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A PORCH FOR A COTTAGE OR SMALL VILLA.

BY ARTHUR YORKE.

MATERIALS — DIMENSIONS — CONSTRUCTION OF FRAMEWORK—FILLING IN THE FRONT—THE ENDS—THE ROOF AND ITS ARRANGEMENTS.

Materials and Dimensions.—The porch for which a design is now given is provided with seats, and is intended for houses standing in their own gardens, and to some extent secluded from observation. It is built with straight stuff, the heavier parts being supposed to be of some one of the straight-growing fir woods, and by preference of larch, which is best and most enduring. Its dimensions are such as are suited to a small house. It projects 3 ft. from the wall, is 6 ft. wide, and 6 ft. high to the lintel. The perspective view (Fig. 1) and Figs. 4 and 6 are not drawn to scale; Figs. 2, 3, and 5 are drawn $\frac{1}{2}$ in. to the foot.

The Framework.—In the ground plan (Fig. 2), it will be seen that the front is supported on four collar-posts, *a*, *a*, *a*, *a*. These are cut from so many rough larch poles—say 3$\frac{1}{2}$ in. or 4 in. at base, and not much less at top, for plantation-grown larch tapers very gradually. They rise 6 ft. above the ground-line. The best way of setting them is on blocks of stone, where the post will be prevented from moving by an iron dowel let into the stone and the bottom of the post. Since, however, this rustic work is perhaps most frequently followed by the non-professional workman, who will prefer an easier method, it should be said that it will suffice to let them into the ground, like ordinary gate-posts, for a couple of feet, and to well ram them in with stones and earth. If this last plan is adopted, it will be well roughly to shave off the bark from the part to be buried, and to gas-tar it. Though more liable to rot than when mounted on a stone, a well-seasoned larch-post, thus treated, will last for many years.

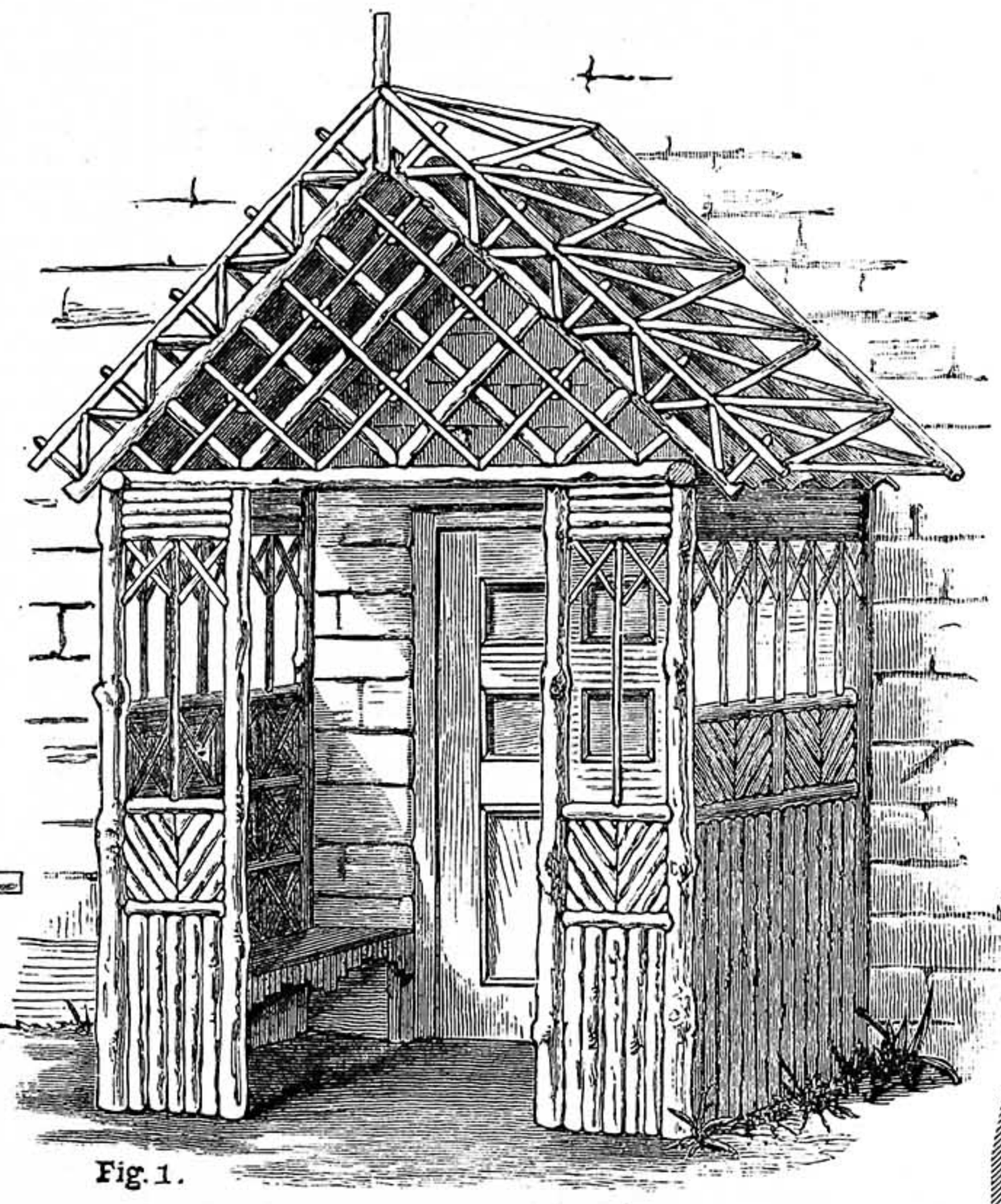


Fig. 1.

The back-posts, *b*, *b*, are of poles sawn in half, and nailed to plugs driven into the masonry. The nails alone will hold them in place, as also the dwarf-posts *c*, *c*, which are 14 in. high, and support the corners of the seats.

On the top of the four front collar-posts rests the lintel, which is nailed down to them, and over the two corner-posts it is cut half through to receive the wall plates (*d*, Fig. 3), which here rest upon it. These wall plates, it will be seen from the figure just named, are 3 ft. 3 in. long, and so project 3 in. beyond the collar-posts. This allows the front rafters to be set slightly farther forward than the posts, which will thus be better sheltered by the roof. At top the rafters

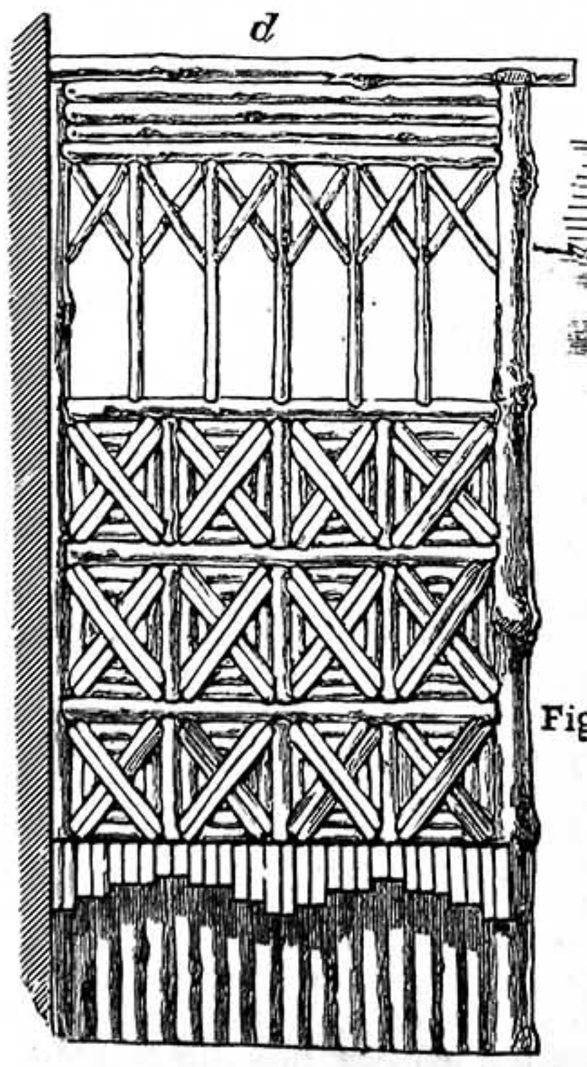
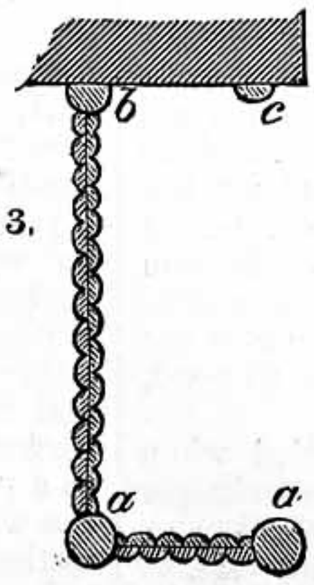


Fig. 3.



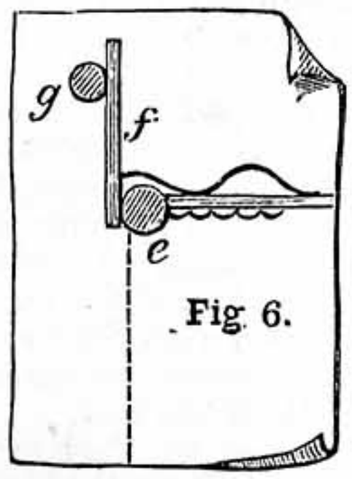


Fig. 6.

Fig 2.

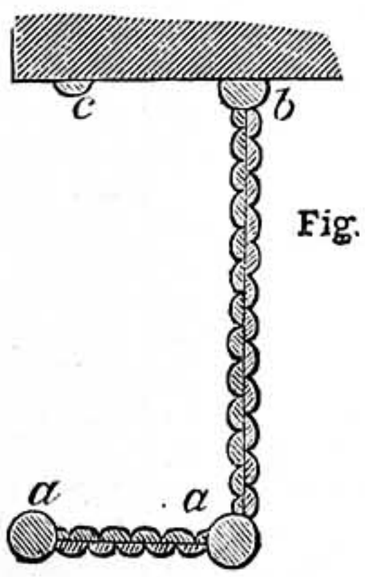


Fig. 5.

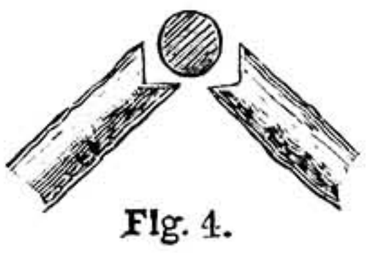


Fig. 4.

