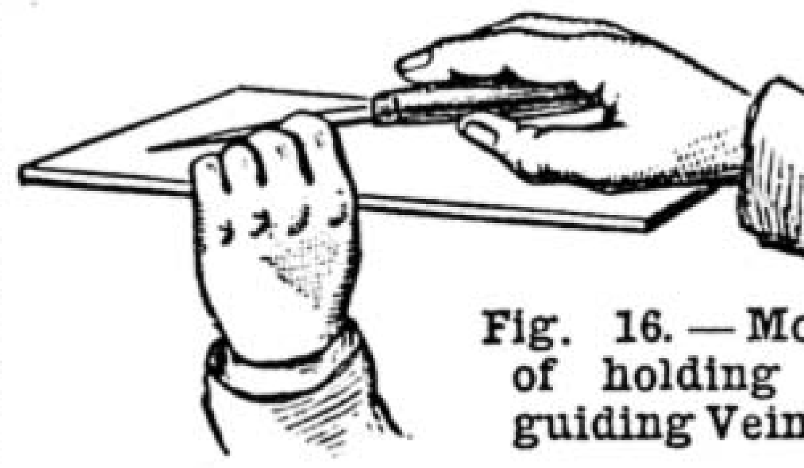


Fig. 16.—Mode of holding or guiding Veiner.

The veiner, as I said before, has another and very simple use, best shown by a diagram (Fig. 17). This is composed of four scalene triangles cut with the chisel; the square in the centre is left solid and the nicks cut with the veiner.

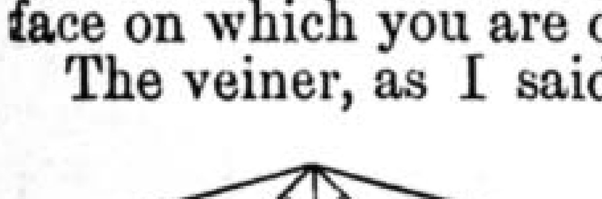


Fig. 17.—Simple Diagram exemplifying use of Tools.

I will now explain how the spade tool is used. It has two kinds of cuts — firstly, when it is held vertically, in cutting the triangular pockets, as they have to be deeper in the centre, you must press harder on one side than the other; thus in Fig. 18 I show a pocket veined round, then with the chisel cut lines 1, 2, and 3, pressing more heavily on the side which is near the centre of the triangle. After making these vertical cuts, we come to the use of the tool in its second position (Fig. 19). Begin at point, Y, then push the tool in a slanting direction from Y to W, until the corner of the tool at X reaches point 2, where the cut will be stopped by the vertical cut which was made from W to Z; repeat this process from all the corners, and the result will be three clear triangular chips in the shape of a wedge (Fig. 20), that is to say, thick at one corner and thin on the opposite side. Great care must be taken to slant the tool sufficiently, or else the three wedges (Z W Y, Z W V, and V W Y) will not meet perfectly in their centre point, W, and the chips will not come out. The student must also be very careful to keep the tool on the boundary lines of the pocket (Y Z, Z V, and V Y), and not allow it to cut beyond them; veining them first greatly assists in guiding the spade along the edge of the triangle and keeping it in place.

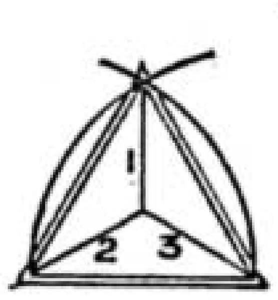


Fig. 18.—Pocket Veined round.

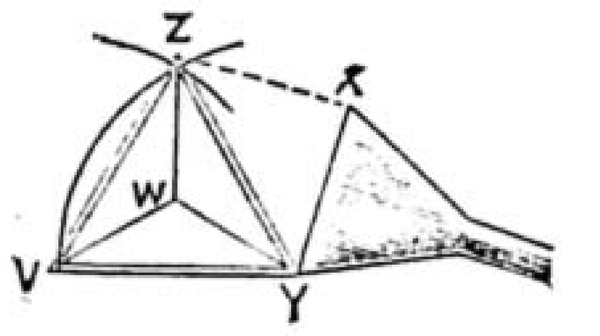


Fig. 19.—Mode of cutting Spade or Fish-tail.

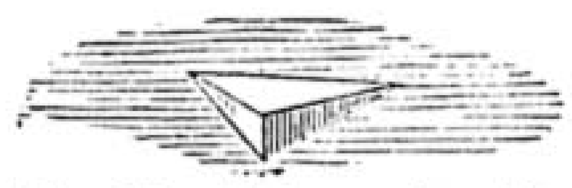


Fig. 20.—Triangular Incision in Surface.

I have now completed all I have to say about the tools, and hope in my next paper to give some designs for the decoration of small objects, with a short description of them.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

INTERNAL FITTINGS FOR HIVES—FRAMES—FRAME BLOCK—DISTANCE RACK—DISTANCE PINS—METAL ENDS—REVERSIBLE FRAMES—SECTION FRAMES—QUEEN EXCLUDER.

Of the internal fittings for our hives, the first in order and in importance are the frames. For a long time after the introduction of movable comb hives there was no standard size of frame. Every bee-master did what was right in his own eyes, and, as a consequence, there were almost as many sizes of frames and hives as there were manufacturers of such articles. Now, however, the British Bee Keepers' Association has fixed the standard frame as I gave it before—viz., external dimensions, 14 in. by $8\frac{1}{2}$ in., with top bar 17 in. long.

As we shall require a considerable number of frames which we must have exactly of the proper dimensions, and perfectly square, it would repay us well to make a block upon which they can be nailed together; in fact, I may say that such a block is a necessity. I give a drawing of mine in Fig. 1. It is not very difficult to make, although it appears rather complicated in the figure.

For the back, take a piece of pine about 20 in. long and exactly $8\frac{1}{2}$ in. wide, being parallel, and the edges planed square and true. The thickness is immaterial, but three quarters of an inch would suit admirably. Find the centre of one of the long sides and measure from that seven inches in both directions. Thus we shall have two points fourteen inches apart and equidistant from the ends of the board. With a square and sharp chisel scribe two lines across the board from these points, and two other lines an inch and a half nearer the ends. Be careful that the inner lines are not farther apart than fourteen inches; if anything, let them be a shade less. If the wood is not very hard, the chisel, when held nearly vertical, and pressed down hard while being drawn along, will sink a little distance into it. The space between the cuts at the ends should be chiselled out to the depth of an eighth of an inch.

Two pieces of wood, each $7\frac{3}{8}$ in. long, $1\frac{1}{4}$ in. wide, and a little more than 1 in. thick, should now be prepared and fitted into the spaces thus cut out. They occupy a position just in the middle of the width of the board, being nine-sixteenths of an inch from either edge.

If all has been well done, these pieces will be 14 in. apart inside, 17 in. outside, and stand $\frac{7}{8}$ in. from the board. They should be screwed and glued in that position. If a piece of $\frac{3}{4}$ in. stuff, 3 in. wide, be nailed to one edge of the board, it will act as a foot, upon which the whole apparatus will stand firmly. Frames could be nailed together by the help of this block in its present condition, but we would require a couple of hands to hold the sides of the frames against the inner surfaces of the stand-out pieces while the top bar is being nailed on. This is not always convenient, and so we must devise a more convenient method. This is not difficult. Two pieces of wood, each $7\frac{3}{8}$ in. by 6 in. by $\frac{7}{8}$ in., are planed flat and smooth, and three mortises are cut through each. These may be $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. wide, and in approximately the positions shown. These pieces, which we may call the jambing blocks, are fastened to the back by means of six round-headed screws with washers, as shown. In the diagram I leave out one of the screws to show the nature of the mortise in which they work. The best way to fix the positions of the screws is to put a couple of frame ends in position as if for nailing together, push the jambing blocks against them, and insert the screws nearly in the centres of their mortises. A hole should be made in the middle of the back so that a wedge can be pushed through to force the blocks apart and against the frame ends. I put a couple of loops of elastic between them, so as to pull them together and release the frame when the wedge is withdrawn. The elastic loops are upon little screws placed near the inner edges of the blocks. A strip of wood nailed against the outer surface of one of the fixed pieces acts as a stop, against which the top bars of the frames can be pushed when nailing them together.

It is scarcely necessary for me to explain how this is used. One of the lower bars of the frames is laid on the foot and pressed into the back, then a couple of ends are laid in position standing on the lower bar, the wedge is inserted, and holds the ends tightly. A top bar is laid on the tops of the end bars, which will be found to project slightly, and its position regulated by the stop at one end, glue is applied, and two 1 in. or $1\frac{1}{4}$ in. sprigs, or joiners' brads, are driven down through the top bar into each end, the wedge is withdrawn, the jambing blocks come together owing to the elastic bands, and the frame is loose. The same is done to the next, until all are finished to that extent. The bar, which has all this time been resting on the foot, is then removed, and, the frame being again inserted reversed, the lower bars are nailed on in a similar manner. The peculiar construction of the block will draw our attention to any defect in the various parts of the frames. If perfect, the sides and top bars will be on a level with the jambing blocks of the apparatus, and the top bar will be just flush with the upper edge of the back.

In length it will reach from the stop at one end to the outer surface of the fixed piece at the other. It would be good policy to attach the wedge to the block with a bit of twine, or it would probably be lost.

It is wonderful how quickly and accurately frames can be nailed together by means of this simple affair. Without it, I would very much fear to attack a gross of frames and guarantee their interchangeability.

But I will return to the preparation of the wood for the frames. Here a circular exactly to gauge. I set the saw then to cut $\frac{1}{2}$ in. exactly, and run the 17 in. pieces through, taking off as many as I can, and running the last one through to reduce it to the proper thickness. For the sides the saw is set to three-eighths, and for the lower bars to a quarter. I do not plane after the saw, because it makes them very smooth. I simply remove any ragged edges which may remain. It is important in sawing to hold the wood firmly against the guide, else the cut may be crooked. If this happens, shoot the edge of what remains, or turn it over and saw from the true edge. acts well with an experienced hand to guide it, I would not recommend it to a beginner. A rack (Fig. 3) is sometimes used, but is not recommended. The spaces are $\frac{7}{8}$ in. wide and the dividers $\frac{5}{8}$ in. slack, both together amounting to $1\frac{9}{20}$ in. Some people simply drive a wire nail into each end of the frame, others a bell staple or screw, but I prefer the little screwed eyes which are sometimes used to hang pictures with. I show one in Fig. 4. A gauge wherewith to judge the proper depth to put in the screw can be easily made like Fig. 5. A piece of wood is nailed upright on another, and a

