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Fig. 1.

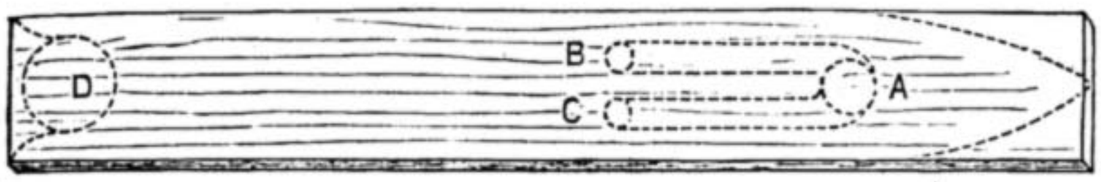

Fig. 2.

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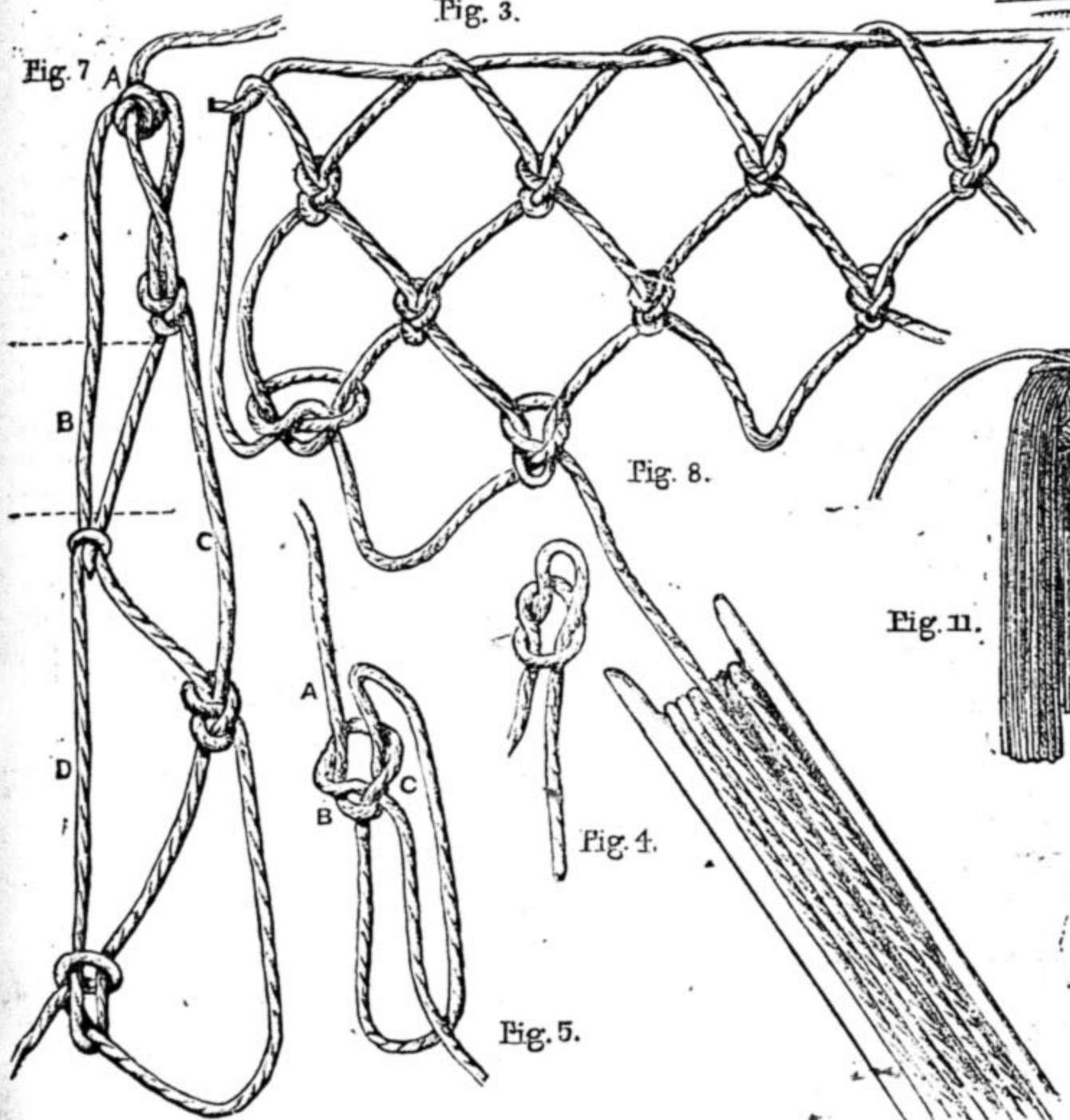


Fig. 7.

Fig. 8.

Fig. 5.

Fig. 4.

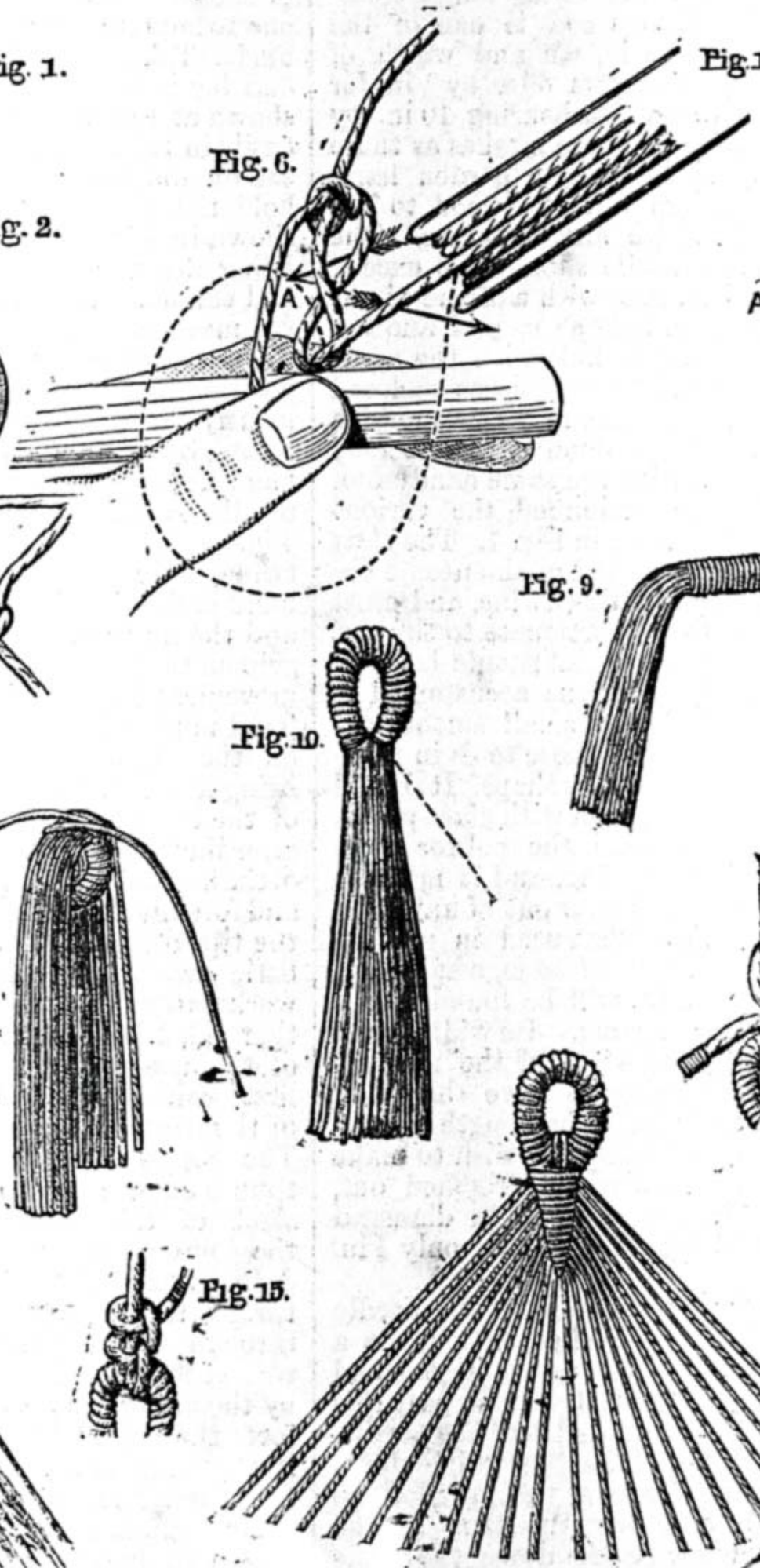


Fig. 6.

Fig. 13.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 14.

Fig. 15.

Fig. 12.

Fig. 1.—Netting Needle finished. Fig. 2.—Needle marked out on Wood. Fig. 3.—Mesh-stick. Fig. 4.—Noose to go over Tongue of Needle. Fig. 5.—Becket Stitch to start First Mesh. Fig. 6.—How to make the Mesh. Fig. 7.—First Chain of Meshes. Fig. 8.—How to make Second Row of Meshes. Fig. 9.—Bundle of Nettle Cords to form Clew. Fig. 10.—Bound Bundle of Cords turned to form Eye of Clew. Fig. 11.—How to form Head of Clew. Fig. 12.—Hammock Clew complete. Fig. 13.—How to whip Ends of Cords. Fig. 14.—Looped Half-Hitch. Fig. 15.—Anchor Bend Hitch.

HOW TO NET A GARDEN HAMMOCK.

BY G. E. BONNEY.

IN netting a garden hammock, two sources of pleasure are opened up to the worker. First he has a pleasant occupation for long winter evenings in netting the hammock by his own fireside, and, whilst doing so, can look forward with pleasurable anticipation to the time when he will be able to enjoy the fruits of his labours. Then will come the long summer evenings, when, reclining at ease in his airy couch, slung between two trees in his garden, he can enjoy the shady coolness of the arboreal retreat, and read, or smoke, or doze away the time whilst taking a well-earned rest.

The tools required in the occupation of netting (of which this is one example) are very few, of simple construction, easily made at home, and of low cost. They consist of (1) a netting needle and (2) a mesh-stick. The materials also cost very little, since they are simply some stout twine and a few yards of fine cord. Almost any stout twine may be used, providing it is strong enough to bear a person's weight when made into a net. Whip-cord is a very good strong material, but it is rather costly. Macramè cord is also very good, but this is too costly for the purpose, as it would take several sixpenny balls to make a hammock. If whip-cord

is chosen, it will be best to buy it in quantity by the pound, since it can be got at less price than when bought in balls. One of the best and cheapest materials is that of soft three-cord packing-twine of smooth and even texture throughout. The stiff, rough, and lumpy varieties are altogether unsuitable. A good soft three-cord twine for the purpose will cost about 3s. per lb. Those who can afford it will find the macramè cord a most superior article, as it is soft, strong, and very durable.

The Netting Needle.—This tool, shown in Fig. 1, may be bought at any shop where fishing-tackle is sold, or it may be easily made at home out of a strip of thin oak, holly, hornbeam, ash, or other tough close-grained wood. Lancewood is one of the best materials. The length and width of the needle may vary from 5 in. by ½ in. for small meshes, to one measuring 10 in. by 1 in. for use with such large meshes as those generally adopted in making garden hammocks. First rough out the wood to the required length, width, and thickness. The thickness of the needle should not exceed $\frac{3}{16}$ in. Bore a ¼ in. hole with a centre-bit at A in Fig. 2, a $\frac{3}{16}$ in. hole at B, and another at C. Also bore a ½ in. hole with the same tool at D. Next cut out the pieces enclosed by the dotted lines. This may be done with a fret saw, but I have done it with a good pocket-knife, and with the same handy tool have smoothed and trimmed the various parts to shape, as shown in Fig. 1. The slots in the head and at the tail of the needle are receptacles for the netting-twine, and must be cut to a length proportionate to the size of the needle. The head-slot should be 2¾ in. for a 10-in. needle. Persons accustomed to the use of the chisel, or a small smoothing-plane, may use either of these tools in trimming the needle to its proper shape. It should then be made quite smooth with glass-paper.

The Mesh-stick.—This is the tool for forming the mesh of the netting, and is made to the shape shown at Fig. 3 out of any strip of hard wood, such as that used in making the needle; or it may be of bone, whalebone, or ivory. About 8 in. will be found a convenient length for this tool. Its width must be determined by the width of the mesh to be made, the rule being to have the width of the stick nearly half the length of the mesh. That is, supposing we wish to make a mesh 2 in. in length when stretched out, or measuring 1 in. across when in diamond form, we should use a mesh-stick only ⅞ in. in width.

How to fill the Needle.—To fill the needle with netting-twine, we must first make a running knot and loop or noose in one end of the twine, as shown at Fig. 4, pass this over the tang in the head-slot of the needle, and draw it tight. Pass the twine down one side of the needle, over the tail-slot, up the other side, and over the tang in the head-slot; then back again down the same side of the needle, over the tail-slot, and up the other side. Thus proceed, first one side, then the other, alternately, passing the twine over the tang in the head-slot each time, and laying it carefully side by side, and tight, along the needle until the slot will hold no more. Wind it regularly and tight, so as to get as much twine as possible on the needle without making it bulge out with twine at the sides when the head-slot is full, because a bulky needleful is not so easy to get through the meshes as one neatly wound. When the needle is full, cut the twine off from the ball.

How to make the Mesh.—Take from 4 to 5 in. of the end of the netting-twine, and, at 4 in. from the end, make a bend as shown at A, Fig. 5. Pinch this between the tips of the thumb and forefinger of the left hand to form a loop, pass the needle with the right hand through this loop at B, and draw the twine through until another loop is formed large enough for the first mesh. Then grip the bend at B between the finger and thumb of the left hand, to hold the twine in its proper position, pass the needle around the back of the bend B, and bring its head out through the loop C. This will form the knot, as shown in the figure, which must then be drawn tight, when it will assume the appearance shown in Fig. 7, and the first mesh is made. Next tie the free end of the twine to a nail or hook, or get some one to hold it whilst the next few meshes are made. Take the mesh-stick in the left hand, and lay it against the twine in the position shown at Fig. 7. The mesh-stick should lie easily in the crotch of the left hand, between the forefinger and the thumb, which should hold the twine against the mesh-stick, as shown in Fig. 6, the loop of the first mesh being also under the command of the finger and thumb. This will give the right size to the mesh, as it will then be in length twice the width of the stick. Whilst held in this position, the slack of the twine is to be dextrously thrown over the knuckle of the left thumb by a backward movement of the right hand holding the needle. The head of the needle is passed through the mesh at A, Fig. 6, passed behind the slack of the twine, and then drawn tight, whilst the left hand maintains its hold of the mesh-stick, and the finger and thumb of the left hand its grip on the bend of the first loop. At first this movement is not easily performed, for the left hand must not be allowed to relax its grip on the mesh-stick and mesh, the needle being altogether manipulated by the fingers of the right hand, much in the same way as an ordinary needle is used in sewing; the head of the needle being gripped between the thumb and forefinger, whilst the tail is held between the tips of the third and fourth fingers. A little practice, will, however, secure to the workman the needed dexterity. As a further aid, I have marked the several positions of the needle by arrows in Fig. 6. The first position is that shown by the direction of the needle after passing through the loop. The loop must now be pinched between the thumb and finger of the left hand, and the slack of the twine thrown back around the joint of the thumb, as shown by the dotted line. The point of the needle is now turned to the left, and made to pass out through the opening A. This done, it is turned to the right in the direction shown by the arrow, and the loop drawn tight to form the knot. I have purposely left some knots loose in Figs. 7 and 8, to show how they are made.

Having made the first mesh in the chain shown in Fig. 7, turn the chain over, place the mesh-stick on the part marked C, and knot the twine into the lower loop of the mesh B; this finished, turn the chain over again, place the mesh-stick on D, and knot the twine into the lower loop of C; proceed in a similar manner with the next mesh and all succeeding ones, until a chain of meshes have been made long enough to form the head of the hammock. The length of this must not be taken with the meshes stretched out as shown in Fig. 7, but must be estimated when the meshes are elongated in the other direction, as shown in Fig. 8. I cannot give the exact length—that is, the extreme width of the hammock—as this must be made to suit the occupant. As a guide to obtaining the width, I may say that it may be represented by the measurement from elbow to elbow around the back of the occupant. This for myself would be about 36 in.

When the end of the chain has been reached, take a 3-ft. length of stout cord, pass it in and out the meshes as shown in Fig. 8, and tie the two ends together to form a ring, to act as a convenient holdfast whilst netting the remainder of the hammock. This ring is placed over the bent knee of the workman whilst sitting down, and connected to his foot by a looped piece of cord. As the hammock gets longer, the ring itself is passed over the foot, and the netting brought up over the knee. When the chain has been thus strung on the ring of cord, and the meshes stretched out to their proper shape, it will assume the appearance shown in Fig. 8. The chain must now be turned over, to bring the last mesh with its needle on the left-hand side, and then we proceed to put on another row of meshes, as shown in the figure, working from left to right along the whole width of the hammock. When the other end is reached, turn the netting over, and again work from left to right. Thus go on, adding row to row until the required length has been obtained, which must be, of course, that of the intended occupant, with a few spare inches over. Just a few words of caution will not be out of place here. Be careful to suit the size of mesh to the size of twine selected for the netting. A fine-size twine should have a fine mesh, to ensure the necessary strength. A three-cord twine will wear much longer than a twofold twine of the same size. Make the meshes of equal size throughout the whole hammock, or it will bag in some parts, and the bagged parts will be the first to break, because of unequal strain on the meshes. Draw each knot tight as the mesh is made, and so secure it as the work proceeds. When one needleful of twine is used, join on the end of the next needleful by a knot, made as shown in Fig. 6, or what is known as a becket hitch.

How to sling the Hammock.—A garden hammock is slung, by means of suitable attachments at head and foot, between two trees in the garden, or between two boughs of a large tree, or to the supports of the roof of a verandah, or between two tripods (one at head and the other at foot) secured by stout cords and tent-pegs. The body of the hammock having been netted, we must next consider how we are to attach the netting to the ropes by which it is to be slung. Several methods of doing this may be suggested:—(1) A ring of stout cord may be threaded in the meshes at head and foot, as shown in Fig. 8, and the ends of this ring spliced together to form what sailors call a grummet. To this the supporting ropes may be fastened. (2) A short stout piece of rope may be passed through the meshes at head and foot, then turned to form an eye, and spliced. A smaller eye may then be spliced at the other end to receive a hook, or the end of a supporting rope. (3) A piece of stout ash or oak stick may be lashed to the meshes at head and foot of the hammock, and a stout rope tied securely to each corner to form a support. This would spread out the hammock, and would be, perhaps, preferred by an invalid or a timid person to the others herein mentioned. (4) The usual and most approved method, however, of slinging a hammock is by means of attachments named "clews" at head and foot, and made as now described. Procure for each clew, twenty-two 40-in.

lengths of cord, about the size of the stem of a clay pipe. Lay them all equally together to form a bundle, and prepare to bind them, as shown in Fig. 9. First take about 5 yards of netting-twine, and tie one end to a nail or hook driven in a post. Next take the bundle of cords in the left hand, and at a spot 3½ in. to the left of the middle of the bundle, lay about 3 in. of the netting-twine in among the cords, holding it firmly with the thumb of the left hand in this position. Draw the twine tight, and commence turning the bundle of cords so as to wind the twine closely around the bundle, as shown in Fig. 9, for a distance of 7 in. The first end of the twine will be held firmly under its coils; the other end must now be fastened off. Bend the part of the bundle so wound into the form of an eye, as shown in Fig. 10, with the free end of the whipping-twine to the right of the eye, as shown by the dotted lines. Pass the end through the eye, around the left side of the eye at the back, then through the eye again from the front, and bring it down sharp in the crotch of the eye. This will bring the two sides close together at the bottom. Pass the end once more through the eye from the front, and again pull it tight; then fasten off by taking a couple of turns around one of its own coils in under the crotch of the eye, out of sight among the down-hanging cords. The cords—or nettles, as they are named—must now be plaited, to assume the form shown in Fig. 12. To do this, take the bundle by the eye firmly in the left hand, and part the nettles equally in a transverse direction, as shown in Fig. 11, throwing eleven nettles over the back of the hand, and allowing eleven to hang in front. Next take the outside one of each group (that is, one to the left, and the other to the right), cross them both in the middle, as shown in the figure, and pull them down tight. Then proceed to cross all the others over these alternately, passing first one from the inside group over to the outside group, then one from the outside group over to the inside, until all the twenty have been made to change places. Next take the two outside ones of this twenty, cross them in the middle as at first, and pass the remaining eighteen from side to side alternately, pulling each down firmly with the right hand as they are crossed over. From these, select two more to cross in the middle, and throw the remaining sixteen across alternately as at first. Thus proceed with all the nettles, leaving two behind at each time, until all have been worked in; then tie the two remaining ones together twice, and the plaiting is complete. Each end of the nettle cords should now be whipped with sailmaker's twine, to prevent the strands from fraying out. To do this, take about a foot of sailmaker's twine in the right hand, and the end of the nettle in the left hand. Lay one end of the twine upward in among the strands at the end of the nettle, and bring it down straight for an inch or so, then grip it there with the thumb of the left hand. Take the other end of the twine, and lay it in downwards from the top, and grip this also with the thumb. Then proceed to wind on the twine over the end of the nettle, each coil close to the other, until the loop of twine, shown in Fig. 13, is too small to admit of being passed again over the end of the nettle. Then pull the end A down sharp, and so draw the loop tight around the end of the nettle, and cut off all loose ends close.

The nettles are secured to the hammock by a becket hitch into one or two or more meshes, and the clews, when thus attached and spread out, present the appearance shown in Fig. 12. The head and foot lines of the hammock—that is, the ropes which are employed to suspend it—are run through the eyes of the clews, and tied with a looped half-hitch, as shown in Fig. 14. When thus slung, the knot can be easily undone by pulling out the loop. Or it may be fastened by an anchor bend, as shown in Fig. 15.

If the owner of the hammock wishes to strengthen the sides, this may be done by running a stout cord through the meshes, as shown in Fig. 8, and lashing each mesh to the cord with sailmaker's twine. The hammock will be further strengthened if this cord is made to pass around the head and foot as well, as then the head and foot meshes will be relieved from strain. Experienced netters may be frequently seen working without a mesh-stick, using the fingers of the left hand to act as gauges to the size of the mesh; but I advise the novice to make for himself a stick, and use that in preference. In conclusion, I may just add that, having learned how to mesh a hammock, the workman may go on making other nets, only varying the size of tools and size of twine to his requirements.

BRICKLAYERS' WORK.

BY MUNIO.

ARCHES (*continued*).

THE ELLIPTIC ARCH.

DRAW the springing line A B (Fig. 41), and divide it into three equal parts at the points C, D, then with the radii C A, D B, and the centres C, D, describe the arcs A G, B F, making the chords A G and B F equal to C A and D B; draw F D and produce it to E, also draw G C, and produce it to E, then with the radius E G and the centre E draw the arc G F, set off the depth of the arch H A, and from the centres C, D, and E draw the outer arc; draw K I at right angles to A B, and set off on each side of I, half the thickness of the key, and draw lines radiating to E between the two curves; then divide the remainder of the outer curve into equal spaces the size of the key, and draw lines between the two curves, radiating to the centres from which the arch is struck; these divisions will be the moulds for the arch bricks. It will be evident that the intrados of the bricks in the lower part of the arch will be narrower than those in the upper part, and this is sometimes objected to, and the whole of the joints are made to radiate to the centre K, but when so done, the labour of cutting is very much increased and the strength of the arch decreased; when thus drawn, the soffit bevels may be taken in the same manner as those of the camber arch.

THE ELLIPTIC GOTHIC ARCH.