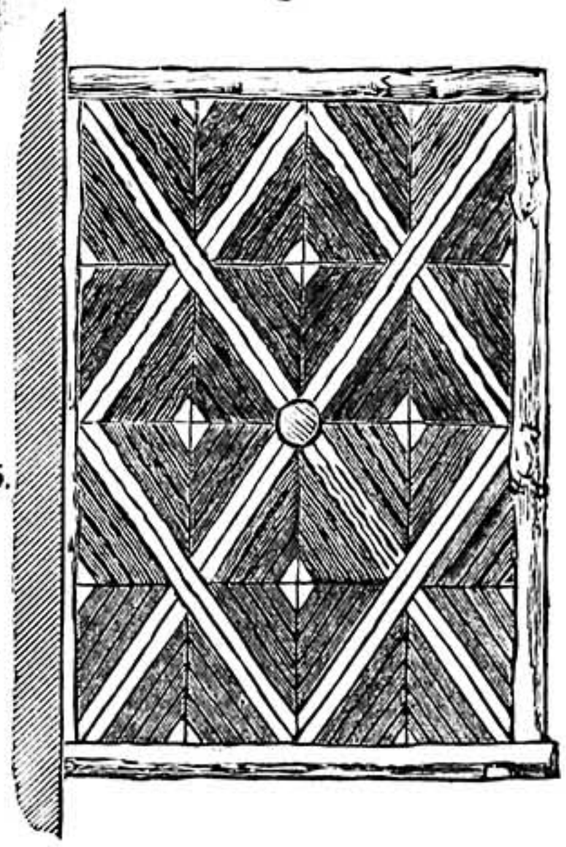


Fig. 1.—Perspective View of Rustic Porch for Cottage or Small Villa. Fig. 2.—Ground Plan. Fig. 3.—View of Side as finished within. Fig. 4.—Rafter Ends showing Mode of Connection with Ridge-Pole. Fig. 5.—Ceiling. Fig. 6.—Support of Trellis for Climbers.

are cut to clip the rustic ridge-piece, as in Fig. 4. The back rafters are, of course, of half stuff, and are nailed to the wall.

The Front.—Having thus put together the main framework of our porch, we will consider how the front is filled in. Between the two collar-posts, at each side, it will be seen that the space is closely filled up halfway—that is, to a height of 3 ft. In the first place, we take a piece of quartered stuff and nail it from post to post, one of its sawn sides being outwards and in a line with the middles of the two posts, and the other sawn side upwards and 14 in. from the ground. To the former side will be nailed the pieces of half stuff seen in Fig. 1, which form the outer side of the wall, and on the latter will rest the end of the board which forms the seat. The upright pieces of half stuff mentioned above are 2 ft. long, and on their tops another cross-piece of quartered stuff (shown in Fig. 1) is fixed, and nailed down into them. Other upright pieces of half stuff, so arranged as to "break joint," are nailed against these from within, both above and below the seat; and the diagonal pieces seen outside (Fig. 1) are again nailed against these latter. Above comes some open work, which explains itself, and at top is a little more solid work—viz., four or five horizontal pieces of round stuff, of which the ends are cut to clip the posts somewhat as those in Fig. 4.

Above the lintel, it will be seen that the gable is filled with open trellis. The little quatrefoils seen in this are made by nailing short bits of rod, with their ends to the front, at the intersections of the smaller members of the trellis.

The Ends.—The construction of the ends, as regards their lower and upper parts, is much the same as that of the sides of the front. There is a cross-piece for the seat, and the space beneath is filled by a double row of upright halved stuff: but here we have the closed work rising higher than at the front—namely, 4 ft.—in order that the heads of those sitting within may not be exposed to draughts. Fig. 3 shows the inner side of one end. Here the seat-board, which will be some 14 in. wide, is supposed to be seen fixed, and its edge is ornamented with short strips of split rod. To fix these last securely, a slip of lath should be nailed along below the front edge of the seat-board; the strips can then be bradded to this, as well as to the edge itself. Above the seat, and below the open work, is a large space to be filled with rustic mosaic, to the given design. The cross and upright pieces which form the panels in this are of constructive value, as keeping in place the pieces of half stuff which form the outer wall. In the panels light and dark rods may be used in contrast, the St. Andrew's crosses being of peeled willow, and the filling-in of hazel, birch, or the like, with the bark on.

If, as in this rough work is pretty sure to be the case, chinks should show where they ought not, they can be made air-tight by neatly stuffing with moss.

The Roof.—Passing to the roof, it must be observed that its under side—the ceiling, so to speak—is of rustic mosaic; the design for it is given in Fig. 5. In outdoor carpentry there is no prettier work than fitting together rustic mosaic, but it is not so if it has to be done overhead. It is better, therefore, to arrange boards to cover one side of the roof, to screw them temporarily together with ledgers on the off side, and to brad the mosaic upon them before they are fixed up. To the backs of these boards the roof proper, which is of zinc or galvanised iron, will be screwed down.

A metal roof has been introduced, because of the greater facility with which such a roof can be applied by the amateur builder, and not that metal roofs are in other respects things to be desired. They are the reverse of ornamental, and are far too effective as conductors of heat. I have, therefore, taken precautions both to disguise the present one and to keep it cool. Fig. 1 shows a trellis thrown over it, so that it may be hidden and shaded by climbing plants. If brought close to metal, and the aspect is a warm one, climbing plants will not thrive; this trellis is, therefore, kept 4 in. or 5 in. above the roof. Fig. 6 is an oblique section showing how the trellis is fixed over the true roof: *e* is the true rafter; *f* is one of the short pieces of rod which support the false rafter *g*; and it will be seen that these pieces are nailed to the *front* of the true rafter and to the *back* of the false one. The front of the trellis, therefore, projects beyond the roof, and is, in consequence, more effective. At its back the trellis is supported on rafters of half stuff nailed to the wall.

CONSTRUCTIVE STRENGTH IN METAL WORK.

BY J. WHITFIELD HARLAND.

STRENGTH OBTAINED BY FORM ONLY—CAST-IRON COLUMNS — BEAMS — GIRDERS — "FISH-BELLIED" GIRDERS—T SECTION—DOUBLE-FLANGE HOLES IN WEB OF CAST GIRDERS—TESTING GIRDERS—FRAMING FOR MACHINE TOOLS—SECTION THEREOF — BOSSES OR LUGS FOR LONGITUDINAL TIE RODS—"A" FORM OF SUPPORT—LATHE BEDS—SHARP INNER ANGLES PRODUCTIVE OF FRACTURE—OBVIATING THIS.

IN a former paper I said that the further consideration of this subject divided itself into two distinct classifications: the first involving strength obtained by form only, the other obtaining strength from aggregating separate parts in a constructive manner; and it is the former class that I now propose to describe.

In the construction of buildings, bridges, etc., the replacement of wooden beams, formerly used almost universally, by the use of cast or wrought-iron ones has caused the fullest inquiry and experiment on the part of engineers, and whilst the result has been the compilation of tables of strength of both and formulæ for calculating the required dimensions to carry the necessary weight, and for ascertaining the direction and force of the strains it will be subjected to, it has also led to various theories as to the strongest possible form or shape of material for the purpose in view, and to the economy of weight, and therefore value. Hence it is now recognised that a hollow cast-iron column is able to bear a heavier perpendicular pressure than the same quantity of metal if cast solid; and as columns are intended entirely to support weight, and are not subject to side thrusts, the result has been that cast-iron columns are the rule. It would be expensive to make wrought-iron columns tubular, and the expense would be unnecessary, as, with the exception of a fire taking place, cast columns are just as good, and at one-third the cost.

In beams—or, as they are called when made in iron, girders—the strain is no longer vertical, *i.e.*, compressive, but deflective or tensile, the whole superincumbent weight being supported at the ends where the girder rests on either walls or columns, as the case may be. Its breaking weight in the centre can be accurately ascertained from formulæ and tables, and the point of fracture will naturally be exactly in the centre, if the weight be at all evenly distributed. On this account the form of the girder known as the "fish-belly" is designed, in which the top flange is straight, whilst the under edge of the web takes the form of an inverted arch, so that at the centre of the girder the depth is considerably more than at the ends. Virtually the metal is taken away from the part where it is not needed, and placed where the breakage would be certain to take place, so as to strengthen such part by economical distribution of the same weight of metal in a more scientific form (see Fig. 1). Here the dotted line shows the original straight girder, and the curved line the "fish-belly" or inverted arch.

It is not only in the length and depth of a girder that difference of form produces extra strength, but also in the breadth, or, as it is generally termed, the "section." Thus the T section, as shown in Fig. 2, can readily be either rolled in wrought iron or cast in metal, and the flange thus formed keeps the web from buckling and overcomes side thrust, besides giving a broader flat surface at the top upon which to lay joists, etc. Sometimes a second though smaller flange is made at the bottom also (see Fig. 3), upon the upper edge of which the ends of joists abut, so that their upper edges and that of the top flange are flush, or nearly so.

Sometimes, especially in bridges, the girder is formed of either one arch-shaped segment or of several segments flanged at the joints and bolted together to form one arch, butting against the springers of the piers, and sometimes cast girders are straight and level at the top flange, whilst the web is, instead of being of inverted arch-shape, latticed and pierced, the bottom flange being really an arch pure and simple, and such girders are in wide spans made in several separate segments and bolted together through flanges at their ends. Girders of wrought iron, on this principle, come under the second classification above-mentioned, as do roofs. There is one point in respect to cast-iron girders that should not be lost sight of, viz., that when necessary to strut them apart, it is very bad construction to drill holes in the web itself. The effect of a hole in the web of a girder weakens it in this way: that the forces are by it divided (as the draft in a flue is divided by a slate put edgeways across) into two directions. The weight upon the top then uses the part of the web above the hole as a fulcrum to tear the part below the hole asunder; whilst the depression or side thrust (acting downwards in this case) has only that depth of the web above the hole to resist it instead of the whole depth of the web. Thus the web is attacked in two directions by opposite forces—one tensile, tearing at the lower part, and the other at right angles as a side thrust; and it will be seen that even a small hole, by its dire consequences in thus dividing opposing forces, weakens the web by very nearly one-half, if the hole be central. The nearer the hole to either flange the less dangerous it becomes, because either the upper part of the web is greater, and therefore better able to support the thrust, and at the same time less able to act as a fulcrum, whilst the lower intact part of the web is reduced so as to be subject only to the partial tensile strain (the rest of such being neutralised by the rest of the downthrust); or, the hole being nearer to the top

flange, the upper part is less, and therefore the lower part is the greater and the better able to resist tensile strains. At the same time, whilst the fulcrum, it must be admitted, is better, yet the amount of increased cohesion below is so much greater to overcome than before, that the down-thrust loses, in antagonism with the balance or rest of the tensile strain, much of the power it would have were the hole in the centre, so that it is nearly neutralised. Still, a hole anywhere weakens the web; and what is more curious, and almost seems paradoxical, is the fact that two holes in the proper places do not weaken it so much as one in the centre of it. The reason is this: that all space between the two holes is neutral territory where the forces spend their energies in counteracting one another; it is only that below the lower hole that is subject to the undivided force of tensile strain, and that above the higher hole that has to resist the undiverted down-thrust. I am not going now into the method of ascertaining the exact value in pounds of such strains, but they can be ascertained; all I attempt is to point out their existence, and to deduce the inference that, to bolt any strut to a cast-iron girder, holes should be bored in the flanges in preference to the web. It is also evident that if a hole bored on purpose right through may so weaken a girder, that a blow-hole might exist, invisible from the sides, which would weaken it almost as much. Therefore, every girder ought to be tested up to at least two-thirds of its intended breaking strain, which is usually three times that of the maximum load it is intended to carry.

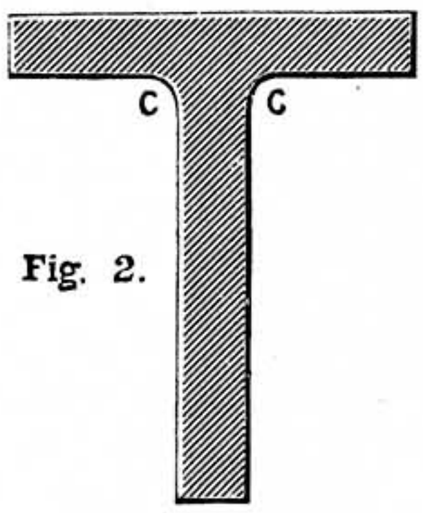


Fig. 2.