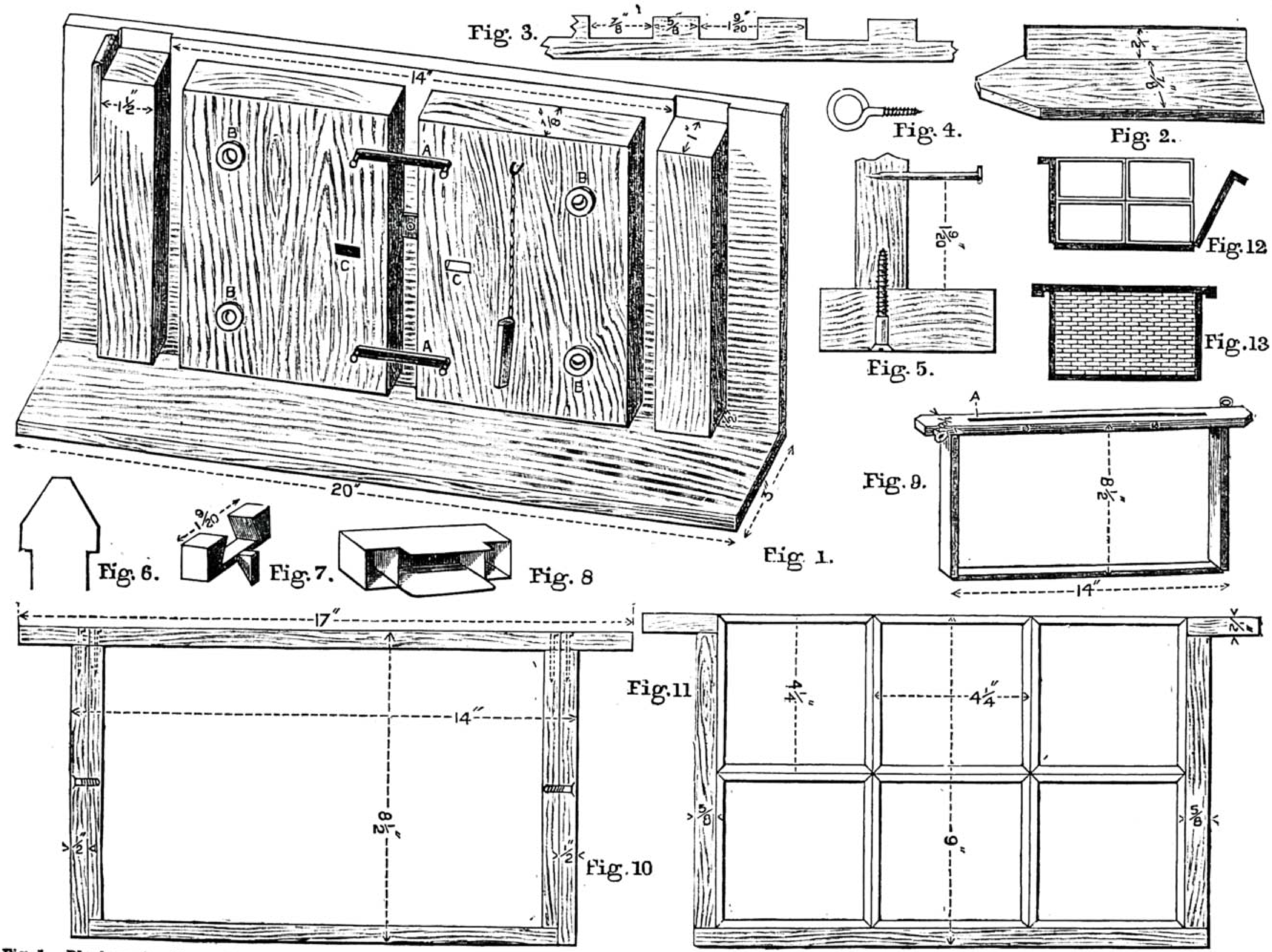


Fig. 1.—Block as Appliance for nailing Frames together. Fig. 2.—Gauge for Ends of Top Bars. Fig. 3.—Distance Rack. Fig. 4.—Screwed Eye. Fig. 5.—Gauge to measure Width of Frame End and Eye. Fig. 6.—End of Abbott's Broad-shouldered Frame. Fig. 7.—Dr. Pine's Metal End. Fig. 8.—Carr's Metal End. Fig. 9.—Frame complete. Fig. 10.—Reversible Frame. Fig. 11.—Section Frame for $4\frac{1}{4}$ in. by $4\frac{1}{4}$ in. Sections. Fig. 12.—Section Frame with Hinged Sides. Fig. 13.—Queen Excluder.

saw may be considered an absolute necessity, and I will take for granted that one is provided.

I have an excellent one for this work, which I hope to describe before these papers are concluded, and thus give my readers an opportunity of following my example in making one.

Yellow pine is the wood usually recommended for making frames. My procedure is to get inch stuff and plane it smooth on both sides, when it will usually turn out to be seven-eighths. Then I cut off 17 in. lengths for the top bars, and twice as many $7\frac{3}{4}$ in. lengths for the sides. The lower bars are of $\frac{1}{2}$ in. stuff, and 14 in. long. When sawn, I touch up the ends with the trying-plane and shooting-board to reduce them

If the foundation is to be fixed in a saw-cut, this must be made before the frames are put together. It is about 13 in. long, and can easily be made with the circular saw. A gauge which shows where to begin and cease cutting can be easily attached to the saw-table. Of course, the saw-cut will be in the centre of the bar.

One other thing remains, and that is to make the ends of the top bars V-shaped, to prevent propolising. A little gauge can easily be made for this purpose, like Fig. 2, and a sharp, thinly ground chisel will do the rest.

Sundry and divers methods have been used for keeping the frames the correct distance apart. Some bee-masters employ the ever ready rule of thumb, but, although it nail driven in at the correct height. Lay the frame on its side, and if the staple passes under the nail, just grazing it, it is right; if not, it must be driven in further, or drawn out until perfect.

When the frame hangs in its natural position, I always put the eye or staple in the right-hand edge at the near end, the far end having it at the left-hand side. This, I believe, is the usual plan, but some of Mr. Abbott's broad-shouldered frames are fashioned like Fig. 6, and so could not well be used with frames of the staple type, unless four staples were used in the latter, which would be waste.

I ought not to neglect mentioning metal ends for frames, although I never use them myself. Fig. 7 shows Dr. Pine's metal ends, and Fig. 8, Carr's. Both fit on the projecting end of the top bar, which must be cut to fit them. I give in Fig. 9 a view of frame complete and ready for the foundation. This is inserted in the saw-cut made in the top bar by thinning it slightly at the upper edge, opening the slit with a wedge, and inserting the foundation, which is held in place with a couple of screws. Some people run a little saw-cut from one side of the bar to the slit in the middle of the frame top, but I manage to put the foundation into place without doing this, which must weaken the frame. A good deal depends, however, upon the width of the saw kerf. If it is narrow, the frame must almost of necessity be opened at one end, but mine is wide enough to embrace the foundation with very little trouble.

If any of my readers wish to experiment with reversible frames, they can easily be made as shown in Fig. 10. The inner, which holds the comb, is 8½ in. by 13 in. Then two L-shaped pieces are made of ½ in. stuff and fastened to the centre of the frame with a couple of wood screws, which act as pivots. The frame then takes the place of the ordinary kind, but it can be reversed by turning the end pieces half a turn on the pivot. The line of juncture should be very close, or the bees will propolise the two together in such a way as to make it practically a fixture.

I may here mention that propolis is a glutinous material with which the bees fill up every crevice in the hive. If any space is much less than a quarter of an inch, they will fill it up with this gluten, and if it is much greater, they will build combs in it, hence the necessity of having all hives and their belongings made accurately. If, for instance, a frame is not square, it may touch the brood-nest at one corner and be half an inch from it at the opposite one. The bees will stick them together at one corner and build the comb at the other side, so that the frame will be practically fixed to the hive. If they can be separated, it will be only with the greatest difficulty, perhaps at the sacrifice of the frame, certainly with the loss of a good deal of bee life and human temper. Therefore, in everything be accurate and square.

As there is a block upon which to build the frames, so also one can be made easily to gauge the inside of the hive with. It may be a piece of pine, 14½ in. long, 8¼ in. wide, and, say, 1 in. thick. It should be made as true as plane and square can accomplish, as it will be the standard by which to judge of the truth of our work. To test a hive, slip this into the brood-nest, standing it on the floor board on one of its long edges. The strips upon which the frames rest should then be flush with its upper surface, and the hive should be exactly as wide as the gauge is long. If the hive will not stand this test, smash it up, or use it to hold old combs, but don't put bees to work in it.

It is sometimes desirable to start sections in the brood-nest, and for this purpose a section frame is necessary. This is simply a frame consisting of three sides made of 2 in. stuff (Fig. 11). The sections being 4¼ in. square, three of them will be 12¾ in. long. The sides of the section frame must, therefore, be of ⅝ in. stuff to have the external length 14 in. The top pieces for supporting it will be ½ in. thick, to bring it to a level with the other frames. The lower bar must be ½ in. thick, and will touch the floor board. The entire structure should be nailed and glued very firmly together, as it will be subjected to considerable strain.

Fig. 12 shows a section frame slightly different. It holds four sections of a larger size, and the sides are hinged to the bottom bar to make the removal of the sections easier. Any of these section frames would be placed at the back of the brood-nest, and the queen is sometimes prevented from laying in them by putting a sheet of excluder zinc between them and the brood frames. Fig. 13 shows such an excluder. The zinc must be bought, as the holes have to be punched very accurately. As the object is to allow the workers as free access as possible while excluding her majesty, the zinc should not be covered with an unnecessarily wide frame of wood. Sometimes I put merely a bead of tin round it, to give it rigidity, slipping it into an ordinary top bar at one edge; but, when I use wood, it is of the very lightest description, merely a half-inch strip with a saw-cut run half through it, in which the zinc fits. We must remember that the queen might creep round the end of the top bar, and so we attach a little block to it to stop her passage, as shown in Fig. 13.

I have now described most of the requirements for the brood-nest, and I will postpone the section racks to the next paper.

THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

Modelling in Relief.

Working from the Antique — Preparing Grounds—Copying in Relief on a Large Scale — Modelled Ornament on Curved Surfaces — Reduced Reliefs of Statues and Groups—Modelling from the Flat.

Sculptors are accustomed to speak of their works as belonging to two great classes—those in the "Round" and those in "Relief." The Round includes all sculpture which is not attached to a background—such as busts, etc.; whilst whatever is attached to a background, however slightly, is included under the head of Relief. Again, they speak of Reliefs as of three kinds—Low-Relief (sometimes called Bas-Relief), in which the work lies flatly upon the background, and has no under-cutting; Middle-Relief, in which the work is somewhat more raised, and in which an amount of under-cutting occurs; and High-Relief, in which the figures, etc., stand out so boldly from the background as to be frequently almost detached from it.

Works in the round demand most skill and care, and for this reason—they are intended to be looked at from every side, and ought therefore to appear satisfactory from whatever point of view the spectator may choose to take; whereas a work in relief is supposed to be looked at from one point of view only—namely, from the front. The merely mechanical difficulties of making a figure in the round are also much greater than those of making a work in relief. Hence those who are learning modelling usually work far more in relief than in the round. It will be well, therefore, that we should now see how the modeller sets about a study in relief.

We will presume that he has procured a cast of the bust of that well-known statue the Apollo Belvedere. This will afford excellent practice, as the modelling in it is large and grand, and it has so much beauty and expression as cannot fail to make it interesting. It is, of course, in the round, but we are going to see how a study in relief can be made from it. Ours will be a profile view, of the size of the original, but in somewhat low relief.

This head is about 12 in. high and 10 in. across, so that, allowing for a portion of the bust which it will be desirable to show, our background must not be less than 24 in. by 18 in. The best background is a slab of clay, which must be formed either on board or slate. Slate has its advantages, inasmuch that it does not warp; but it is heavy, and, besides, the clay model is less easily secured to it, and, should it get too dry, may be liable to slip off. A modelling board is, therefore, more commonly used. It will need cross-clamping or ledgers to keep it from warping, and a projection along the bottom in front, to support the clay. Fig. 13 shows a modelling board in section. Such a board stands better if the screws which fasten on the ledgers are driven through slots rather than round holes, so as to allow of free swelling and shrinking of the wood.

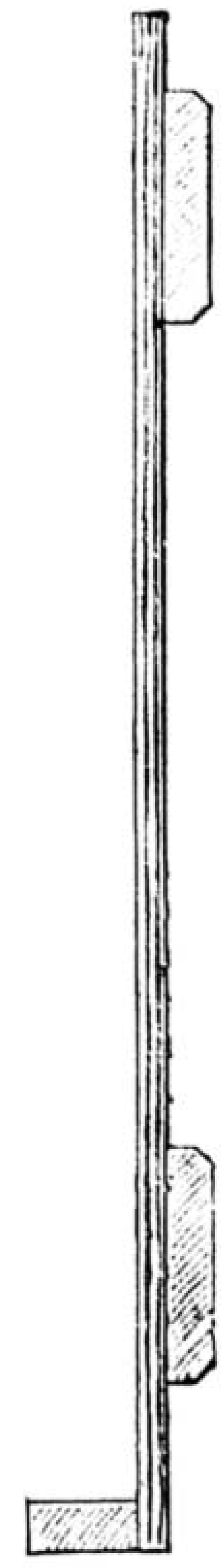


Fig. 13. — Modelling Board for Reliefs.

Such a board may be used on a modelling stool like Fig. 2 (p. 123, Vol. II.), or on an ordinary easel of moderate strength. For the present purpose a slab of clay about an inch thick will be desirable. Before spreading it, the board should be damped with a sponge, otherwise the clay will not stick well. Even in so simple a business as making a slab the clay should be laid on properly, and no air-holes left, otherwise the surface will by-and-by become uneven. This will also be the case if the clay forming it is not well tempered but is softer in some parts than others. When enough clay has been laid on, it is smoothed with a modeller's straightedge. One made of boxwood, about 12 in. long by 2 in. broad, and toothed in the same manner as the roughing-out tools, would be useful for this and similar purposes. A slab to be pleasant to work upon should always have a toothed face. The slab is then left uncovered for some twenty-four hours, that it may set, when it will need again working over with the straightedge, and making perfectly level and true.

The modeller can now draw in the outline of his relief. For doing this he will probably use such a tool as the rounded end of Fig. 8 (p. 124, Vol. II.). With this he can draw upon his clay slab as he would with a stick of charcoal on paper, any false stroke being obliterated by finger or tool; and he should take care to make his outline correct in all essentials, as this will save much future labour.