Draw the springing line A B (Fig. 42), and divide it into four equal parts, at C, D, E, then with the radii C A, E B, and from the centres C and E, draw the curves A G, B H, making the chords A G and B H equal to C A and E B; draw D F perpendicular to A B, and make D F equal to the rise of the arch, then from the points H, F and G, F, with a radius equal to or longer than the springing line, draw curves intersecting each other in the points I and K, and from the points I and K, with the same radius, draw the remainder of the arch; set off the depth of the arch A L, and from the same centres draw the outer curves; set off half the width of key on each side of F M, drawing lines radiating to the centres, divide the remainder of the outer curve into equal spaces the size of the key, and from these points draw lines between the two curves radiating to the different centres. The same remarks as to the size of the intrados in the lower portion of the elliptic arch will apply to this arch, and sometimes the joints are all drawn to radiate to the centre D; but when so drawn the soffit bevels in a portion of the arch are very acute, and difficult to cut.

SETTING.

In setting plain arches, the courses should be marked on the boards of the centre, to keep the courses parallel with the line of abutments, or the last course may be wider at one end than the other; the courses should be well bonded, and set with joints of one uniform thickness; the head or face of arch is set to a line strung between the abutments, or a line may be marked on the centre, and the work set to it; after one course is closed, it should be plastered over with a thin coat of mortar for the next course to rest on.

Rubbed and gauged work is set with fine putty; the bricks are dipped in the putty, which must be mixed to a proper consistency, and as soon as sufficient adheres, they are set; care must be used so as not to stain the face or soffit; any surplus putty which squeezes out of the joint in setting, must be left till it stiffens, when it can be cut off clean; the faces of the bricks are set to a line stretched along the wall, and the joints must be set to radiate to the centre, by having a cord fixed to a pin or nail at the centre from which it is struck. When this is inconvenient, a templet to lay on the centre (Fig. 43) can be used; the courses should also be marked on the centre, to prevent them gaining or losing.

Cut or axed arches are not dipped; the mortar is spread on the bricks by means of the trowel, and they are set in a similar manner to gauged arches; sometimes Portland cement is mixed with the putty.

MOULDED BRICKS.

Cornices, strings, and other ornamental work are cut by the bricklayer; the mould is marked on each side or edge of the brick after it is squared and gauged, and the mould is cut: but if a great number are to be cut, a box with open end is used, into which several bricks are fixed, and the whole cut at one operation; in cutting from one brick to another, great care must be used so as not to chip the edges of the bricks; the chisel should be used as much as possible in the direction of the length of the brick. When arches are moulded, if the bricks are cut before being reduced to the wedge shape, both beds of the brick will require cutting down, or the mould will not fit; when moulded, after being made wedge-shaped, much care must be exercised so as not to break the brick at the narrow end.

A great number of moulded bricks both for cornices and arches are now made by various manufacturers, which are cut or moulded before being burnt, and these, when carefully set, although not so perfectly accurate as hand-cut bricks, make very good work; good setting is quite as important as good cutting. Figs. 44, 45, and 46A represent some moulded bricks made by Messrs. Lawrence & Son, of Bracknell, Berkshire, which are moulded before being burnt. This firm also manufactures excellent cutters and rubbers, which harden by

exposure to the weather, and, owing to the nature of the clay, carry the same colour throughout. Many other firms manufacture moulded bricks.

PAVING.

Paving is laid with brick flat, brick on edge, and paving squares or quarries, from 9 in. to 12 in. square. They are all laid in the same manner. The floor should be filled up with hard, dry material, and well rammed down. It is a good plan to level it up as the building is going on; it then gets well trampled down. It should be levelled to within one inch of the under side of the bricks or squares, and covered with fine sand; then fix at each side of the room a strip of wood, the upper edge of which is straight, and fixed level to the floor line; then stretch a line between the two strips and lay the bricks in parallel courses, bedding them down solid, and keeping them level to the line. The bricks should be bonded, and when the whole floor is laid, take up the strips, and piece each course out to the wall. It will be most convenient to lay the first course parallel and in line with the outer edge of the hearth flag. The whole of the cutting is then thrown against the walls, where it will not be so much seen.

After the floor is finished, it is covered with dry sand, which is well brushed into the joints till they are full. Sometimes the floor is grouted with liquid mortar, which must be run into the joints till they are full, and the floor is washed clean. The floors are sometimes laid diagonally, or in herring-bone bond.

STAFFORDSHIRE TILE LAYING.

Staffordshire tiles are very extensively used for flooring. They are made 6 in. square and 1 in. thick, and sometimes in octagons 6 in. in diameter, with small squares. Fig. 47 represents Staffordshire tiles. They are made in various colours—red, blue, buff, black, etc. They are laid in the following manner. Level up and ram the foundation within 6 in. of the finished surface, and cover the floor with three inches of broken stones to pass through a 2 in. ring. Upon this lay a bed of cement concrete 1½ in. thick, finished level, then nail down at opposite sides of the floor strips of wood, the tops of which are level with the finished surface of the floor; then, when this is set, spread a bed of Portland cement on the concrete, and lay the tiles level to a line stretched between the strips of wood, trying them occasionally with straightedge. When all is laid up to the strips, take them up, and finish each course up to the wall. When the cement has set, grout the whole of the joints with liquid cement, till the whole of the joints are full, and clean off the surface before the cement sets, as it is almost impossible to get it off if allowed to set on the tiles.

These tiles are sometimes laid diagonally in various patterns, a proportion of the tiles being nicked before being burnt, to facilitate cutting, which is necessary at times when it happens that halves or quarters of tiles are required to fill in.

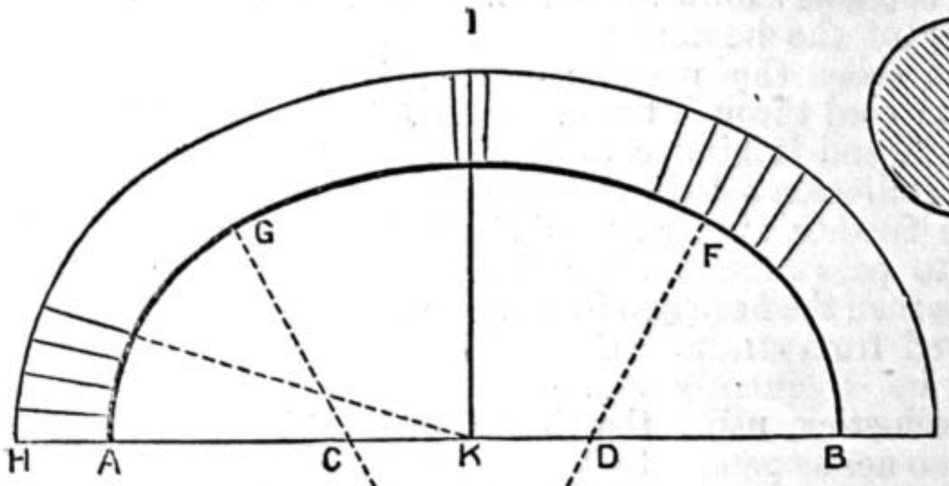


Fig. 41.—Elliptic Arch.

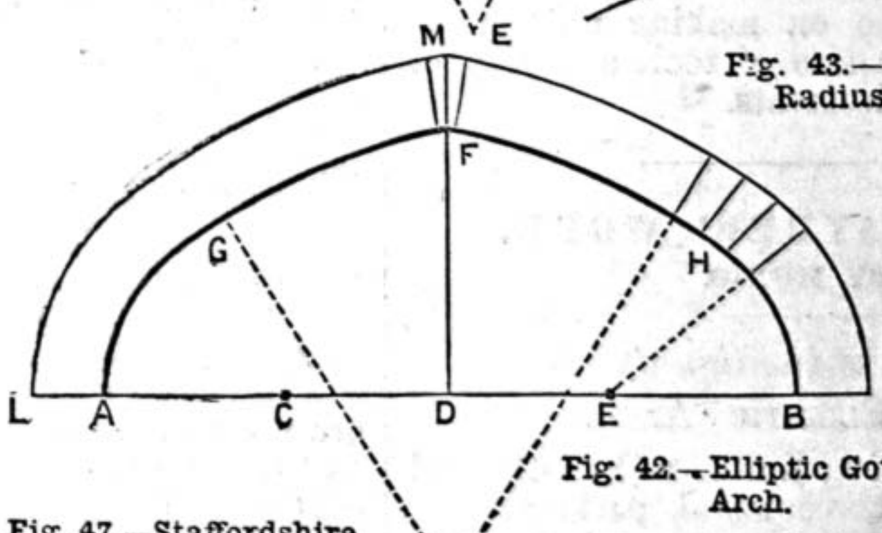


Fig. 42.—Elliptic Gothic Arch.

Fig. 47.—Staffordshire Tiles.

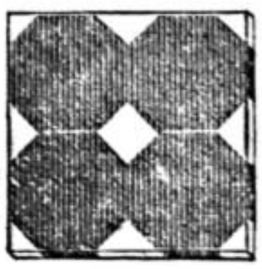


Fig. 49.—Mode of laying Geometrical Tiles.

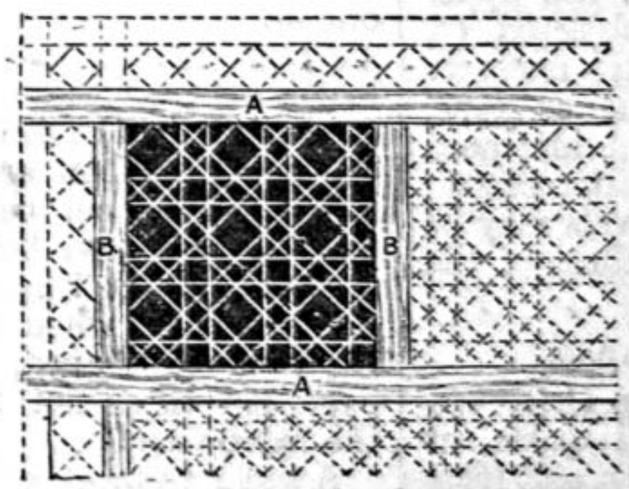


Fig. 50.—Screeder for levelling Bed of Tiles.

GEOMETRICAL AND ENCAUSTIC TILE LAYING.

Geometrical tiles are used for the floors of churches, halls, passages, etc. They are made in various shapes and sizes from 1 to 6 in. square, also in triangles, hexagons, and octagons, and are generally ½ in. thick. They are of various colours, as red, blue, green, black, white, and many others. Fig. 48 represents a portion of a geometrical floor. Encaustic tiles are ornamented on the surface, either by painting, or by different coloured clays let into the surface. They are from ¾ to 1 in. thick; they are generally used in connection with geometrical tiles as centres, borders, etc., and also for dados and wall linings.

The following method of laying these tiles is recommended by Messrs. Maw and Co., of Broseley. Level up and well ram the foundation, and cover it with a 3 in. layer of broken stones to pass through a 2 in. ring, and upon this lay a bed of cement concrete 1½ or 2 in. thick, the top finished level, and ⅜ in. below the under side of the tiles. Then lay out a portion of the tiles on a level floor, and also the border, so as to get the actual sizes, and mark the sizes on the concrete with chalk lines, and nail down to these lines strips of wood 3 in. wide and 1 in. thick, the top side of the strips being level with the finished surface of floor. Two cross strips must also be fixed between the two long strips, two or three feet apart, as shown in Fig. 49. Then wet the foundation, and spread upon it a bed of Portland cement mixed with clean sharp sand, and level it by means of a lath or screeder, running on the strips, the ends being notched to the thickness of the tiles, which level the cement (see Fig. 50). Then, having soaked the tiles well in water, lay them down according to pattern, beating them down to the level of the strips, under a piece of wood, by means of a mason's hammer, and regulating the joints at the same time by means of a small trowel. By this process the tiles will be brought to a perfectly even surface, and thoroughly consolidated with the cement, which the beating down regularly distributes under them. The surface of the floor should be also tested by a straightedge

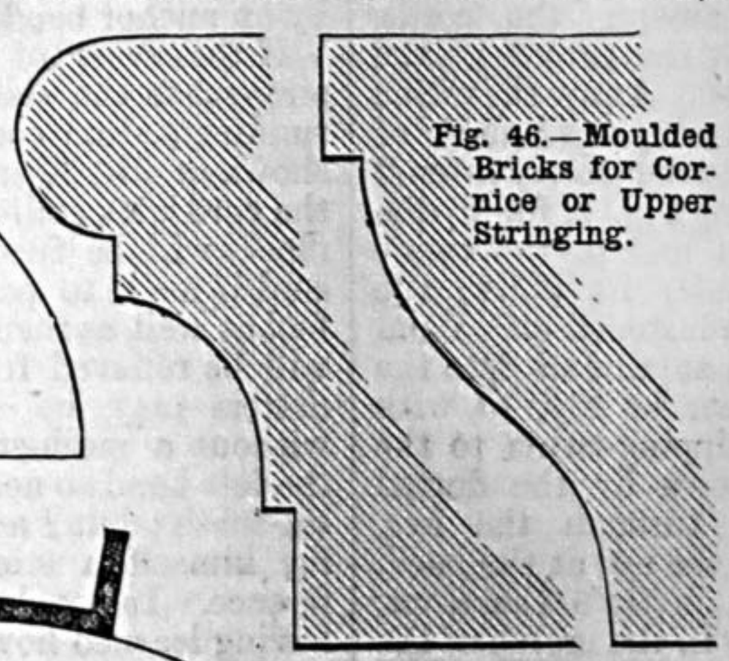


Fig. 46.—Moulded Bricks for Cornice or Upper Stringing.

Fig. 43.—Templet to Radius of Arch.

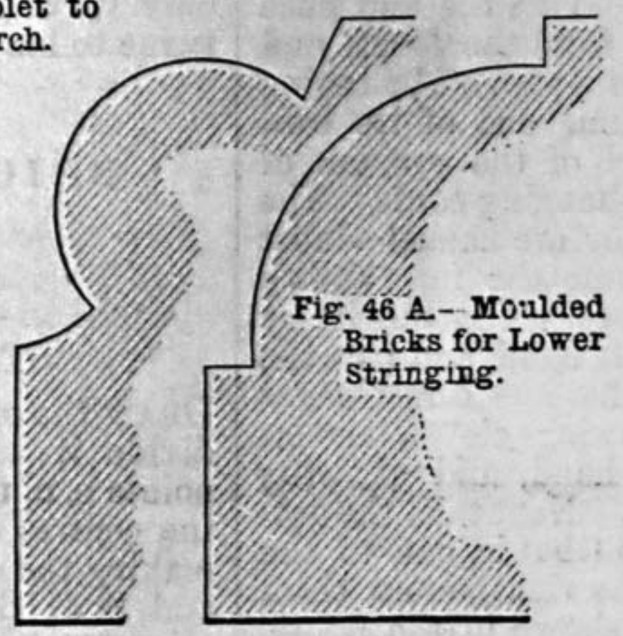


Fig. 46 A.—Moulded Bricks for Lower Stringing.

Fig. 44.—Moulded Bricks.

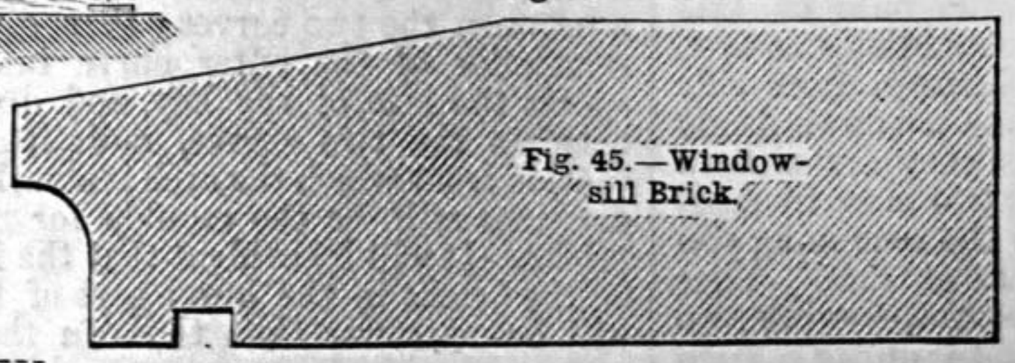
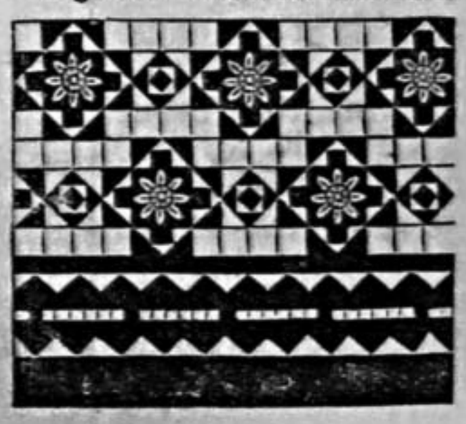


Fig. 45.—Window-sill Brick.

Fig. 48.—Geometrical Tile.

Fig. 48 A.—Ornamental Tile.



laid across the strips. As soon as the tiles are laid up to the cross-piece, it must be removed and refixed, and another square of tiles laid, and so on till the centre of the floor is completed. Care must be taken in marking out for the strips, that the borders at each side are equal in width.

After the centre portion is laid, take up the strips, and refix them for the border, one tile width from the wall, and lay the border all round; take up the strips, and lay the tile next the wall, levelling it from the tiles already laid. When the tiles are sufficiently set, the whole of the joints must be grouted and run full of pure cement, mixed to a thin consistency. The grouting must be cleaned off the surface of the tiles before it sets hard, or it will be impossible to get it off after. Dry sawdust brushed over the surface is a good material for cleaning off the cement. The surface of the tiles must also be kept clean while they are being laid.

The tiles should always be laid before the skirting boards are fixed, to save cutting the tiles, and in an old house the skirting boards should be taken off while the tiles are being laid, and refixed after.

When a tile requires cutting, mark a line across it, and lay it on the sharp edge of a stone, with the mark over the edge, and nick it across the line with a chisel, when it will easily break. When a recess is to be formed for a mat, a stone, wood, or iron margin must be laid round it, and the tiles laid at the bottom as already described; but it is a much better method to keep the threshold of the door the thickness of the mat above the tiles, so that the door opens clear over it, as the recess forms a receptacle for dust.

Skirtings, dados, and wall-linings are fixed in the same manner as flooring tiles, the strips being nailed to the walls. The tiles are fixed with Keen's cement, except in cases where the walls are liable to damp, when Portland cement should be used. Tiled floors should be covered 1 in. thick with dry sawdust, to protect them from paint stains, dirt, etc., till all is complete. That the introduction of tiles in entrances and passages frequently adds very considerably to the general effect is a truth on which I need not dwell here.

FITTING AN ELLIPTIC CHUCK.

BY JAMES LUKIN.

THE SIMPLER FORM OF CHUCK—BACK PLATE—FRONT PLATE—NOSE PLATE AND RING.

THE elliptic, or oval, chuck, as it is often called, adds materially to the capabilities of a lathe, but is, unfortunately, of sheer necessity, an expensive article, costing from £7 to £15, or even more, according to the way in which it is made, the finish put upon it, and the maker's estimate of the worth of his own name; and in respect of lathes and their manifold appliances, a good name is decidedly better than precious ointment, being generally, if not invariably, a guarantee of good workmanship. High prices, moreover, permit the time to be spent upon work which is absolutely required for its efficient construction. Hurried work is always bad, and it is such alone that can be cheaply produced. At the same time, prices ought not now to rule as high as when chipping and filing were the sole means of bringing the work into its intended form. With the appliances of modern machinery, much tedious labour is avoided, and the earlier stages of manufacture are greatly facilitated. If lathe appliances, indeed, were as marketable commodities as clocks and watches, there is no doubt they could be produced by machinery as easily as the Waltham watches, and perhaps completely fitted in that way. But the sale is so comparatively limited that it would not pay a maker to set up elaborate and, therefore, costly machinery to make a few chucks, which can be made by hand in quite sufficient number to meet the demand. Two or three lathe makers, moreover, have tried to bring ornamental lathe apparatus within the reach of amateurs of limited means, offering it, fairly well made, at prices far below that demanded by the leading lathe makers; but the result has not proved satisfactory to makers or buyers, as the sale is too limited to make it a profitable speculation, and the desired accuracy of workmanship is hardly thus attainable.

The natural result is that amateurs find it expedient to become home manufacturers. They have little difficulty in obtaining castings, and with file and scraper, and a little plain turning, they often succeed in making workable apparatus of various kinds. A moment's consideration will show why their success is comparatively limited. The fault is that they attack a dozen distinct trades, each of which demands apprenticeship and lengthened practice to ensure success. There is little hope of much practical skill being attained as long as amateurs attempt to become blacksmiths, carpenters, turners, watchmakers, and so forth without a proper training in any one of these difficult handicrafts. If, indeed, there must be allowed to an amateur a little special freedom in this way, I would suggest either metal or wood as his material, but not both—plain and ornamental turning in wood and ivory, with some amount of cabinet or joinery work, to enable him to utilise his lathe productions; or, as an alternative, metal-turning—filing, scraping, engine-model making, and so forth, which will give him the skill required for making and mending any sort of metal work that may fall in his way. I know a few—very few—who make well, and use equally well, ornamental lathe apparatus,

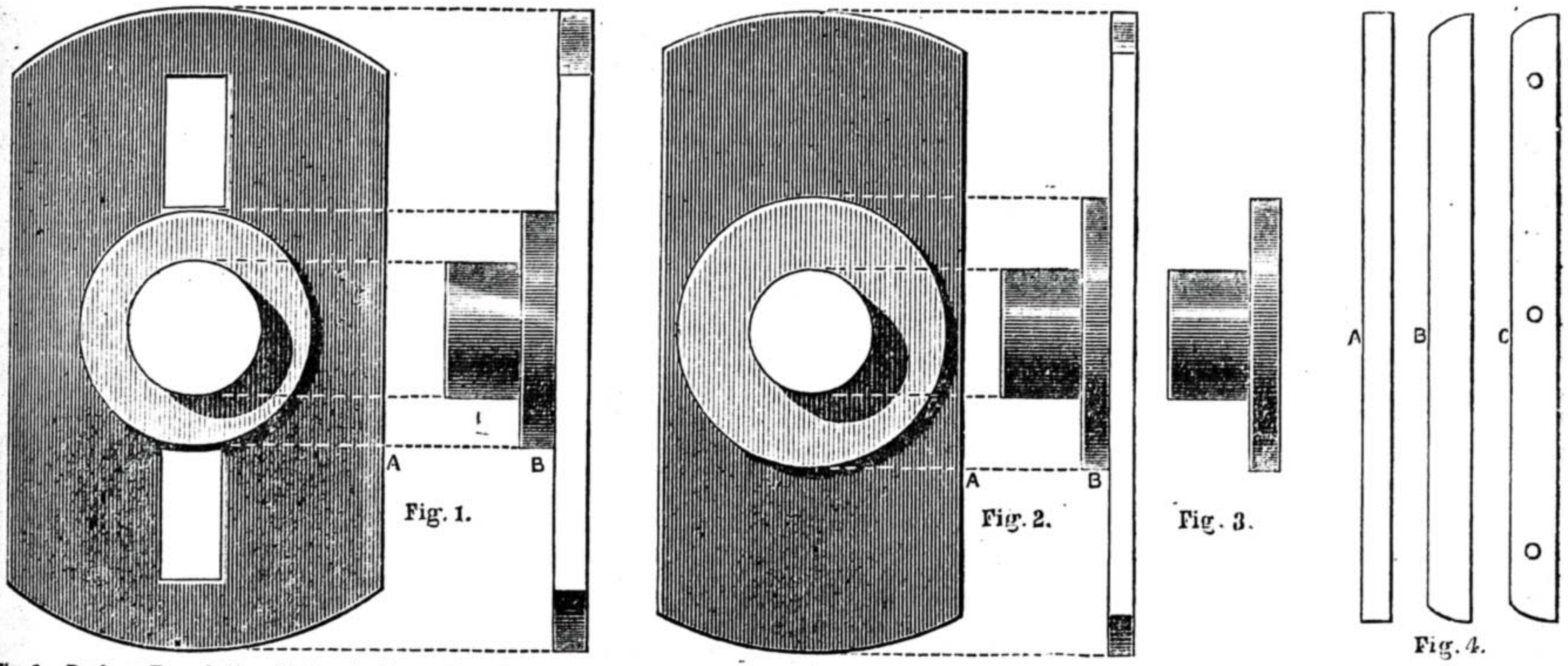


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Fig. 1.—Back or Foundation Plate—A, Plan; B, Side Elevation. Fig. 2.—The Slide with Nose cast on—A, Plan; B, Side Elevation showing Nose cast on. Fig. 3.—Nose separate from Slide. Fig. 4.—Steel Bars for Base Plate—A, Edge; B, Flat Front; C, Front drilled for Screws.

but they have had sound technical instruction to begin with, and these exceptions do not materially affect my suggestion that the fewer trades an amateur takes up, the more satisfactory will be his work.