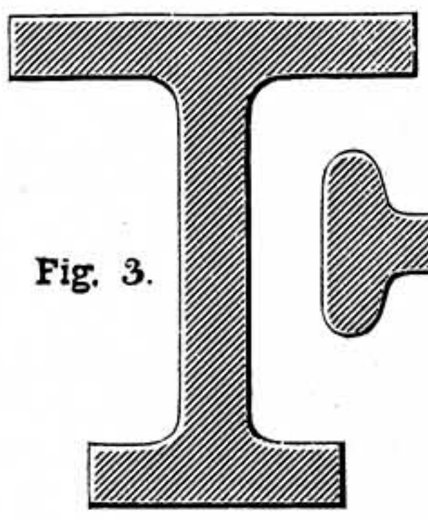


Fig. 3.

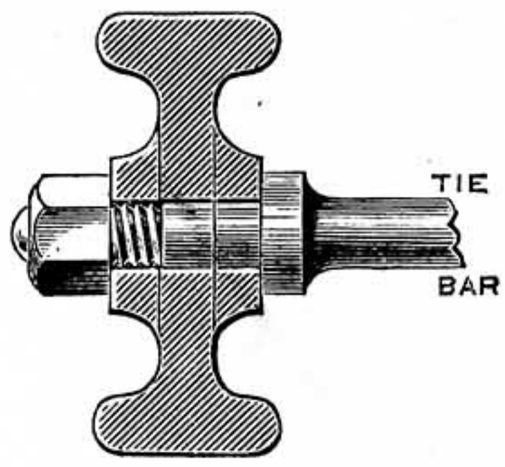


Fig. 6.

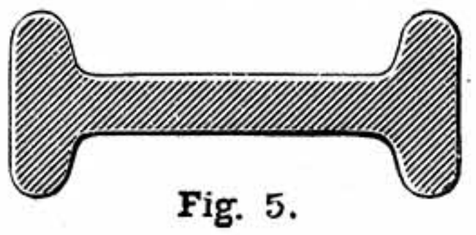


Fig. 5.

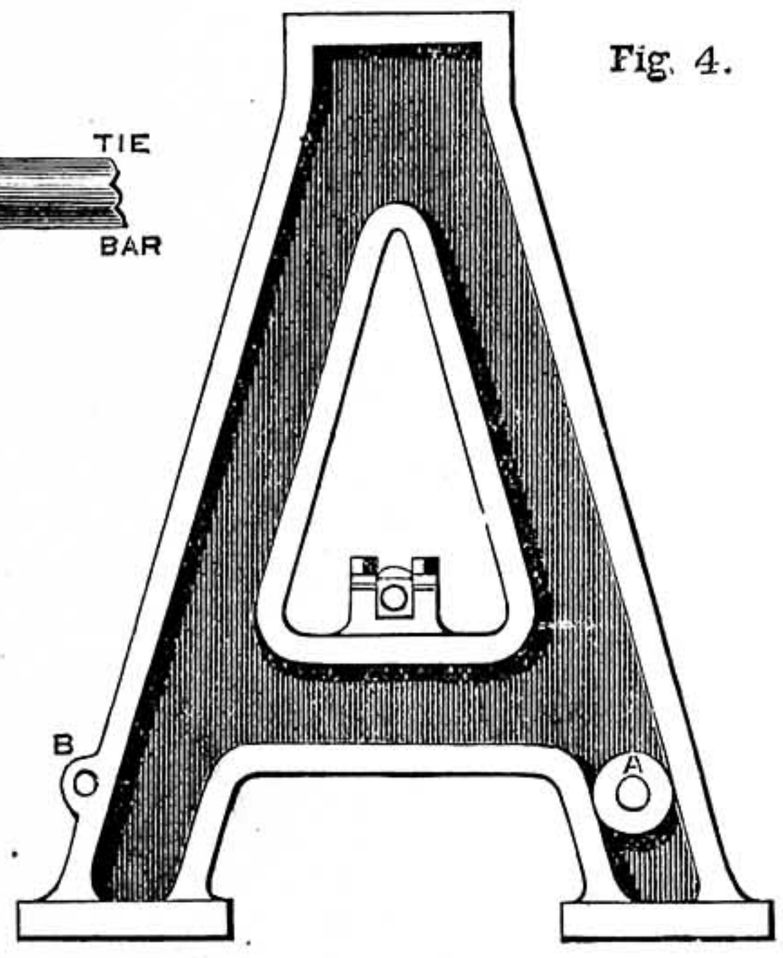


Fig. 4.

Fig. 1.

Leaving girders, let us glance at the construction of what is termed the framing of machines and tools, as to the form which gives the greatest amount of strength, and also confers the quality of rigidity—a most essential point. It ought scarcely to be necessary to point out that in order that any machine may work well it must be placed on a perfectly level foundation or floor; if this be not done, all sorts of twists and strains are created, and the journals and shafts work at very great loss through extra friction. In such machines as have horizontal beds, such as lathes, printing presses, planing machines, shaping machines, saw benches, etc., the bed should be dead level both transversely and longitudinally, and the feet it stands upon should, moreover, be placed on an equally level foundation, so that the weight be evenly distributed equally amongst all the supports. The broader the base the lower the centre of gravity will fall, and the more stability will be obtained; at the same time forces will be carried harmlessly away to the earth. The ends, therefore, of a lathe-bed are usually made in the form of a capital letter A (see Fig. 4), which not only is broad at the base, but also, by being bridged across by a rail which is both tie and strut at the same time, affords a solid bearing for a pedestal to be fixed in which the crank shaft revolves. For extra strengthening of this support it is most often made of the section of a double-flanged T girder—*i.e.*, consists of a web and flanges (see Fig. 5)—this form being strong in proportion to the weight of metal used. Upon this flange at the top is fixed the bed itself, and it is often strengthened by longitudinal wrought-iron bars. Too often these are put through the web itself, but in good construction either the web is thicknessed out by having a boss cast upon it or a lug is cast on the outer flange for this purpose (see A and B, Fig. 4), bored, and the rod turned true to fit, and screwed for a nut to force it up to a shoulder forged on the rod (see Fig. 6).

By using the "A" form of support, in which both legs are of the same length, it follows that the contracting in their cooling will be equal, and the after expansion and contraction from changes of temperature will be equal in both and act at the same angle, as also at each end, so that the level of the bed will never be disturbed either lengthways or crosswise—a most important point, as has been shown above, the true working of the tool depending upon it. In a lathe, in order to prevent the bed deflecting out of the straight line—or, rather, plane—of its upper surface, its two parts are cast fish-bellied underneath, as the slightest springiness would be fatal to the work intended to be done. In very long beds, intermediate supports are even requisite, so as to reduce the span between the supports at the two ends.

By a glance at Fig. 2, section of a T girder, at C, C, it will be seen that these angles are rounded off, not left square and sharp. The reason for this is that much extra strength with very little extra metal is gained. Were they allowed to go sharp and square at the shoulder, they would help the forces in certain directions to break the flange away from the web; but this slight rounding obviates this, and the tendency that all sharp inner angles have to go farther, like a crack or the beginning of a crack, is overcome.

In the construction of surfaced bed-plates for all tools, whether shaping machines, planing machines, printing presses or machines, surface plates, drilling machines, saw benches, and the like, where absolute rigidity is a *sine qud non*—a required necessity—one has to consider the best means of

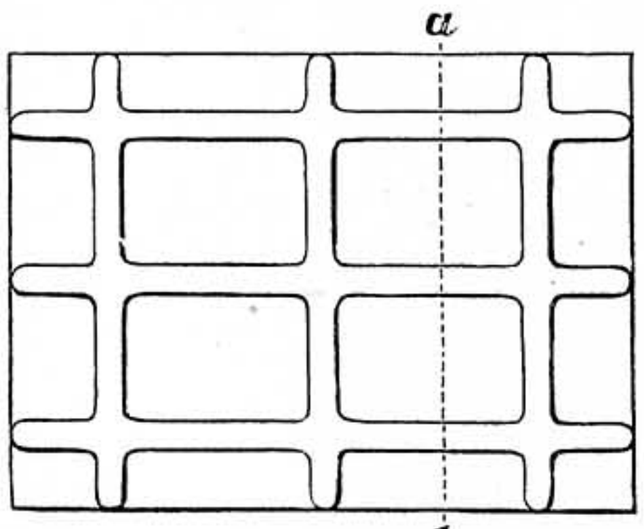


Fig. 7.

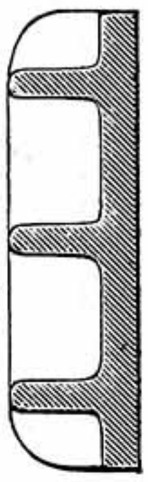


Fig. 8.

Fig. 1.—"Fish-Belly" Girder. Dotted Line shows where Metal is taken away and where added. Fig. 2.—Section of T Girder. Fig. 3.—Section of Double-Flange Girder. Fig. 4.—Elevation of Support in "A" Form. Fig. 5.—Section through the Support. Fig. 6.—Section at A, Fig. 4, showing Boss and Tie-Rod. Fig. 7.—Plan, looking up, under Parallel-Ribbed Plate. Fig. 8.—Section through *a b* in Fig. 7. Fig. 9.—Plan, looking up, under Diagonally-Ribbed Plate. Fig. 10.—Section through *a b* in Fig. 9.

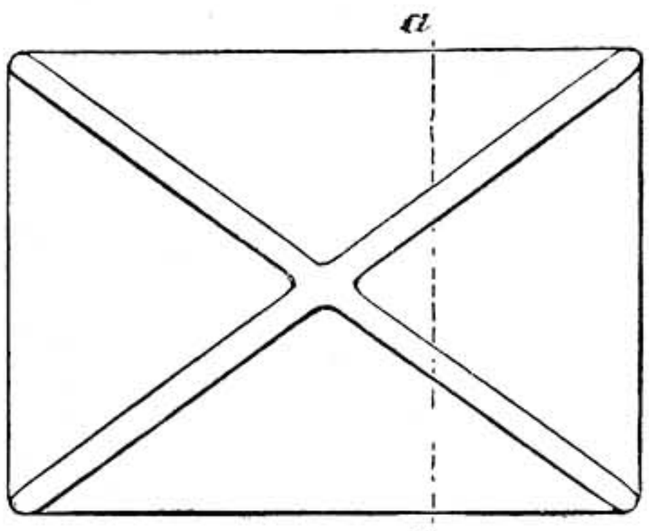


Fig. 9.


Fig. 10.

attaining this attribute by the form given to the metal, for they are almost without exception cast. Taking the square or, more often still, the oblong form of table or bed-plate—usually supported at the corners or all along the sides—experiment teaches us that diagonals drawn from each corner, crossing in the centre (and thereby giving the centre), show us the weakest point in any plate of even thickness throughout—viz., that centre which, under pressure, sustains the full brunt of all opposing forces. To avoid thickening the plate out until it shall be strong enough everywhere to enable the centre to resist the opposing forces, which would entail putting metal where it was, not only not required at all, but which would also throw in an attraction to the forces evolved, absolutely weakening the centre (by putting more weight of metal at the extremities of the plane), the principle of the fish-bellied girder is logically resorted to. In Figs. 7 and 9 (the underside, or plan, looking up) I show two forms of this application: the one, Fig. 7, showing webs or ribs running parallel to the four sides of the table intersecting at the diagonals; the other, Fig. 9, diagonal webs intersecting at the centre. A combination of these two forms with slight modifications is probably the best form of construction, especially where very great strength is required—but an illustration of it is scarcely needed. Note always that internal angles of intersection should be rounded into one another and never left sharp (see Fig. 2, C, C), as also where they die into the underside of the plate itself. Fig. 8 is a section through *a b*, Fig. 7. Fig. 10 is a section through *a b*, Fig. 9.