Within the outline he now begins to lay on his clay in larger or smaller pieces, according to the bulk required in any particular part, and works it down with his thumbs as he goes on. He will have determined somewhere about how far his relief is to project. In this case it might be about two inches, and, in building up, he will take care to keep his highest parts somewhat lower than this, for they are sure to grow higher as the work goes on. All forms are to be represented as much more flat than they are in the cast, and some attention will be necessary to give to each its proper relative amount of projection. An unpractised eye is often deceived on this point, and it will be found necessary frequently to look at the cast at right angles to the point of sight, and to use a plummet. In roughing-out, the desirability already alluded to—of sketching mainly in right lines and angles—will be borne in mind. The different slightly-rounded surfaces will be represented by planes, and much attention will be given to making all these planes "move" at such inclinations as are relatively correct.

By looking well to these matters in the earlier stages, much future labour, and many after alterations and corrections which involve the destruction of elaborate work, may be avoided.

Everything at present is kept large and broad, and no attempt made to represent details which detract from breadth—such, for instance, as eyelids; but by judiciously indicating the main features in their correct positions, much general resemblance to the cast may be attained. It is this sketching out of a model which chiefly demands the worker's energies, his powers of perception, his judgment, and his dextrous handling of the plastic material. The after-work of finishing he may take far more easily.

An important matter in this, and indeed in all modelling, is the light in which the work is done. It should fall from the same direction upon both cast and model. Some sculptors' studios have sky-lights. Under the light so thrown forms are strongly brought out, but the work done in it does not look so well when taken, as it generally must be, into a less forcing light. Perhaps the best light is one which falls obliquely from above at an angle of about 45°, and the most approved arrangement for studios is the high window above the level of the head and looking towards the north. The north aspect is desirable as admitting no sunshine. A strong gas-light is even better than daylight for modelling from the cast, since it throws more decided shadows.

As the relief advances, the worker will find that his clay background has various advantages over one of plaster or bare slate. Reliefs of moderate size like the present are best laid flat when work is over and they have to be damped for the night, and with the slab most of the skewers which support the wet cloths can be stuck into it rather than into the work; besides, by adding considerably to the bulk of clay, it allows the figure to be kept in a more regular state of moisture than would otherwise be possible. These are merely practical advantages, but there are others which are purely artistic, though these are less apparent in a tolerably bold relief like the present than in one of greater delicacy. One of these is the more tender outline of which this ground admits. A hard continuous outline has a crude effect in low relief, and a clay background allows it to be softened and almost blended with the slab in parts, which could not be done were the ground of another and a hard material.

Again, much labour may be saved at times, when the ground is of clay, by sinking it a little so as to bring in some receding form. Moreover, in very delicate work the parts are less likely to be brought into proper harmony when the eye is disturbed by difference of colour in figures and background.

Other conditions regulate the modelling of mere ornament in low relief. It is in perhaps the majority of cases necessary that this should be upon a curved ground; and to keep such a ground true through the operations of modelling may be a difficult matter if it is in so yielding a material as clay. Often therefore in ornamental work it is better to model the ground roughly in clay, to cast it in plaster, and in that material to bring it to its proper form and level. In the case of a curved surface this is more readily done in the firmer material than in the clay. Then to model the ornament on it in clay; and for ornament the outline will rarely be too firm or decided. But it must be remembered that the adhesion between clay and plaster is not strong, and that the former is likely to peel from the latter if care is not taken to keep the work regularly damped.

But to return to our Apollo. The broad flesh surfaces which this figure offers will give admirable practice for finishing with the thumb, though, of course, the outline and more intricate parts of the features will need tools. The hair will be all tool-work. In working from nature, hair is a difficult thing to treat; but here, as in the antique generally, it is conventional and simple. A little drapery is thrown across the bust; and in finishing this, a flat wire tool, such as Fig. 12 (page 124, Vol. II.), will be found most serviceable.

For further practice in relief, whole antique figures or groups of figures, modelled to perhaps a third of their original size, are usual subjects. Of these, single figures in high relief are the most easy, and groups in quite low relief demand the most skill. In choosing a view of any statue or group for this purpose, some judgment is needed; it should be one in which the lines compose gracefully; and if they can be to a great extent in one plane, so much the better. It is not well to have a leg or arm sticking straight out towards the spectator; it is difficult to foreshorten such limbs, and they always look awkward.

After all care taken in sketching, it will sometimes be found, as a work of this kind progresses, that an arm, a leg, or a head is not just in the right place. It is far easier to correct such an error in modelling than in drawing. All that has to be done is to cut the part from the background with a wire or string, and move it to its proper position. Or the part may have been modelled in a relief relatively too high or too low; if the latter, it is easy to detach it from the ground with the wire, and by putting clay under it to raise it to its proper height; if the former, a slice can be cut from under it, and the relief thus lowered as required. These are some of the many facilities which clay gives for alterations and experiments, and which tend to render it the most delightful of all materials in which to work.

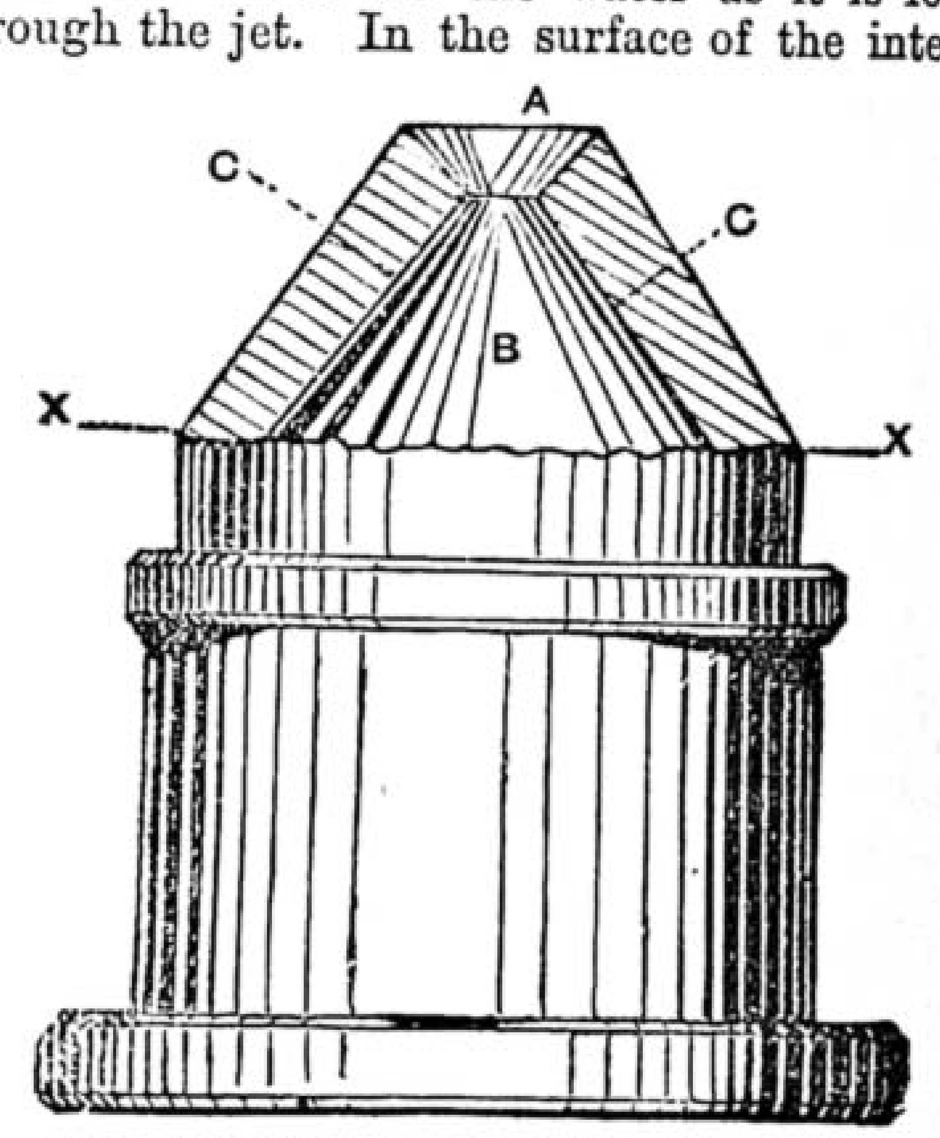
Another variety of work in relief, but one which it is better not to attempt till some experience of actual form has been gained by working from the round, is what is known as modelling from the flat. This means working from drawings, engravings, etc.—and highly interesting work it is. Designs appearing in a new form of art and a new material have something of the value of original works, and may be capable of application to various purposes.

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.*

24.—Eade's Patent Converging Water Jets.

In sprinkling water over plants, it is always desirable to break the water into as fine a spray as possible, and to throw it as far as may be practicable; and to obtain a really good and efficient water jet by which a fine spray can be sent to a greater distance than can be covered by water issuing from an ordinary rose-jet has always been a desideratum among nursery-men, gardeners, hop-growers, and all others who at times find it necessary to syringe, and thereby diffuse a spray over trees, plants, vines, flowers, etc., whether housed under glass or in the open air. To do this thoroughly and effectively, it is necessary to break up the water before it leaves the nozzle of the jet, and this has been managed by Mr. A. J. Eade, Bridge Iron Works, Edenbridge, Kent, by means of his new Patent Converging Water Jet, a section of which is given in the accompanying illustration on a somewhat larger scale than even the largest size in which the jets are made. From this it will be seen that the nozzle of the jet beyond the line, X X, although it appears to be a single cone, is, in reality, a double cone—namely, the internal cone, B, and the external cone, A, which meet in a small orifice that forms the outlet for the water as it is forced through the jet. In the surface of the internal



Eade's Patent Converging Water Jet.

cone, B, at the points indicated in the illustration by the dotted lines, C C, two deep grooves are cut on each side, which meet at the orifice in the form of two V's placed front to front, thus > <. As the water passes through the nozzle, it is split up by the grooves into separate jets, which converge towards the outlet, where they meet, the impact of the particles breaking up the water and causing it to be diffused in a soft divergent spray as it passes outwards through the smaller external cylinder, A. The jets, which are of brass, are in no way liable to be choked by any small particles of rubbish, weeds, etc., which may find their way to the orifice; and the construction, as will have been understood from the description given, is so simple, being without any loose parts in the shape of separate striking plates or guides, that it is utterly impossible for them to get out of order. The jets are screwed to fit three sizes of pipes—namely, $\frac{1}{4}$ in., $\frac{3}{8}$ in., and $\frac{1}{2}$ in., and they may be also had with tap complete for binding in hose. Jets of two different degrees of power are manufactured, distinguished as No. 1 and No. 2. Of these, the first throws the spray to a distance of 10 ft., and the second to a distance of 20 ft., and even more. Jets screwed to fit $\frac{1}{4}$ in. pipe are supplied at 1s. 3d. each; the larger sizes, which are admirably adapted for the purpose of hop-washing, screwed to fit $\frac{3}{8}$ in. and $\frac{1}{2}$ in. pipes, are supplied respectively at 1s. 6d. and 1s. 9d. each. Taps for binding to hose to fit jets screwed for $\frac{1}{4}$ in. pipe are supplied, suitable for $\frac{1}{2}$ in. hose, at 2s. 9d.; for $\frac{5}{8}$ in. hose at 3s.; and for $\frac{3}{4}$ in. hose at 3s. 3d. A single trial of a jet will be sufficient to show that they only require to be known to be appreciated.

The Editor.

SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

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

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

I.—Letters from Correspondents.

Band Saw Brazing.—A. R. (*Scorrier*) writes: —"On page 19, Vol. II., of Work, an article is written on the above, and as I have written more than once on the subject, the remarks by one who has done it incite me to pen the following. I often file and bevel the length of two teeth as described on page 19, Fig. 2, but the better way is to file the ends of saw as in the annexed sketch, Fig. 1, as it will make a stronger joint than if the end of braze is at the gullet of teeth. Again, when I commenced some years ago to braze band saws, I used to do as the writer of the article on page 19, that is, make the borax to a paste, and put it between and on top and underneath the joint, but have done away with that way of working long since, as I found the better way is to beat the borax to a powder and mix the spelter with it, damping only the ends of the saw; then take a

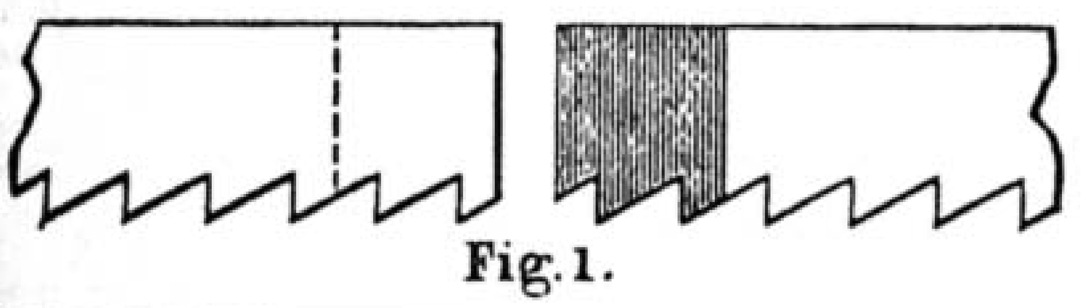


Fig. 1.