In detailing, however, the process of making and fitting an elliptic chuck, I am obliged to presume a certain amount of skill in filing, scraping, and turning metal. This, again, presupposes a lathe and slide rest, files, scrapers, punch, drills, screw tackle, and a scribing block; and a few other tools would be an advantage. A vice-bench, hammers, and such-like are always at hand in any place that can be called a workshop; also squares, callipers, and compasses, as necessary tools of a metal-worker.

A most useful appliance—quite essential if much accurate work is to be done, apart from turning—is the surface plate, but for a chance job, such as the elliptic chuck, it can be done without. We will begin with the chuck itself, and then pass on to the adjustable ring which regulates and controls the action of its slide. It is as well to explain that this chuck is made in two forms. In one it has a fixed nozzle screwed to the same pitch as the nose of the mandrel, that the ordinary chuck may be attached. This

nozzle is securely and permanently attached to the sliding plate, and when the latter is in its central position, the nozzle forms, to all intents and purposes, a continuation of the mandrel. In more complete, but more expensive, chucks, this screwed nose-piece is attached to a circular division plate, and revolves on a central pin riveted into the sliding plate. The division plate is either cut into cogs so as to be held by a spring ratchet, or it is fitted to work with a tangent screw. The former is, perhaps, easier to make, but the latter has, in all the high-priced chucks, supplanted it.

The several parts of the simpler pattern will be a casting of the back plate, another of the front plate, a third of the nose-piece, and, fourthly, a casting of the ring. There will have to be provided two steel bars to be fitted on the base plate, and two screw blanks, which should be eventually cut with a fine screw thread, as they are to be tapped into the lugs of the ring plate, and ought to be capable of fine adjustment. The size will be, for a 5 in. lathe, about 6 in. by 3½ in., and the thickness ⅜ in. when finished, which will be $\frac{7}{16}$ in. in the rough. The boss which is to be bored and screwed on the mandrel will be 1½ in. in diameter, or 1¾ in., according to the size of the mandrel nose. The several parts are given in the drawing. Fig. 1 is the back or foundation plate; Fig. 2, the slide; Fig. 3, the nose; Fig. 4, the bars. Figs. 2 and 3 may, if preferred, be in a single casting, if there is to be no division plate, and it will be easier, as a first attempt, to make it thus, because all parts can be faced in the lathe, thus saving much difficult work with file and scraper. The solid nose-piece will facilitate chucking, and in planning such work, it is always well to consider this detail. Indeed, it is sometimes advisable to cast a boss on a piece of work solely as a means of holding it in the lathe, such boss being removed subsequently.

Two slots will be noticed in the drawing of the back plate, which will file up to half an inch wide; two steel arms which grasp the ring work in these slots, and are secured to the slides; these will be described in due time. As I have suggested buying castings, because they are then certain to be correctly proportioned, and of nice fine metal, I may state that some makers now fit the bars on the back of the sliding plate, and, in that case, it will be found that the foundation plate is narrowest. As far as fitting is concerned, one way is about as easy, or as difficult, as the other, the several operations being similar. In both it is a question of accuracy in filing, grooving, and turning, and it will require the greatest patience and care if the result is to prove satisfactory.

The base plate calls first for attention, and the sooner it can be mounted on its own mandrel the better; and on its own mandrel all the turning and fitting must be done, or it will fail in that perfect accuracy which is so essential in this particular chuck. Examine the casting first of all, and if it is free, as it ought to be, from little excrescences, and of a nice, uniform surface, it may at once be mounted by means of suitable clamps on the face plate of the lathe, the boss being outwards. If, on trial, it is found that this boss, after being accurately centred, still wobbles out of truth, the casting is in "winding," and is, probably, useless.

In a good casting, this plate should run with very nearly absolute truth, and will need, at most, a little cleaning off with the file, in order to render it true enough to bed closely upon the face plate. If the latter is of a bright surface—and lathe makers seem fond of putting that sort of finish upon it—the casting is liable to slip, and it will be found a good plan to lay under it a sheet of coarse brown paper. This gives a little grip without interfering with the accuracy of the surface. A rub of chalk will serve the same purpose. In my own lathe, which had a very smooth 10 in. face plate, I went over the surface with a sharp-pointed tool, just cutting deep enough to give it a grain, and I have never had cause to regret it. The clips used to secure the work must be placed round the edge in order to get at the greater part of the surface with the turning tool; but after all has been so turned that can be reached, and the boss turned, bored, and screwed, a pair of clamps can be fitted through the slots, and then, after these have been tightened up—but on no account before—the others can be removed, and the turning carried out to the edge of the plate. The tool used should be either a round-nose or a point tool, the former having an elliptical end so as to approach somewhat to a point, and the angle of edge 80°. With this angle it may, and ought, to have a *sharp* edge, and, to preserve it, it is a good plan to file a bevel to the brass plate before allowing the tool to work. It will thus begin in clear metal, and at once get somewhat below the hard rough surface of the casting. A slow motion must be used and light cuts taken. Remember always that a tool of acute angle of cutting edge—under 70°—is almost certain to catch in if used upon brass or gun-metal, but it is not good practice by any means to use a tool that has blunted upon iron for the purpose of cutting, or even roughing-down, brass. Use well-sharpened tools always, ground to the angle, which experience has proved to be the best angle for the material, and metal turning will be found quite as pleasant and interesting as ornamental work in ivory.

Before taking a finishing cut with a well-sharpened and oil-stoned edge of 85° to 90°, the hole is to be bored for the lathe mandrel nose. Face the boss, but its cylindrical side can remain for awhile. If this boss has not been cored out by the founder, it will have to be drilled and the hole subsequently enlarged. With the sharp angle of a graver, or point tool, make a central shallow hole to take a drill point, taking care it is a conical depression without a little bit of metal in the centre, as will happen if care is not taken to cut it clean to the bottom.

A twist or other drill is now to be centered on the back poppet, with its end in the conical recess, a small spanner being used to prevent it from turning, and this is to be carefully fed into the hole by means of the back poppet centre screw. Another way is to place a flat drill in the slide-rest, but I prefer to start a true hole first of all of, say, ¼ in. diameter, and then to enlarge it with a slide-rest drill. A half-round engineer's bit will either clear out a cored hole, if an entrance is given by turning a quarter of an inch first of all to fit it; or, in a similar way, it may be used to follow the drill, which will somewhat relieve its work. But we are obliged to consider here the capabilities of the lathe, which may not be fitted with back gear; in which case, the easiest mode is to drill and follow up very gradually with a larger tool, leaving the final cut for an inside slide-rest tool, with which to make the hole quite true and parallel. It is not, after all, a very difficult job, yet it is one that may very quickly be spoilt by undue haste. The hole should, at this point, be still left a shade smaller than it is eventually to be, as a loosely fitted screw will be detrimental to the working of the chuck.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

Useful Methods of Graining and Finishing Cheap Furniture.

With a view to avoid any feeling of dry monotony which the continuance of a set of papers of a purely instructive and theoretical nature might result in to the general reader of Work, I purpose to vary these lessons by occasional chapters dealing not so much with the art and technical aspect of graining as with the practical and every-day purposes to which the instructions can be applied. In due course, a consideration of the *decorative* application of these imitations may furnish herein some matter of interest and, I hope, guidance to operative painters and grainers especially. For the present, however, we will content ourselves with putting into practice some of the knowledge and skill which the student should have now acquired from this series.

The furniture of the home, be it ever so common and plain, is a topic that every reader can be interested in; and amongst such a large community of wood-workers as our magazine circulates, the subject of its *cheap, durable, and effective finish* will provide a welcome paper for many. Notwithstanding, it may be remarked, with perfect truth, that the learner who, from a preceding lesson, can grain a door will surely be able to grain a wardrobe, there is much information that can with advantage be tendered such an one upon the above imperative conditions of method and cost, and which, to the wage-earning worker, would make all the difference between profit and loss in graining cheaply-made furniture.

In graining bedroom furniture—the bulk of cheap *suites* of which are so finished—we may here consider, in the first place, what is the most suitable colour and aspect to give them. The most favoured appearance for all things connected with the sleeping apartment is, at the present time, that of lightness and "sweet cleanliness," if I may so term it. This is as it should be, for however much there may be to admire in the "good old times," the disappearance of its massive and cumbersome bedsteads and chests of drawers, with the arrangements of "dust-harbouring" hangings and "valances," of fifty years ago, can scarcely be grieved over—that is, from the sanitary and progressive point of view. How far this is a change for the better or for worse, in that a *suite* of bedroom furniture can now be purchased for the price of about a single article of the past generation, is a question of political economy that does not here concern us. We will take these things as we find them, and assuming that you, my individual reader, have purchased such a bedroom set "in the white"—viz., the common plain deal or pine—I will endeavour to help you in making them appear a credit to your little homestead and the admiration of your "better half."

Under this category of lightness and cheerfulness we have, therefore, the imitations of light "maiden" oak, maple, satinwood, pitch-pine, birch, etc. The first-mentioned

light oak is, without doubt, the most popular of the list, and as imitations of oak have been thoroughly explored herein, we will apply ourselves to the "getting up" of the furniture.

The preparation of furniture for graining upon may be considered from the various aspects of cost, durability, and excellence of finish. These we will return to farther on. Our present purpose shall be to make a good permanent job without stinting our time or the cost of a little material. Ready-made furniture which is essentially cheap can scarcely be finely finished in the wood, so we commence by glass-papering the work down, where required, with No. 1½, then, after dusting it well over, we coat the knots with "patent knotting," and stand aside to dry whilst we prepare our first or priming coat. This is best made with white lead—say, 4 lbs.; patent driers, ¼ lb.; red lead, ¼ lb. Beat up in linseed oil and turpentine, in parts three to one respectively, until our paint is of thin working consistency. This makes a hard-drying paint of an oily nature to stop the suction of the new wood. Our second coat is made with white lead and driers of similar proportions and a little more "turps." This is, however, first tinted a decided light buff with ochre in oil, and strained before being used; and our furniture must also be again papered down and all holes puttied up before the second coating is spread. It is advisable to make our second coating a little darker than the desired tint of ground for graining upon. After standing a day, and without further glass-papering, we may spread the third and grounding coat. This should be made as before, but with equal parts of oil and turps, to give a hard and fairly glossy surface for the combing and figuring. The furniture is now ready for oil-graining, over-graining, and varnishing. The colour being made with raw umber in oil, according to earlier lessons, each article of furniture is barely rubbed in and then combed. In working the usual "turned" table-legs, it is best to stipple them with a dry duster or tool, and comb only the plainest portions of such surfaces. Care must be taken to maintain the proper direction of the grain, and, as when working a door, the panels and drawer-fronts only should be figured, and the surrounding portions finished with varieties of plain combing. When dry, we may overgrain the figure and further improve the plain parts with a shading of different natural depths and stronger contrasts, according to personal fancy. The top of the wash-hand stand is better finished with an easy imitation of marble, called usually "black and white." Instead of, therefore, painting this portion twice with buff, we use white paint; and after the graining is finished we again coat it carefully with quick-drying white paint, and with a black crayon, or fine pencil and black, put in the veins, and then blend them slightly whilst the white is wet. The furniture should, finally, have one or two coats of "hard-drying" or "church oak" varnish, as ordinary oak or copal may not, and does not usually, harden sufficiently for much handling. The "marbled" top should be varnished with two or three coats of "white hard" *Bath varnish*, and the articles will then last, with ordinary care, a lifetime. The wash-hand stand, which usually gets the most wear, will need a periodical touch-up and re-varnishing; and, especially with regard to the top, be it remembered that an occasional coat or two of varnish will save the trouble of repainting many times over.

The *graining of furniture in maple, satin-wood, and pitch-pine*, etc., will appear to most advantage when used on better-made woodwork than that of the ordinary factory articles. They should be prepared and "brought on" in white lead paint, if a good job is desired, in the same manner as I have described for oak, and the lessons in my succeeding papers upon imitating these woods will form a useful sequence to this *résumé*. Most of these woods are usually grained in distemper, and to get an effective display, larger spaces and portions are necessary; whereas with oak, no matter how small the work, the figure can be pleasingly adapted thereto. Some of the prettiest bedroom *suites* I remember seeing were at a City house, ten or more years ago. They were made—or veneered, I suppose—in maple and satin-wood, and were partly polished before being turned over to an artist. This art-worker embellished the articles with ornament in semi-natural colours of the Adams type of design, but with all the charm and elegance of Louis XIV. decorative work. The predominant tone of the painted ornament was blue, and this served to heighten, by contrast, the richness of the golden-coloured woods. This work was finally polished, over painting as well.

American walnut and pitch-pine are two varieties of wood that have become very popular for bedroom furniture during the last few years. Some effective suites of these two woods combined have recently attracted some notice. The panels were walnut, with inlay of lighter wood, and the framing portions were of the pitch-pine. Any reader who has the skill, and with it a well-made suite of such goods, is recommended to try this imitation. Maple combined with American walnut I have also used to decided advantage and satisfaction, but in such a case, with light panels and walnut framework. Such ornate treatments of bedroom furniture would, of course, be entirely misapplied to the common goods first alluded to; but in the face of a present and growing tendency to make the bedroom a pleasant private sanctum as well as the sleeping room, their appearance is one sure to meet with much favour.

The imitation of mahogany, rosewood, and other hard and costly woods, is very seldom required or advisable with bedroom furniture. The comparative cheapness of real American walnut has been the main reason for its use in sleeping apartments, and chiefly accounts for its increasing popularity, notwithstanding the current "rage" for light painted and enamelled work. What is acceptable in the real polished wood respecting the walnut is scarcely so of its imitations, for one reason especially: dark-grained woods are very prone to show white wherever they get a knock, and the ordinary copal varnish never appears to so much advantage upon dark woods as upon light ones—loss of gloss and "bloom" is much more readily apparent upon the former surfaces. Where there is much "wear and tear," light wood imitations are, therefore, undoubtedly the best for bedroom furniture. It is possible, nevertheless, to avoid the disadvantage of dark woods showing when knocked or rubbed by graining the imitation directly upon the natural wood's colours. This is a treatment capable of giving most excellent and woody effects, combined with extreme durability, when the time and cost is no great object. To this process I will return in a future paper.

The *cheapest modes of preparing and graining furniture* will prove a matter of some further useful instruction herein, and will enable the poorer worker to get the best show and wear at the smallest cost, and will also explain how such articles are grained "wholesale" for the large and cheap makers.

A distemper "grounding" paint is made with well-washed whiting and strong patent or best glue size, and this is substituted for the previous coats of white lead paint. Common and the cheapest whiting will suffice, but if such is at all gritty, we must strain it through a hair-sieve. A few pounds of whiting are broken up into sufficient only of water to slacken it. The stainer is now added in the form of cheap powdered pigments — ochre, umber, and Venetian red—according to desired ground colour. These stainers can be purchased at about one penny per pound; and, as the whiting is usually retailed at not more than a halfpenny per pound, the most expensive ingredient is, therefore, the glue or patent size. The latter being the most convenient, we take about the same quantity as we have whiting, and having melted it, with a very little water, over a fire, we stir it into the stained whiting. The worker must here remember that the distemper ground will dry much lighter, but that the ordinary hard-drying varnish will also restore much yellowness of colour.

Usually, without knotting or glass-papering, the goods are simply dusted and given a good coating of the hot distemper paint. When thoroughly dry, a second coat is spread, and this gives a solid and hard ground for the graining colour. If the distemper is free from grit and has been well spread, it is not necessary or advisable to glass-paper the cheapest goods. For graining, we take a little fine umber, ground in beer—or such pigments as we know will best suit our imitation—and dilute it to working consistency with weak beer. With a large sash tool we rub over the different portions, and by streaking it with a dusting brush and then using gutta-percha or indiarubber combs, we get the varieties of grain. Now with a piece of wash-leather instead of rag we quickly wipe out the lights, or figure, before the graining colour dries, and finish each panel or division right off. The roughest goods are then coated with the cheapest resin varnish. In order to obtain a superior finish to this quick process, the articles may be given a thin coat of japan gold-size and turps in equal portions. The overgraining by the usual distemper process is then done, and a final good coat of varnish will make a fair and durable finish to a cheap imitation.

When graining dark woods after this method, one coat of the distemper ground will suffice to cover up the wood, but it is a good plan to give a second coat of strong clear size only, which will enable us to work either oil-graining colour or water-colour upon it with much more facility and effect.

In graining with oil-colour upon these distemper grounds, it need scarcely be pointed out that there is no necessity to "bind down" before over-graining, as is required upon water graining. The strong size used with the ground, or in the after-sizing, effectually prevents the varnish from blackening and discolouring the whiting contained therein. For a good class of grained furniture we may get the surface up in strong size and whiting, then well glass-paper it down, coat with clear size, and give one coat of white lead paint. For maple this is by far the best plan, and

much of the cheap plain-painted and enamelled furniture is also so treated.

Patent knotting composition or varnish is sometimes used as a first coating, then a coat of size will effectually stop the suction of new wood. The "knotting," as it is usually termed, will alone make a good and rich stain for deal wood, and one which can be either polished or varnished upon almost immediately.

Lest there be any doubt in the mind of the worker as to the durability of imitations grained upon size colour, I may add that for the usual wear of bedroom furniture such work will last any reasonable length of time. To summarise the *pros and cons* of the two preparatory methods, oil-paint *v.* distemper, we have the greater durability, accompanied with extra cost of time and material and the objectionable smell of the former, as against the cheapness and quickness, with less wear, of the latter, while the absence of the smell of paint compensates for the dustier and dirtier manipulation of size and whiting colours.

KEATS'S STAR-DISCS FOR SEWING MACHINES:

BEING IMPROVEMENTS IN WINDING MACHINERY FOR SILK, COTTON, THREAD, AND WOOL.

BY JOHN CHARLES KING.

In introducing something new—applicable to textile or sewing machines—the inventor, if wise, first ascertains if there is a demand for it, or can be created with commercial advantage. That this has been done will be obvious when the above-named invention is explained, and the improvements demonstrated. To show that a demand—in relation to the winding and unwinding of spun-silk, cotton, thread, or wool—is, and has long been, urged by users and merchants, we will take a rapid retrospective glance for a half-century: when the tailor and seamstress bought their silk retail by the "skein" at twopence; their cotton by the ball at a penny; their thread by the "knot" at a penny. The boot closers their skein of thread called "barber's twist" for a penny, and flax thread—grey or yellow—called closing flax, for a penny, or threepence, and the wool or worsted by the "hank," etc. In all these various forms of putting-up this spun material, there was no complaint of strain, pressure, or "kink," affecting the material.

The advent of the sewing machine, now a requisite in every household nearly all over the civilised world, created new requirements for feeding the machine. The "reel" was introduced; this graft on to the sewing machine required regulating in its unwinding, and a "brake" was put on the reel for that purpose. This was found to strain the silk or thread too much, causing an uneven stitch; then the "brake" was put on the thread, and the reel allowed free play in unwinding. This acted; yet withal there arose complaints against the silk and thread used on the sewing machine; it did not yield the "pearl" stitch equal to hand work, and the evil was judged to be in the reel. The best tailors of Paris and London, and seamstresses at high-class work, were supplied with silk thread, etc., wound on cards of various shapes called "Carton" silk, or thread; and about five years ago a form of card called "Plastron" was introduced; but this, besides being unsuited for use direct with the sewing machine, "kinked" the material by being wound over the edge of the card in successive layers. The objectionable reel still at present holds its place, with its admitted evils. This year a gentleman, who combines the philosopher and the mechanician in his mental attributes, was thinking of the best plan of winding spun-silk, and had his attention drawn to the camels being loaded at Scutari

No. 1.

No. 3.

No. 4.

Keats's Star-Discs for Sewing Machines. No. 1.—For Silk or Fine Cotton. No. 3.—For Large Thread or Fine Worsted. No. 4.—For Wool. The above Diagrams are reproduced on a scale of two-thirds actual size.

for their journey with spools of silk for Teheran, and on inquiry found they had to carry 75 per cent. of wood for 25 per cent. of silk; and the weight, and bad pack-saddles, caused a loss of 10 per cent. of camels on the journey. He set himself the task of inquiring into the complaints of sewing-machine workers, and also to diminish the load of wood used in the export of spun-silk and thread.

In investigating the silk worked from reels he found that it was not round silk, but *square*, consequent upon a demand of users for highly-finished silk and thread. To effect this, the strain put on the silk or thread in winding sometimes reduced its tensile strength one-half; and the effect of winding silk or thread tight upon a hard wood cylinder, between two end discs forming the reel, was that packed side by side, and layer upon layer, the silk or thread was converted from round to square—this is easily felt by the fingers. In the action of passing through the needle eye, and through the stuff being sewn, the square edges become abraided, and a "pearl" stitch—so much sought for by good workers—cannot be got. To obviate these evils, Mr. Keats invented star-discs of card of such forms as would readily receive either silk, cotton, thread, or wool direct from bobbins or the "twister's frame;" and in the transfer, not to injure the spun silk or thread by strain, pressure, or kinks, as with reels or plastrons.

The star-discs are made of card with five, seven, nine, or eleven points (even numbers would not work) to receive the spun silk of the finest sort or the largest wool. Of these, the discs with eleven, seven, and five points are shown in the accompanying illustration. The radiation is in tangential curves, so formed that the lay of the silk, etc., starting at the inner interstice of the star-rings, is wound not round the star-disc direct, but in and out on the star-points till the outside edge of the disc is reached. The machinery which carries the twelve star-discs at once has a rocking action, which allows the lay of the silk to enter in and out each side of the star points with regularity and automatic precision.