Having thus explained the reasons for the most usual and ordinary methods of gaining strength by form only, I must leave the rest of the subject for another paper.

EAR-RINGS AND OTHER ORNAMENTS FOR THE EAR.

PRINCIPALLY WITH REFERENCE TO THEIR MODES OF ATTACHMENT.

BY H. S. GOLDSMITH.

JOINT HOOKS — EAR-STUDS — EAR-RINGS FOR UNPIERCED EARS.

JOINT HOOKS—RULES FOR JOINT HOOKS—STOPS—PATENT SPRING EAR-RING JOINT—FRENCH MODE OF FIXING EAR-TOP—EAR-STUDS—MODES OF RETAINING EAR-STUDS—SPRING PIECES—AMERICAN SPRING PIECE—GERMAN HOOK—DETAILS OF GERMAN HOOK—FASTENINGS AND MODES OF ATTACHMENT FOR UNPIERCED EARS.

Joint Hooks.—Joint hooks, such as Fig. 18, A, B, were formerly used here in England to a much greater extent; in fact, most of the jewellery made more than forty years ago will be found to have this class of fastening, and even at the present time the French use it a great deal. We find, whenever we examine their work, that the hooks are of a proper shape, and in addition, they have made the fastening into a nicely-formed lip piece, which acts as a guide to lead the wire into the hole, whose edge retains the hook in its place. It is sketched in Fig. 18, B.

Just a word about the proper shape spoken of above. This hook is governed by the same rules as the ear-wire, and *must* be brought well forward if the work is to hang properly.

It is because these are generally bought ready made, and are put on to the work in the shape they then are, that we so often see English-made collet ear-rings hanging down like Fig. 18, C, instead of like Fig. 18, A and B. These last two *could* not hang very much out, while the other one is sure not to hang properly for the whole of its natural life.

Some of this class of fastening (now mostly seen in museums and collections) have the hook and its catch-piece straight up and down, like Fig. 19, A and B, and yet there is nothing wrong with them when in the ear, for the tilting forward is prevented by some arrangement or stop. These stops are generally small, like Fig. 19, A and B; but now and then we meet with a wire mount, devised to keep the ear-top in its place. The arrangement is large enough to rest against the firm cartilage of the ear. The pair sketched here, which are really rather larger than the diagram shows, point out very unmistakably this way of keeping the ear-top in its place, and that is why both right and left are shown in both back and side views.

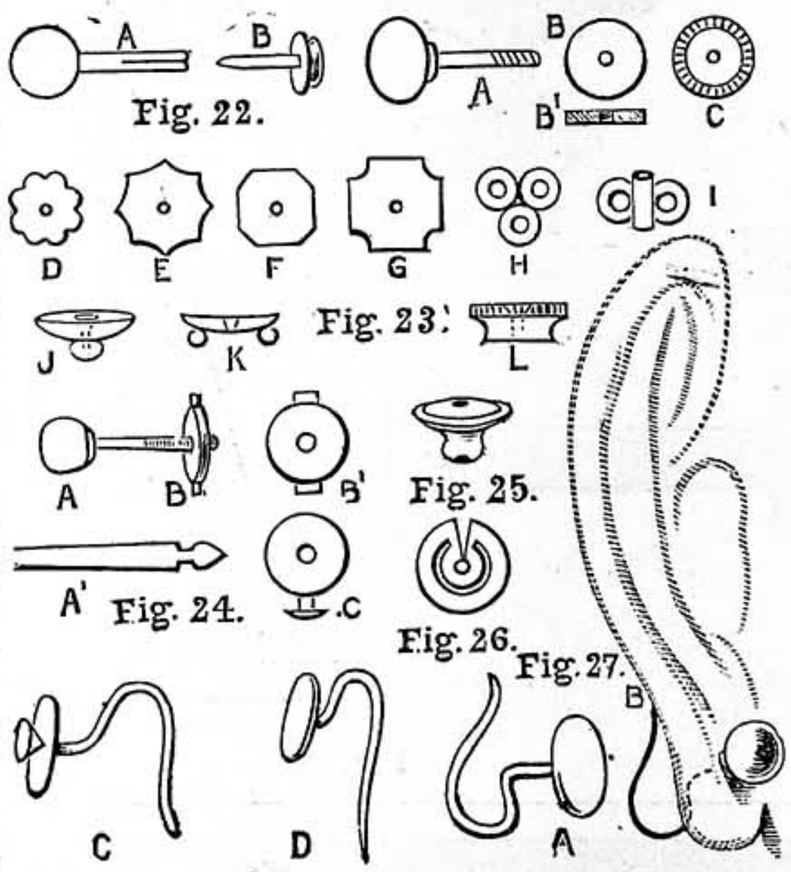


Fig. 22.

Fig. 23.

Fig. 25.

Fig. 24.

Fig. 26.

Fig. 27.

Fig. 22.—Ear-Stud Split Tube (A) and Plug Fastening (B).
Fig. 23.—A, Ear-Stud with end of Ear-Wire as a Screw; B, C, D, E, F, G, H, Different forms of Nuts for same: B' gives the average thickness; I, J, K, L, Other and deeper forms of Nuts.
Fig. 24.—A, B, Side View of Spring Ear-Stud when fastened; B', End View or Plan of Spring Back; C, Plan of another Spring Back.
Fig. 25.—New Patent Spring or Magic Fastening to fasten on to Plain Wire.
Fig. 26.—Form of simple Spring Back to fasten on Plain Wire, made from a piece of flat Plate pierced as Diagram.
Fig. 27.—German Hooks—A, Correct Form; B, Correct Position in the Ear; C and D, Incorrect Forms of same.

If ends ever do justify the means taken to attain them, then these clumsy ways may be justified, for they certainly succeed in keeping the front of the ear-top *to* the front, and that is one of our chief ends that we must always keep in view and attain, somehow or other. But, after all, would it not be much easier to have the wire of a proper curve whenever we can, so as to bring it into conformity with the remainder of our work, which we take pains to make neat and nice? Not only would it be a saving of trouble, but it would be the best way, because of its suitability and of its simplicity; and in our trade, as in all others, good work shows no effect of labour or worry, but simply seems to have grown like it is, and then it possesses some of the qualities of beauty as defined by Ralph Waldo Emerson, who writes:—"We ascribe beauty to that which is simple, which has no superfluous parts, which exactly answers its end, which stands related to all things, which is the means of many extremes." And in the same essay on Beauty he quotes Michael Angelo: "It (beauty) is a purgation of superfluities."

There is no doubt that stop pieces are necessary under some conditions; but unless such conditions obtain, let us never use ugly arrangements like these except when other and neater methods are not available. Similar to the foregoing, but acting differently, are those sketched in Fig. 20 and Fig. 21.

Fig. 20 is the patent spring ear-ring joint, of which Messrs. Calipé, Dettmar, & Co., 19, Poland Street, London, W., are the sole agents.

The diagrams Fig. 20, A and B, are copied from their handbill; Fig. 20, B, is the form in which they are sold ready for soldering on, Fig. 20, A, being the complete article, the limits of the spring action being shown by the dotted lines. The principle on which this is made seems a good one, for the hook is a fixture, being hard-soldered on, thereby lessening the chance of losing the ornament even if the spring failed to act. The movable or spring piece has no strain on it, and that is, of course, an advantage in favour of security.

Another way of fixing an ear-top is shown in Fig. 21. It fastens in this way:—First the straight piece that passes through the ear is soldered on in a slightly downward direction, and is flattened and notched as sketched. Then the jointed piece is pierced with an oval hole to allow the notched end to pass through until it clips down, and thus it is secured. For both of these we are indebted to the French.

Ear-Studs.—Ear-studs are those ornaments which rest on the lobe of the ear, for I have for my present purpose defined ear-rings as the ornaments that hang below it.

To achieve the proper position of this class it is a necessity that the piece of tube or wire that actually rests in the thickness of the lobe should be straight, and should have the ornament fixed on its end, just the same as a brass-headed picture nail has the head fixed on.

This straight piece is the real difference between ear-studs and ear-rings, and in the diagrams, be they screws, pegs, or the German ear-wire, we find the same straight piece; and in the latter it will help us to get the right shape if it can only be understood that in the thickness of the lobe of the ear the straight piece should go, for it is not a hook to be used as we use an ordinary ear-ring hook, as you will see when you get to the details of this a little further on.

Generally, these ear-studs are retained on the ear by one of three methods—first, by pegs, like Fig. 22; secondly, by screws and nuts, Fig. 23, A to L; thirdly, by a spring piece to clasp the wire, like Fig. 25, or to fasten on the end of it, like Fig. 24.

The mode of fastening by a peg, or plug, can be judged from Fig. 22, A and B. It is merely a thin, unsoldered, or split tube for the front piece, which passes through the ear from front to back, and when in position the back plate B (which has a peg soldered on it) is inserted, and, if properly made, holds well. The only two things to see to are—first, that the split chenier is made of rather thin (say size 2 Shakespeare gauge), tough gold, and that the peg fits rather tight.

Those fastened with screws are now the most often made, and after the fashion of Fig. 23, A to L. The other way of screwing the back into the chenier seems to have been dropped entirely. If it were made, the two pieces would be just like Fig. 22 in appearance, but then the chenier would be soldered and tapped to take the peg, which would also be given a screw thread so as to screw in.

Fig. 23 shows that the wire which passes through the ear is screwed at the end, and on this screwed part a nut is made to run. Here are a few shapes that I have taken note of, some drawn in plan, some as seen from the side. They are all in use and all act pretty well, but the best are those which have a good thickness for the screw, like Fig. 23, I, J, K, L, for here we not only get a steady-running nut, and one that will wear well, but we have the chance of bevelling the hole on its top edge, and so be able to lead the end of the screw more easily into its place. Ever such a little bevel is better than none, for we know that ladies have to fumble about behind their ears to get these nuts on.

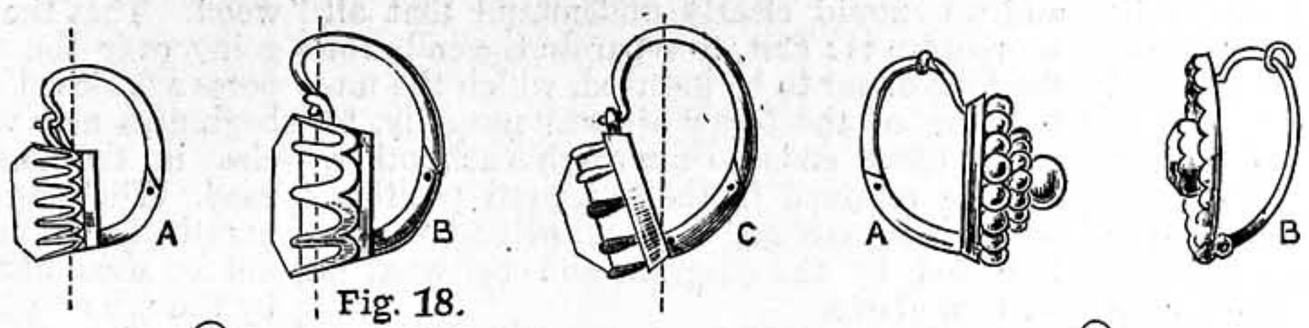


Fig. 18.