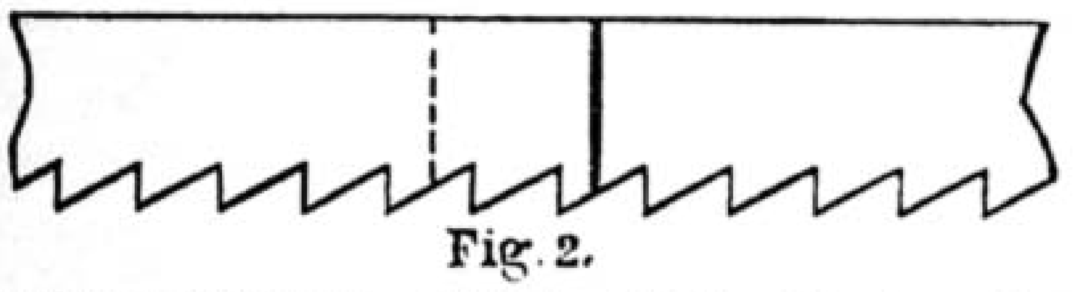


Fig. 2.

Band Saw Brazing. Fig. 1.—Ends of Broken Saw filed for Brazing. Fig. 2.—The Saw when Ends have been Brazed.

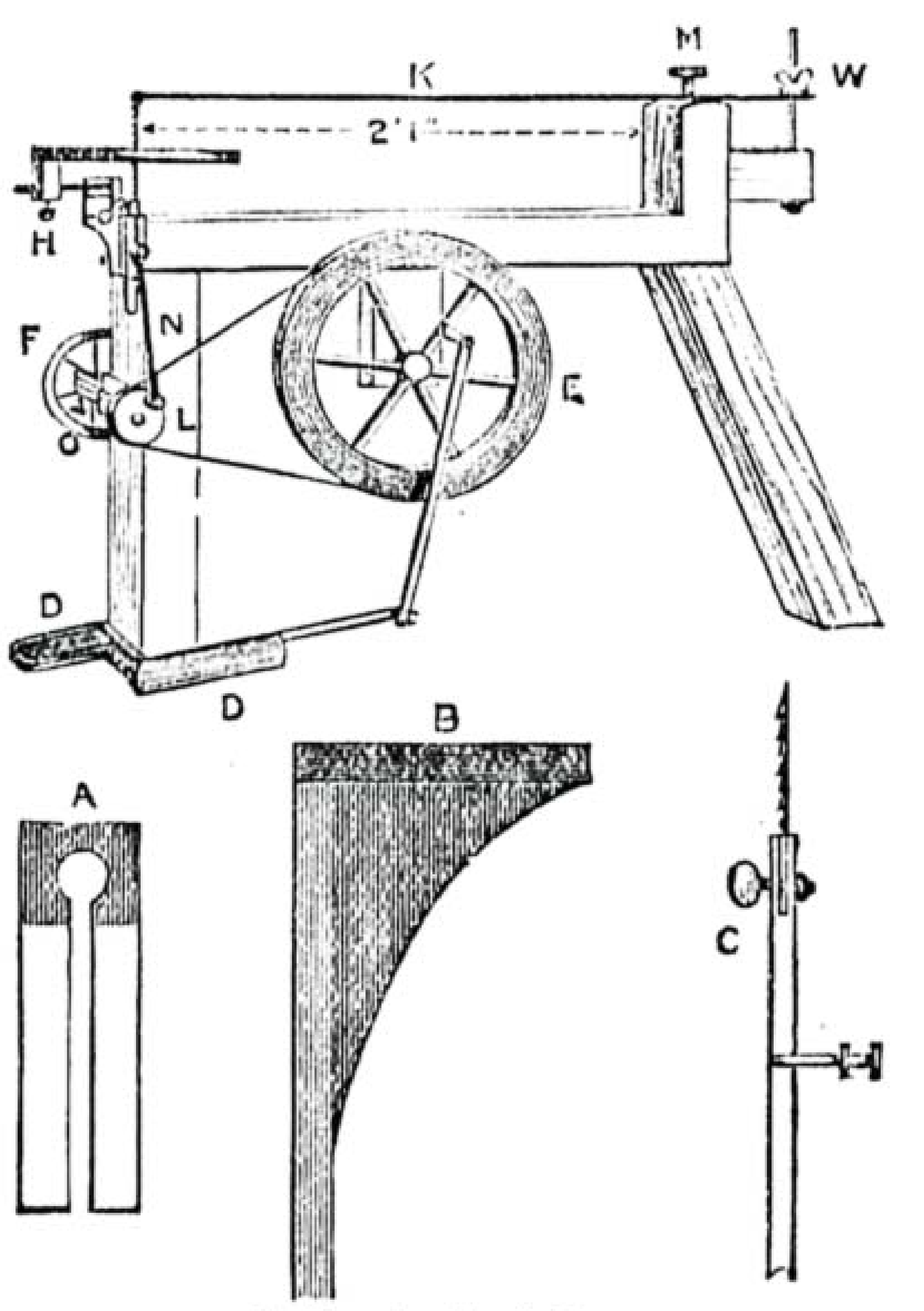
little of the same and put between the ends where they lap; there will be none needed on top or underneath the joint. I will give my reasons for this. A practical man may get on all right, but a beginner is likely to get trouble. The hot tongs being closed on the joint the spelter begins to run, and the young hand, to make sure that the spelter has well run, keeps the tongs on a little longer than is necessary. When he tries to slip it off he finds it fast to the saw, and is liable to spoil his joint. Not only so, the spelter gets on the tongs, which should be kept as clean as possible, which is essential in making a good joint. I always keep an old file near by when brazing to clean off the jaws of tongs before applying to the saw. Again, if only a pair of tongs were used, it would not only take longer to make the joint, but if spelter was put on the top and underneath the saw, and the tongs kept on until the spelter gets solid, I am of an opinion that it would be quite a job to separate the saw from the tongs. Fig. 2 is braze completed. I think the above remarks, with those I have given in former numbers, have made band saw brazing quite clear."

Tempering Brass Wire and Case Hardening.—J. C. K. (*London, N.W.*) writes:—"It is very kind of some of your correspondents to reply to queries, and shows the good heart and honest impulse, but respondents should reflect that if they answer vaguely where exact information is needed, they waste their own time and the time of perhaps fifty tyros, who take advantage of replies to try them. I have noticed this in too many instances, that I feel constrained to point out one, as an illustration of carelessness in answering a simple question or two, in No. 57. To say 'Tempering brass wire is imparted by drawing' is misleading; perhaps brass wire has to be tempered without drawing. Where is the value of such an answer? The whole view of the matter must be taken. If not to be drawn, the wire must be made red hot and plunged into cold water, which makes brittle wire soft, and unless soft it cannot be properly drawn, which really makes it denser. J. says, 'To case-harden iron, put it in a pot enclosed and covered over with a quantity of nitrogenous matter.' This reads as if the pot was covered over with it. Again, 'The deeper the case-hardening the more liable is the forging to become warped,' as if the case-hardening warped the iron, whereas that results from prolonged heat altering the molecular structure of the iron. Again he says, 'For mere surface case-hardening, heat the iron and roll it in powdered yellow prussiate of potash.' No mention is made of chilling in water."

Jointing Boards.—A. G. (*Newcastle-on-Tyne*) writes:—"In jointing boards with a plain square joint for gluing, after the boards have been dressed and tried up, put a mark on—what is termed a face mark—so that when you shoot your joint you keep one mark next to you and the other from you; for this reason it is impossible to hold the plane at right angles, so by reversing the board your joint comes truer and even and much quicker, because you don't want to put a square to it."

Chords for Organette.—G. A. D. (*Stratford New Town*) writes:—"There is no rule that is of use in this matter. If correspondents refer to the rules in any book on harmony and counterpoint, it will be found that making the instrument is much easier than 'dropping in chords,' or 'enriching the subject;' my advice is learn music, which would enable correspondents to arrange their organette music from the composer's own copy, something better than a mere 'hum-strum' accompaniment. If, however, applicants have a knowledge of music, and wish to condense it to suit the organette, I am willing to assist them if they care to send me a few bars of music together with the compass of their instrument. One applicant had a list of chords in C; if he sends it (through Work) I will set them to a melody and explain to the best of my ability."

A Simple Fret Saw.—Artist in Wood sends the following description of a simple fret saw useful for light frets and marquetry work:—E, heavy driving wheel about forty-five lb.; F, small fly; E wheel twenty inch; F wheel nine inch; L, 2 in. pulley on ½ spindle, working in single bearing



A Simple Fret Saw.

4 in. long; O, set-screw to fix the wheel, F; A, slide; C, slide spindle; B, seat for workman; K, straight steel spring; M, fixing screw; W, straining screw; N, rod from crank pin to slide; the stroke of the saw is 1½ in.; H, tilting for inlaying; D D, treadle to work with both feet. The machine stands on three legs, two at the back and one in front. E wheel is loose, and works on a fixed pin. The crank pin on E wheel should be made large or small according to the length of treadle."

Fretwork Frame Designs.—A Novice writes: —"I have purchased the fretwork picture-frame design recommended by W. B. (*Wigan*) to Amateur (*Belfast*) (see page 621, Vol. I.), but I cannot understand what the small numbered patterns are for. If W. B. will kindly explain, I should feel glad."

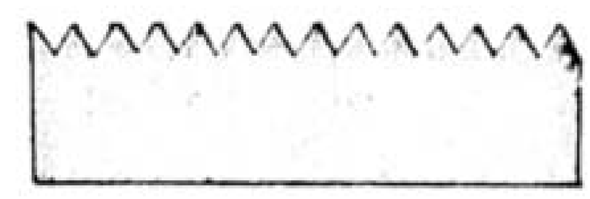
Saw Hammering.—J. R. G. (*Ennis*) writes:—"I see on page 715, Vol. I., that J. N. (*Sheffield*) promises to give any information on saw hammering. I am a circular sawyer; my employer has given me the job of saw-sharpening, but the difficulty is how to hammer the saws when they are not true. Will J. N. kindly help me?"

Sheet Metal Work Book.—Tinker writes:—"I notice in Work (see page 91, Vol. II.) that Aliquando says that Warne's book is practically useless, and contains numerous errors. As I am in possession of one, and have found it of immense benefit in my work, perhaps Aliquando would kindly point out a few of the numerous errors, and some of the problems that are practically impossible for large work."

Rubbing Down Oilstones.—A. G. (*Newcastle-on-Tyne*) writes in reply to Brum (*Keighley*) (see page 798, Vol. I.):—"In the first place you do not say whether you tried what I recommended or not. In this you are entirely wrong. 1st, you must have a grindstone; 2nd, you must either have it turned by steam or by a second person, which is not only a tedious job but expensive, and in the end not such good results. When I sent my communication I was thinking of the amateurs and 'prentices who had not the use of a grindstone. I have tried both ways myself, and for the last fifteen years I have never used anything else."

Cigarette Maker.—C. W. B. (*Plymouth*) writes in reply to Thomaso (see page 91, Vol. II.):—"My opinion is that the knuckles of hinges prevent their being practically soldered close, or, even if they were let in, the tube still has the objectionable joint when open, to fill which more than ordinary care and time would be required to prevent some of the fine shreds of tobacco overlapping, which would then get fixed on shutting. Thomaso can test this with his ordinary room door: leave it open, place his finger in the crevice, and shut to; this, no doubt, would give a good idea of the tree that he is thinking upon."

P. R. P. Glass.—A. G. (*Newcastle-on-Tyne*) writes:—"I hope I have not exhausted the patience of E. P. (*Great Yarmouth*), who wants me to explain what P. R. P. glass is (see page 795, Vol. I.). It is P. R. P. and not P. K. P. It is glass full $\frac{3}{16}$ in. thick, with one side smooth and the other small V's like the rough sketch."