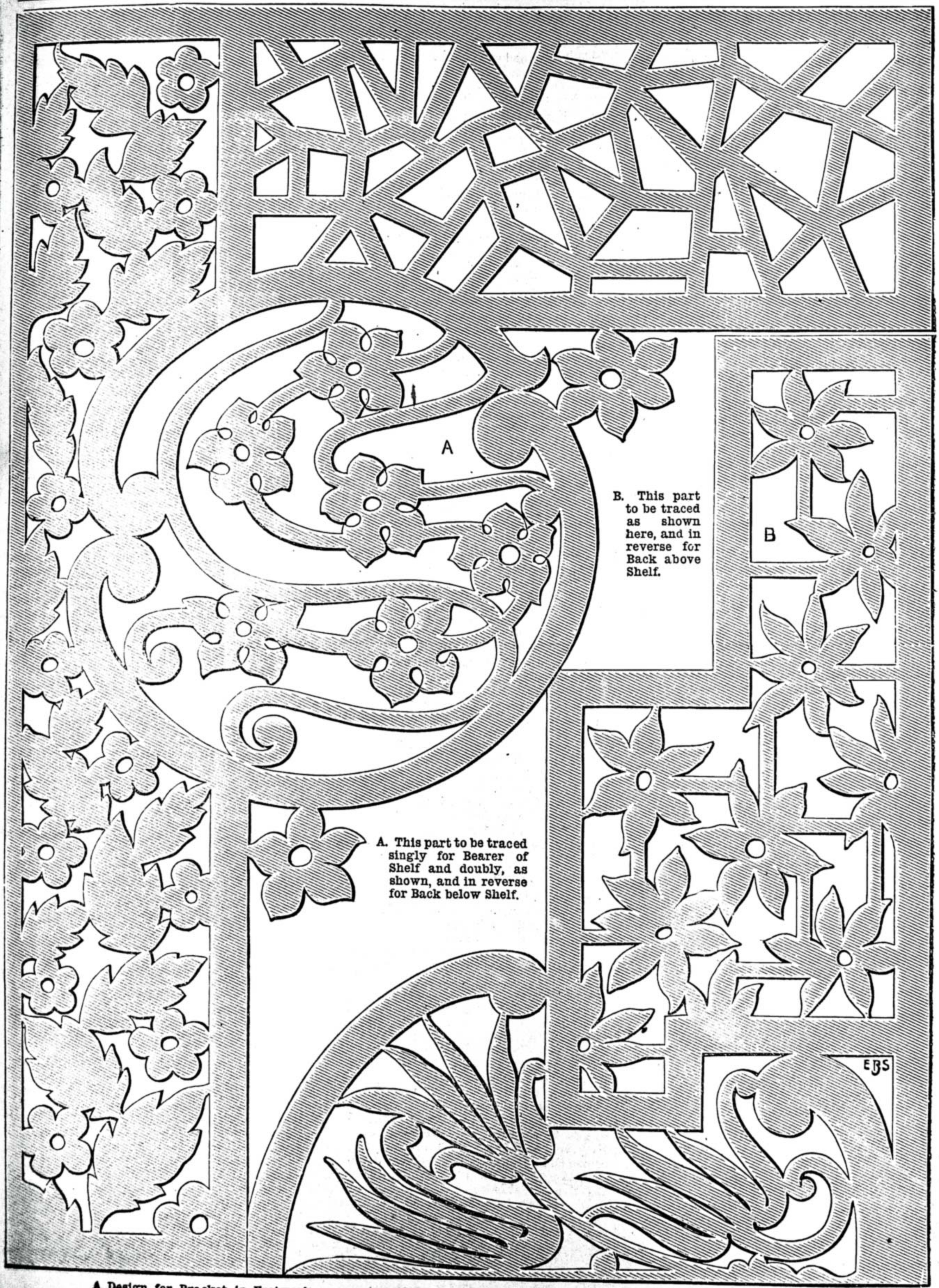
In its use on the sewing machine, it requires no brake; the draft, it will be seen, is not from the periphery as in reels, but nearly central.

For wool working and hand-embroidery, several star-discs may hang from a wrist-hook without any inconvenience to the worker. The fact that sixty millions of plastrons were sold in France in 1888, is a marked protest against the reel, and an encouragement to the inventor of the star-discs and winding machinery; which, with other new inventions of his, obtained the Grand Prize at this year's Paris Exposition. The demand for absolute quantities of silk, linen, and cotton threads on the "Keats Cards" is now met by a further improved machine, which measures off any requisite length desired; and, on the length being determined, the thread is cut off automatically, ensuring absolute quantities—from 10 to 500 yards—so that a poor dress-maker in buying her "penn'orth" of silk or linen thread knows exactly what length she gets to a certainty never before arrived at. It may not be uninteresting to know that Mr. John Keats is grandson to the brother of the poet Keats's father.

DESIGN FOR A BRACKET IN FRETWORK.

BY E. BONNEY STEYNE.

To produce a pattern for amateur fret-cutters, on which they might try their 'prentice hand, is all that has been attempted here. Whether satisfactory as a pleasing design, or regarded as a mere jumble of heterogeneous details, matters little, but if one who is anxious to try the mechanism of the craft wishes for a subject



A Design for Bracket in Fretwork, measuring 15 in. by 14½ in., drawn expressly for WORK by E. Bonney Steyne.

that shall test his resources, this may serve his purpose and try his patience, for even the worst bugbear of raw workers has been introduced in one part of the ornament—a quantity of straight lines cut in true parallels. In kindness to the operator, this has been placed where the shadow of the shelf will prevent the close examination of his attempt. To utilise the idea, first make a replica of the printed pattern. Take a piece of tracing-paper, about 16 in. square, fold it accurately in the centre, place the page where the design is printed on a board, with the crease of the pattern exactly over the left-hand upright edge; trace the A portion, and then removing the paper, trace the B part, so that the line at the bottom of the page touches the crease in the tracing-paper, and the line, now upright at the right-hand edge, touches the line at the top of the A, previously traced. Then removing the paper, double it again, and complete the pattern by tracing the portion already drawn. This process will yield the complete pattern of the main portion of the bracket, as it is intended to be used. Of course, it is quite open to employ only the A portion, and have no fretwork above the shelf, if that way is preferred.

For wood, choose a piece of mahogany, walnut, or similar wood, about $\frac{3}{16}$ in. thick, or a piece of the three-ply wood sold specially for fret-cutting; work with a No. 1 saw. When the cutting is done, remove the pattern by passing a wet sponge over the surface and peeling off the paper. To avoid warping, see that the back of the wood is also moistened at the same time. When quite dry, some hours after, take a piece of coarse glass-paper, wrap it over a level piece of cork or wood, and rub down the surface, finishing with a very fine piece. The bracket support for the shelf should be either a duplicate of A, but with about 2 in. of the irregular trellis-work cut off and replaced by a plain border of wood, or else a simple L-shaped piece of wood. The shelf may be entirely at the discretion of the worker. Whether the finish be polish stain or gilded with gold bronze is purely a matter of taste.

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.*

66.—Anderson's Patent Expanding Centre-bit.

I have received from Mr. Robert J. Anderson, Engineer, 3, Poulton Road, Seacombe, one of his new Patent Expanding Centre-bits, of which an illustration on a small scale is given in Fig. 1, and let me say at once, before proceeding to describe the tool itself and the principle on

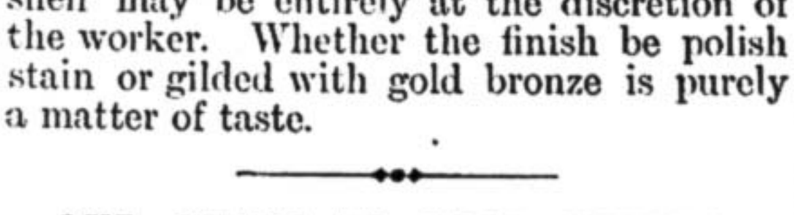


Fig. 1.—Anderson's Patent Expanding Centre-bit.

which it is made, that I understand from Mr. Anderson that he has decided to make them in three sizes, namely, $\frac{5}{16}$ in., $\frac{9}{16}$ in., and 1 in., instead of $\frac{1}{4}$ in., $\frac{1}{2}$ in., and 1 in., as he had originally determined, and that the centre-bits at the sizes named will be sold at 1s. 6d., 2s., and 3s. respectively. Now the first thing to be said of these bits is that each will cut a hole double its size, and any hole intermediate between the two extremes of the size of the bit and twice its size; that a $\frac{5}{16}$ in. bit will cut any hole from $\frac{5}{16}$ in. up to $\frac{5}{8}$ in.; the $\frac{9}{16}$ in. bit, any hole from $\frac{9}{16}$ in. to $1\frac{1}{8}$ in.; and the 1 in. bit, any hole between 1 in. and 2 in. Thus the workman who owns these three sizes would be able to bore any sized hole whatever between $\frac{5}{16}$ in. and 2 in., a great advantage when it is remembered that there are only three sizes made under $\frac{5}{16}$ in., namely, $\frac{1}{4}$ in., $\frac{3}{16}$ in., and $\frac{1}{8}$ in., at all events, to the best of my belief and knowledge, seeing that these three sizes are the smallest that I have in my own set. Again, looking at the price lists, I notice that best black centre-bits are quoted at 4d. each *up to* $\frac{5}{8}$ in., which would include the sizes I have just named, and thence to 2 in. there being about eighteen sizes, Gedge & Douglas's Pattern Auger Bits and Jennings' Pattern Auger Bits ranging from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. in seventeen sizes. Thus by the purchase of Anderson's Expanding Bits as named, and the three very small sizes below $\frac{5}{16}$ in., a workman not only saves money, but he has a fewer number, and, therefore, less weight of tools to handle when he requires them, and can do more with them than he possibly could with bits of the ordinary set sizes, as he can cut any size whatever intermediate to any two of the set sizes. The principles of the expansion will be seen from the illustration. Thus to an ordinary $\frac{9}{16}$ in. centre-bit, a side-piece is attached by means of a screw entering the bit at A. Another screw enters the bit at B, passing through a slot in the movable piece, thus restraining its motion outwards to the length of the slot. The arm may be regulated in its outward movement by the milled screw head C, which is the head of a screw passing through the bit. In setting these expanding bits, nothing more is necessary than to move the milled headed regulating screw as far as may be required. The notched mushroom-headed screws do not require touching at all, the one at B near the point being close enough down to the plate to prevent any chatter, and yet near enough to allow the movable cutter to slide. When commencing to bore, directly the little side blade takes the wood it expands the sliding cutter to the proper diameter—that is, until it comes in contact with the head of the regulating screw, beyond which, of course, it cannot go, its tendency being to expand, and will not collapse. It will be found that these bits cut a beautifully clear hole. I believe the only other bit of the kind in the market is Clark's Patent Expansive Bit, which is more expensive, costing 7s. with two cutters boring from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in., and 10s. boring from $\frac{1}{8}$ in. to 3 in., the principle on which the expansion is effected being altogether different.

67.—Practical Perspective Diagrams.

Messrs. F. O. Ferguson & Co., 400, Goldhawk Road, Hammersmith, London, S.W., send three large sheets, embodying by means of some excellent diagrams, though rather coarsely drawn, instructions of a simple character, and, therefore, more readily understood, in "Practical Perspective: Means, Course, and Operations." The instructions are rendered and the drawings executed by "A Draughtsman" whose identity with the publisher is indicated by Part III., in which is given a large sketch of a dwelling-house in a style which finds much favour in these days. Part I. deals with the elementary rules of perspective by means of a series of progressive diagrams, with brief but clear and sufficient remarks at the side for the guidance of the student. The rules thus exemplified are applied in Part II. to putting on paper in proper perspective the building sketched in Part III. The course laid down in Part I. applies, it should be said, to putting a small house into perspective, so that the student is led on from commencement to finish, and enabled to understand and appreciate the rules and the reason for them far better than if they had been brought under his notice without actual practical application. The whole scheme is well conceived and cleverly carried out, and will be found useful by all who are seeking to acquire a knowledge of perspective by self-tuition.

68.—The "Hercules" Revolving Pocket Folding Stool.

Hitherto all folding stools have assumed a form that is more or less cumbersome when carried about in the open air for the purpose of obtaining a temporary rest or assuming a sitting posture when needed. Of these the most common are two frames, of which one fits within the other, both having the legs or longer sides of the frame connected about the middle by screws on which they turn as on pivots, the seat being formed by strips of webbing nailed to the top of each frame, thus preventing them from opening beyond a certain distance. Another form is that of a tripod, in which the three legs are pivoted in the centre and connected in a similar way at the top by webbing which forms the seat, one of the legs being extended from the top in the form of a crutch handle, so that the whole, when closed up, may form a sort of clumsy and inconvenient walking-stick. It has been reserved, however, for Messrs. Richford & Co., 149, Fleet Street, London, E.C., to produce a folding stool or out-door seat, that is at the same time portable and convenient in being easily carried. This appliance, which is shown in Fig. 2, is known as the "Hercules Revolving Pocket Folding Stool," and is offered at 3s. 6d.; the framework in this case being japanned, although, if preferred, the metal work may be had galvanised. The folding stool, as may be judged from Fig. 2, affords a desirable seat on the lawn-tennis ground and the cricket-field, and is equally useful when shooting, fishing, sketching, or at picnics. The legs are made of steel, and the joints of the legs, etc., of galvanised iron; they fold together round the central stem; the seat is of canvas. The height of the stool when open for use is 23 in., and its weight is only 28 ozs. When folded up in a bag, it assumes the form shown at A, in which it can be easily carried in the hand or the pocket; or it may be carried over the shoulder, slung in straps like a telescope. The seat is patented.

Fig. 2.—"Hercules" Revolving Pocket Folding Stool—A, Stool folded up and placed in Bag.

69. — Gorringe's Paint Strainers.

Messrs. R. Gorringe & Co., Varnish, Colour, and White Lead Manufacturers and Oil Merchants, and also dealers in lancewood shafts and bent timber of every description, Brewery Road, Caledonian Road, Islington, London, N., have recently introduced a great improvement in paint strainers. This consists in making the strainer in such a form that the copper wire gauze which is used as a strainer may be removed, and a fresh piece put on in a very short space of time, thus saving the body of the strainer and rendering it still useful when the

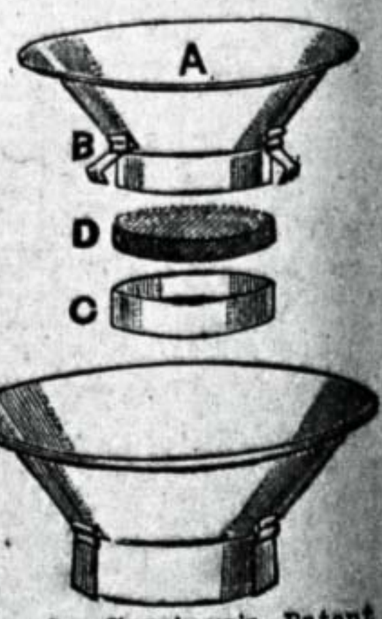


Fig. 3.—Gorringe's Patent Paint Strainer—A, Body; B, Clips holding Compression Band C; D, Wire Gauze Strainer.

wire gauze has been worn out. In Fig. 3, A at top shows the body of the strainer, fitted with the clips B. The wire gauze D fits over the lower part of the strainer, and is held in place by what is called the compression band C, over which the clips B fit down, holding the different parts tightly together. In the lower part of the illustration the strainer is shown with the gauze and band on, and the clips closed down. The strainer costs 2s., and the gauzes, which are made in three sizes, are sold at 5d. per piece. The contrivance is one which ought to find favour among painters and oil and colourmen.

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.

Sheet Metal Work Book.—TINKER writes in rejoinder to ALIQUANDO (see page 355, Vol. II., No. 74):—"I must say that my position is rather a difficult one, from the fact that all of my first letter was not inserted, for had it been, my position would have been different. I stated particularly that I had not used a great many of the problems in Warn's book; but what I had, had greatly assisted me in my work, especially the elbow pattern, which has saved me many an hour of clipping and cutting with the snips, and which alone I, as far as myself am concerned, consider worth the money. The plates also on page 11 just come in for my line of work; also the round tapering body in sections on page 9. As regards the bath patterns, I can only say that, at present, I have not required them, so need not give them any consideration. As regards ALIQUANDO'S offer to go into any problem, I must thank him and decline, as I have neither the time or the ability to wrestle with and correct Warn's mistakes, as I am a poor man and have my living to get, so to me time is money. In conclusion I should like to say that I think every praise is due to Warn from his fellow-workmen for his effort in trying to help them to the best of his ability, and I, for one, can appreciate it. But let one man try to help another, and you will always find some to find fault, and at the same time give us nothing better. And as Warn, I believe, was nearly or quite the first to bring such a work out, he deserves special praise. I don't doubt for a moment that his book can be improved upon, but that doesn't justify me in cavilling at his honest efforts to help me, so his shortcomings I can overlook on those grounds. I cannot also quite understand how anything full (or nearly so) of errors, deficiencies, and impossibilities, could have been of immense benefit at any time in its career."

How to fret a Banjo.—J. G. W. (*London, N.*) writes in sequence to F. H. (*Streatham*):—"You state (see No. 74, Vol. II., page 355) that my method of fretting a banjo by dividing by eighteenths is not right; but that a banjo so fretted would not sound the correct notes. Do you mean that the notes stopped at the frets will sound out of tune? I suppose that is what you do mean. If, as you say, the notes are not in tune when stopped on the frets, then my method of setting out a fretting scale must be all wrong. I have made a great number of banjos, which I am pleased to say have given great satisfaction to my customers, amateur and professional, and to which my very numerous testimonials will also verify, and yet not one of these players has discovered that the banjo they have been playing upon was fretted out of tune. I think they ought to feel extremely obliged to you for enlightening them on the subject. You cannot have tried my method or you would not have written as you have done. The method you give is the same in comparison to a carpenter using a piece of string with knots along it for a rule, the knots marking the inches and the divisions of an inch, why he can guess *near enough*. One might think you had written out your method intending it for some of the comic papers, and had sent it to WORK in mistake. Why, your diagram is marked wrong—it shows fourteen frets when you only intended it to show twelve! The next time you send any of your superior ideas I should advise you to be more careful in drawing the diagrams. By my method the scale is graduated properly from the first to the last fret, and is practically correct, and when once set out will mark off any number of banjos of the same size. If you *have* tried my method, and set the scale out accurately, and when you tested it and found it, as you thought, wrong, your strings have been false: that is, the strings are not the same thickness from end, but thicker in some parts than others; to make such strings sound in tune they would have to be fingered a fret higher or a fret lower as the case may be. In conclusion I should advise you to be certain that you thoroughly understand the subject yourself before rushing into print and trying to correct what does not happen to be wrong, and written by one of the many old and *practical* stagers who write for WORK."

Watch and Clock Repairs.—ONE THAT PAYS BUT WANTS STEADY TICK (*Pall Mall, S.W.*) writes:—"As a constant reader of WORK, I have been much interested on the subject of "Hints to Watch Wearers," and agree with the advice given. But it is of little use, unless one knows where an honest, capable workman is to be found. I possess several valuable clocks and watches. Not long since I took a carriage repeating clock to a man who, to hear him talk, professed to know all about cleaning clocks, etc., of all sorts, informing me that he had worked for years in Paris for the first firms there. The result was that I let him have my clock to clean, and he completely spoilt it. Finding it did not go, I took it to another shop in B—— Street; their remark was, "This clock looks as if it had been in the hands of a blacksmith." To repair the harm done would cost almost as much as a new clock, therefore I decided not to have it done. Again, not long ago, I took a valuable gold watch to a shop of great repute to be cleaned, which they told me was all it required. On getting it back it constantly stopped; therefore I called at another of their branch shops, which I happened to pass, and asked what was the matter with it. They said it wanted cleaning. Why, I said, it was cleaned at their other shop a few days ago. The man looked surprised, and was puzzled what to say. Finding there was no reliance to be placed in this shop, I now have my watch, and am at a loss who to trust. Perhaps your contributor would enlighten your readers by giving the address of one or two respectable workmen of experience and mature age—as experience is only gained by age. There is one point in which I do not agree with the writer—viz., that clocks and watches ought to be cleaned every eighteen months; three years I have always heard was the length of time a properly cleaned watch ought to go, and every watchmaker I have ever spoken to on the subject is of that opinion. If I were to pay the enormous price asked by expensive shops for having my repeating clocks cleaned every eighteen months, in a few years cleaning so often would cost more than the price of a new clock. Of course, these shops charge according to their expensive rents and establishments, therefore it would be a public benefit to society in general if the gentleman who gives such good advice would add to it the address of some reliable working clock and watch makers that are honest and can be trusted, also the usual charges for cleaning watches and repeating clocks, etc."—[HERR SPRING replies as follows to the above:—"The watchmakers with whom you have spoken on the subject of cleaning watches, and who are agreed that a 'properly cleaned' watch ought to go for three years, can scarcely be trusted as safe guides. It is not so much the accumulated dirt that stops a watch as the thickening and drying up of the oil used on the pivots and other parts; and, no matter how perfectly a watch may be cleaned, the oil will thicken, run away, or evaporate in a much shorter time than three years. Speaking now with the authority of several matured and distinguished watch manufacturers at my back, I distinctly assert that a period of eighteen months is the longest average that one may safely rely upon for a watch to go without cleaning. Of course, in all questions of this sort one speaks of averages only. It sometimes happens that a combination of favourable circumstances entirely refute one's average experience. But if you have a good watch, you would be very unwise to trust to exceptional circumstances. Better by far adopt the eighteen months' rule, even if it sometimes happens that, owing to the exceptional and accidental quality of the particular oil used, your watch could go on without injury for a much longer period. You speak of having taken a valuable gold watch to a shop of great repute, and there having it cleaned. After the cleaning the watch stopped, and you took it to another watchmaker, who told you that the watch wanted cleaning. At the same time you yourself knew that the watch had been cleaned only a few days before. You will naturally be surprised to hear that the opinion given by the second watchmaker was not by any means a necessary sign of ignorance. If the wearer of a watch is a 'clean wearer,' there will probably be very little sign, even after eighteen months' time has elapsed, that it requires cleaning. But the clean appearance of a watch is no reliable guide to its condition. Probably under the dial, or in some hidden place, the oil has run away from one pivot, or from some other unseen part of the machinery, and yet the watchmaker on casually examining the watch on the surface, when brought in by a client, could know nothing of this. Still, the lack of oil on some unseen part would, of course, be a certain cause of stoppage or of erratic behaviour. Generally speaking, a watchmaker should, however, detect with his glass if a watch has recently been cleaned, for he would observe the freshness and the quantity of the oil. But when you visited the second watchmaker, you should have said: 'This watch was cleaned a few days ago, but constantly stops.' A watchmaker is as much entitled to an explanation of this sort as a doctor would be with a patient. As regards your carriage repeater clock, I need scarcely tell you that it is a very delicate piece of machinery. Clocks of this kind may be allowed to go without cleaning for a longer time than a watch, because they hold more oil. But carriage clocks usually have watch escapements, and it would be advisable to have the escapement oiled within a reasonable time; the rest of the clock may go on without much injury. It would be rather invidious on my part to indicate the names of certain selected watchmakers; I would prefer for the present, at least, to give a broad idea of the state of affairs among watchmakers. It does not follow that because a watchmaker has a fine shop and gorgeous window that he is a skilful man. The best men to go to are those who do essentially a watch business as distinguished from the jewellery trade. There are a number of quiet, old-standing watchmaking establishments in London, as elsewhere, in which your watches and clocks would be quite safe. These people usually employ good men, and if in any difficulty, know where to send the work to specialists in Clerkenwell and elsewhere. Watchmakers, unless they are well-known men in the trade itself, probably working in their own homes, are like doctors: you require experience of them. No doubt some of your friends, especially if you have any friends who wear very highly adjusted or complicated watches, will be acquainted with a thoroughly reliable watchmaker. By all means give the preference to the man who actually works himself at the bench, and avoid shops where the workmen are cramped together. Good work can only be done in good light, and with ample space and protection from interruption. I think, however, that you do not act wisely in taking your valuable watches from one shop to another. It is advisable to stick to one man, and return the watch or clock to him until it is made right. Armed with the information now given, you could ask him to send it to Clerkenwell if unable to accomplish the work himself. There are men in Clerkenwell—Englishmen, Frenchmen, Germans, and Swiss—who can do any imaginable work in connection with horology. As to prices for cleaning, there is, of course, no hard and fast line. A first-class lever watch, with escapement on end pieces, etc. etc., and keyless work, you should not pay for cleaning more than about 7s. 6d., if really well done. For plain watches, you should get the cleaning well done for about 4s. 6d.; complicated watches run to all prices for cleaning. Repeater carriage clocks should be well done, if they are not too complicated, for half a guinea."]