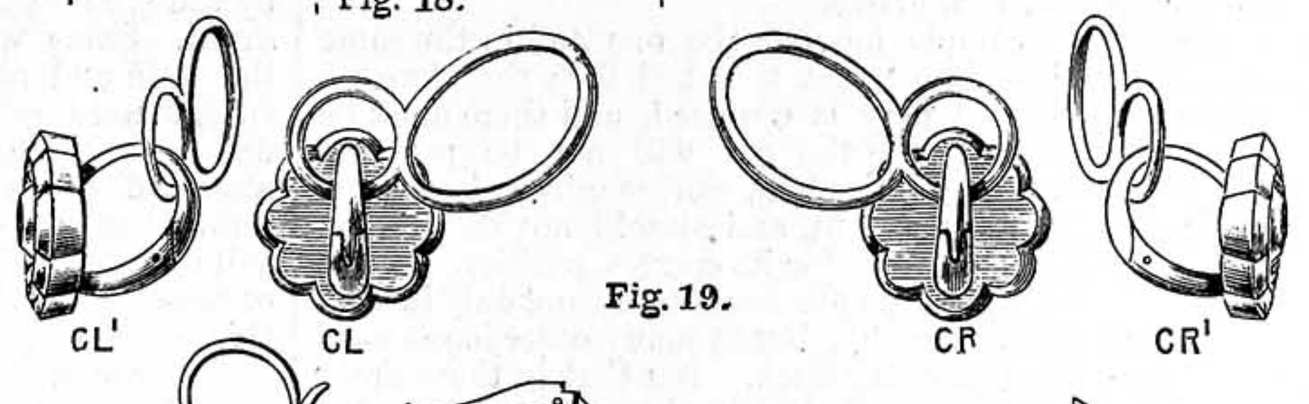


Fig. 19.

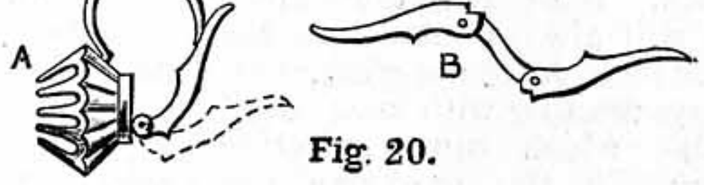


Fig. 20.

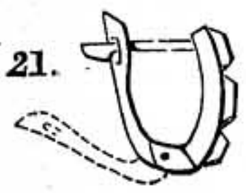


Fig. 21.

Fig. 18.—A and B, Good forms of Joint Hooks, the dotted straight line showing the proper relative positions of highest part of Ear-Wire and the Ear-Ring itself; C, Ordinary and bad shape, which hangs as shown.

Fig. 19.—A, B, Joint Hooks with Stops to prevent the Ear-Ring hanging like Fig. 18, C—A, Mostly used in Seed Pearl Work; B, in Antique Paste Work; C L, Back view of Ear-Ring for Left Ear; C L', View of same from the outside; C R, Back view of right Ear-Ring; C R', Side view of same.

Fig. 20.—A, French Spring Fastening: limit of action shown by dotted lines; B, Form as made and sold, ready for dividing and soldering on.

Fig. 21.—Another French form of jointed Ear-Wire.

Spring pieces (Fig. 24, A, B, and C), that clip the bulb-like end of the wire (Fig. 24, A), do not seem to have given universal satisfaction, for between the two evils of a clumsy wire that will give a good grip to the spring, and a neat wire that will pass through the ear nicely, but is too thin to give good hold, no means seem yet to be devised, unless Fig. 25 should be the one. Both (Fig. 24, A, B, and C) act by pressing the thumb-piece in when the wire is to be released, and they both fasten automatically when the beaded end of the wire is placed in the hole made to receive it.

Fig. 25, of which better things are expected, is an American invention, and Messrs. Calipé, Dettmar, & Co., of Poland Street, London, W., are the patentees here.

The wire needs no preparation or alteration; it simply must be straight and smooth. Then the fastener is made so that it will slide easily up the wire, and will remain and hold just where it is placed, until the bottom bead is caught hold of; then it comes away easily enough. This is a great advantage if the wear and tear of use do not find out defects. There have been a few attempts to use the plain wire and something to grip it. Fig. 26 shows one, but if successful ones have been previously made they have not come under the notice of the writer.

The description of the interior of Fig. 24, B and C, will be given in a paper yet to be written on spring fastenings employed in jewellery.

The so-called German hook, Fig 27, is one of the best, if not the very best, arrangements we have for an ear-stud. It has no loose nut or spring to get lost, and is formed from a simple piece of wire, usually bent as sketched, Fig. 27, A, and worn as sketched in Fig. 27, B.

Now, to make this properly, there are about four things to remember, apart from the quality of the wire, which must not be too soft.

First. The part that rests *in* the ear must be straight, and at right angles with the front of the stud.

Second. This part must be just a shade longer than the average thickness of an ear, not much longer, and certainly not shorter.

Third. As to the shape of the whole wire, it must be that of a curve, which will permit of easy insertion and withdrawal, subject to the

Fourth detail, which is that the very end has to be in line with the front of the bottom loop, so as to steady itself against the back of the ear.

The simplest form is shown correctly bent and inserted in Fig. 27, A and B. These two should be contrasted with C and D, both of which are wrong, and both are prevalent forms of this hook.

Fig. 27, C, is turned wrong way about, to start with, and if worn as an ordinary ear-wire, the front would hang face downwards; if worn in the proper way, the end is much too far away and will not touch the ear, as it should do.

Fig. 27, D, is but a bad ear-ring hook, and possesses all the defects of that class—which has already been spoken of—and possesses none of the advantages of the German hook. This form of hook, or something that is intended for it, is much used, for we find it attached to the costly diamond or pearl, as well as to the faceted steel and common silver so much affected by the linen-draper jewellers.

Methods of Attaching Ear-rings to Unpierced Ears.—With an account of fastenings for ear-rings for ears not pierced, these papers on ear-rings and their fastenings will be brought to a close; for the present, at any rate. And although the writer hopes he has been able to give a little information on the subject, he is by no means confident that he has written a perfect and complete paper, his own opinion being that many good methods have not been spoken of; but the few he has dealt with are those in every-day use, and, after all, they are likely to be the most useful to the junior members of the trade generally.

Hitherto we have attached the ornament by means of a wire of some shape or other, which passed through a hole in the lobe of the ear. Now we have to find some other way, for that road, we will suppose, is entirely blocked for us. And the wire, which was of necessity continuous when passing through the ear, now must be divided at the top where the ear goes, and the ends so obtained must be made to catch the ear, and hold the ear in between them. Nipping the ear is really what is done, but don't tell the ladies that; say the ear-ring is secured, clasped, clipped, sprung on or held by gentle but yet firm measures. Say anything that may seem most suitable, so that you do not convey to their mind the idea of possible pain. For the fastenings should be quite painless, as the blunted or enlarged ends give a gentle pressure, and these are by the screw arrangement so easily and exactly regulated, until just sufficient hold is obtained for all reasonable purposes. The writer's definition of "reasonable purpose" is, that there is plenty of grip to hold the ear-ring *itself*. These sort of fastenings can all be pulled off, but they are safe enough to carry the weight of the ear-rings, and the pressure of an ounce or two besides, and that ought to be enough for us.

If greater security than this is required, then the

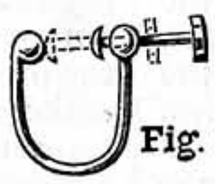


Fig. 28.

Fig. 29.

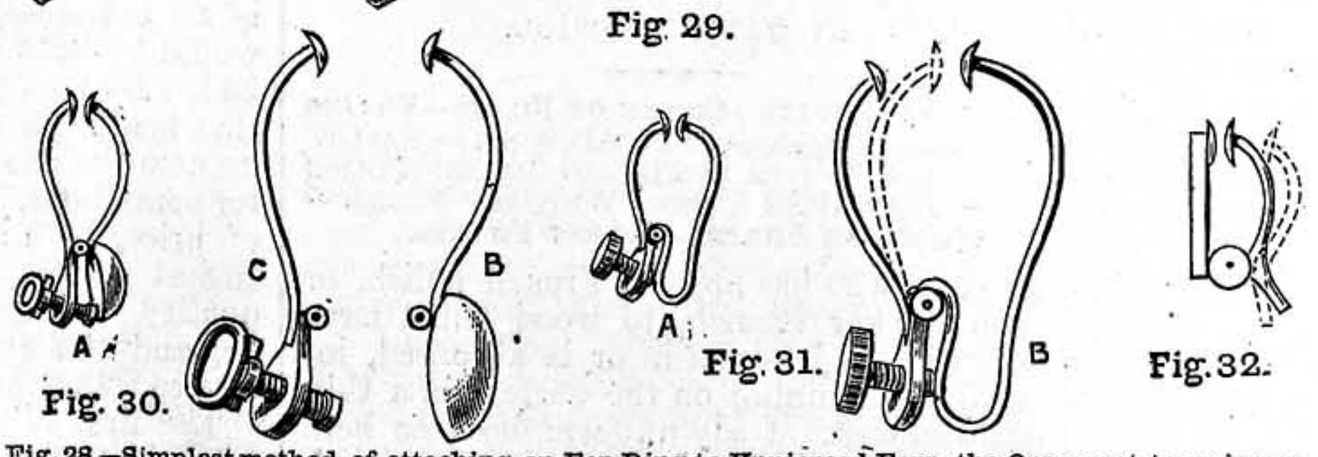


Fig. 30.

Fig. 31.

Fig. 32.

Fig. 28.—Simplest method of attaching an Ear-Ring to Unpierced Ears, the Ornament to swing or be soldered on to the Front.

Fig. 29.—A, Ordinary size and general appearance of Ear-Ring fastened from the Front; B, Enlarged Front of A, to act as handle to the Screw fixed to it; C, Shows Socket for Screw to work in in Section, and also where the Wire and part of the Joint is soldered; C', Back View of same, showing position of Socket-Joint and Wire; also showing how it can be pierced when the Stone is to be set à jour or transparent; D, Back Wire, with the other part of Joint to hinge to Fig. 28, C. This is the piece that actually nips the Ear, for the Screw acting on its lower end will regulate the position of the upper end.

Fig. 30.—A, General appearance and size of Ear-Ring fastened from the Back; B, Enlarged Front of same, with Joint and Ear-Wire soldered in Position; C, Back Wire and Mount which hinges on to B. This carries the Screw which governs the distance between the ends at the top; it also shows a small Collar or Stop soldered on to prevent loss of Screw.

Fig. 31.—A, Wire Mount for attaching a Drop, actual size; B, The same enlarged, shown open. By the aid of dotted lines it is also shown closed, the principle on which this acts being the same as Figs. 28 and 29.

Fig. 32.—Spring Fastening, acting as shown by the dotted lines: the front straight piece is left for the attachment of an Ornament.

pressure brought to bear will have to be much increased, or the ear must be pierced, and one or other of the previously described methods should be used.

Four out of the five diagrams have a screw for the acting power, and this is preferred for the reasons given above. If a spring is used in any other form, then there comes in the difficulty of always keeping it at a proper pressure, for if it is too great it will hurt the wearer, and if too little, then the whole affair drops off. These remarks apply generally to fastenings whose security depends on the proper action of a spring; not to the one sketched in particular, for that is a good form to use, if we elect to use springs at all.

The method common to all has been given above, viz., nipping the ear in between two ends; and, for the purpose of removal or attachment, one end is made movable either by a spring or a screw.