II.—Questions Answered by Editor and Staff.

Dowel Making.—O. G. H. (*Sheffield*).—I do not think there is any machine for making dowels except the lathe. I suppose you mean such as are used by pattern makers for uniting halves of coreboxes. We used to turn ours when large enough to be worth while. You can, of course, saw them out with a little circular saw, take the corners off with a chisel, and then drive them through a hole in a piece of iron; this is well enough for small sizes.—F. A. M.

Timber Purchasing.—E. N. A. (*Newcastle-on-Tyne*).—Yes; you read the article right, as the prices vary according to quality; thus, if the ½ in. by 11 in. were cut from 3rd pine at 4d. per ft. in plank, *i.e.*, 3 in. by 11 in., the price per board would be 9d., and if from 2nds, 10d. and 1s.; while from 1st quality, *i.e.*, planks at 10½d. per ft., they would be 1s. 4d. each or more. As you do not state size of cutter yacht I cannot give exact thickness of timber required, but either ⅝ in. or ¾ in. would, no doubt, suit your requirements. I suppose you will make it out of pitch pine or mahogany, as they are the best for your purpose. The price for ½ in. by 12 in. pitch pine is about 1½d. per ft.; and ⅝ in., 2d.; mahogany, ½ in. by 12 in., 4d. ft.; ⅜ in. by 12 in., 4½d. You need to get either wood quite dry and free from sap and knots.—A. J. H.

Stresses of Metals.—J. A. (*Liverpool*).—The breaking torsional stresses of the metals for a diameter of rod of one inch and leverage of one foot are as follows:—Cast iron, 995 lbs.; English wrought iron and mild steel, 1,005 lbs.; Swedish wrought iron, 950 lbs.; blister steel, 1,668 lbs.; shear steel, 1,709 lbs.; cast steel, 1,759 lbs.; yellow brass, 462 lbs.; cast copper, 402 lbs.; tin, 141 lbs.; lead, 100 lbs. Gun-metal metal varies with its composition, but both that and Muntz metal will fall between brass and copper. For other sizes the resistance will vary as the cube of the diameter, and inversely as the leverage.—F. C.

Stereo Casts.—Amy Chure (*Finsbury Park*) asks me to tell him where to get stereos cast and mounted from copy without providing type, forme, etc., but does not say whether the "copy" is manuscript or letterpress, which makes all the difference. There is no means of stereotyping from manuscript without first setting it up; there is a means of making stereo plates from good clean letterpress, albeit it is far inferior when done to the copy. It is by means of photo-zincography, but it is only resorted to when an absolute facsimile is required of some rare specimen of printing, such as some book by one of the early printers, such as Caxton or Guttenberg. It is expensive, and the casts are very shallow and quite unfit for modern bookwork, except as an illustration. I advise Amy Chure to dismiss from his mind the idea of dispensing with the compositor, and if he cannot himself set the matter up, if he will write to Mr. Hawkins, 72, Mildmay Grove, N., giving full particulars as to size, number of pages, size and style of type, etc., when no doubt he will receive a reply, giving estimates for composition and for mounted stereos, which I know will cost less, by far, than, as he implies by the above question, he expects to have to pay.—J. W. H.

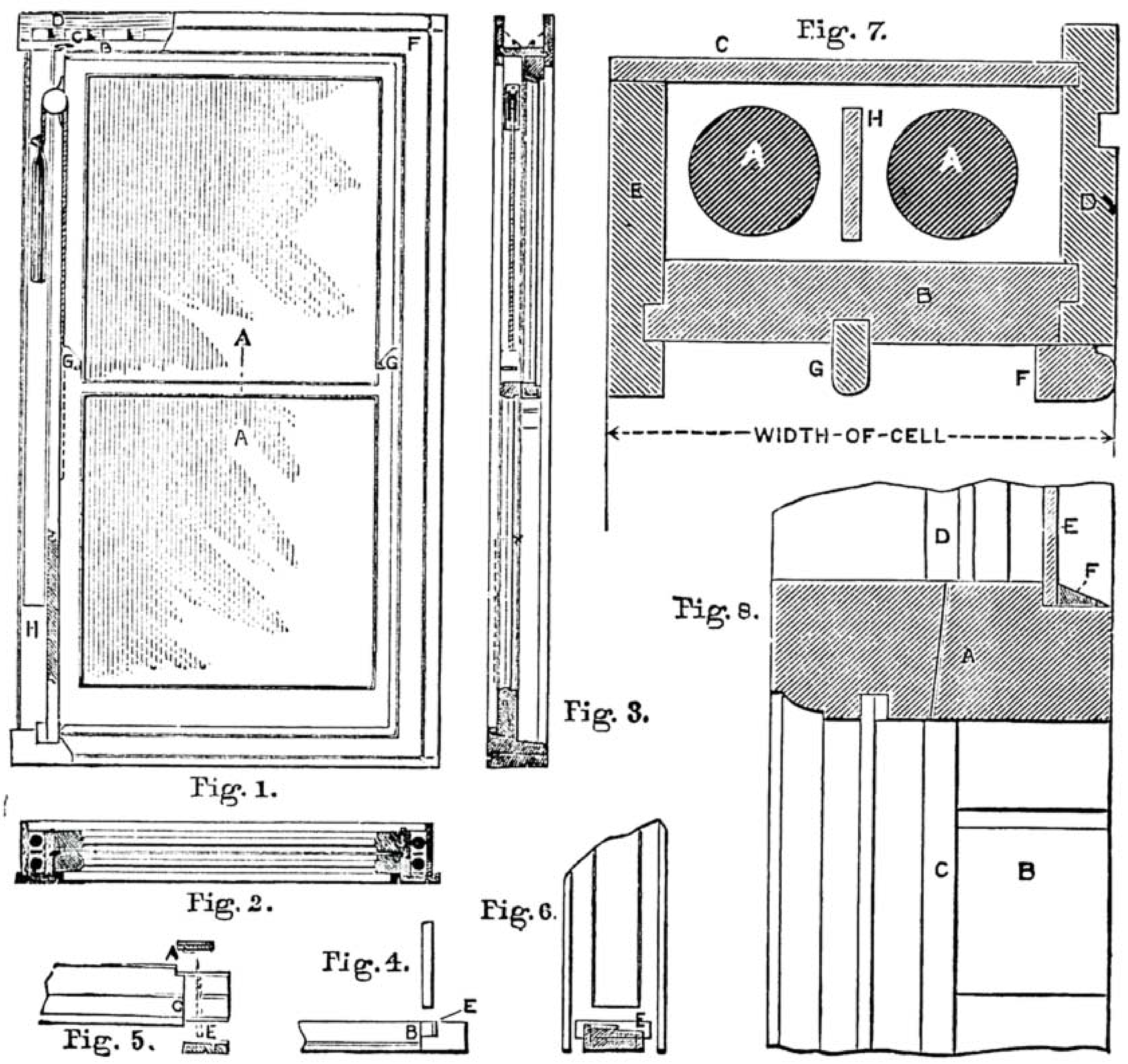
Electric Lighting.—J. R. (*Wapping*).—A six-volt 5 c.p. incandescent lamp could be worked at short intervals through two yards of No. 18 copper wire by current from five Fuller cells arranged in series. For further information on this subject please refer to my article, "Model Electric Lights," which will appear shortly.—G. E. B.

Pocket Lamp.—W. G. H. (*St. German's*) wishes to know where he can obtain a small pocket lamp in which a spring strikes a percussion cap and lights the burner of the lamp. The caps are rolled in a coil of paper held in the head of the lamp. I am sorry not to be able to oblige you. Perhaps some one of our readers may be able to help you.—G. E. B.

Sashes.—T. F. (*Brixton*).—I must confess that I am surprised that after serving your time where you have, you should find any difficulty in making sashes and frames, for, although they may not as a rule make them as they are made at a builder's, still they must go through the same routine from time to time. But I suppose you have not been fortunate enough to get a job in which this particular sort of work was required. I take it for granted that you can make the sashes, and it is the frames only which give you trouble, so I will endeavour to give you a few hints as far as the limited space at my command will allow. First set out the height and width sections, as at Figs. 2 and 3, on a rod to the full size, which we will suppose are for a pair of 2 in. sashes and frames as Fig. 1. As this is the first job of this class we have done, we must feel our way as it were. To do this we must determine the exact width of sill, pulley, stiles, etc.; this is, of course, fixed by the thickness of sashes (which are to be 2 in., that is to say, about $1\frac{3}{4}$ in. finished), outside lining, parting bead, and width of sash bead, allowing the sashes to be a little thicker than they will finish for play in sliding, say $1\frac{7}{8}$.

Thickness of 2 sashes, each $1\frac{7}{8}$ in. thick ..	$3\frac{3}{4}$
Thickness of outside lining	$\frac{5}{8}$
Thickness of parting bead	$\frac{3}{8}$
Width of sash bead ..	$\frac{7}{8}$
Width of sill ..	$5\frac{5}{8}$

When you have once determined this, the rest of the setting out is plain enough, as will be seen by examining the detail as Fig. 7. A very simple way of making yourself familiar with these different sections would be to obtain samples of sill, pulley, stile, inside and outside linings, sash and parting bead, parting slip, and sash stuff, etc., at any importers of Swedish goods. You would find them very cheap, especially as you only want very short lengths. The only difference between them and the ones you would prepare yourself would be that you would have to do the setting out after the stuff was worked, instead of when it was all suitably planed straight and square. (I hope you will not infer from these remarks that I am in favour of using this class of goods.) We will consider that you have prepared all the pieces you require. Now set off the distance between the pulley stiles on the inside face of sill, as at B, Fig. 4, and along top, as at C, Fig. 5, and the distance between outside linings, as at A, Fig. 5. Next mark the thickness of pulley stiles, allowing for wedge behind, as E, Figs. 4, 5, 6. Now gauge for the depth of this housing, which should be about half the thickness of sill. If you are setting out a sill already sunk and weathered, you will have to gauge from the bottom, taking care that it is out of winding, etc., before you do so. If you now gauge the thickness of the inside and outside linings on top and bottom of sill, all you require to do is to cut the various pieces out and it will be ready for putting together. Next mark off on the head the same distance between pulley stiles, and cut the groove to receive the tongues of same. The pulley stiles may next be set out, squaring the ends where they enter the housing in sill, and marking the position of pocket piece and pulleys. In your case I should advise fitting these four pieces together. The method is this:—Lay the sill on the bench, and stand the right-hand pulley stile up in its place, taking care that it stands square with sill, and fair with the sinkings for inside and outside linings, and gently drive in the wedge, E. Now serve the other side the same, and try and fit on the head. You might now fit on your inside and outside linings. These are very often framed together at F, Fig. 1, and likewise very often not. But you must be sure that your frame is perfectly square before fitting these on. Now knock it apart and cut your pocket pieces, the positions of which are shown by the dotted lines in Fig. 3. This is done by boring a small hole —indicated by star in same figure—and with a pad or keyhole saw making a fine cut down the centre of the groove for parting bead. If you now cut with a fine tenon saw both back and front, as shown in the sectional part of Fig. 1, cutting from the front edge of stile, a slight tap will release the piece, and the same piece will do. This requires a little care to cut it in such a manner that the piece itself forms the so-called "pocket piece," and renders it unnecessary to get out others, which very often has to be done. There are several other means of cutting and joining these pieces, but the way I have explained is the one most in vogue for ordinary purposes. A very thin chisel, about $1\frac{1}{2}$ in. wide and sharpened on both faces, is sometimes used for cutting pocket pieces by men who make sashes and frames for a price. The pulleys should now be let in, and if you make a thick saw cut at each end of head to hold the parting slip, the frame can be put together for good, driving the wedge at bottom of stiles home tight this time, and nailing the stiles to sill as well. After fixing on the linings, the top linings should be blocked to the head, and you will be surprised at the rigidity of the frame. Next put your parting slips in the slots in head, letting them project up about $1\frac{1}{2}$ in., and about 3 in. clear of sill. These are simply secured with a couple of small nails driven through them into the head. I hardly need caution you to be sure that your frame is square and out of winding before fixing on the linings, etc. The back lining may now be nailed on; this is very often simply pieces of thin outside stuff laid horizontally. About the sashes, I think there is very little I can say but what you must already know, except that you must plough the outside of stiles sufficiently long to allow for the pulleys when the sashes are up. The brackets I show at G G, Fig. 1, are not always used, but they make a stronger job, because the meeting bars can be mortised and tenoned instead of dovetailed. The above remarks are very sketchy and brief, because to thoroughly explain everything connected with making sashes and frames would take up a whole number of WORK. I have to condense it accordingly, but I think you will gather from these hints all you as a practical man would want to know.—E. D.