Worn Bearings.—E. T. (*Hackney, N.E.*) writes:—"As to A. L. B's. question about bearings in 'Shop' (see page 326, Vol. II.), I have great pleasure in being able to tell him how we used to reline worn bearings with white metal, and if he prefers to make new ones he can do so by first removing the worn brasses and following the same directions. The brasses must first be cleaned so as to remove grease and dirt, then the shaft must be slightly greased, but also free from dirt and grit. Now take a piece of ordinary clay and close up one end of the bearing, care being taken not to let the clay project into the crevice between the shaft and bearing brass; now the lower part of the other side is to be stopped in the same manner; but in closing the upper half a passage must be formed sufficiently large for the passage of the hot metal; when this is finished the metal must be made hot in a ladle and then poured into the passage, when it will run into the crevice between the shaft and the brasses, and when cold and the clay removed, A. L. B. will find that he has a perfectly light and durable bearing; if he wants a hole for lubricating he must ram a piece of clay into the hole in the brass, taking care that it touches the shaft, and he will find that it answers first class. I may as well state that our bearings were for overhead shafting, by which we used to drive eight lathes, 8 ft. beds, and one grindstone."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Dulcimer for Sale.—W. S. (*Appleby*).—Thanks for your letter, but you and all other correspondents having articles for sale or exchange should advertise them in the Sale and Exchange column of WORK. The "Shop" columns are not open to advertisements.—ED.

Electric Clock Fitment.—J. N. (*Rochester*).—By saying that I used a single-stroke bell, I thought it would be quite plain that as the hammer would complete the circuit each time it rose, therefore the electric bell would strike each time the hammer rose. My clock never gives any trouble, and answers perfectly.—H. J. L. J. M.

Builders' Price Book.—A. B. C. (*Birmingham*).—The book you mean is Laxton's "Builders' Price Book," published by Kelly & Co., 51, Great Queen Street, Lincoln's Inn, London. You would find "Beaton's Pocket Estimator," published by Crosby Lockwood & Co., London, of great service.—E. D.

Terra-cotta Painting.—AMATEUR.—No special article on this particular branch of painting has appeared in WORK, and I do not know that there are any special difficulties in it that call for one. If, however, you will state any difficulties under which you labour, there are many on my staff who will be happy to help you. In painting on terra-cotta you would simply use the ordinary oil colours in tubes, and select such flowers and foliage as would

contrast well with the red colour of the pottery. Perhaps your chief trouble lies in how and where to get suitable designs.—ED.

Lamp.—ONE IN THE DARK.—I am quite unable to answer this query. I should think that you would have seen where to get it in the paper, or wherever it was you saw the description. As you describe it, it is, to say the least, very vague. I can find no one who knows anything about it.—J. L.

Arrangement of WORK.—E. B. (*Bath*).—I am much obliged to you for your kind suggestions, but no change can be made in the arrangements at present adopted for WORK.—ED.

Stone Cutting and Masonry.—PIXIE.—I am dealing with bricklayers' work now, and after that we must hope for papers on the subject you mention. My great difficulty, as you must see, is want of space. There is no difficulty whatever in dealing with any and every subject, but it is not possible to get more into, or give greater variety in, each number than at present, and when any particular subject is once started it is as well to work it off as quickly as other demands on space will allow.—ED.

Violin Making.—A DISAPPOINTED SUBSCRIBER.—The articles on "Violin Making" are in my hands, the manuscript ready to be put into type, and the illustrations ready for the engraver. Beyond this I shall decline to satisfy you, for courtesy is desirable even from those who smart and writhe under disappointment, which after all, in your case, is only pleasure deferred. I wonder if you will like fragments of your letter in type as much as you evidently relished them in pen and ink. This is your style: "Can you give us would-be fiddle makers any idea when you will begin them, or have you been blowing your horn, and promising something that your sign-writing piano-constructing head cannot grapple with? In my opinion your paper is full of promises which you have not the ability to perform. There are very few of the original subscribers here now taking it, and unless you be a little more truthful and perform what you promise you will have none on Tyneside. Will you be so good as to let me know when the Index to Vol. I. will be ready? Be as near the truth as you can." I am afraid you will hardly believe me when I say that the Index to Vol. I. has been ready since March 25, and can be had for 1d. through your newsagent on Tyneside, and although you put me down as a hardened and confirmed sinner in a multiplicity of ways, I think I could put a sufficient number of trustworthy gentlemen into the witness box to satisfy even you that in this case I have so far forsaken the errors of my utterances as to speak the truth, the whole truth, and nothing but the truth, so help, etc. etc.—ED.

Cement.—G. K.—I do not know the receipt for the cement you mention, but the following will, I think, suit your purpose. Soak 2 drs. of isinglass in 2 oz. water for twenty-four hours in a wide-mouthed bottle, then place the bottle in a vessel of boiling water until the contents have evaporated to 1 oz. Now add 1 oz. methylated spirit and strain through very fine muslin. Dissolve 1 dr. gum mastic and ½ dr. powdered gum ammoniac in 1 oz. methylated spirit. Mix this thoroughly with the isinglass solution while hot, and keep in well-corked bottle. I find this a capital cement for such jobs as you mention, but in case you should like a simpler recipe try this: Place ½ oz. isinglass in a wide-mouthed bottle and add water sufficient to cover it; allow to stand for twelve hours; heat in water bath as in first receipt, and add ½ oz. glacial acetic acid. This, perhaps, comes nearer the particular cement mentioned in your query than any other.—OPIFEX.

Wall-paper Maker.—W. E. R. (*Penryn*).—The goods marked T are probably the manufacture of the old-established firm, James Toleman, 17, Goswell Road, London, E.C.—F. P.

Centrifugal Pump.—F. J. H. (*Salford*).—Your question carries me back to the old days, but I must curtail my reply. In the Exhibition, 1851, Appold's pump was shown, and also Gwynne's. I am not allowed space enough to describe what you require, but write to Messrs. Gwynne & Co., Hammersmith, London, and they will give you full particulars.—F. C.

Mechanic's Tips.—H. P. (*Blackheath*).—In testing iron for strength and ductility it is usual to determine the rate of elongation under an increasing strain, the ultimate resistance and percentage elongation in a given length being specified. For instance, for bridge work, iron plates should have an ultimate tensile resistance of 22 tons per sectional square inch, and extend at least 10 per cent in a length of 8 in. before fracture. No permanent set should occur under a stress less than 8 tons per sectional square inch. Friction may be reduced by the employment of rollers; the way in which they are used will depend upon the nature of the work to be done. Screw-jacks are included as lifting-jacks, but bottle-jacks are used in roasting meat, and are not lifting appliances. If you will frame more definite questions I shall be happy to reply to them.—F. C.

Volumes of WORK, etc.—W. S. W. (*Gourock, N. B.*).—It is impossible to say how many volumes there will be of WORK. All connected with it hope it will run on, like Tennyson's brook, for ever! Papers on the subject you name are already in hand awaiting publication.—C.

Cantor Lectures.—P. R. (*Sunderland*).—Write to the Secretary of The Society of Arts, John Street, Adelphi, London.—C.

Fixing Dial by the Compass.—SEMPER FIDELIS can avail himself of the following directions for finding the true or astronomical north:—Place the compass on a level surface, adjust the north or south points of the needle or card correctly to the "lubber line" of the bowl (or point representing it), then (if looking south) turn the bowl carefully to the right (or west) till the lubber line is distant from the south end of the card so many degrees and minutes as represent the variation. The card will then show the direction of the magnetic meridian, and the lubber line the true. If looking north, turn the bowl to the east. The yearly variation (which in 1818 reached its western maximum of some 24½°) has now so nearly approached zero, and is such a small fraction of a degree, that for any practical purpose the variation for the particular place only seems worth taking into account. The true latitude of the observatory at Dublin is, according to Keith Johnstone, 53° 23′ 2″.—A. Y.

Carriage Cushions.—TRIMMER.—The sketch which you have sent is the back-rest; this, together with the side squabs, will be easier to make than seat cushions. In the first place get a couple of sheets of brown paper, extra stiff, and cut a pattern out until it fits the place intended. We next get some backing canvas, or if preferred, black linen, and cut it out a ¼ in. larger than the pattern all round. Next cut out the upholstering material 1½ in. wider all round than the pattern. There are two ways of setting the diamonds out on the cloth. The first is by drawing the lines upon the pattern, and making a pounce of it by pricking the lines with a bradawl and dusting powdered chalk through the holes on to the cloth, or by setting the diamonds out on the cloth with a rule and a piece of chalk,

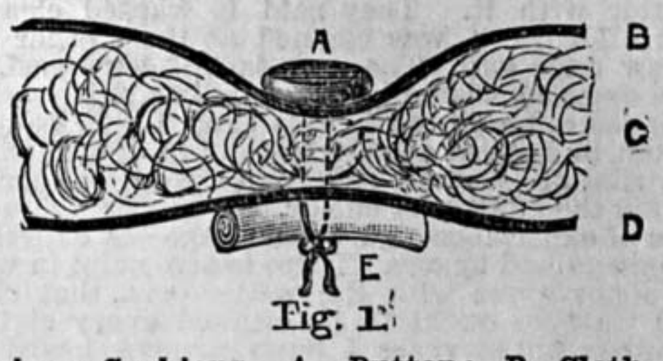


Fig. 1.

Carriage Cushions.—A, Button; B, Cloth; C, Hair; D, Canvas; E, Strip of Cloth or Tuft.

such as is used by tailors. In setting out diamonds, squares, etc., be sure to be careful and not do it in a hurry, as the beauty of the upholstery greatly depends upon the diamonds being all alike. When marked out we stitch the canvas to the material all round near the edge with strong thread, leaving a place at one side to stuff the cushion; some trimmers sew all up and cut a slit in the canvas at the back, afterwards sewing the slit when the cushion is stuffed; others object, as it sometimes happens that a couple of tufts just come where the slit is. We next stuff the back-rest full of the best curled horse hair and ram it in as tight as we can possibly get it. The back-rest will have swelled out to an enormous size. We therefore stitch the slit or end up when the back-rest will not hold any more hair and press the back-rest all over evenly. Next get the buttons or tufts and an upholsterer's needle 6 in. long, place the twine through, and push the needle through where the lines intersect each other. When all the buttons are placed at the front we turn the back-rest over and get some little pieces of cloth or canvas, then pull the strings which hold the buttons tightly, tie on a knot, then place the

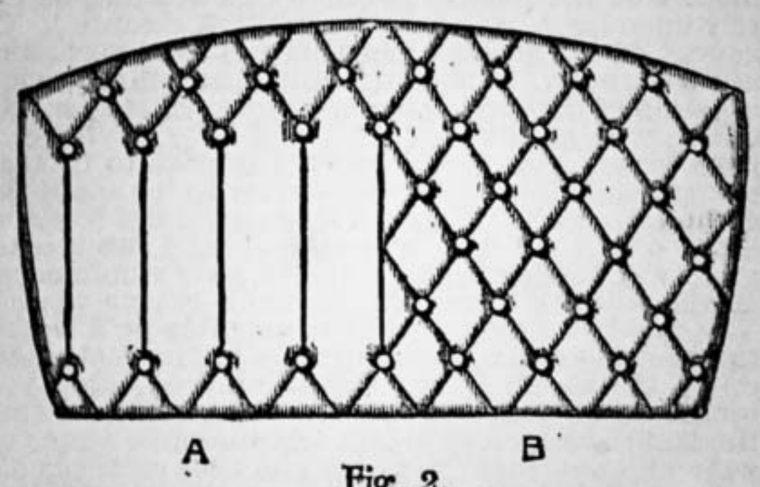


Fig. 2.

Carriage Cushions.—A, Diamond and Piping; B, Diamond.

roll between the twine, and tie up tightly. Tie the first bottom row of buttons first so that it makes the back-rest more full at the top, and more comfortable for the back to rest against. Finish upholstering the back-rest by stitching seaming lace all round the edge, afterwards arranging the diamonds more into shape with the hand, smoothing and arranging the creases out, then fasten with black tacks the back-rest in its place. Fig. 1 shows how the buttons are placed in the back, and Fig. 2 the back-rest finished.—W. P.

Brazing Band Saws.—S. B. (*Nottingham*).—For information concerning method of brazing band saws by means of Duncan's machine, forward address and stamped envelope to the maker, T. Duncan, 305, Manchester Street, Oldham. He will supply printed instructions.—C.

Straightening Rods.—APPRENTICE.—First, are you sure that your rods are properly straightened before they are put into the lathe; and, second, is the steady true with the lathe centres? If you are sure on these points, then the rods must spring solely in consequence of the removal of the outer layer of metal. This is not unusual in long rods, for the skin is always harder and less elastic than the inner metal, and holds it in some constraint. The only way to ensure the straightness of the rods when the turning is finished, is to take a first heavy cut, and note the effect. If they bend, then straighten them before taking the finishing cut, which, if light, will leave them still straight.—J.

Embossing on Glass.—W. C. (*Forest Hill*) has written a long letter on the above subject, concluding with, "Hoping you will understand me." I confess I feel somewhat doubtful on the matter, for statements and questions are somewhat mixed. I will, however, endeavour to unravel the meaning, and answer to the best of my ability. W. C. says he is in the gas lantern trade, and wants to know how to engrave on glass, as it would mean an addition to his income. He has read two or three books on the subject, and has watched glass writers do it, but still does not quite comprehend the how and the why. My emphatic advice is, if W. C. thinks he can increase his income by doing such work, then pay someone in the trade—a practical man—a fee to teach him. This, I think, will be the quickest and, in the end, the cheapest plan. I will, however, give such information as I trust may be helpful. Unless the job is a very small one, wax should not be used. Mark off the lettering on paper, and place it under the glass. Then with Brunswick black and a fine brush go over the glass, covering all except where the lettering has to appear. Let it harden, which will take about twenty-four hours. Examine carefully to see that there are no pin-holes, which must be carefully stopped. Clean the glass so that it is perfectly free from grease, not touching it even with the fingers. Build a small ledge around the glass of lard, and place the article on a perfectly level table out of doors. Pour a sufficient quantity of fluoric acid (which may be obtained of most chemists) to cover the glass. A dangerously corrosive fume is given off, which would be injurious to breathe, hence the need of working in the open air. From five to fifteen minutes may be required in etching the glass, depending on the strength of the acid. To determine the exact time, experiment on a piece of glass first. When the etching has been carried far enough, pour off the acid, well wash the glass, and remove the black. If coloured letters are required, then choose flashed glass of the colour desired. Paint the letters with B.B., and treat as before, biting down to the plain glass. If we desire embossed letters on ground glass, proceed as before, biting the letters, etc., fairly deep. The "ground" must be produced by rubbing the surface with fine emery and water, by the means of a piece of smooth iron. Any degree of fineness may be obtained by using varying Nos. of emery. As to the names of the makers of lamp glasses embossed on the chimneys, I presume it is done by the sand blast; at any rate, it has such an appearance to me. If W. C. will carry out these instructions, I think he will meet with success; but should any further difficulty arise, and he will state his want, I will do my best to meet it.—O. B.

Dulcimer Playing.—P. J. (*Birmingham*).—I am very pleased that P. J. has so far succeeded with his dulcimer, and hope he will be equally as successful in learning to play it. He must not be disheartened at making apparently slow progress at first, as this, if he perseveres, will soon give place to more rapid advance, and after a short time he will find almost any tune come comparatively easy to him, especially if he "has an ear," as it is called. First for the position of the instrument and the performer. Place the instrument on a table with the back end raised on the stand; this will bring the upper notes within easy striking distance, and also enable the player to strike the notes clear of each other. The seat should be of such a height as will bring the elbows (which should be kept close to, but not touching, the sides) on a level with the front edge of the instrument. The beaters should be lightly held, not gripped, between the thumb and the first and second fingers, and the blow should be given not with a stiff forearm, as such is fatal to good playing, but with the slightest possible movement of the wrist aided by an almost insensible contraction of the muscles of the thumb and fingers. Commence by practising the scale of G, starting with the first two bass notes. These should be struck with the right hand, the next two with the left hand, the next three with the right hand, which will bring us to the seventh note of the scale, and the left hand is now ready to commence the next octave, which commences on the right-hand side of the centre bridges. The first two notes, G A, are struck with the left hand, the next two, B C, with the right, the next two, D E (on the left of the bridges), with the left, and so on to the top, taking two notes with each hand and returning down scale in exactly the same order. When the scale can be played up and down with equal facility, *and not till then*, the learner may proceed to some simple air, taking care that he does not attempt another till the first is thoroughly mastered. I know of nothing more unpleasant than listening to a

"player" who can tinker innumerable snatches of tunes, but who cannot get through one without a bungle; such a one is sure to have the wind taken out of his sails by the first who comes along who can rattle a tune, be it ever so simple, right off the reel. Again I say don't be discouraged if you don't appear to be getting on. Over anxiety is a very powerful factor against progress, and very often a tune or exercise that *won't* come right one day, will come as easy as possible the very next time of trying. It is not advisable to sit too long at a stretch, as the ear gets dull and tired, as well as the muscles, and "little and often" is generally found to ensure better progress than long drudging practices with corresponding intervals between. One very important part must not be forgotten, and that is to keep the instrument well in tune; frequent tuning accustoms the hand to the places where the notes are to be found, and also keeps the ear trained, and has a far more beneficial effect than at first appears, both upon the instrument and the player.—R. F.

Piano Soundboard.—PIANO.—You will have read, by the time you see this, that an iron plate is placed at the bottom of the piano to receive the bass strings. Glue all edges of the soundboard except the bottom; of course that includes the bent side edges. The soundboard rests on fillets or slips of wood, the rabbet on the bent side forming one. The reason the soundboard is left ¼ in. below the wrest plank is in case the back bends a little; when the strain is on it will not jam the soundboard. Now with reference to your Broadwood piano, if it is going to remain the same height, you will have to string it as it was before. If you are remaking it, and you make it according to instructions given by NIL DESPERANDUM, of course it will be strengthened, and you can string it according to instructions given in No. 41 of WORK.—T. E.

Table Piano.—SINBAD.—Your idea for making a table piano with metal bars instead of strings has been anticipated in some measure by an instrument called the Audiphone, tuning forks being used instead of strings; but as to cost, they are more expensive than some pianos, the merit in them chiefly being in their remaining in tune longer than a piano. Those of one or two octaves sold in shops are only toys; the difficulty would be to get the lower notes, then you would require keyboard and action, which form a large item in the cost of a piano.—T. E.

Phonograph Parts.—OGRAPH.—I am pleased to see that you take an interest in WORK; and as you are a constant reader of it, it will doubtless be of great service to you. I am also pleased to learn that you are interested in the phonograph, and would like to make one. It is true that I did promise to give working drawings and instructions for making a phonograph, but you know such a thing is too long for publication in "Shop," and there are many things of more importance to the reading public awaiting publication in the body of the paper; these, of course, must be attended to and get the preference. Perhaps sometime, when the demand for such an article will have arisen, the Editor will find room for it. In the meantime, if you have a definite want in this or any other matter, write stating the same as plainly as you can, and we will do our level best to help you.—W. D.

Acacia Wood.—LEO.—This wood will not hurt by keeping either in the "round" or "plank," as it is very dense, and will require a very considerable time to dry and season, especially if cut into thick planks. As regards when to cut, as wood does not deteriorate by being kept, this is quite immaterial.—A. J. H.

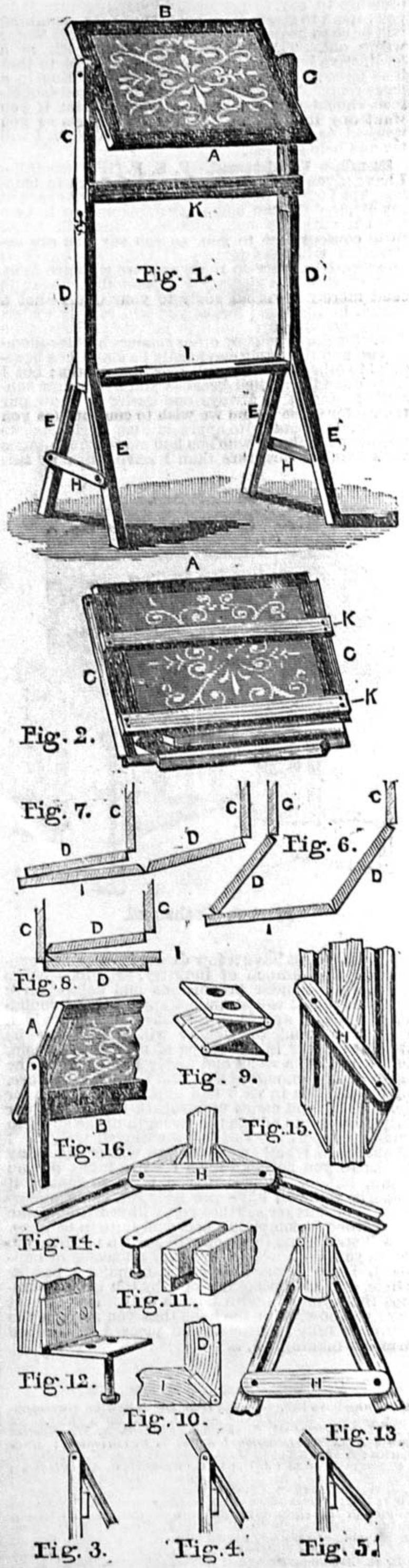
Engineering Employment. — 'PRENTICE. — Some shops take working apprentices, and if you send your address to T. M. Bear, Britannia Works, Colchester, he may, perhaps, give you the names of some likely firms.—ED.

Bismuth and Metal Sample.—IGNORAMUS.—You can buy bismuth at Messrs. Johnson, Matthey, and Co., Hatton Garden, E.C., but as the price varies with the market and the form in which it is required, you had better write to them, stating what you require, and asking for an estimate. The sample you sent was a piece of galena, which is sulphide of lead, and which forms extensive veins running through a limestone rock in Cumberland and Derbyshire and through a clay slate in Cornwall; 100 parts of the pure ore contain 86½ parts of lead. Galena almost invariably contains silver, and even so small a proportion as two parts of the latter in a thousand of ore can be profitably extracted from the lead after smelting it from the ore.—F. B. C.

Metals, Purchasing.—J. M. H. (*Wallsend-on-Tyne*).—You can obtain antimony and bismuth from Messrs. Johnson, Matthey, & Co., Hatton Garden, London, E.C., but as the prices vary with the market and the form in which it is required, you had better write to them, stating what you require, and asking for an estimate.—F. B. C.

Dresser, Dovetailing, etc.—T. T. (*Kilburn*).—Two articles on the former have appeared in Vol. II., pages 117 and 170, otherwise Nos. 60 and 63. Kindly look them up. Dovetailing will be treated in time, but as all wants have to be supplied, as well as those of amateur joiners, too much space cannot be given to articles on woodwork. Very pleased to hear you are always willing to listen to advice, of which you will find plenty in WORK.—D. A.