The simplest is given in Fig. 28; it explains its action clearly by the dotted lines; it is but a U-shape wire. To one end is attached a nut, in which a screw works, and the end of the screw which is blunted is made to approach or recede from the other end (also blunted) of the U-shape wire by simply rotating the screw, whose other end is enlarged, for the purpose of giving a better hold to the fingers. This is but a form of ear-ring wire, and to it an ornament has to be attached, or swing, before it is an ear-ring, properly so-called.

In the next two, Fig. 29, A, and Fig. 30, A, there is a greater resemblance to the ordinary wire, and they can be formed into ornamental ear-tops as ear-tops are usually made.

The desired result in these wires is obtained in a somewhat different way, and the next three diagrams, Figs. 29, 30, and 31, show that one part of the wire is *fixed* to the front of the ear-top, while the other (back) part of the wire is jointed to it in such a way that enough opening is obtained between the ends to let the ear pass, and so that a screw, acting on the lower part of the same jointed wire, will cause the upper end to approach the end of the fixed front wire. And it is in between these ends that the ear is nipped. After all, the diagrams, and the descriptions on them, will doubtless do more in the way of explanation than several paragraphs.

Fig. 29, A, Fig. 30 A, Fig. 31, A, are all about the size they should be made; but as it was impossible to in any way show the details in drawings of that size, the whole of the parts have been enlarged.

The reader will not require to be told that the coronet setting, with its open or skeleton back, of Fig. 29, and the plain dome of Fig. 30, are not at all necessary parts of these fastenings, for there is no reason at all against the employment of the coronet (without a screw, of course), as the front of Fig. 30; or on the other hand, if we should require a plain gold front to Fig. 29 in place of the coronet setting, we can use a plain gold front as a thumb-screw just as well. Or we could have a smaller centre on the dome, and make that act as the means to turn the screw. The principle upon which all these act is such a simple one that there should not be the slightest difficulty in adapting one or other of these to our work, be it ever so much unlike the few that are given here.

Fig. 31 is but an alternative form of wire to Fig. 28, and is here given principally for the purpose of showing the action which is common to the two previous ones.

This action is of the simplest description, and we should clearly understand that all we require is: first, to separate the ends for the lobe of ear to be inserted, which the untwisting of the screw allows; secondly, to cause these ends to approach each other, and be retained in the approved position, and this is managed as is clearly shown, it is hoped, by the diagram and by what is written above.

Simply moving the one end in the same line is all that is asked for; therefore, no lateral play is required, and there must be none, else the ear will not be properly clasped. In plain, workmanlike phrase, the joint should fit, and should not depend on the joint pin for its correct position, as too many joints are made to do, not only in such things as this, but in many other joints used in every-day work. But that is the refrain of a song that will always come into the writer's head, for he is in the workshop all day, and is always meeting with such small annoying details, which cause irritating delays, for generally the workman can do them all right at a second attempt, and should do them at a first, but he does not.

When we have room enough, a small collar or washer should be soldered on the top of the screw, for the purpose of preventing its withdrawal from the screw socket in which it works, for then it cannot be lost. It is shown in Fig. 30, C, and need be very small, for it has but to just *not* go through the female screw.

In Fig. 29, we use the front as a handle to turn the screw with, but in Figs. 30 and 31 we have handles expressly made. Now, of these, there are but two kinds, namely, fixed and jointed. Fig. 30 gives the simplest form of jointed, and Fig. 31 a simple specimen of the fixed form. Something must be drawn to show a complete article, so these two are selected, not that they should be always followed, for they can easily be made more ornamental; and if they are, see that the form selected combines neatness with unlikeliness of catching the lace or other material that ladies wear, and that, above all, the handle should be easily grasped when the screw has to be turned.

Fig. 32 is a spring fastening, made by the firm previously spoken of (Calipé, Dettmar, and Co.). The spring is contained in the hinge, and the limit of its action is shown in the diagram. This more nearly approaches an ear-stud in appearance, for the front straight bar is intended to have an ornament fixed on it, and is made of hollow wire for that purpose.

FILLERS IN FRENCH POLISHING.

BY DAVID DENNING.

OBJECT OF FILLERS—CHOICE OF FILLER—FILLING WITH POLISH — PUMICE-POWDER — TALLOW FILLER—WATER IN FILLER—OIL AND POLISH — TURPENTINE AND WHITING FILLER — COLOURING FILLERS—PATENT FILLERS.

ANYONE who has applied French polish, or even thicker varnish, to wood must have noticed that it sinks in or is absorbed, instead of remaining on the surface in a thin uniform coat. I say uniform, because here and there it will be observed that the polish or varnish has given more gloss than elsewhere. Where the gloss is brightest the varnish has sunk least. Those who know why size is used in painting or coarse varnishing will understand me when I say that fillers are used by French polishers for much the same reason—viz., to prevent immoderate absorption of the polish by the wood. That the grain may be filled up by going over the wood with polish till the pores are closed cannot be denied, and some beginners may want to know why anything else in the nature of a filler should be used. The reason is simply that the comparatively valuable French polish need not be used instead of a cheaper material, by the use of which, moreover, time is also saved. Some woods, being more open in the grain and porous than others, stand in special need of a filler, while with some fine close-grained woods fillers may be almost dispensed with. I do not, however, know that they—or rather, I should say, a suitable one—can do any harm to any kind of wood, so that, however fine the grain of this may be, there can be no disadvantage in going over it with a filler preparatory to polishing. At the worst, it may be a slight waste of time, and there are polishers who occasionally dispense with any filler except a preliminary rub over with polish when working on a fine wood such as olive, which those who have used it know is both close and hard. As in every other operation, in polishing opinions differ as to the best way of attaining the desired result—viz., the production of a thin glossy film of shellac, which shall not be liable to grow dull unreasonably soon. Some of the processes and methods of manipulation savour strongly of empiricism, so that, without advising the novice to use some particular filler with some particular kind of wood, and none at all with others, it will be more to his advantage to recommend him to use a filler whenever he thinks that by so doing he can save time and material. It may, however, be said that the woods ordinarily used in furniture—ash, oak, mahogany, walnut, etc.—certainly should have the grain filled. After what has been said, the reason for this is obvious, for they are all of comparatively open grain, ash and oak especially being coarse.

Now, when so many different kinds of fillers are used, and each has its advocates, I do not consider it would be fair to readers simply to mention the one I prefer, and claim for it all good qualities, while denying them to others which I may not so much approve of. It will be much better to name the principal fillers used in the trade, and make a few remarks about each, so that learners can experiment with them, and perhaps finally fix on that which may seem to suit them best. In any case, they will find them all reliable, for good work is turned out by polishers with any of them. Naturally, the man who has confined himself principally to one filler is more at home with it than with others; but, unless he is an extremely prejudiced individual, he would hesitate to say that the others are all bad. He uses the one which suits him best, that is all. Mind, it is not even said that he uses the one which he thinks is the best; for sometimes, owing to the great question of price, he may be impelled to use the easiest and quickest, irrespective of its quality. This, perhaps, is not as it should be, and the amateur, at any rate, will be free to follow his own fancy.

The first filler that will occur to one is varnish, or extra thick polish, rubbed into the wood till the pores are full. This is a clean and natural filler, but unfortunately it is a troublesome one, and the results are little, if any, better than those arrived at by a cheaper and more expeditious method. It is, however, easy to conceive that occasionally it may be an advantage to proceed with this, though, if he is doing it for trade

purposes and at trade prices, he will find that on ordinary furniture he is "out" by employing it. Briefly stated, the process is simply rubbing in polish or thin varnish, and when it is dry smoothing down with the finest glass-paper. The application of polish and paper must alternate till the former no longer sinks, and this will depend altogether on the nature of the wood and the material used. With fine, close-grained, hard wood, the process will be much more expeditious than with a coarse open one, such as ash.

A modification of this direct filling with polish is effected by the use of fine pumice-powder, which not only renders the process quicker, but better. I believe this method is more practised in France than in this country, where, though it is sometimes employed by the trade, it has not been anything like generally adopted. Apart from the time required with it, it is doubtful if any better means of filling the grain has been discovered, for it is both clean and free from greasiness. Those who wish to try it may proceed as follows, adopting such modifications as may seem advisable. As before, polish is the basis of the filler, the pumice-powder being useful not only in assisting to fill by getting into the pores of the wood, but in rubbing down inequalities of the polish. The powder is kept in a muslin bag, and lightly sprinkled on the wood, which is then gone over with an ordinary polish rubber fairly charged with polish. Only a small quantity of the pumice-powder should be used at a time, as if in excess, the work suffers. Instead of sprinkling the powder on the wood, some polishers prefer to put it on the sole of the rubber. The work will require papering down afterwards, whichever method be adopted, but perhaps not to the same extent as when the pumice-powder has not been used.

A filler that is very much used is composed of Russian tallow, mixed with either plaster of Paris or whiting; and I fear the chief thing that can be said in its favour is that it is a quick process, and therefore allows of polishing being done at a comparatively small cost for labour. Tallow is not, however, a nice material to work with, for reasons which will be readily understood. Apart from its unpleasantness, tallow is apt to increase the tendency of the polished wood to sweat, from the grease breaking through the film of lac. In saying this, I am aware that I am laying myself open to contradiction from many experienced French polishers who use no other filler than the one now referred to; but there can be no doubt that oil or grease, in connection with polish, can, at the best, only be regarded as a necessary evil. As there are fillers in which there is no grease, it is just as well to use them, even if, to avoid discussion, it is admitted that a "tallow filler" is not prejudicial to good work or to durability.

The tallow and plaster are made into a stiffish paste and well rubbed into the wood, from which any excess must be wiped off; and, to avoid repetition, the same remark applies also to the following fillers. Any that set hard must be wiped off while the filling is still soft.

But it may be asked whether, if grease is objectionable, water cannot be used instead, to render the plaster or whiting soft and pasty? It may be, and often is; but then, one objection is that the water is apt to raise the grain of the wood, which I suppose all readers know means making it rough. Of course, the surface can be rubbed down smooth with fine glass-paper, but then, tallow does not raise the wood at all. Still, whiting, or plaster of Paris and water, do not form by any means a bad filler, and, personally, I much prefer this mixture to any in which tallow or grease is found.

As tallow is unpleasant stuff, many polishers discard it in favour of oil (raw linseed), with some polish mixed with it. By the use of this with whiting, the objection to water is overcome, but it is not altogether a suitable filler for the novice. If he errs by having too much oil, the sweating already alluded to is apt to take place at no distant day; while if he uses too much polish in the mixture, the filling is apt to remain on the surface instead of being forced into the pores of the wood. It is, however, unfortunately not possible to give proportions of oil and polish which shall be suitable on all occasions, so that the polisher must use his own discretion. If he does not feel up to this exertion, he may as well leave this filler alone till he has acquired some experience, but in capable hands it is a really good one.

For a good general filler—in fact, the one which I consider the best—I do not know of one to beat whiting and turpentine. It is both clean and economical, does not raise the grain as when water is used, and it contains no grease. Those who have followed me will thus see that it is not open to the objections which are urged against other fillers, and, from personal experience, I can recommend it to all and sundry. I can certainly say, if they do not succeed with it, that the fault does not lie with the filler, and that they are not likely to succeed with any other. Another advantage it possesses over plaster of Paris and water is that it does not harden so quickly—some, indeed, urge that it does not harden sufficiently—but this objection cannot be treated as a serious one, or founded on practical experience. Let the mixture be in the form of a stiffish paste, but still thin enough to be worked into the wood, and no difficulty ought to occur.