Sash Making.

String Hammocks. — G. F. K. (*Belper*).—An article on how to make string hammocks will be published in an early number of WORK. This will fully meet your requirements.—G. E. B.

Book on Accumulators.—B. F. E. (*Carlisle*).—Sir D. Salomon's book on the management of accumulators is published by Whittaker & Co., Paternoster Square, London, E.C. The price is 3s. —G. E. B.

Printing Hatters' Labels.—G. MCA. (*Liverpool*). — (1) "Hat tips," as they are technically termed, are printed by means of heat—like tickets for goods—in metal or leaf. Firstly, a brass block must be cut similar to an engraved woodcut—*i.e.*, the portions not intended to be gold or metal cut away, and the rest left level with the surface. The block being heated, usually over a gas jet, the gold leaf or metal leaf is laid upon it, and next the silk, which is not always sized; pressure is then applied. When cool, the superfluous metal is brushed off. It can be done in any ordinary letterpress, but there is a delay consequent upon removing the brass block to heat it every five or six pulls, and therefore hat tip printers have special presses, giving heavier pressure, and with a hole through the table, which comes exactly over a gas jet when the table is out, so that when the necessary heat is once attained, it is easily kept up by being renovated whilst the leaf or metal is being laid to register upon the block. It is very seldom that gold leaf is used, as this class of work is badly paid. Dutch metal is usually quite good enough. (2) The tips are usually printed, not upon separate labels, but upon the circular crown linings of hats, and often upon the "head-leathers," also especially for the felt hat trade; it is but seldom that the necessity arises for "cutting round," as G. MCA. phrases it. When required, a cutter of the exact shape is made of steel, square inside and tapering outwards, with chisel edges, and several sheets of paper, silk, or leather, as the case may be, are knocked up in register, laid upon a block of lead, and the cutter forced through them, either in a ball press or, more primitively, with a mallet. (3) As to the use of size, isinglass is the best; if too expensive, use "Gloy" (12s. per cwt.; "Gloy" Co., St. Mary's Chambers, St. Mary Axe, E.C.), one of the best sizes ever made, as it never can decompose. If the latter, let it down with two-thirds water for either paper or silk, and one-third for leather or American cloth. I think you had almost better put this kind of work out to be done, unless you have a prospect of having a long run of consecutive orders for it, as in the neighbourhood of Denton, Failsworth, and Stockport there are plenty of tip printers, who will print in metal or gold (supplied) for 10s. to 15s. per thousand, on your own unsized stuff; and there used to be some years ago a colony of them round and about Rylands' warehouses, Manchester. Finally, I have never heard of the use of gutta-percha in this connection, and fail to see how it could come in, as in the tympan no blanket is used, only shalloon boards, so as to keep the edges of the leaf or metal as sharp as possible.—J. W. H.

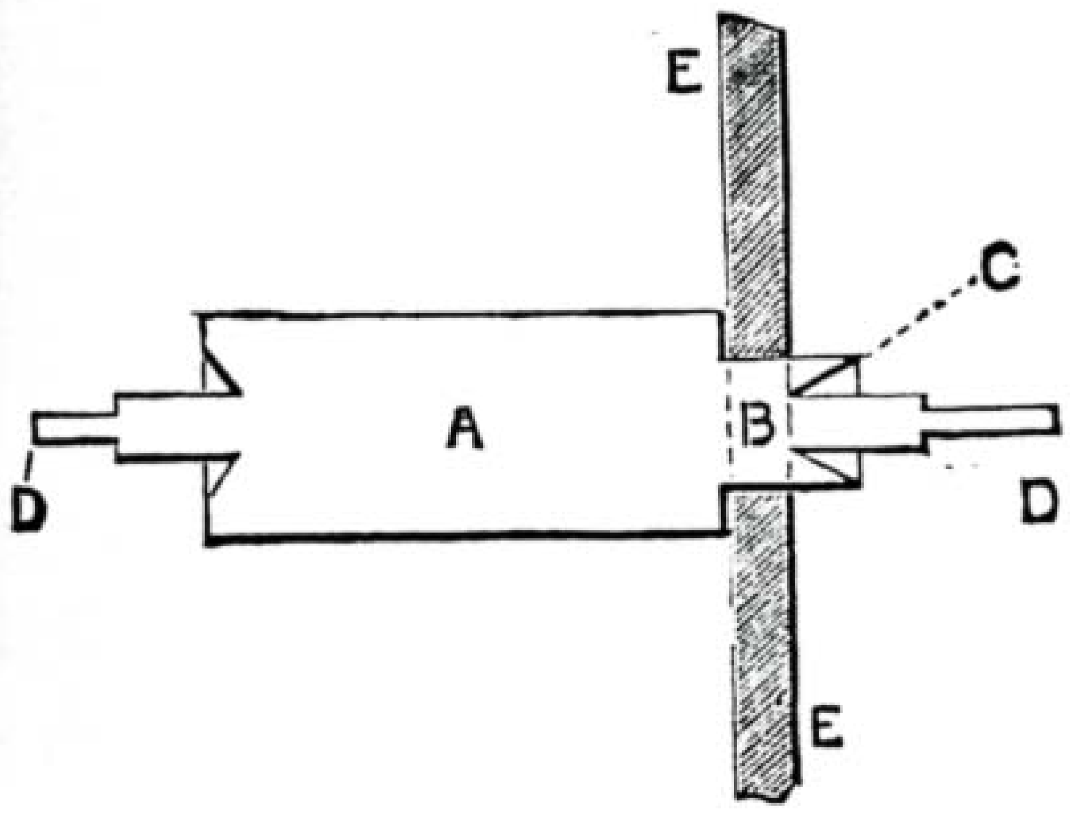
Coppering Blotting-Paper.—A. J. (*Manchester*).—This can be done by polishing the paper with blacklead on both sides, then mount it on a wood frame, with the edges of the paper clipped by strips of paper. Connect these strips to the wires of a battery, and immerse in a copper depositing solution until the required thickness has been obtained. Calico or linen would be better than blotting - paper because stronger. But I am working quite in the dark, because you do not choose to enlighten me with the purpose for which you require the coppered paper. If you could trust me with your secret, I could help you with sound advice. Had you enclosed a stamped directed envelope, I might have replied by post, but it is obvious I could not do so when you omitted to give your address. I do not keep letters after I have answered them, nor register the addresses of correspondents.—G. E. B.

Light Forgings.—J. F. (*Wandsworth*).—Bayliss, Jones, & Bayliss, Wolverhampton, supply these.—J.

Crucibles.—J. C. H.—The Morgan Crucible Co., Battersea, sell these.—J.

Child's Cot.—F. G. (*Stamford Hill*).—I have carefully examined the rough sketch and specification of your child's cot, and I certainly cannot advise you to take out a patent for it, for the simple reason that the improvements claimed for it have been forestalled in a way that I think is superior to yours. However, this latter is merely an opinion, and you may prefer yours, but I am afraid in any case you could not substantiate your claim for originality, as the falling side of yours seems to be practically the same as the prior patent, though the details may vary slightly. Your suggestions for folding up the cot do not appear to possess so many good features as another patent which I think is an improvement on yours. I am very sorry I cannot give you more encouragement to proceed with the cot, and having given my opinion, it is, of course, optional with you to do as you think best. The advantage of having a side which can be altered in height is at least a doubtful one, so far as safety is concerned, and it is chiefly a convenience when the cot is close alongside an ordinary bedstead. In answer to your inquiry about the number of children who are injured by falling out of low railed cots, I can only say that I have never known of an instance, and my experience has been considerable. The number certainly cannot be large, and the risk is very inconsiderable. Personally I think that the risk is greater with a cot of which the sides are high (unless they are so high that a child cannot climb over them) just because the height of the fall is greater. Most of us, at least those who are family men, know that even the best of children, *i.e.*, our own, soon acquire mischievous habits, one of which is a tendency to climb. I hope the other idea to which you allude as having been derived from WORK may be a successful one, and you may quite rely, whenever you choose to send us particulars of any improvements you contemplate patenting, that your communications will be regarded as confidential.—D. A.

Watch Repairs.—W. W. R. (*Poplar, E.*).—If you have the pieces of old cylinder for the size, perhaps, though, it would be best to see that the old one is the correct size by trying a tooth of 'scape wheel in the body, and see that it has a little shake, then hold the cylinder between two teeth of 'scape wheel and see that there is a little shake or freedom equal to what the tooth had inside; then select a new cylinder, exact size, and proceed as follows:—To put a new pinion, select a new one, same size as old one, or, if lost, send wheel to tool shop for one, or, if you have a stock by you, select one to suit the wheel it is to be driven by. Mount a ferrule on it and truly centre it—that is, run true centres or points on each end of it; now with your graver turn a part of it, slightly longer than the thickness of the wheel, down, till the wheel fits tightly on. See that you make the shoulder or seat quite flat for the wheel to pass on; now undercut the part you have just turned, so that you can rivet the wheel on. Gauge or measure the height for your wheel from the plate or cock, and turn your pivot shoulder

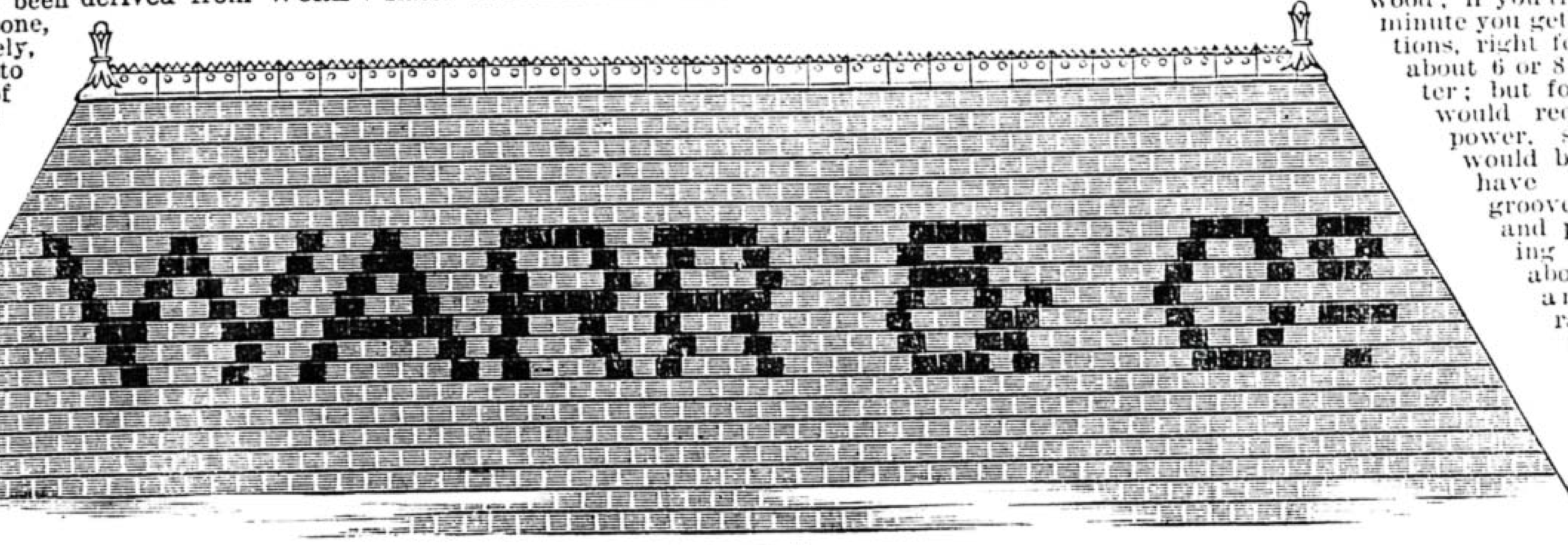


Watch Repairs—A, Body of Pinion; B, Seat for Wheel; C, Undercut for Rivet when finished—that is, punched down on the Wheel and holds it; D D, Pivots; E, Wheel.

back to that mark; turn your pivot straight and true till it will just go in the hole; then a rub with a burnisher, and slightly rub a round broach through the hole and that end is done. Now take a peg and cut it flat; cut a notch in it and let the end rest on the plate, and cut away the notch or bottom of the peg till it will just fit under the top plate or cock. You have now the measure for the other pivot shoulder; turn it back to that mark and fit it as the other. Now try it in its place; if no endshake, turn one or other of the shoulders back till it has a little shake up and down. Shorten pivots till they just come through the plate, and nicely round off. You did not say what pinion it is, so that these hints may require a little altering to suit the particular pinion; for instance, the centre pinion of a Geneva watch is hollow, and must be fitted in on an arbor, and the 'scape wheel pinion is so short there is no room for a screw ferrule, and must be fixed to wax ferrule; then a fourth pinion, with a seconds pivot, should have the long pivot finished last, or you may bend or break it. But should you not be able to get on, write again. There was a description and illustration on "How to Pivot a Cylinder" in WORK, No. 19, page 302. Refer to that.—A. B. C.