Folding Reading Stand.—E. H. (*London, N.*).—I have lately given two designs, one of which might suit you. But as "tastes differ," and as you might not fancy either of those two, I have designed the one here shown. If well made it should be as rigid as if made *minus* its folding facilities. You may imagine that the article would be a rickety affair—no such thing. Sizes must be left to yourself, but I will give you a few hints. No piece comes entirely apart from the others. It may seem a lot of trouble necessary to make this stand, but you will know best whether it will recompense you. The rails C, C are connected by cross rails K, K, screwed on to their fronts, not between them. Through C, C pass pivots, which enter into the side thicknesses of the frame. The latter are grooved for about three-parts their length, starting from the A end. According to the distance the top rail K is screwed from the tops of C, C, so will be regulated the angle at which the frame will be adjusted. Figs. 3, 4, and 5 explain this. In folding, the frame is turned up and over; it then runs down between C, C. This action can be seen by Fig. 16. The rails D, D, are hinged to C, C, so that they may fold as in Figs. 6, 7, and 8, where is shown the process of closing. The right-hand D is united to C by an ordinary hinge. The left-hand D must be connected to C by a hinge similar to Fig. 9. I do not know whether such a hinge is obtainable. It, or something like it, could be easily made by yourself. It will be necessary, as the left-hand D turns both to left and right. The rail I is hinged, as in Fig. 10, at one end to D, and, at the left-hand end is shaped for an inch or so, as in section in Fig. 11. On the inner thickness of D at the end is a hinge, to the lower half of which is screwed a pivot, as in Fig. 12. The pivot travels along I when folded, as in Figs. 6, 7, and 8. D, D must not be longer than the length of the frame—the left-hand one being the longer by the combined thicknesses of one D and I. The feet are shown in Figs. 13, 14, and 15. H, H are *very* thin flat metal rails, at each end of which is a pivot, as in Fig. 12, which runs along the feet, which will be in section for some distance similar to Fig. 11. When folding, H is pushed up, taking with it the feet, as in Fig. 14, and finally as in Fig. 15. H, H must run a good distance down the feet, or they will be useless. A small hook or bolt must be fixed to the left-hand C, to connect it and D, and prevent the stand from collapsing. Thickness of wood you will, no doubt, be able to judge of. If not, write again. Space is important.—J. S.



Folding Reading Stand.

Fig. 1.—Stand erect. Fig. 2.—Closed. Figs. 3, 4, and 5.—Angles at which frame can be adjusted by fixing Rail K in Figs. 1 and 2. Figs. 6, 7, and 8.—Showing process of part of Stand folding. Fig. 9.—Hinge to be used in connection with C and D. Fig. 10.—Junction of right-hand D and I. Fig. 11.—Pivots to be used at ends of H, H and also section of part of Rails E and I. Fig. 12.—Hinge and Pivot at bottom of left-hand D. Figs. 13, 14, and 15.—Process of closing the Feet E, E. Fig. 16.—Showing how to fold Frame.

Carpenter's Paper Cap.—CARADOC.—The construction of a paper cap can hardly be described in WORK while there are so many more useful and practical subjects requiring attention.—D. A.

Initials and Tool Chest.—S. H. D. (*Newtown*).—Unless you can engrave neatly, do not attempt to do the initials. Any engraver will do the work for you much better than you could possibly do it without considerable practice and skill. I presume you are wanting the initials for trade purposes. Yes, you may be sure that a joiner's tool chest will not be overlooked, but no time can be named for the appearance of an article on it.—D. D.

French Polish.—J. G. (*Ashton-under-Lyne*).—French polish for oak or bay wood is just the same as any other French polish. It is a solution of shellac and methylated spirit. Other ingredients are often used, but they are of doubtful advantage. The polish may be made either thick or thin, according to the proportions of lac and spirit.—D. D.

Enamelling.—P. W. B. (*Keynsham*).—There are several ways of enamelling furniture of the kind you refer to. If the ordinary enamel paints do not produce a sufficiently good result, you may try the following process, but to get it to the high finish "which is seen on the best furniture of the kind," requires skill and experience. Stain the wood (pine?) with vermilion mixed with French polish. Then in the usual way get up the polish with spirit rubber. Unless you can do French polishing well, you may as well be content with enamel paint.—D. D.

Bagatelle Table Covering.—LITTLE SCOT.—A good deal will depend on the construction of the table. You will not find the job an easy one, though it will be much simplified if you can unscrew the bed. If you can do this, and notice how the present cloth is fastened, directions are unnecessary. If you cannot, I must ask for further particulars before I can help you.—D. D.

Marble Stains.—G. F. H. (*South Lambeth*).—The simplest mixture you can use for restoring marble and removing stains, is one of whiting, oxalic acid, and water. Dissolve some of the acid and then make a paste with the whiting. Let the paste remain on the marble for a few hours and then wash off. The application may be repeated if necessary. Remember that oxalic acid is a deadly poison.—D. D.

Worm in Wood.—R. J. (*Edinburgh*).—Unless your chairs are very old, the state of the wood shows that the material has been unsuited to the purpose. You can do little or nothing to arrest the decay, which from your account should not have been allowed to proceed so far as it has. The best thing you can do is to impregnate the defective parts with benzoline. This will kill the worms, and, so far as is possible, will prevent the injury extending. From your description, I imagine the suite is only a common one, so pray do not let my remarks in any way be taken as implying that you have been taken in. If you are inclined to tinker with the chairs yourself, the hint that decayed parts may be cut out and replaced by sound wood will perhaps be of service to you.—D. D.

Boring out Rifle.—J. W. S. (*Orkney*).—To make it suit for a shot-gun:—For this job a good lathe is wanted, and a plug-reamer with a cutting shoulder; the plug to fit snugly into the barrel, and the cutting shoulder as much larger in diameter as will cut away the lands of the rifling. To attempt this job, the worker must be expert at the use of the lathe, and handy at adapting tools to the requirement of the job as it progresses. This plug-reamer must be followed by a reamer that will finish the inside of the barrel quite smooth. Great care will be required in using the cutting reamer, or some parts will cut up roughly and leave a faulty surface that cannot be removed in the finishing.—LIVERPOOL.

Rubber Sheeting.—MAZINNDAR (*Rawal Pindi*).—I am afraid that anything which could be said in "Shop" about the manufacture of rubber sheeting would be of very little assistance to you, but your suggestion shall be kept in mind. I am pleased to hear that the article on rubber-stamp making has been of assistance to you, and your letter is another evidence of the utility of WORK in any part of the world.—D. A.

Lead Lights.—CINQUE PORTS.—The material used for cementing or stopping in the glass leaded lights is a mixture of lamp black and putty (painter's), and then cleaned off with plaster of Paris, the plaster helping the setting of the putty.—E. D.

Addresses of Writers in WORK.—F. B. (*Taunton*).—The addresses of the members of the staff of WORK cannot be given; but any sealed and stamped communication sent to the office of WORK will be forwarded to the desired destination.—C.

Windmill Speed.—WINDMILL.—The angle at which to set the sails of a windmill varies from 15 degrees at the shaft to 27 degrees at the end of each blade. You can regulate your mill by a "counter-fan" if on level ground. If you will send full particulars as to load and nature of work to be done by the mill, I can furnish the information you seem to require.—F. C.

Dialling.—H. E. T. S. (*Lewisham*).—I am not acquainted with the table referred to, unless it be a table of Mean Time, *i.e.*, of the differences between dial and clock. Many good almanacs, Whitaker's for instance, give this difference for every day in the year. Would not H. E. T. S. do better to work out his dial, full size, by rule? In the process of engraving a small diagram trifling errors may creep in which become grave ones when enlarged. I am not aware that ring dials are made at the present time, but I believe that in the old "Chambers's Encyclopædia," published last century, such a dial is figured, and its construction explained.—A. Y.

Locomotive Boiler.—T. L. P. (*Liverpool*).—To make a locomotive boiler you must, after the designing and drawing is completed, lay out all the several plates to full size, giving their proper allowances for flanging; and cutting out such holes as may be required before attempting to put them together. The flanging must be done over a block of cast iron whose edges are rounded to the same radius as the insides of the plates. This will be stiff work in these plates, especially in the tube plates, whose thickness for your boiler should not be less than 6 or 7 gauge. The radius over which they are flanged should not be less than ½ in. The plates will have to be held down on the block by means of a collared or a screwed bolt passing through any convenient hole or holes. Properly each plate should have its own special block, made to the contour of the internal part of the flange. Great care and patience are necessary to the formation of neat and even flanges, and if they are not regular, proper joints cannot be made between the plates. The barrel need not be made in three rings as in practice, but a single sheet will do just as well. It should be about 18½ in. or 19 in. long, and be rolled round to make a butt joint, and then be united with a strip of about ⅜ in. wide with two rows of $\frac{5}{16}$ in. or ½ in. rivets. When rivetting the various parts you must pitch the rivets pretty closely together, say not further apart than ⅝ in. from centre to centre; better $\frac{5}{16}$ in. or ½ in., for if too far apart the seams will certainly leak. You had better buy the rivets of copper, not iron, or else you will have galvanic action going on; have snap or cup heads everywhere rather than countersunk heads. The head of the rivet will be held up by means of a dolly or bar of iron slightly hollowed on the end to support it, while the tail is hammered over with the narrow pane of a hammer, and finally finished and rounded neatly with a snap tool. In positions where a dolly cannot be made to afford direct support to the rivet head, a hammer with an elastic ash handle, called a "holding-up hammer," is pressed against a suitable fulcrum, and forced up underneath the rivet head. Your fire tubes should be about ⅝ in. internal diameter, and from nine to twelve in number. They must be expanded in their holes to make them water-tight, and beaded over in the fire box to protect them from the action of the flame. They may be of copper or of brass, but not iron. When the rivetting is done the seams are caulked—that is, the ends of the plates are all dumped up in minute detail by driving a blunt chisel-like bent tool, say ⅛ in. thick at the end, against them with a hammer. This slightly spreads the metal and causes close contact to take place between the plates. Caulking is always necessary, and if neglected, or done hurriedly, the boiler will inevitably leak. When the boiler is finished, you must test it under water pressure to, say, 50 per cent. higher pressure than you intend to steam it under. Then more caulking will have to be done at those sections where water weeps out. There is so very much work in a locomotive boiler of the size you contemplate that it is impossible to give you full information in a mere reply. The various stays, fittings, and mountings should demand some attention. But if you want any information about special parts as you proceed, or drawings, or any hints in design, I will try and help you.—J.

Bamboo Washstand.—F. S. P. (*Whitworth*).—I have given you a design for a washstand in bamboo, but I regret that there is not sufficient space at my disposal for the necessary explanations in connection with the construction. This will be of little consequence to you, as you say you are acquainted with the joinery of bamboos, but it is an essential matter to those readers who are ignorant of this knowledge. I was at first about to send merely a verbal reply to your query—not a sketch in addition; for, as you will readily understand, answers are given to individual correspondents for the benefit of other readers besides themselves, and this reply can hardly be classed as beneficial to others without full working details; but I have done thus much because you are a new subscriber, and it is always our desire to show our regard for those whom we wish to continue (as you say you at present do) to appreciate us. Perhaps some brother contributor who has had more acquaintance with bamboo furniture than I have will note this

Bamboo Washstand.

reply, and let us have a few descriptive papers concerning this branch of industry. Bamboo canes are of such slender proportions and comparative lightness that it would almost appear that in building up such an article as a washstand, upon which a great amount of weight will necessarily be brought to bear in the shape of marble top, basin, and water, but a weak and feeble job would be the result of any amount of skill and labour; therefore, my having this in view will explain my reason for showing upright canes underneath the table, their purpose being to add to the strength of the stand in lending support for the just-mentioned weight. I do not know whether this design will suggest any details to you suitable for a toilette table, as you desire, but, of course, if you wish to match it properly you will have precisely the same underpart. You further say that you will probably make a wardrobe to complete a bedroom suite in bamboo. Now it strikes me that you will have a peculiar job before you, for a wardrobe being a species of cupboard, I fail to see how you can make a lighter article, or a better-looking one, by the aid of bamboos than you can with boards only. But I must leave you now, with the hope that you may, in the future, be fully instructed and pleased in bamboo furniture making.—J. S.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—G. H. (*London, E.C.*); C. A. W. (*Kentish Town*); A. E. W. (*Islington*); J. W. T. B. (*Brighton*); MAGNESIUM; A WORKER; G. W. R. (*Leyton*); R. A. W. (*Stratford*); R. C. (*South Lambeth*); J. H.; H. C. (*Walsall*); R. A. (*Islington*); G. H. M. (*Leeds*); A. M. (*Holborn*); S. P. (*Nottingham*); W. J. W. (*King's Cross*); J. C. R. (*Liverpool*); F. J. W. (*London, N.W.*); F. K. (*Manchester*); L. J. F. (*Maidenhead*); PLUMBER; DELPH; J. R. (*Redcar*); SUBSCRIBER (*Go-port*); READER (*Walsall*); HULTA (*Hull*); J. M. S. T. (*Govan*); N. Q. (*Manchester*); GOOD OLD JEFF; DABBLER; A. C. H. (*Kennington*); A. M. A. (*Ayrshire*); HOSIER'S ASSISTANT; E. A. (*Bristol*); J. R. C. (*Ashton-under-Lyne*); C. W. (*London, S.E.*); E. P. (*Castleford*); R. H. P. (*Redruth*); G. S. (*London, W.*); J. W. (*London, S.W.*); C. H. B. (*London, W.*); YACHT; AN ADMIRER OF "WORK"; E. E. B. (*Cockermouth*); W. P. (*Dartford*); AMATEUR CARPENTER; ONE WHO WOULD LIKE TO KNOW; J. W. (*South Wales*); H. J. G. (*Northampton*); C. J. (*Surrey*); F. W. P. (*Cockermouth*); W. C. (*Hulme*); MAGIC; H. H. (*Highbury*); G. P. (*Lower Edmonton*); H. H. (*Hull*); G. W. M. (*London, S.E.*); L. E. (*Camberwell*); J. G. (*Liverpool*); J. H. (*Burton-on-Trent*); M. R. (*Huddersfield*); J. M. J. (*Belfast*); F. W. (*Leicester*); A. H. (*Stratford, E.*); J. & E. M. (*London, E.C.*); G. W. H. (*Plumstead*); H. W. D. (*Bermondsey*); R. H. H. (*Shutter Oak*); J. S. (*Aberdeen*); IRONWORKER; W. P. (*Pipton*); D. McG. (*Renton*); A. E. B. (*Bow*).

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Cycles.—A. G. H. (*Bolton*).—In answer to this correspondent, who writes criticising adversely the article on "A Few Hints to Intending Purchasers of Cycles," which appeared in No. 66 of WORK, it will be the best plan to reply to his strictures in the order in which they occur in his letter. He writes as follows:—"I was considerably astonished at the 'hints' to cyclists you publish in this week's issue, and am afraid novices following the writer of the article's advice will speedily 'get disgusted with it.' The vertical position he so strongly recommends is *now discarded by all our best riders both on the road and path.* Mr. A. Holbein, the hero of the great ride of 324 miles in twenty-four hours, says the *nose* of the saddle should be 3 to 6 in. *behind* the centre of crank axle, not 'centrally above crank shaft,' as your writer says. Mr. W. Chater Lea, champion hill climber, endorses Mr. Holbein's opinion, and this position is adopted by all the crack riders of the day." From the above remarks it is very evident that A. G. H. paid very slight attention to what he was reading, or he would most probably have found out that the author's intention in writing the article was not to teach the people he mentions, and brings forward as authorities on the best position of the saddle suitable to their style of riding, viz., heroes, path and road racers, champion hill climbers, crack riders, etc., nor himself, if he includes himself among the above, as, from his expression about "our crack riders," I suppose he does. On the contrary, it was for people who, knowing almost or absolutely nothing about riding, were about to commence this exhilarating pastime for getting about and seeing the beauties of the country. It was also especially written to persuade them to get a machine on which they could ride in a becoming and upright position, and still be able to get over the ground to the best advantage, as regards the application of the power and speed if desired, and not by any means for racing purposes, which A. G. H. seems to think is the acme and only use of cycling. At the present time, when racing is indulged in to such an extent that records are often beaten by only very small fractions of seconds, it is evident that racing men must bend almost horizontal to lessen the friction of the air, as when no wind is blowing, men travelling at fifteen miles and more an hour find that the pressure increases materially at every increase of speed. On this account, when there is any wind, it is an absolute necessity that every racer, when so engaged, either against other men or time, should lie on his machine as nearly horizontal as possible in order to reduce the friction to a minimum; and in order to be able, by the swaying of the body, to put more pressure on the pedals, the seat must be placed further back, as in this position crack riders (as A. G. H. says) prefer it. The only racing man I have seen who, when on the path racing, sat in an upright attitude, was Keen, and it is a question whether any rider would be able to cut the present records in such a position. A. G. H. next says that I advise the seat to be placed "centrally above crank shaft." My expression was "almost centrally above crank shaft," and by this I did not mean the centre of the seat was to be above the centre of the crank shaft, but the nose of the saddle, which A. G. H. might have found out by carefully reading the following paragraph to the one in which the expression quoted by him appeared, in which it says:—"The seat is placed only slightly behind the crank shaft." He could also have found out by raising a perpendicular through the crank shaft in Fig. 3 of the article, as he was so kind to do in the sketches which he forwarded, when he would have easily seen that it was the nose of the saddle that was intended to be over the centre of the crank shaft. For my benefit he kindly sent some advertisement cuttings of various machine makers, some good, some bad. Among the former was the advertisement of one of the best makers and designers in the trade. In this sketch A. G. H., with an ordinary pen, kindly draws a line (which is by no means vertical) to show how far back the nose of the saddle is from the centre of the crank shaft. In order to show that advertisements cannot be relied on as accurate drawings of what a manufacturer sells, I can only say that the sketch shown in Fig. 3 of WORK was taken from an almost new machine of the writer's by the same makers, and the nose of the saddle is just ½ in. behind the centre of the crank shaft. He then writes:—"The position recommended by your article is bad in the highest degree, as it throws the rider on to the *narrow part of saddle, causing perennial pressure;* in addition to which a good pace can only be maintained for a short time, and by great exertion. A rider, to travel easily and with a minimum of exertion, must sit well on the back part of the saddle, which must be well behind his work; he is thus enabled to push the pedals instead of stamping, also to use his ankles with good effect." Here he says that perennial pressure is caused by the rider being thrown on to the narrow part of the saddle. If, by perennial, he means constant, I cannot see why the pressure won't be perennial when he sits well back; I suppose he means to say that it will be more detrimental to the rider to rest on the front or narrow part of the saddle than on the broad part. This I quite agree with. I therefore maintain that my position of saddle will allow the rider to sit further back, and, therefore, with greater comfort. When the greatest exertion is needed, viz., climbing hills, then I am almost standing on the pedals, thus being relieved of almost all pressure from the saddle. When the work is light, as on a good level road, I can sit with ease on the broad part of the saddle. A good rider, when using his ankles to the best advantage, not only has to push the pedals over the highest part of the throw of crank, but he should likewise push them backwards when passing the lowest point. When sitting far back he is in the best position for performing the first of these actions, but he is in the worst as regards the performance of the backward push on the pedals, and he should be placed in such a position that when using his ankles he is able to push with the foot both when passing the top centre and also when passing the bottom. The word "stamping," used by A. G. H., is not quite clear; he does not surely mean to say that because a man sits well above his work he must necessarily give blows to the pedals on the same principle as the hammers in a quartz mill. He concludes this paragraph with the sentence, "I have tried both positions, and can travel faster and longer distances with less fatigue." If A. G. H. is so fond of destroying the meaning of phrases in other people's articles he should be more careful about his own letters. The meaning of this unfinished sentence I shall not make myself appear such a dunce as not to understand, but he might have finished it. I also have tried both positions, and find that I can go farther, and with less fatigue, when the seat is as shown in Fig. 3—that is, when in the forward position. He next writes: "Again, the advice that the seat and handles should be of the same height is absurd, as it is evident that the relative height of both depends on the reach of the rider." Here, again, A. G. H. jumps to a conclusion which, if he had shown one half the pains in understanding the article which he has shown in finding fault with it, he would have had less reason to complain of it. What I said was the pedals, handle bar, and seat, in all well-designed safeties are *adjustable* in a slot, and when the handle bar and seat are in their mid position as regards adjustability, they should be level. The reason of this was that in a *well-proportioned* man the hand when closed *comes* slightly *below* the seat, so that when the arms are extended outwards to grasp the handles they will be about level with the seat. If a rider should, therefore, be deformed by having his arms too long or too short, the seat and handles, being level when in their mid position, would be more easily adjustable to suit either case. He proceeds as follows: "If your paper is widely read, I am afraid the article will cause annoyance to budding cyclists, and should like to see another article by a competent authority on cycling." The Editor of WORK is generally ready to accept literary matter on approval. Probably A. G. H., who, from the way he writes, wishes to appear to be a great authority on racing matters, would oblige with an article in order to teach the novices how to become racers. He concludes with: "I enclose a few cuttings from the advertisements of well-known makers which you will notice are rather different to the model (?) machine of your writer's." As I mentioned before, the model (?) machine was a real one, and is much more reliable than a sketch, the accuracy of which can never be relied on, as the machines themselves are continually undergoing alterations, while the blocks from which the printing is done, if there is any likeness to the machine at all, are not altered.—P. B. H.

Palliasse.—R. W. (*Ruspidge*).—Unless you are wanting to make palliasses in large numbers, it is not necessary to have a box. The only object of a box is to allow the straw stuffing to be pressed closely and firmly, but you ought to be able to get the same result without. All you have to do is to lay the straw evenly and in sufficient quantity. There is no regulation pattern for the boxes; and when I tell you that a couple of boards made to sufficient size, either by jointing or otherwise, and kept at suitable distance apart, will do as well as anything, I do not think I need say more. The details you can easily arrange.—D. D.

Fret Wood Dealers.—E. A. T. (*Doncaster*).—It is quite impossible to give answers to questions in the issues immediately succeeding receipt of inquiry. A moment's reflection must have shown you the absurdity of expecting a reply in such a short time, and as you say an answer otherwise will be no use, I do not give it. This acknowledgment is sent in the hope that it may catch your eye, and explain to you how it is the information you want is not in "this week's issue."—D. D.

American Cloth.—C. W. (*Kensington*).—I am unable to tell you how to make American (or leather) cloth of the best quality, for the simple reason that manufacturers of a speciality do not usually divulge their methods. Even if you were to be told, it would be useless for you to attempt to make the cloth, as the best you could possibly make, without the necessary plant and experience, would be far worse than the commonest you could buy. I daresay you are not aware that one manufacturer enjoys a pre-eminent reputation for quality of this material; and as it is made in almost an endless variety of colour, I think you will be able to get what you want from any good upholsterer. Of course, if you get common cheap stuff, you must expect it to become sticky and objectionable in other ways. If you had stated for what purpose you want the cloth, I might have been able to suggest some preparation which you could make; but as you have, like too many inquirers, been so scanty in your information, I am unable to do more than treat your inquiry in a general way.—D. D.

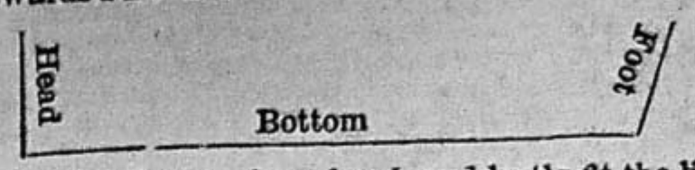
Pill Boxes.—MATCHWOOD.—As these require special machinery, they are not suitable things for an amateur to make in small quantities. You will save time and money by purchasing any you may require. The cost is a mere nothing.—D. D.

Plumbing.—J. P. (*Kingsland*).—Replying to your questions in the order in which you give them:—(1) Plumbers' metal or solder, when purchased at the shops or metal warehouses, does not require anything added to or mixed with it, as it is all ready for use. You can mix it yourself if you wish it; it is composed of lead two parts, tin one part, melted and mixed together, and run out into strips or ingots. (2) The material of which the wiping cloths, or "wipes," as the plumbers term them, are made is fustian or moleskin and bed ticking; some prefer one, and some the other; if the ticking is used, of course a greater number of thicknesses are required than if fustian were used; they are not soaked in tallow, but are rubbed with it each time of making a joint; they vary in size from 2 in. square and upwards. The way to make a saddle joint is to make a hole in one pipe and let the other into it—it must be a perfect fit, or the metal will run in and shake the pipe. The parts where the solder is not to go are then soiled with the usual mixture; next proceed as in making any other joint. You would find the Paquelin lamp, which I have several times spoken of in these columns, a great help to you, as you would, for the odd jobs that you have to do, be able to dispense in a great measure with the metal pot and irons.—R. A.