It is advisable, if not absolutely necessary, that this, as well as other white fillers, should be tinted to correspond to some extent with the colour of the wood on which they are used. The following colours will be some guide to the novice, and it may be remarked that the polisher will seldom have occasion to use any other in his fillers: for mahogany, rose-pink; walnut, or any brown wood, such as stained oak, Vandyke brown; and for ebonised work, gas-black, are as good as any. Light woods, of course, may have the filler applied *au naturel;* but if it should be deemed advisable to tint it, there will be no difficulty in doing so, as an exact match is not necessary.

In addition to these, the ordinary fillers of the British workshop, there are several patent and American fillers which may be used by those who like them; but I do not think that any of them have ever come into general use, or are likely to supersede the commoner varieties. A common complaint among polishers against them is that they are more expensive than these, without having sufficient compensating advantages. I do not, however, wish to prejudice readers of WORK against any form of filler that may be introduced to their notice; but, at the same time, I cannot recommend any of those I have tried as being much, if at all, superior, for general purposes, to a good home-made filler, properly used. I do not affirm they are worse, and they may be as good, or even better; but I must say that I am inclined to be sceptical whenever I see the great advantages which are sometimes claimed for new preparations—a scepticism which may possibly be attributed to prejudice. Well, perhaps it may be, but at any rate it is a prejudice which I am quite willing to have removed whenever I can find a filler, clean, thorough, expeditious, and as cheap as any of those I have named. If any *professional* French polisher uses such a one, and can speak from his own experience of it for two or three years, perhaps he will kindly name it for the benefit of readers of WORK. A mere trial or experiment is not sufficient, hence my reference in the last sentence to professional polishers.

THE SAFETY BICYCLE: ITS PRACTICAL CONSTRUCTION, ETC.

BY A. S. P.

DRAWING-BOARD—LINE DIAGRAM—RAKE OF STEERING—L-PIN—STEERING BARREL AND HANDLE-BAR ADJUSTMENT—BOTTOM BRACKET—TUBES AND MUD-GUARDS—STEEL CASTINGS—PATTERNS—CENTRE STEERING—DETAILS OF BOTTOM BRACKET—ADJUSTMENT SCREWS—DETAILS OF STEERING BARREL—DETAILS OF L-PIN SOCKET—MATERIALS, HUBS, AND FITTINGS.

BEFORE beginning the construction of our safety bicycle, we must provide ourselves with the materials, and our first step in practical progress is to make a full-size drawing of the machine, either on a large sheet of paper mounted on a board, or on the board itself, which is on the whole preferable.

The board must not be less than 4 ft. long and 3 ft. 6 in. broad. It should be planed clean and smooth, and have the near edge made quite straight. Proceed by laying down two 30 in. circles, 12 in. apart. Of course, only a part of each circle will be on the board, it being too short to hold the whole, but it is sufficient if the hubs are shown on the board. In the absence of beam compasses, use a thin wood lath. Make two holes in the lath, 15 in. apart—one hole for a bradawl or a nail, the other to let through the point of a pencil. Make two marks for the bradawl on the board, 15 in. from the near edge—which we will call the ground-line—and 42 in. apart, and from these points draw the two circles, which will each touch the edge of the board, or ground-line.

Now, with the line diagram before you which accompanies the second paper of this series, proceed to lay down the various lines as therein shown. In that diagram (Fig. 2, p. 100) we have A, A, the two wheels; call A, on the left, the steering, or front wheel. From C, in its centre, let fall the vertical line to D. Next draw a line parallel to the ground-line, and 12 in. above it, joining the two circles, as shown by a dotted line in the diagram. Divide the dotted line into four equal parts, and at 3 place the centre of the bottom bracket or pedal shaft, marked B on the diagram. From B raise a vertical line, which will touch the nose of the saddle on the one hand, and the rear end of the handles on the other. Now, in order to find the rake of the front steering tube, you draw the line E F from the centre of the rear circle or wheel to a point 4 in. above the periphery of the front wheel. Now, from C to O draw a line 3 in. long; then from D, on the ground-line, mark off towards H $4\frac{1}{2}$ in.; from H draw line H G through O. This will be the centre line of rake. For the machine with curved fork, the curve of the fork ending at C C, 3 in. in advance of O, this line, if correctly drawn, will be found to form a right angle

with the line E F. Now, to find the true position of the L-pin socket, draw a line to the right of, parallel to and 3 in. from, the line rising from B. Mark off on this line the top of the socket, 30 in. from the ground-line. The complete socket, as shown in Fig. 1 (p. 33), may now be drawn, showing the attachments for the various tubes.

Now, turning to the fore-part of the machine, we have the barrel J (Fig. 1). This is drawn on the line G H; it is 6 in. long and $1\frac{3}{8}$ in. thick in the body. The position of the lower end of the barrel is 2 in. above the periphery of the wheel. The barrel should be drawn in section, showing the 1 in. tube passing up from the fork crown to the clamping ring. The full length of this inch tube, G, is 11 in. The handle-bar adjustment tube, K, which is 8 in. long and $\frac{7}{8}$ in. diameter, may also be shown in section. On the barrel, J, should be drawn the two sockets for the tubes B and C, having their centres on the lines P, P, in Fig. 2. The socket for tube B is $1\frac{1}{8}$ in. inside, and that for tube C $\frac{5}{8}$ in. inside measure. The front fork should now be drawn in, with its mud-guard and stays; also the spoon of the brake, with the hingeing pin which passes through the sides of the fork, 1 in. above the rubber of the wheel.

The bottom bracket has now to be indicated. In our design it is a fork having the chain wheel inside, and the two bearings close to the cranks, which makes by far the best bottom bracket. Further on, details of this fork will be given; meantime, it is only necessary, in preparing the full-size drawing, to show the side of the bracket fork, as in Fig. 1, with a knuckle-joint ball-bearing fitted in. The socket for the lower end of tube B is 4 in. above the centre of the pedal shaft; from this point the bent tube, D, is drawn, from the top of the bracket to the L-pin stamping; M, radius from the centre of wheel at F. The small forked stampings that carry the rear wheel axle usually have tenons (not sockets) that enter the tubes. When this part is put down in the drawing, the lengths of the various tubes may be readily found, allowing 1 in. of tube to enter all sockets. The pair of tubes, E, have a cross-piece on their forward ends for bolting on to the back edges of the bottom bracket fork. The pair of tubes, F, enter sockets at the top, and on the tenons of the small rear stampings. The diameters of all these tubes are given in a former paper. The bent tube, D, which follows the curve of the wheel rim till within 3 in. of the top of the bracket fork, is about $1\frac{1}{4}$ in. clear of the rubber tyre; to the back of this tube is bolted the rear mud-guard. This guard has two pairs of stays, and is consequently supported at four points. I prefer the two stays, because I notice constantly that a badly-supported mud-guard sags in the middle.

There are but two stampings or castings in the frame here shown that cannot be bought in the market—namely, the bottom bracket fork and the L-pin stamping. These I get made (together with all my solid parts, in fact), cast from patterns, in malleable steel. The barrel, J, can be had in the market, fitted with balls. In the present case, however, we will show it as a cone-steering arrangement.

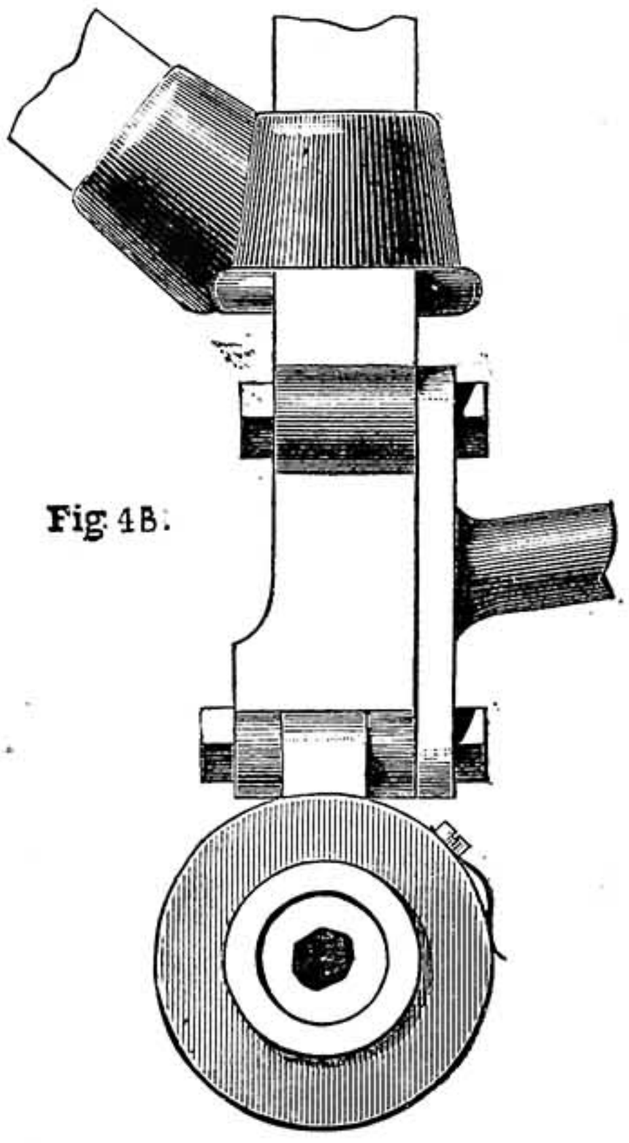
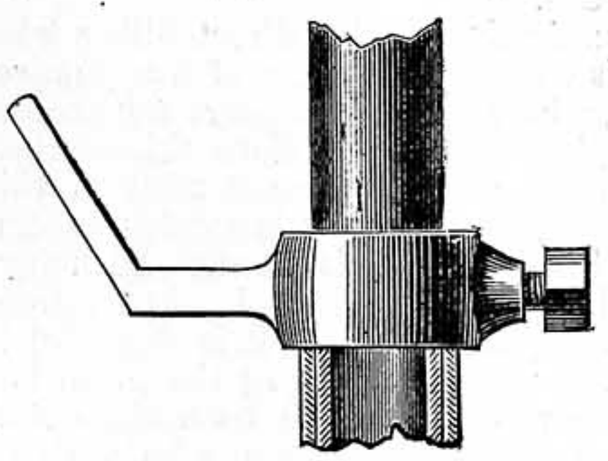


Fig. 4B.

Fig. 4A.

Fig. 6.



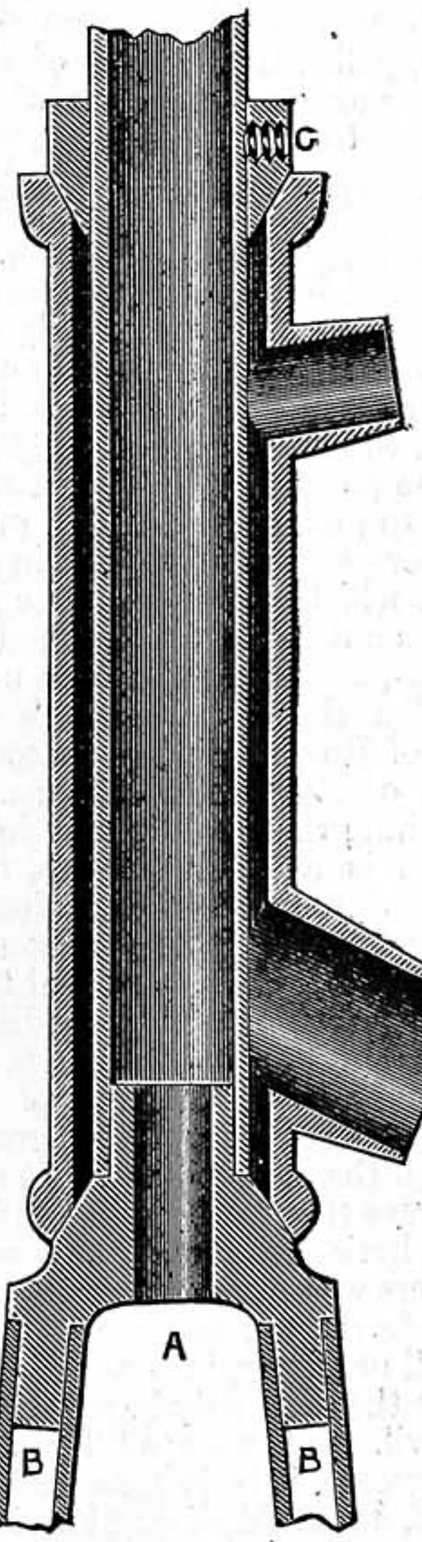


Fig. 8.