Incubator.—D. F. A. (*Winona, near Hamilton, Ontario*).—Messrs. Hearson & Co's. incubator is patented, and to describe it in full would be injurious to them, as it would enable others to make that which is manufactured and sold by them to their profit in virtue of their patent rights. A notice of the incubator was given on page 153, Vol. II.

Slating.—J. K. (*Bolton*).—I append a sketch showing how the name mentioned can be worked in two different coloured slates. If you had given the size of the slates, and length and width of roof, etc., it would have been much more satisfactory; for, although the sketch answers your query, it may not be exactly what you require. But I hope this may not be so. The slates shown are 20 in. by 10 in., or countess slates, laid to a 3 in. lap, and consequently 8½ in. gauge. You being a practical slater will understand these terms.—E. D.



Example in Slating.

Xylophone.—INSTRUMENTALIST (*Saltaire*).—In reply to your questions respecting this instrument, (1) The straw ropes are similar to what are used in some parts by farmers to fix the thatch on stack tops. If you were at a farm, you could get as much as you require for a few pence; if you have no opportunity of getting any in this way, you might make them in the following manner: fix a wooden axle about 2 ft. long in bearings, putting a pin in at each end to prevent its working out; fix a handle at one end, and a small iron hook at the other end, then draw some straw straight with your hands, bend it in the centre over the hook, get some one to turn the handle, and draw your hand back over the straw, when it will be twisted into a rope; before the end is reached, insert another length of drawn straw between the ends of the first piece, and so on, till you get the requisite length; you must try to keep it of one size, about ¾ or 1 in. diameter; when finished, tie the end and keep it stretched till wanted, as if let go, it has a tendency to untwist. If you cannot manage this, I believe a piece of dry white hemp rope the same size would do; fix it on the wood with wire staples, keeping them clear of the notes. (2) I don't think knots will affect the tone if hard wood is used; if pine, it would be better clear of knots; the wood must be dry and well seasoned. Rosewood is supposed to be best, but oak, pitch pine, or yellow pine may be used; make the notes about 1 in. wide and 1½ in. deep. (3) Set the notes 1 in. or 1¼ in. apart, remembering that the wider apart they are, the longer the instrument will be; they are made with from twenty-eight to thirty-six notes, naturals; if you want to have flats and sharps, you could fix a third bar with rope on it, and fix the sharps and flats in groups of two and three, same as the keyboard of a piano. I did not notice what note the highest or lowest was, and cannot see the instrument at present. If I have an opportunity of seeing it again, I will get all particulars and dimensions, and with the Editor's permission will send a description to WORK.—E.

Micro Lens.—If J. L. (*Shields*) will send to Messrs. Lancaster & Son, Colemore Row, Birmingham, for a set of lens for the microscope at 4s. or thereabout, he will have what he requires. It will be understood that the object glass will only be a common one, but quite good enough for a beginner. I would also advise J. L. at the same time to get Messrs. Lancaster & Son's catalogue; he will find it a great help, as he will then see what is to be had and at what cost. I have placed an article on eye-pieces in the hands of the Editor, which I think will help those who are working in optics. If it will be any convenience to J. L., I would procure the lens suitable for the microscope. Shall be glad to help any amateur in the same way.—O. B.

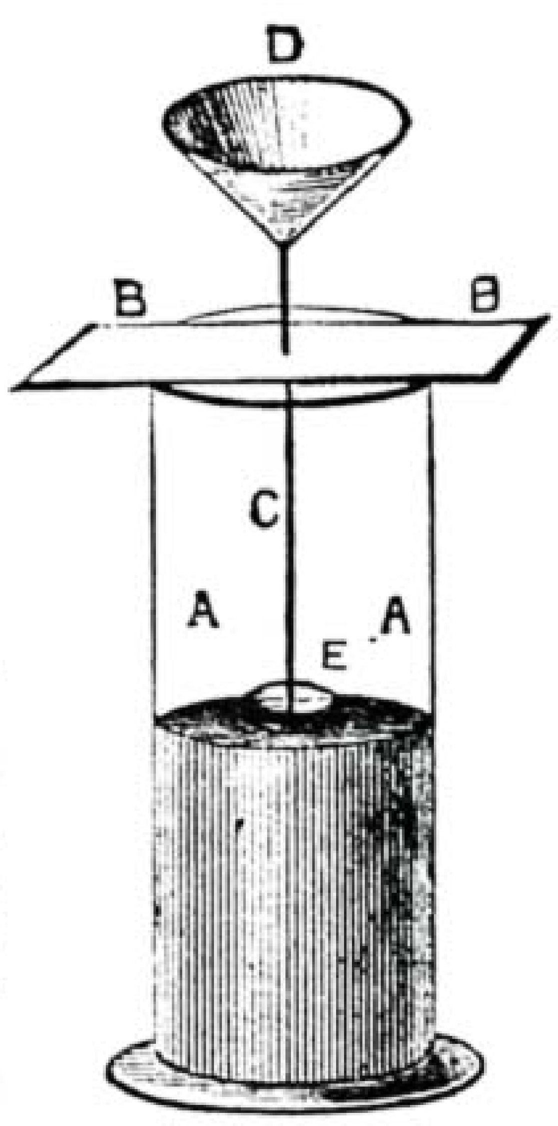
Oval Chuck.—W. B. G. (*Manchester*).—Descriptions of an oval chuck, with sketches, are in hand, and have been written in answer to a similar question by A. S. H. L. (*Walworth*), another subscriber. Probably these will be sufficient for W. B. G., but the explanation is short, as befits "Shop" columns.

Battery for Lamp.—A. C. F. (*London, W.*).—The lamp you have is, probably, a Fairy Star lamp, requiring a current of ·75 ampères at a pressure of four volts to light it. This you could obtain from a two-cell pocket accumulator, or a three-cell chloride of silver battery. To make the accumulator, you will require closely-fitting, well-made ebonite cells of the desired size. The lead plates will have to be cut to fit the cells. You will probably know respecting their preparation. A six-cell bichromate battery is scarcely suitable for charging an accumulator, even when charged with chromic acid solution, as this battery so soon polarises when a large current is demanded from it. Three cells of a Bunsen (quart size) will be more suitable to use in charging a four-volt pocket accumulator.—G. E. B.

Speed for Lathe.—D. C. D. (*Bowis in Ossory*).—As the speed of your mandrel will vary with the rate of treading, it may be best to reckon the speed of your 4-in. lathe by the ratio of the wheel to the pulley; in other words, the number of times the diameter of the wheel is greater than the diameter of the pulley. Now in a 4-in. lathe a good proportion will be 8 to 1—say, the wheel 24 in., and the pulley on mandrel 3 in. diameter. If you tread very fast, say, 120 per minute, you will get 120 by 8=960 revolutions, which is fast enough for small work in wood; if you tread 60 per minute you get 480 revolutions, right for wood of about 6 or 8 in. diameter; but for this you would require more power, so that it would be better to have a second groove on wheel and pulley having a ratio of about 5 to 1, and so arranged that the band will fit equally well on either place.—F. A. M.

Transfer Process Pictures.—G. W. E. (*Leeds*).—Messrs. J. Barnard & Son, 19, Berners St., London, supply transfer process pictures.—F. B.

Quality of Glue Test.—F. R. (*London*).—Good glue should be nearly transparent, without taste or smell, free from spots or cloudiness, and of a deep brown colour. A rough method of testing its adhesive power is to soak it in a large quantity of water for some time, which causes it to swell considerably, absorbing 5 to 16 times its own weight of water. The more consistent and elastic the glue in this state is found to be, the greater will be its adhesive power; and the larger the quantity of water absorbed, the more economical will the glue be in use. But as this test is only applicable to bone glues—for those from animal offal do not behave similarly — Lippowitz's method is often used, which is as follows:—Five parts of glue are soaked in cold water for some time, and then dissolved in sufficient hot water to make the weight of the solution equal to fifty parts, when it is kept at about 64° F. for twelve hours to gelatinise. To determine its consistency the jelly is placed in a cylindrical glass vessel, A, across the top of which is a piece of tin, B, perforated in the centre. The hole in the tin should be large enough to allow the free passage of a stout iron wire, C, having a funnel, D, soldered to the upper end, while the lower is provided with a saucer-shaped piece of tin, E, with its convex side turned downwards and touching the surface of the jelly into which it is forced by loading the funnel, D, with weights. The greater the consistency of the glue, the greater the weight which will have to be used. But the most accurate method consists of ascertaining the weight of force required to break a given bar of the material as compared with that used to break a specimen of known quality employed as a standard. Sticks of pure gypsum or plaster of Paris are cast of precisely the same dimensions, and then saturated with solutions of the different glues and thoroughly dried. These are placed one by one in a metallic ring, having notches which receive them, and a lever having the centre of the stick as the resistance and a graduated mercury cup upon the long arm as the counterpoise. Mercury is poured into the cup until the standard stick commences to break; the level of the mercury is taken as the absolute standard, and marked O, and the scale can then be numbered at equal distances above and below. Glue, which is less tenacious, will require less mercury, and will be so many degrees *below* zero; whilst a stronger glue will require more mercury, and be so many degrees *above* zero. The chemical method of estimating the gluten by precipitating it with tannic acid is not a criterion of the quality of glue, as a glue rich in gluten may have poor adhesive qualities.—F. B. C.



Glue Test Machine.

Inlaying.—J. G. (*Falmouth*).—The subject is too vast to be treated fully in "Shop," but you may be sure it will have due attention in the body of the magazine. A series of papers is projected, but they must wait their turn, as there are many which are considered more important waiting publication. In the meantime, without giving you all the information I should like, the following hints may help you. I daresay you are aware that inlaying is generally done with veneers or very thin wood. In the simplest form two pieces are cut at the same time—that is, the saw cuts through two thicknesses. It follows that the piece cut out of one must fit in the other, so that if, say, a piece of white veneer is cut at the same time as a piece of black, two inlays can be formed. The piece cut out of the black will go in the opening of the white, and that from the white will fit within the black. The pieces will, however, not fit closely to each other, for the saw in cutting removes a perceptible amount of material. To do away with this looseness is the intention of the tilting table. It is tilted to such an angle that the saw cuts through the wood on the bevel instead of perpendicularly to the surface of the wood. The piece cut from the upper veneer is therefore slightly larger than the hole in the lower piece. I think the purpose of the tilting table will now be plain to you, though I have done little more than indicate how it is to be used. The elaborate inlays so much used in furniture just now are produced by an entirely different method, requiring great exactness in cutting. Each piece is cut separately, or rather each colour, for four inlays are usually prepared at the same time. This marquetry or inlaid work is not done with a machine, but with a hand frame almost exactly the same as those used for fret cutting, the principal difference being that the marquetry cutter uses one made of wood. The veneers while being sawn are held in a peculiar appliance called a "donkey." After veneers are cut, the best way to lay them is to glue the pieces down on a sheet of paper. When dry, the upper or uncovered surface must be levelled, and should be roughened with a toothed plane or other means. It is then ready for laying on the solid wood like any other piece of veneer. If you try the work, read the articles which have already appeared on veneering. After the veneer has been properly laid (with a caul) the paper may be removed. The surface is then cleaned up and finished in any way desired. If you still want to know anything, write again and state clearly on what point you want information.—D. A.