Bookcase.—J. P. (*Blackburn*).—An article describing the construction of a bookcase is in hand. Though not quite the style of thing you ask about, you will have no difficulty in understanding from the description how to make what you require. All you will have to do is to ignore the directions so far as they refer to the lower part. I am afraid you have not read WORK carefully, or you would not have said you have never seen "anything of the sort" in it.—D. D.

Staining.—R. A. DE P. (*South Kensington*).—I am afraid the reason for wood stained with your mixture not looking nice must be attributed to your want of experience rather than to any fault in the stain itself. I have carefully tested both of the samples you have sent, and while I find one is much clearer than the other, I find no serious objection with either. That which I take to be your own—it is, by the way, a pity you did not put on the bottles some indication of which was which—is rather too dark for ordinary purposes. If you reduce the strength by adding some more water, you will probably improve the appearance of your work, unless you want it very dark indeed. The other stain seems to be merely a solution of bichromate of potash, but I may be wrong in this assumption. Wherever it is thought desirable, proportions of ingredients are named; but, as a rule, it is better for the maker or user to know the contents, leaving him to vary proportions according to circumstances. One of the chief elements in staining and French polishing operations is judgment.—D. D.

Coffins.—J. B. (*Rawtenstall*).—The measure for a coffin is taken much as any other measures are obtained, from the crown of the head to the great toe for the length; for the width the measure is taken across the shoulders; but for a woman it is necessary to provide a wider coffin, owing to the greater breadth of the hips in the female figure: it is customary to add an inch to the shoulder measure; but J. B. must use his own judgment, always remembering that it is better to make the coffin too wide than too narrow; it gives great pain to the relatives if any difficulty occurs in the placing of the body of one they have loved in the coffin provided. The average-sized coffin may be taken at 5 ft. 6 in. long, and 17 in. broad at the shoulders; the sides of such a coffin should be 13 in. at the head and 11 in. broad at the foot: this gives a clear depth to the coffin of 12 in. and 10 in. respectively. J. B. had better make a set of patterns of the bottom, or half patterns will do. The head and foot are fixed on to the coffin bottom with nails driven through the bottom into the head and foot, which average 8 in. wide at the outside of head and 6½ in. wide at the outside of foot. Both head and foot must be sawn wider than above, and planed to the width and the angle required after fixing them on the bottom. I give these figures to help J. B. to set out his pattern, which, being preserved, will save a great deal of time; the distance of the shoulder line from the head is about ⅔ of the length, and I ought to say that the pattern is made the length of the coffin; the 2 in. lost by nailing on the head and foot is regained by making the foot splay outwards 2 in. thus—



Then nail sides on plane level, and lastly fit the lid. If J. B. wishes for help to make patterns, please ask again.—B. A. B.

Prince of Wales' Harp.—W. J. (*Belfast*).—In stringing the harp, use for the first three (the shortest) strings No. 7, next three No. 8, next three No. 9, next two No. 10, and last two No. 11 steel wire M. W. G. The tuning is a simple scale, commencing at C, and continuing upward to the limit of the harp. The lowest note having been tuned to the pitch required, tune No. 8 an octave above; then tune No. 5 a fifth above; then return to No. 4.

and tune that a fourth below No. 5; then No. 6 a fifth above No. 2; then No. 3 a fourth below No. 6; then No. 7 a fifth above No. 3; and, lastly, to complete the "diatonic" scale, tune No. 4 a fourth above No. 1. The remaining notes are tuned in octaves to Nos. 2, 3, 4, 5, and 6 respectively. If the fifths in the ascending scale are all tuned just a shade—flat "tempered," as it is called—the chords will sound smoother and much more pleasant to the ear.—R. F.

Piano Front Treatment.—NEMO.—A full fret-work front in a piano is a little old-fashioned, and you would certainly improve the appearance if you could form a small panel at each end, say of oak gilded all over. Any picture-frame maker would make it for you, and paint a bird resting on a spray of flowers on each; I have painted several myself, and have found them most effective. Then you could treat the centre in the way you name, when I think you would say it was most artistic. I do not think the design you mention would be suitable. If you wish to enlarge it, do it by means of squares (see front page of No. 14 of WORK).—T. E.

Stringing Square Piano.—H. A. C. (*Plaistow, E.*).—As I understand your letter, your square piano is a five octave, C to C; the pieces of whalebone you mention, I presume, are the dampers. You can repair the soundboard with some thin pine wood; fit the piece in, then glue a piece of linen underneath to support it. You will have to use care in stringing; see that it is sound where the ends of the strings are hitched. Start at treble end with No. 8 steel wire—put on twelve notes of this size; next take No. 9 steel wire—put on twelve notes of this; then No. 10 steel—eighteen notes. Now take brass music wire No. 10, and put on eight notes; No. 12, and put on four notes; No. 14, and put on four notes; No. 20, and put on four notes; this will complete it. You can obtain the wire from W. Hughes, 37, Drury Lane.—T. E.

How to Make a Piano.—KINGSLAND.—I thank you for your kind remarks, and I cannot understand how you leave off at E instead of A. Perhaps the best way to give you an answer will be for me to give you the notes for the seven octaves—[A, A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A] [A sharp, B, C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A]. You will now see that there are eighty-five notes, commencing at A and ending with A as stated in the paper, each octave in brackets, and seven in number. If you could see a pianoforte instruction book, you would there find a representation of the keyboard, with each note marked. You can obtain an iron frame at the ironmonger's named in the paper, but you will not need one for the piano you are making.—T. E.

Rusty Piano Strings.—SALE MOOR.—The strings on your piano may be cleaned without removal by rubbing with a leather pad moistened slightly with paraffin and a little pumice powder; afterwards rub over with a leathern pad on which is a little lard, free from salt, and mixed with camphor to prevent a repetition of your trouble.—T. E.

Platinum Test.—B. S. (*Saddleworth*).—Platinum is proof against the attacks of simple acids, however strong they may be. It is only soluble in a mixture of nitric and muriatic acids. It is a white metal resembling in colour such metals as zinc, silver, or tin, or the alloy known as German silver and nickel silver. Tin is readily soluble in muriatic acid, and all the others will dissolve in nitric acid. If, therefore, you suspect a piece of metal sold to you as platinum, test it by applying a drop of nitric or of muriatic acid to some obscure part, and if the acid acts on the metal to dissolve or blacken it, you may be sure it is not platinum. Its weight will also help you to decide, as there are no others so heavy in proportion to the bulk.—G. E. B.

Small Dynamo.—W. J. C. (*London, W.*).—Instructions for making small dynamos are given in the series of articles on "Model Electric Lights," which are now appearing.—G. E. B.

Zither Strings.—W. J. J. (*Belfast*).—The strings for the zither consist of the five melody or finger-board strings and the twenty-six accompaniment strings. Of the first, Nos. 1 and 2 are No. 8 steel wire, No. 3 is 9 brass, and Nos. 4 and 5 are copper-covered on steel or silk. Of the accompaniment strings, Nos. 1, 3, 6, 8, and 11 are gut, and Nos. 2, 4, 5, 7, 9, 10, 12 to 26, are silk or steel-covered. The complete set costs about 6s. or more according to quality. The method of tuning is given in every tutor, and these, as well as strings and other fittings, may be procured of Messrs. Chilvers & Co., St. Stephen's, Norwich.—R. F.

Strings for Æolian Harp.—SCOT.—The most suitable strings for this are stout first or E violin strings, or fine second or D. But whichever are chosen, great care should be taken to have them all of exactly the same thickness and quality. In tuning they must be all of the same pitch, and the tension should be low, as when the harp is in use the fundamental or lowest note is not heard, but only the harmonies or overtones. The plan of making the sounding board sloping has this advantage: that the wind is concentrated upon the strings, and they consequently vibrate more readily. Of course the wind-board does not slope, so that the aperture presented to the wind is considerably larger than that on the inside of the window. Again, it is better to make the harp of the same length as the width of the window, so that when the sash is shut down upon it all the air that enters must pass over the strings. Violin papers are in hand.—R. F.

Æolian Harp Strings.—KILDONAN.—See above reply to SCOT.—R. F.

Wardrobe.—J. D. (*Belfast*).—As a preliminary to this reply I must inform you that it is entirely outside the regulations to send an answer by post, as you request. All requisite notice is taken of each communication for the purpose of benefiting the readers as a whole; and this desired result could hardly be attained by replying per post. You wish first to know whether the dimensions, 6 ft. by 4 ft. by 18 in., are suitable for application to a wardrobe. They are quite so, with the exception of the height, which I should advise you to have, at least, 6 ft. 6 in. I herewith give you a design, but it is not an uncommon pattern; I have not striven to give you anything out of the way, as you do not seem to desire it. As you have made a set of drawers (although you do not say whether an

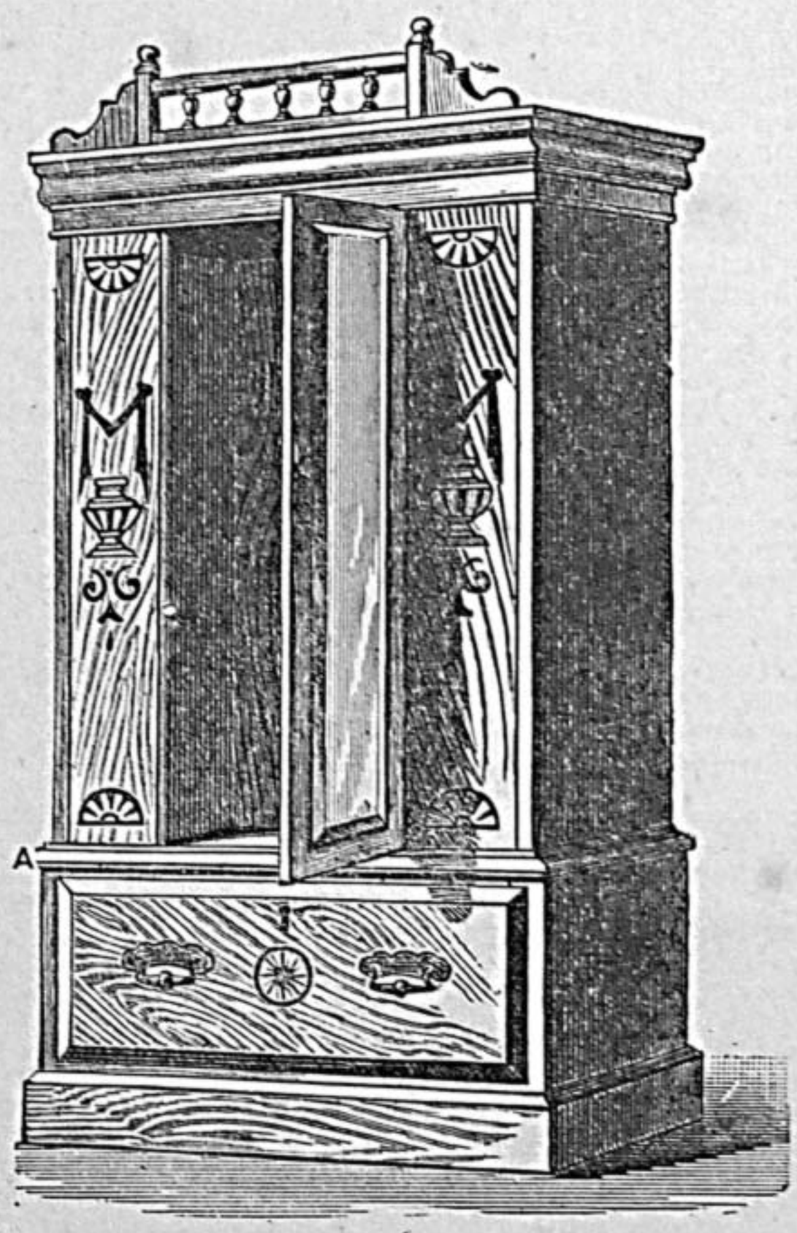


Fig. 1.

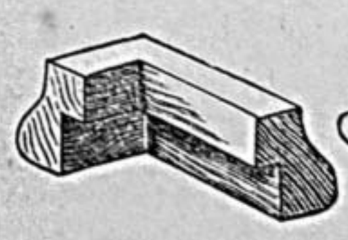


Fig. 2.

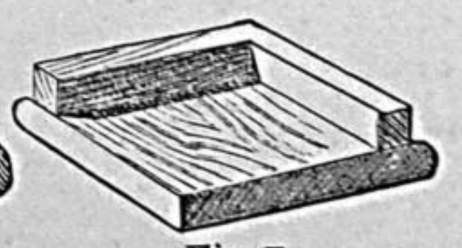


Fig. 3.

Wardrobe. Fig. 1.—Ordinary Pattern Wardrobe. Figs. 2 and 3.—Sections in connection with Bottom Carcase Top-board.

ordinary chest or merely a cabinet), I think much instruction will be superfluous; and to those to whom more than I give is necessary I should say, "Look through back numbers of Vol. II. and along the Index of Vol. I." The details previously given for the manipulation of wood are equally applicable in this instance as in any other. Wardrobes of this description are usually made in two carcases, their union being at A. The top board of the bottom carcase is moulded, and around the top of it is a rim (Fig. 3), into which the bottom of the top carcase will fit. Or you might make the carcase as a box, all edges being square, and mitre and glue a moulding (Fig. 2) round the top of it; the rebated portion only of which will come in direct contact with the carcase. Top and bottom carcases will each contain two side boards, top, bottom, and back board; and the former, in addition, two front boards, and both can be screwed together at A or left separate, as being more convenient for removal. Cornice and frieze together should be about 6 in. deep, the former being mitred up on front and sides—not at the back as well. Plinth will be about 4½ in. deep, and of ½ in., ⅝ in., or ¾ in. stuff, as thought best. I suppose you know that mouldings for cornice, etc., can be purchased? Read my article on "Combination Bedroom Suite," No. 26, Vol. I. (front page), for a method of putting together cornice and frieze and plinth; but don't pounce upon me concerning my advice for thickness of wood, for I have elsewhere endeavoured to explain my reasons for a difference of opinion in this direction. I hope that by telling you to use 1 in. stuff for sides, and ¾ in. for the remainder, the door stiles (which will be mortised and tenoned) being either 4 in. or 4½ in., I shall not bring further opposition upon my weary head. Previous articles will tell you how to make the door, which will be about 29 in. wide, with either a plain or bevelled mirror in it; drawers you say you can make. A bevel will enhance the appearance of the latter. Two boards, joined in the front, will complete the top carcase, and leave a roomy space for the insertion of a number of hat and coat pegs. The pattern of the bottom carcase depends upon individual taste. Sometimes pieces are joined in the front of the bottom carcase (which, by the way, might be 13 in. deep) against the side boards to bring the sides of the drawers in a continuous line with the inside of the top side boards. Concerning wood, walnut is most extensively used among the men I am acquainted with. Ash, pine, and plain deal are also much utilised, and either painted entirely or decorated with stencilling or incising. It must rest with your taste and your purse as to what wood you use.—J. S.

Wax Flowers.—C. A. G. (*Loughborough*).—Wax flowers are made from sheets of prepared and coloured wax sold for the purpose. The petals are cut out with scissors (wetted to keep the wax from sticking to them) and rolled to the required curvature in the hollow of the hand with small globular-headed tools, called curling pins, made of wood, ivory, or wire with glass heads; these, too, are wetted before use. Tinting is done with dry colours, and brushes sold for the purpose. For stems, wire covered with cotton is used. To form a flower a loop is made at the end of the wire and covered with scraps of sheet wax as a foundation, to which the petals are attached by pressure. There are dodges for making leaves, such as punching them out with tin cutters, or squeezing them in plaster moulds taken from real foliage, but the really artistic method is to cut and mark them by hand, giving to each an individual character, as in Nature. The materials and appliances are not costly, and the keepers of fancy shops will have, or will get, them. There is scope for artistic taste in this work, but to excel in it demands much practice and delicacy of touch.—M. M.

Polishing Horns.—INQUIRER.—The natural roughnesses of the surface of the horns have first to be scraped off with glass, and the horn rubbed smooth: this can be done with Dutch rush, or with very fine sandpaper, or with water and powdered pumice-stone or bath brick dust, whichever may come to hand most readily. The actual polishing has then to be done, and for doing it there is also choice of means. Powdered charcoal and water may be applied on a felt pad, and afterwards either powdered rotten-stone or putty powder; the final gloss being given with soft chamois leather just moistened with olive oil, or with the naked palm of the hand and a little subnitrate of bismuth. Another way of polishing is with fine rotten-stone and oil only, applied with a chamois leather; then rubbing with leather and oil; and, lastly, with a clean, dry leather. A third method is (after the rotten-stone and oil) to rub with dry whiting on a soft, clean rag, and to finish with the palm of the hand slightly dusted over with whiting, or with a clean leather. Whichever way INQUIRER goes to work, he will find that the secret of getting a fine polish lies mainly in giving plenty of good hard rubbing.—M. M.

Repairing Indiarubber Gas-bags.—OXYGEN.—I must say I have had no experience with gas-bags, but I do not see why there should be any difficulty in making such small faults air-tight (they are only of the size of pins) with a solution of india-rubber. A solution might be made of half an ounce of rubber in three ounces of spirits of turpentine, and the holes filled with it.—M. M.

Detective Camera.—T. P. H. (*Liverpool*) must bear in mind that certain rules must be adhered to, however rough and ready the instrument is, if it is expected to do good work. The best method of proceeding, or one that will give the best result with the least trouble, is to procure a cheap ¼ plate camera, say, for instance, a Lancaster ¼ plate with lens, and half a dozen double dark slides. One only is supplied with the camera, but if you have constructive ability equal to the task, five more might be made, and the whole enclosed in a small box after adjusting the focus for objects beyond, say 12 ft. distance. An aperture at one end of box will permit the lens to act, and may be opened or closed by a shutter on the outside actuated by an elastic band, the slides of course used in the ordinary manner. The exterior of the box may be made to look like a brown-paper parcel. It will not take a vast amount of ingenuity to make a very workable apparatus. Messrs. Taylor, of Slate St. Works, Lancaster, supply lenses, made expressly for this purpose, but any quick acting lens with good depth of definition will do.—D.

Gaiting Wheels.—A. P. (*Hardy's Gate*).—To gait any kind of wheels which revolve upon arms, whether hand, larry, or heavy cart wheels, so as to allow them to knock and run sweet, we proceed as follows after we have planed and trued the bed and got it ready for fixing the arms, preparatory to giving them "hook." In the first place we will suppose that we are fixing arms in a new bed for a pair of 6-in. tire cart wheels. We get the straight-edge across the felloes at the front of the wheel, then measure the space between the face of the spoke on the nave and the straightedge, which will be, if the wheels are well dished, 4½ in.; keep the straightedge in the same position, and measure

the space at the other end of the same spoke near the felloe—whatever this measurement may be it must be deducted from the first measurement; we will suppose it is 2¼ in., therefore it leaves 2 in. Now the secret lies in allowing a small ¼ in. hook off every inch measurement in the dish of the wheel, so that in this case it will be a very little under, or a small ¼ in. Therefore, when the string is stretched tight across the arms, and in the centre, and through the lynch-pin holes, the measurement of the arms should be, when fitted in the bed right, from the top of the shoulder to the string, a small ¼ in. if the wheels have a 2 in. dish. I do not know of any books or journals published upon wheelwrighting or railway waggon building published in England, but there are several published upon coach-building, both in London and Paris. In America there are monthly journals published, namely, *The Hub*, *Carriage Monthly*, and *The Wheelwright and Blacksmith*. I believe they are published in New York, but as I have not seen any I am unable to give the address and price of the same.—W. P.

The Length of Felloes.—W. H. O. (*Stanton*).—To ascertain the length of felloes for a wheel, however large or small, we describe a circle ¼ in. higher than the height of the wheel; we next describe an inner circle 2 or 2¼ in. (whatever the thickness of the felloes may be) distant from the outer circle. If there are fourteen spokes, we divide this circle into seven equal parts, each arc representing a felloe. If there are twelve spokes to each wheel, we divide into six parts, etc., two spokes to each felloe. A piece of board should be fixed so that one of these arcs is described upon it when dividing the circle into parts; each part must be of equal length, or the felloe joint would have the wrong bevel, a most important point in wheeling. When the pattern is sawn out, the size of the wheel should be painted upon it to show at a glance the height the wheel would be if six or seven of these felloe patterns were placed in a circle. The reason why ¼ in. is added to the height is because the wheel, when hooped and dressed off, will revert back to the original measurement or height of the wheel you want, besides ensuring a perfectly round wheel.—W. P.

Improvement by Patentee in a Patented Article.—H. S. R. P. (*Tunbridge Wells*).—As the alteration is so trifling, cannot our correspondent amend his specification? The form of application to amend (to be got at a post office) costs up to sealing, £1 10s.; after sealing, £3.—C. C. C.

Fixing Labels on Tin.—STICKPHAST (*Beccles*) would, perhaps, find Le Page's carriage glue answer. It will fix lighter materials to iron.—S. W.

Article in Pipeclay.—C. H. C. (*Cheltenham*) might make his query direct to the firm which he names.—M. M.

Advice as to Trade.—B. R. G. (*Dorking*).—A communication awaits B. R. G. under the care of the Editor of WORK.

Subjects in WORK.—J. C. H. (*Custom House*).—An article on a "Kitchen Dresser" will soon appear. I will endeavour to meet your requirements, but at the same time your watchword should be "Excelsior," and you should strive to tread in the higher walks of carpentry.—ED.

Use of "Patent."—If FAIRPLAY will refer to the Patents, Designs, and Trade Marks Act, 1883 (46847 Vict., ch. 57), he will there find in part 5, section 105, "Offences"—that (1) "Any person who represents that any article sold by him is a *patented* article, when *no patent has been granted for the same*, . . . shall be liable for *every offence* on summary conviction to a fine not exceeding five pounds. (2) Any person shall be deemed, for the purposes of this enactment, to represent that an article is patented if he *sells* the article with the word 'patent' or 'patented,' or any word or words expressing or implying that a patent has been obtained for the article stamped, engraved, or impressed on or otherwise applied to the article." This Act, with the usual failing of most Acts of Parliament, does not say who may, or is to, put the provisions of the Act in force, or whether it is to be done by the Patent Office on the matter being properly brought to their notice with proper proofs of the actual sale of the article improperly marked satisfactorily proved, or whether an individual may put it into operation on his own account. It seems to us if FAIRPLAY is in a position to prove what he states in a sufficient manner, it will be his duty to place the facts before the Commissioners, and see if they are prepared to carry out their powers for the benefit of the public—which it is evidently their duty to do—and then we should learn what is to be done. So far as we know, this question has not yet arisen, consequently there is no precedent to guide us.—C. E.

Bench Screw and Fly-wheel.—A. K. (*Glasgow*).—(1) The bench screw described by you is very unsuitable for cabinet work; if able, get an instantaneous grip vice (about 15s.); if not, put a piece of wood, equal in thickness to that you wish to plane, the other side of the screw. Cabinet makers use two screws to their benches as a rule. If A. K. had on guide G a few holes, and a peg to fit, it would help him. (2) A lathe fly-wheel may be from 24 in. to 30 in. in diameter; get an iron one if possible.—B. A. B.

Cabinet Making Lessons.—LEDGER.—I have wood-working classes in the winter months at Hampstead, but these are now over, and it is very unlikely that you will obtain any lessons from such people as you indicate. Certainly you ought to try an advertisement in WORK. Private lessons are expensive.—B. A. B.