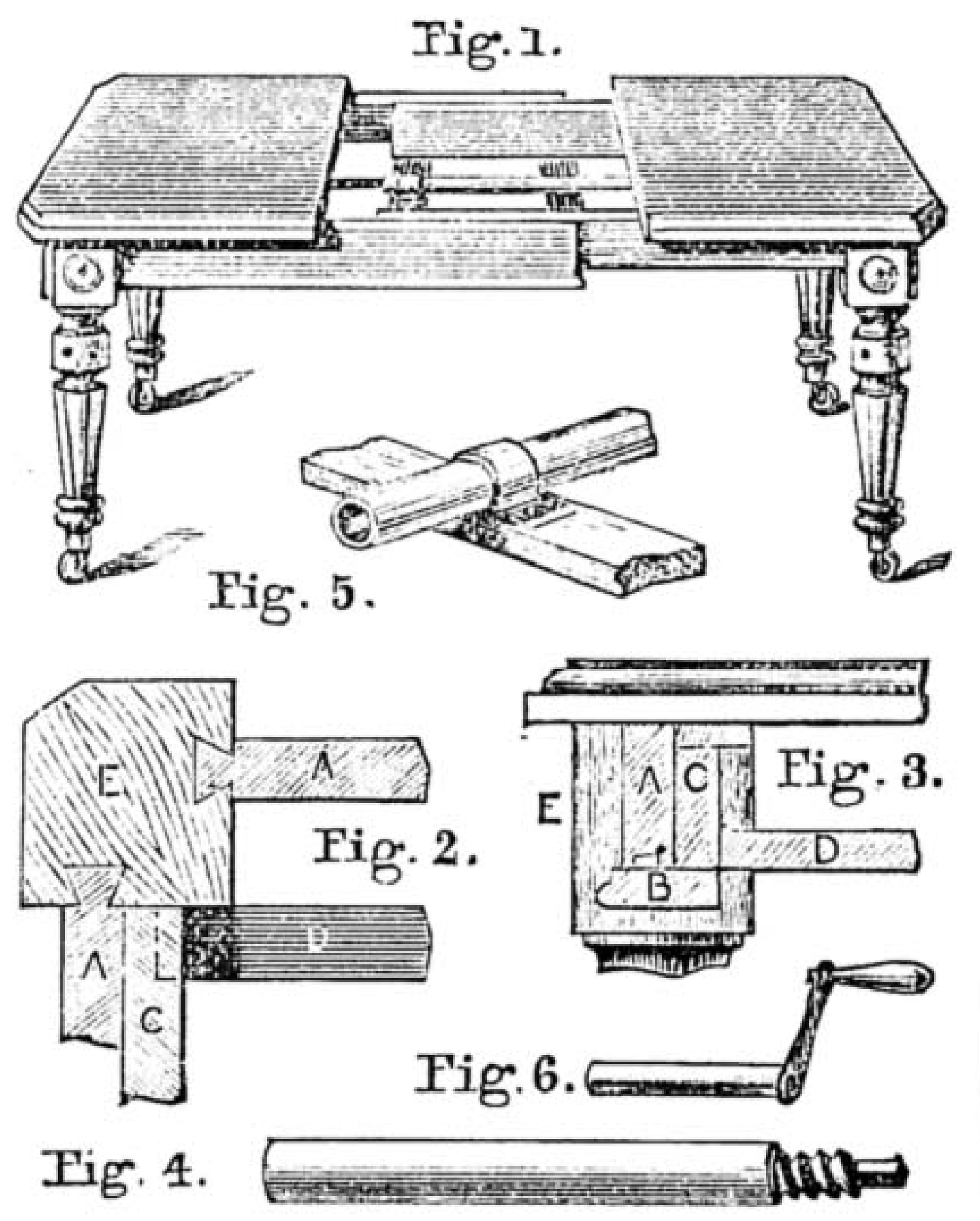
Cover for Book.—AMATEUR (*Holloway*).—It is impossible to oblige you with the probable price of covers for a book about the size of WORK, and also where you could buy them about Islington. You should name the work for which the cloth cover is wanted. It would then be possible to find out if such a cover is supplied for the book in question.—ED.

Taxidermy.—G. G. H. (*Oswestry*).—It would take up too much time and space of "Shop" to give a complete description as you require for preserving and stuffing birds. The cases you speak of you will be able to make yourself, or a joiner could make them for you. They cannot be bought ready-made, as they vary so much in size—in fact, they are made to fit the birds; for instance, what will fit a wren will not fit a crow. You can get the eyes either from myself or Messrs. Pache & Sons, Birmingham. The work that is likely to suit you is published by West, Newman, & Co., 54, Hatton Garden, London, price 1s. With respect to the last part of your note, I intend, if the Editor will allow me, to treat of the art of taxidermy in all its branches.—J. A. W.

Mortising. — H. N. (*Airdrie*) appears to believe that it makes some considerable difference which edge of a stile is mortised first. I have not found much difference, and certainly never spoilt a job through "it being all one which edge was uppermost." He appears to use a machine; my directions were for mortising with mallet and chisel, not for machine. Certainly, if by "blazing" he means driving out the core, the inner edge should be uppermost. If this surmise is correct, H. N. is, of course, quite right. Whenever a mortise is smaller one edge than the other, the core should be driven from the smaller mortise to the larger, or the accumulated core is likely to do damage, especially under the pressure of a mortising machine core-driver. Machines need experience, and H. N. is wise to find out the reason of his failure.—B. A. B.

Spirit Graining.—EXILE.—By the time this appears, it is probable that the subject of graining will have made some progress in the pages of WORK. We will not, however, deny you herein the information you ask for, briefly. I assume you refer to the imitation of oak in "spirit," or turps, colour, and which is a quick-drying process, useful for such places like Cheapside, where ordinary oil graining on the outsides of the shops, etc., would be spoiled before it could dry. The graining colour is made in this way:—Rub up a few ounces of gilders' whiting, which must be quite dry, in turpentine to a thick paste; stain—that is, colour—this with either raw or burnt sienna, burnt umber, and ivory black (ground in oil), according to the colour desired—light, medium, or antique oak. Add to this a little quick-drying bath varnish, and then thin with turps to working consistency. About two ounces of varnish to one pint of turps will usually bind the colour; too much varnish will dry it too quickly for working, and will not let it be spread evenly. Spread as with oil graining, but "hurry up!" and don't cover too much at once. Use a dusting brush to give variety of depth after spreading the colour, and then comb at once, not attempting too much variety with the latter. To put in the figure of oak, procure a flat hog-hair veining fitch, and with a solution of common soda-water, stained with a little Vandyke in water, or such-like pigment, mark in the figure. Care must be taken to avoid the soda-water running down or spreading, only sufficient being in the brush to make a clean, sharp marking. With practice, it will be found that the flat but thin formation of the brush can be made to execute the desired shapes quite as well as the ordinary bone or thumb-nail in oil graining. The soda-water, of course, bites out the spirit colour, and should be all right and clean after the work has been well sponged off with clean water. In working stiles and cross-rails, a little turps is used on a rag for "cutting up" the joints cleanly, just as a wash-leather would be in overgraining in water. Turps can also be used for the biting out, but this is done by veining, and then drawing a pad of old flannel down it at once. This process allows work being grained, overgrained in water, and varnished on same day. Respecting your other question, I would advise getting a printer to put them in the cutting machine for you, or get a bookbinder to finish them off.—F. P.

A Screw (Telescope) Dining Table.—T. H. and E. C. (*Blackburn*).—As there are two of you who have signed the query creating this reply, I hope these particulars will satisfy both. You want a table 5 ft. by 4 ft. 6 in. to extend to 10 ft. This one will extend to nearly the distance—9 ft.; it will give you much more trouble to have it to extend the extra 12 in. The height of it will be either 28 in., 29 in., or 30 in., as considered best. Do not condemn me if the following dimensions do not suit you, but alter them accordingly, as there is no decided rule to work to. Thickness of top, 1¼ in.; thickness of leg blocks, 4½ in.; thickness of inner framing, 1¼ in.; thickness of outer framing, 1 in.; width of side framing, 4½ in.; width of inner framing, 3 in. The top must, of course, be divided in the middle. To one pair of leg blocks are joined the *outer* side frames; to the opposite pair the *inner* frames. These must work freely along each other. In Fig. 2, A is the outer framing, C the inner framing, D the rail joining together the two inner frames at the end. A similar rail to this latter connects the two outer frames together at the end at B in Fig. 3. Underneath all the outer framing is a moulded rail, B, in Fig. 3, between which and the top rail shown above, C in Fig. 3, the inner frames, C, run. I have not shown the rail above C in Fig. 1, as it would then partly conceal the working of the table. The iron tube, Fig. 4, is screwed down, as in Fig. 5, to the back connection of the inner frames, the other end of it being inserted in a block fixed to the framing at the end. In this tube works a screw which should protrude partly through a hole bored in the end framing. The table, as perhaps you know, is opened or closed by turning the screw with the key or handle in Fig. 6. Extra flaps are required to fit into the top. Read previous articles for polishing, finishing, etc.—J. S.



A Screw (Telescope) Dining Table. A, C, D, E, in Figs. 2 and 3, show correspondence of parts. Fig. 1.—Table partly extended. Fig. 2.—Plan of one Corner. Fig. 3.—Section of one Corner. Fig. 4.—The Tube and Screw. Fig. 5.—Method of screwing down Tube. Fig. 6.—The Handle or Key.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. W. C. (*Tottenham*); W. S. (*Glasgow*); C. C. H. (*Northallerton*); BREVITY; W. J. B. (*Chesterfield*); NEW SUBSCRIBER; J. C. S. (*Cardiff*); J. S. B. (*Oldham*); M. (*York*); F. P. (*Brighouse*); DIDYMUS; T. B. (*Blackburn*); X. W. I. (*Portsmouth*); CLOCK JOBBER; F. W. R. (*Harling*); A. G. (*Newcastle-on-Tyne*); W. L. (*Durham*); HYDROSTATIC; SELF-HELP; H. S. (*Stratford, E.*); J. A. M. (*Stamford Hill*); SOLUTION; P. P. (*London*); H. W. (*Nottingham*); J. R. (*Dewsbury*); T. H. (*Glossop*); B. J. T. (*Southsea*); SHEET IRON; G. R. R. (*West Calder*).

Trade Notes and Memoranda.

EXHIBITION OF HOME INDUSTRIES.—The third exhibition of home industries organised by the Co-operative Union, Limited, will be held in the Crystal Palace on August the 16th, 1890. Prizes will be given for the best specimens of amateur work in any of the following classes: Engineering, marine and miscellaneous models, art metal work, general metal work, cabinet making, joinery, house decorating, wood carving, wood turning, fretwork, toy making, painting on glass, china, and pottery, oil painting, water-colour drawing, pen or pencil drawing, bookbinding, modelling in clay or plaster, musical instruments, confectionery, inventions, and miscellaneous collections. "All work entered for competition must be executed by amateurs, and must be the *boná-fide* individual work of the exhibitors." Intending exhibitors must be members of some co-operative society. There will also be held at the same time an exhibition of specimens of work showing the skill of workmen and apprentices in their own trades. Full particulars may be obtained from Mr. Wm. Broomhall, general secretary, 19, Bedford Street, Strand, W.C.

A MANCHESTER EXHIBITION OF ARTS AND CRAFTS.—The Art Gallery Committee of the Manchester Corporation have issued regulations for the proposed Exhibition of Arts and Crafts in the City Art Gallery, which will open on February 9th, 1891. The articles to be exhibited must be produced during 1890, and be the work of residents within a radius of twenty miles from the Town Hall. Prizes are offered, and firms at a distance may exhibit, but not for competition. Forms of application for space will be supplied by the Curator to intending exhibitors, and the forms must be returned before November 1st, 1890. All work must be delivered in January, 1891.

The exhibition will consist of contemporary work in design and handicraft, and will include the following:—

Designs and cartoons for decoration of all kinds.
Decorative painting, more particularly in association with architectural or cabinet work.
Textiles: tapestry, needlework, woven and printed fabrics, lace.
Painted glass, lead light-work.
Pottery: tiles, majolica, painted china.
Table glass: blown, cut, and engraved.
Metal work: wrought iron, brass and copper repoussé, gold and silversmiths' work, chasing, enamels, and clockwork.
Models, architectural and mechanical.
Wood-carving } carving in ivory, cameo, and
Stone-carving } other materials.
Cabinet work: inlaid and painted and carved furniture.
Decorative sculpture and modelled work: friezes, architectural enrichments, relievos, plaster and gesso work.
Printing: book decoration, printers' ornaments, illuminations and decorative manuscripts, wood and metal engraving.
Bookbinding and cloth cases.
Wall Papers.
Stencilling.
Leather work, stamped, tooled, cuirboulli.
Fishing tackle and the arts of the taxidermist.

And such other kinds of decorative art not above enumerated as may be approved by the Selection Committee.

WORK

is published at La Belle Sauvage, Ludgate Hill, London, at 9 o'clock every Wednesday morning, and should be obtainable everywhere throughout the United Kingdom on Friday at the latest.

*** Advertisements should reach the Office fourteen days in advance of the date of issue.

PRINTED AND PUBLISHED BY CASSELL & COMPANY, LIMITED, LA BELLE SAUVAGE, LONDON, E.C.