Wire Rope Splice.—R. G. (*Leamside*).—There are two kinds of splices, the short and the long. The first is used when bulge or bunch is of no consequence, and when there is but moderate stress; the second when uniformity of diameter is requisite and no diminution in strength. There is no difference in the manner of making splices in hempen or wire ropes, except that a longer splice is made in the latter than in the former. To make a short splice, unlay the strands, three or six as the case may be, for a length of several inches, say from six to twelve—dependent on the size of rope and amount of security desired. Open them out and place them together in alternate positions, as shown in Fig. 1. This is called "marrying" the ends. After this, each strand is passed over and under the next strands in succession, three, or four, or half a dozen times in succession. I have tried to show the interlacing of the opposed sets of strands once (Fig. 2) before the rope is pulled taut, but am afraid it will not be very clear. The strands are greased, and a way made between the strands in the rope by thrusting in a marlinespike (Fig. 3)

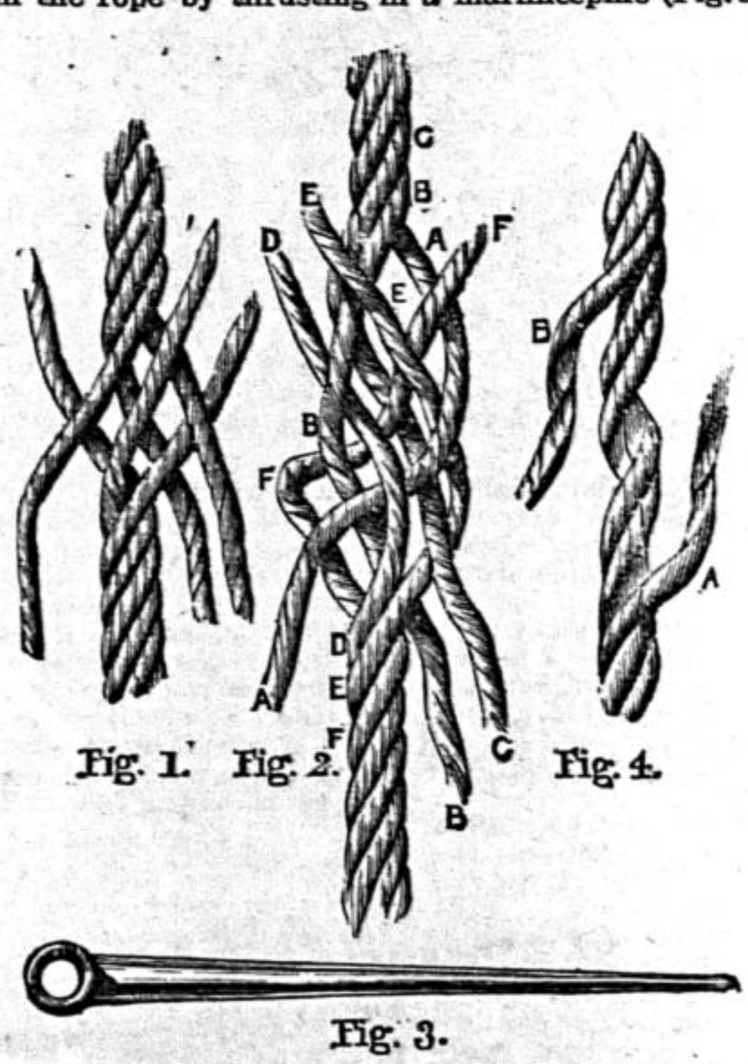


Fig. 1. Fig. 2.

Fig. 4.

Fig. 3.

Wire Rope Splicing. Fig. 1.—Marrying Ends of Strands. Fig. 2. — Interlacing of Strands. Fig. 3.—Marlinespike. Fig. 4.—Long Splice.

of iron. They are pulled as tight as possible and then rolled between boards or under foot, so that the increase in size shall not be excessive. To make the long splice, unlay the strands in the ends of the ropes to be united for a considerable distance, and lay the one set of strands A in the groove left by the unlaying of the other set B (Fig. 4). After a sufficient length has been so treated by the unwinding and unlaying of all the strands in succession, the ends are united by thrusting them through openings made by the marlinespike, as in ordinary splicing, and the union then, though of considerable length, is scarcely perceptible. The rope is held in its socket by means of pins passing through the iron from side to side.—J.

Wood Carving.—R. J. E. M. (*Athlone*).—I am somewhat at a loss how to advise you about following the art of wood carving as a means of livelihood, for so much depends on yourself and your prospects otherwise. If you are content with moderate means, no doubt you can make a living by carving if your work is fairly good; but, as in kindred arts, you must remember that only the few "make money." At present, no doubt, the occupation is a very pleasant one, for you are following it *en amateur*, but have you considered what it would be if you were forced to grind at it daily? Now you can please yourself what you carve, but pursuing it as a business you would find you have to please your customers rather than yourself, and they will not always think as you do. You will be hurried in time, be beaten down in price, and meet with the thousand and one little annoyances which harass every one in business. Therefore I say, if you are getting on fairly well in your present occupation, do not throw it up for the sake of becoming a carver. Of course, if you "have got no work to do" the case is different, and then there can be no harm in endeavouring to go ahead as a carver. I do not say all this to damp your enthusiasm, but rather to recommend caution before you take such a serious step as beginning another occupation at your time of life, for though you are not very old, yet it may be supposed you are not at school, and that you have done something towards learning a business or profession. Further—and in saying so I do not at all wish to disparage your work—although you like carving, and may be really a clever carver for an amateur, that you could earn a livelihood at the work is doubtful: a skilful amateur is often but an indifferent worker when compared with even a poor professional. However, if you are really determined to turn your attention seriously to wood carving, and wish to achieve success at it, you should study design, and practise drawing. Unless you can draw you will never become a first-rate carver, though you may become a fair journeyman, a mechanic, but not an artist. Design must be studied, for though you may, indeed must, derive inspiration from nature, you must learn to interpret nature. It sounds very fine to talk about following nature and its teachings, but what does this mean? Simply nothing unless the student is able to adapt the teachings to his own special requirements. In the carver's case these are the necessity of rendering and adapting nature's forms—not copying them—in wood with the aid of sharp steel. However, I daresay I have said enough about the artistic aspect, and something of the prosaic may help you further. It is not necessary that you should study for seven years at schools of art before you could have a chance of earning a livelihood, if you are at all capable of doing so. Naturally, the more time you could spend at study the better, but I think you would do better by getting under some practical carver and working with him. Of course I have not seen your actual work. If I had, I might be able to advise you more to the point. I do not know whether the design you send is your own composition, but if it is, it shows you have some talent which only requires developing. Perhaps if you were to send a specimen frame to Messrs. Urquhart & Adamson, Bold Street, Liverpool, they might be willing to show it in their "Artists' Own" Exhibition; and if they do not, after seeing the work, think that it is suitable, you will have the satisfaction of knowing that it is deficient in some quality. As a rule carving looks better unpolished, but the best polish, and how to apply it, depends so much on the work, that I cannot answer this portion of your letter fully, especially as so much space has been devoted to the foregoing. Why not apply to Herkomer direct?—D. D.

Tobacco Plant.—R. W. M. (*Kildare*) asks for hints as to the management of a crop of tobacco, complaining that it is so hot as to blister the tongue. Years ago, in the West Indies, I grew a quantity of tobacco, and the plan I then adopted, under advice from other planters, was, as soon as the leaves had grown to full size, and before they commence to turn brown or "rusty" (when they are useless), pull them off the plants, lay them upon a flat flag, one upon another, sprinkle them with a little saltpetre dissolved in water between each leaf, and place another flag with a weight upon it over the top of the pile. I used, of course, to sun them first till they were just crisp and make piles of them close together in the above manner, leaving them until fermentation had just set in. If left too long they turn black, if not long enough they are yellow and pale; you should carefully watch, as they heat like a haystack. Stop the sweating the moment fermentation fairly commences throughout. Then dry the leaves separately in the sun, turning them over till they are quite brittle. They are then fit for cigar making, or for steeping in water to take the full strength out of them, and to have them moist enough to cut into "shag" or "birdseye." For the former, take all the principal veins or leaf stalks out; for the latter, leave all the veins in. Before cutting up, all water should be pressed out, leaving the leaves just limp, and when cut it may be still further dried on hot plates. Sailors take the dry leaves, sprinkle rum and molasses mixed with a little water over them, and roll them very tightly with strips of canvas first, and afterwards with strong twine or thin cord with a "Spanish windlass," and put these rolls away for a time. West Indian negroes twist the leaves dry without other preparation into a rope about an inch and a quarter thick, which is termed "jackass rope," which they cut up in slices and rub between their hands as they require to fill their pipes. At best, home-grown tobacco has a flat taste, and not the aroma of tobacco as sold ready cut by manufacturers; it varies a great deal also in the curing as above described, and is, in my opinion, preferable for making cigars rather than for smoking either in pipes or cigarettes. The cigars, however, are flavourless, if not smoked the day they are made, unless they are kept a couple of years to get again into condition; but I do not think any cigar is ever so good as the day it is made. I recommend R. W. M. to cure his crop and send it to some respectable manufacturer to be cut to his order, if he desires to obtain the full flavour without the bitterness.—J. W. H.

Vellum Making.—PRACTICAL will find a short account of the processes of vellum making given at page 397, No. 25, Vol. I. of WORK. All the questions which he asks, as to tools, unhairing, stretching, thinning, finishing, etc., are briefly answered there.—S. W.

Model Cutter.—W. W. T. (*Shettleston*).—The following measurements are for an ordinary 3 ft. cutter yacht; if the boat is intended for racing, the beam must be lessened and the depth increased. Beam, 8½ in.; width at taffrail, 4 in.; depth amidships, including keel, 9½ in.; depth at sternpost, 10 in.; length between sternpost and taffrail, 5 in.

The spars should be of the following measurements: Mainmast above deck, 21 in., tapering from ¾ in. to ½ in.; topmast, 19½ in., tapering from ⅜ in. to ¼ in.; main boom, 28½ in., ¾ in. thick in the middle tapering to ½ in. at each end; main gaff, 22¼ in., tapering from ½ in. to ⅜ in. If a gaff is used with the topsail it should be 21¼ in. long and ¼ in. thick, slightly tapered at each end. After the false wooden keel is screwed firmly on from inside, the following is the best method of fixing the keel:—Get two pieces of wood about 2 in. wide, and fasten them with glue or brads along the sides of the false keel, then stop up the ends of the groove thus made, and you will have a little channel or trough along the false keel, wherein you can pour your melted lead. The stern part of the hull should be slightly tilted before the lead is poured in, as the stern should always draw more water than the bows. After the lead is poured evenly into the trough the boards can be taken off, and the lead keel filed smooth and screwed on to the wooden keel. The tools absolutely necessary for constructing a boat can be brought down to a saw, plane, a chisel, a couple of gouges, and a jack-knife; but to turn out a good boat you should have most of a carpenter's ordinary tools, and also a variety of wood worker's rasps and files, and a few carver's chisels. I am afraid that if you are thinking of buying the tools especially to build your model, you will find it a very expensive matter.—G. J. E.

Chuck for Lathe.—J. H. (*Nottingham*).—As you have succeeded in making the chuck for holding the ordinary bits as used in the carpenter's brace, it is scarcely needful for me to give directions how to make the chuck. J. H. finds, as most of us have found who have tried the same experiment, that ordinary boring bits will not run true. The fact is they are merely forged as near as possible, and the only way to succeed is to mark with a centre-punch or with a drill-mark a dot on chuck, and carefully file every bit *separately* to the chuck, and mark the bit with a similar mark, so that the bit can be replaced in the same way when required. —B. A. B.

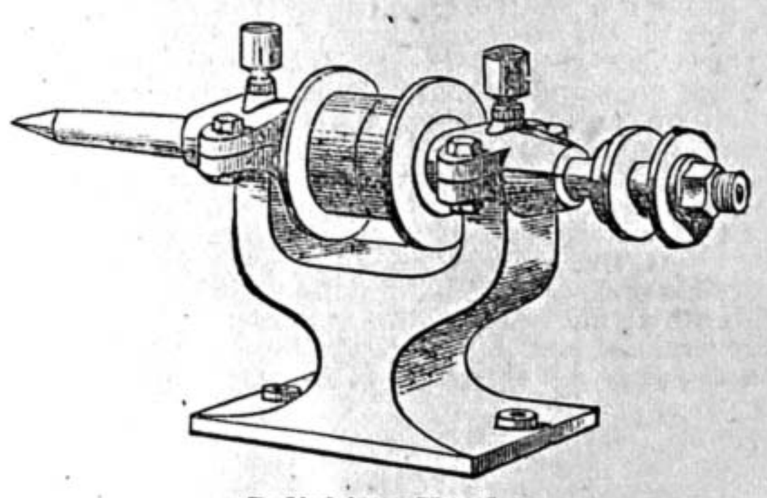
Photo Rim Mounts in Brass.—W. J. V. (*Abingdon*).—You will be able to obtain the rims you inquire for at almost any general photographic dealer's. Better try Fallowfield's, Charing Cross Road, or Marion's, 23, Soho Square, who generally keep them in stock.—D.

Electric Alarm Bells for Trains.—SCOT.—There is no difficulty whatever in establishing communication between the passengers and guards of a train by means of electric alarums. It might be done in the way you mention, but I do not see anything new in your proposed arrangement. The able electricians on the managing staffs of our railways are fully alive to the importance of this subject, and are quite prepared to meet the demand should it ever arise. Villains, such as you describe, can as easily tamper with an electric as with a mechanical communicating system. The difficulty lies in not having any means of communicating with the guard on some trains, and it is on these that such outrages are committed.—G. E. B.

Address of American Inventor.—J. B. B. (*Sutton*) asks: "Can you or any reader of WORK kindly supply me with the full address of Mr. W. J. Norton, Pittsburgh, U.S.A., the inventor of a new chemical light? I have sent several letters but they have all been returned, as there are five different Pittsburghs in the United States." Have you addressed any of your letters to Pittsburgh, Pennsylvania? This would be the most likely place, but it is quite possible there may be several persons of the same name there, and you might as well address it to Mr. Norton, Birmingham, with as good a chance of finding the right man. We give your letter publicity in WORK on the chance of it meeting the eye of Mr. Norton or some one of his friends. This is all we can do for you.—G. E. B.

Suction Pipe and Electric Machine.—J. N. B. The corresponding staff of WORK get some queer letters and questions from their correspondents, and they always try to understand the wants and wishes of the writers. But we must draw the line of forbearance somewhere, and we do this at riddles. As an example of the riddles sent us we give your first question:—"How must I make a suction pipe something similar to this one, and in what height can it be made to act?" Seeing that your sketch shows a cistern of water with the delivery pipe bent up by the outside of the cistern and curved over the top, I really cannot understand what you mean, or what you want to do. You must please put your thoughts in order before writing them on paper, and tell us plainly what you wish to have done. In your second question you ask: "What power will it take to drive an electric machine of about two lights?" This is another vague question. The answer will depend upon the candle power of the lights, and this you have not given. Your last request is most enigmatical, "Please answer by post." Now, as you have not seen fit to give us the least idea of your residence, and there are some thousands of B's in the United Kingdom, we must give up this riddle too. It is bad enough when correspondents expect us to give our time to answering their questions, and then make them a present of the postage; but when one expects us to find him out among many thousands bearing the same name, and send a prepaid letter to him in reply to two vague queries, the limit of forbearance is reached.—G. E. B.

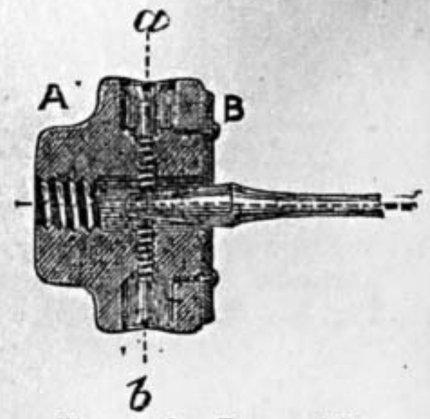
Brass Burnishing.—YOUNG BRASS FINISHER.—You are quite right in your surmise that a deal of brass burnishing, or rather polishing, is done by means of a revolving wire brush; the process is termed scratch-brushing. The brushes revolve at a high speed on either a lathe or an appliance specially made for the purpose. If you have a lathe, all you have to do is to get a spindle about 1 ft. or 18 in. long, cut a thread on it for a good distance, and fit two backnuts on it to clamp the brushes together; fit one end in a dog chuck, and let the back centre support the other end. I send you a sketch of a proper polishing head, so that you may see exactly what it is like, should you



Polishing Head.

care to attempt to make one. The brushes, of course, you would not be able to make. You can get them from any wire brush manufacturer: Pemberton's, of Worcester, or Messrs. Riddell and Co., 142, Trongate, Glasgow, for instance. But, in conclusion, let me say that I do not think you will find it pay to make up gas fittings from the rough yourself, as there would be many other appliances needed besides scratch-brushes, etc.—R. A.

Chuck for Holding Brace-bits.—J. H. (*Nottingham*).—You wish to know how to do this, having tried without success. There is an extremely simple way which you will find very easy. A is a piece of hard wood—the harder the better; it is screwed so as to go on to the nose of the lathe, and may be 3 in. in diameter. Being turned to shape, smoothed, and polished, a round piece of plate iron (B) about ⅛ in. thick is obtained and screwed upon the front of it. A hole is now drilled in the centre of this plate, as it runs in the lathe, the diameter of which is the same as the measurement over the flats of the square on the bits—at their large end—and this hole must be filed out with a square file till the bits will go in, as in the figure, being careful to take the same amount out of each of the four corners. The iron plate may then have its edge turned and polished. The next thing is to mark a line round the body of the chuck at *a b*; divide this into four for the four wood screws, which must be placed so that their points will bear upon the flats of the bits close to the small end. The holes are enlarged as seen in the figure so that the screw heads may sink *below the surface*, as their heads would be very dangerous to the hands when in rapid revolution. These four screws are easily adjusted, so as to bring the point or end of the bit perfectly true; and, as bits are not all alike, the screws can be adjusted to suit any bit, which they will hold quite firmly.—F. A. M.



Chuck for Brace-bits.

Resistance Coils in Dynamos.—ELECTRICIAN.—Resistance coils are employed on dynamos to check the flow of current in the outer circuit and divert more of it to the F. M. coils. In a shunt wound machine, a resistance put into the outer circuit would check the flow of current there, and send more by way of the shunt into the coils of the machine. Resistance coils are employed in plating dynamos to prevent "burning" of the work being plated.—G. E. B.

Small Electric Lamps.—W. H. S. (*Brockley*).—Small electric lamps of 2½, 5, or 10 c.-p. can be obtained from any dealer in electrical sundries. I have frequently given addresses of these in reply to letters of other correspondents. Instructions on how to make a battery for lighting a small lamp to be used in a photographer's dark room, will be found on pages 445 and 781, Vol. I., of WORK. The cost of lamp would be about 5s., and the battery 15s., about £1 altogether.—G. E. B.

Battery.—W. N. (*Birmingham*).—I do not recognise your battery by your description of it, as I cannot understand the part played by the tinfoil in the cell. However, as you have a carbon element suspended in a zinc-lined cell, it is evidently a single fluid battery of some sort. As you only require it to ring an electric bell, first well wash all the inside parts by soaking them and rinsing them in several changes of warm water. Recharge the cells with 2 oz. of sal-ammoniac and ½ oz. of chlorate of potash in each cell, then fill up with water. If you like to use the muslin envelope again, make a mixture of the above-named salts, spread on a piece of muslin, and wrap this around each carbon. This will allow the salts to dissolve slowly and will filter out any dirt there may be in them.—G. E. B.

Transfer to Glass.—NEMO A. (*Attercliffe*).—I am glad to hear that you find WORK helpful, but think it would be much more so if when sending a query to "Shop" you were to enter more into particulars, and stated plainly the nature of your work, and the exact difficulties you experience. With your letter before me, I do not know what kind of glass decoration you propose to execute, or whether you ask merely for suggestions as to colouring from an artistic point of view, or require direction as to the ingredients of the colours. At present I assume that the former will suit you, and therefore suggest that the iris flowers be of the richest yellow consistent with transparency shaded with a darker tone of the same colour, the seed vessels being tipped with rich brown. The stalks pale green shaded with semi-transparent green—*i.e.*, same colour darkened with brown. The leaves rich green, the lights being as vivid and transparent as possible, and while the lower portions should be shaded rather heavily at the base by the use of brown, the shading may be carried upwards, using less of the latter pigment, and finally merging into darker green than the groundwork of the leaves.—OPIFEX.

"Foliate."—F. S. (*Kidderminster*) objects to the use of the word "foliate" on page 316, No. 72, and asks me to "look at the dictionary definition," and then see whether I have made the right use of the word, adding the sententious advice, "be correct." In the paragraph referred to, I meant to convey that two portions of the ironwork should be so shaped and placed that together they should present the appearance of a *foliated* scroll—*i.e.*, a scroll "formed like leaves" (dictionary); in other words, that the curves should partake of the nature of a conventional *foliation*—*i.e.*, "leaves in the act of *foliating*" (dictionary); but inasmuch as space in the columns of WORK is precious, I used the word "foliate" to express myself. I certainly did not mean any reader "to beat" the particular portions of the bracket "into thin plates," and to anyone at all familiar with the technical language applicable to the subject, my meaning is plain, and therefore—notwithstanding F. S.'s stricture—correct.—OPIFEX.

Blind Rollers.—J. McK. (*Lisburn*).—I am surprised that you should find any difficulty in obtaining Hartshorn's patent blind rollers, as they are now in almost universal use. Noting your address, I should advise you to write to any house-furnishing firm in Belfast, or to Messrs. Millar and Beatty, 14, Grafton Street, Dublin.—OPIFEX.

Polishing Pebbles.—E. C. (*St. Leonard's-on-Sea*).—From the form of the question, I conclude a few simple directions for polishing the surface of pebbles are required; and that the cutting of them into halves, or slices (such as for microscopical slides), is not required, as the requisites for this include an expensive machine costing about £10 or £12, such as is used by lapidaries, and although pebbles may sometimes be split with a cold chisel and hammer, sections cannot be done without a machine. We will proceed, then, upon the assumption that only the simplest means consistent with getting a fair result are at hand. Having found a pebble which you think would look well when polished—and here let me say that every stone found will not repay the labour bestowed upon it, but some splendid stones may be found upon Hastings beach: I have seen some with beautiful markings when polished that were found there—the first thing is to grind upon a stone with water so as to get a flat surface; a grindstone with someone to turn for you is best, but if this is not available, use a flat piece of sandstone, or even the stone sink if the "powers that be" will allow it. If the pebble is large enough, it may be held in the hand during the grinding operations; if not, it must be cemented to a piece of wood, with a cement composed of pitch, resin, and beeswax. When a level surface has been obtained, it must be rubbed upon a water-of-Ayr stone, to take out the scratches left by the rough stone. It ought now, when allowed to dry, to present a smooth, dull surface; if not, it must be rubbed until it does; it is then ready for the polishing process, the others being only preparatory. Cover two boards with leather, oil slightly, and dust on flour emery; rub the pebble upon this, and when it begins to take a little polish, finish off on the other board, only dress it with putty powder (oxide of tin) instead of emery, or colcothar may be used with equally good result, and has the advantage of being much cheaper than putty powder. I hope these few hints may prove useful; but if there is anything I have not made perfectly plain, I hope you will write again. I ought, perhaps, to say that you may find one part of the pebble will show much finer markings than another part, so it is best to wet it and examine closely, and, of course, polish the best. If you would like to see some pebbles that have been polished, I could give you an address in Hastings if you write me through the Editor.—W. E. D., JR.

Graph and Copying Apparatus.—A. J. W. (*Manor Park*).—I like the litho-copier of Fordham and Smith, Wormwood Street, E.C., the best of anything I have seen of the kind.—J. W. H.

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