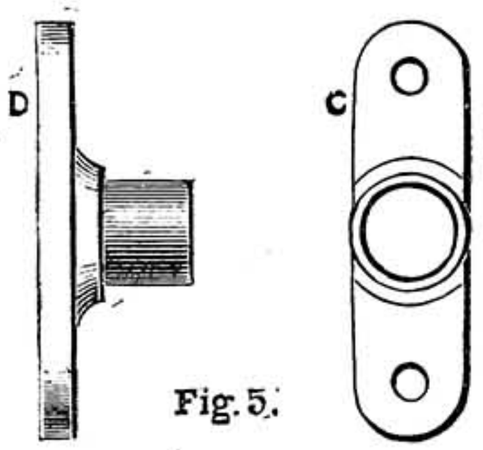


Fig. 5.

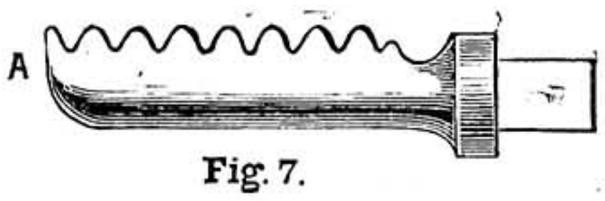
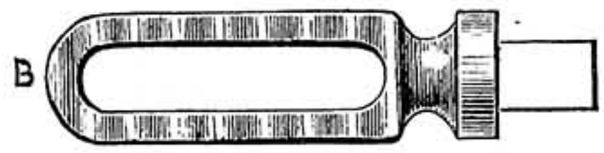


Fig. 7.



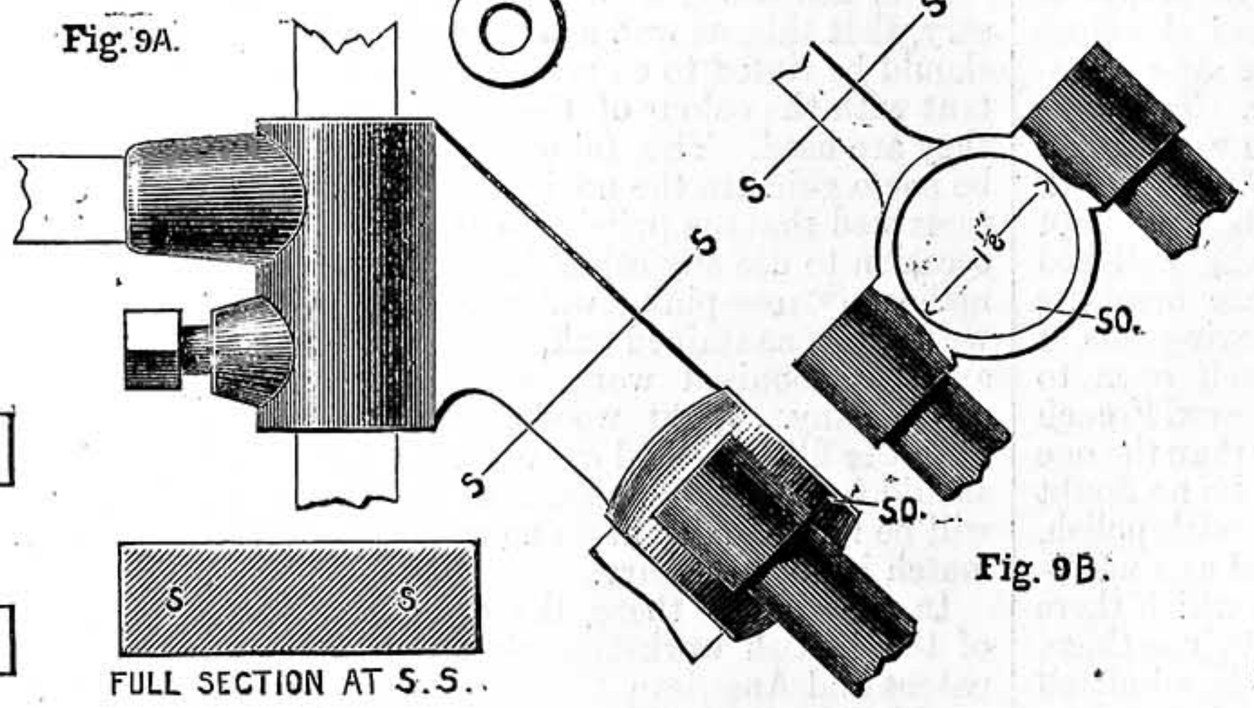


Fig. 9A.

Fig. 9B.

Fig. 4 A.—Bottom Bracket Fork. Fig. 4 B.—Ditto, Side View. Fig. 5.—T-Piece showing Face (C) and Edge (D). Fig. 6.—Rear Fork Stamping. Fig. 7.—Mounting-Step, in Side View (A) and Plan (B). Fig. 8.—Section of Steering Head or Barrel. Fig. 9 A.—Connection of Upper Tubes of Frame (Side View). Fig. 9 B.—Ditto, Plan. The above figures are all half full size.

To those who do not care about making patterns for any part, stampings for all the parts may be bought. This would, however, involve a slight alteration in the design of the frame, particularly at the junction of the various tubes with the seat socket. But anyone laying down the full-size drawing, by observing strictly the positions shown in Fig. 2, and after drawing the stampings in their proper places, can set the various tubes with them.

Then, again, some might prefer the open centre-steering arrangement, which has the turning centres about 1½ in. behind the centre of steering tube. In this case two lugs are brazed on to the steering tube, about 4 in. apart, the lower one being immediately over the crown of the fork, and the upper one having a set or head-screw, with lock-nut for steering adjustment. All the parts for this arrangement may be readily purchased. The firms where to purchase, and the prices of the parts as near as they can be ascertained, will be given at the end of this paper.

Fig. 4A and Fig. 4B are half-size drawings of the bottom bracket fork, A being the front view and B the side, showing the attachment of the forward end of one of the lower tubes from rear of frame. In Fig. 4A, the width of the fork, as well as the height from the dotted line passing through the centre of the bearings, are indicated. A full-size section of the fork (s s) is given, the lower forked ends being broadened out to receive $\frac{5}{16}$ in. holes, to bolt in the knuckles of the bearings. The sockets for the main tubes are placed on the centre of the fork, that for the tube D being vertical with the arms of the fork, the other, for the main or backbone tube, going off at an angle, which can be readily determined from the full-size drawing. They run into each other, and are reamed out for 1⅛ in. tube, the vertical socket going quite through, the other running into it. The tubes should go at least an inch into the sockets. On the back of Fig. 4B will be seen the T-piece of the rear tube. It is a steel casting 2½ in. long, ⅝ in. broad, and ¼ in. thick, with a tenon on the back to enter the tube; it is bolted through the bracket at its upper end, and the lower end is held by the bolt that passes through the knuckle of the bearing.

This T-piece is shown half-size at Fig. 5, C, (face) and Fig. 5, D (edge). Two of them, of course, go to the one machine.

Fig. 6 is the rear fork stamping, which carries the rear axle; it has the two tenons for the tubes. The screw for adjusting the chain is also shown; the shank of the screw is square, and may be turned for adjustment by a small key. In the figure shown there is a descending projection for the mounting-step; the other, of the pair, would be on the right side of the machine and without the descending piece, the mounting-step being always on the left. The step itself may be either rubber on a steel pin, or a piece of hollow serrated steel, like Fig. 7.

Now we come to an important part of our machine, the steering head or barrel. Fig. 8 is a section of this barrel in half-size. As will be seen, the bearing parts are cones, not balls. To those who would prefer a ball-head, I should refer them to No. 92, Vol. II., of Work, where a ball-head is illustrated and described in answer to a correspondent. In our head (Fig. 8), the two ends of the barrel are coned to an angle of about 30 degrees; the top of the fork crown is coned to the same angle, while for the upper end of the barrel a coned ring is made. This fits easily on the steering tube, and is set in its place by a set-screw, passing through the side and pressing on the steering tube. The figure shows the sockets for the tubes, and the proper angle in making the pattern is found from the full-size drawing.

We now come to that part (Figs. 9A and 9B) which connects the upper tubes of the frame and contains the L-pin. This also is a steel casting from a pattern. The vertical part is that which is bored for the L-pin, ⅝ in. thick, of round steel. The part behind the L-pin socket falls away at the angle of the two tubes which descend to the rear axle. At s s a section of this part is shown full size. The part marked s o is the socket to receive the bent tube D, 1⅛ in. thick; on each side of s o is an eye or socket to receive the rear tubes above mentioned. The tubes are not brazed into these eyes, but merely fitted, and set-screws inserted through the side of the eye and into the tube. When these screws are removed, and the bolts at the bottom bracket, the hinder half of the frame comes away. The L-pin socket has on the front of it a socket to receive the ⅝ in. upper tube, C, corresponding in size to the upper socket on the barrel (Fig. 8). Beneath this socket is a ⅝ in. snug, which is bored and screwed for a set-screw to fix the L-pin. This casting is over all 4½ in. long. The small bracket which clamps the saddle-spring to the L-pin is bought ready made, and need not be described here.

Having described most of the parts, we have now to consider where they are to be procured, and at what price.

I may state, first of all, that steel castings cost from 6d. to 8d. per pound, and that there are from 5 lb. to 6 lb. in the machine. The whole tubes can be bought for 7s. 6d. Front forks, brazed, per pair, 1s. 3d.; weldless steel, per pair, 3s. 3d. Handle-bar tube, 2s. 6d. Full set break-work, 2s. 9d. in the rough. Pair mud-guards, 9d.; mud-guard stays, per pair 9d.; 30 in. by ¾ in. crescent steel rims, 3s.

Now as to the parts that may be bought finished.

We have first a pair of ball hubs, bored for spokes, tapped and plated, from 16s. to 24s. A pair of Bown's ball bearings, for bottom bracket, 11s. Chain wheel, sixteen teeth, 2s. 4 ft. Abingdon Humber chain, 6s. Cranks, rough, 1s. 2d.; finished, 4s. Pedals, ball, from 9s. 6d; plain, from 5s. (both plated). 3-coil spring, 2s. Long-distance saddle, 4s. 6d.; or saddle and spring combined, much superior, from 7s. 6d. to 15s. Handles (horn, rubber, or cork), from 2s. 6d. a pair.

Now as to the firms where these things can be procured, I have found the following to be good houses:—

Wm. Bown, 308, Summer Lane, Birmingham.

Thomas Smith & Son, Saltley Mills, Birmingham.

W. A. Lloyd & Co., Clyde Works, Birmingham.

Henry Matthews, Snow Hill, Birmingham.

Brown Brothers, 7, Great Eastern Street, London.

St. George's Cycle Company, London.

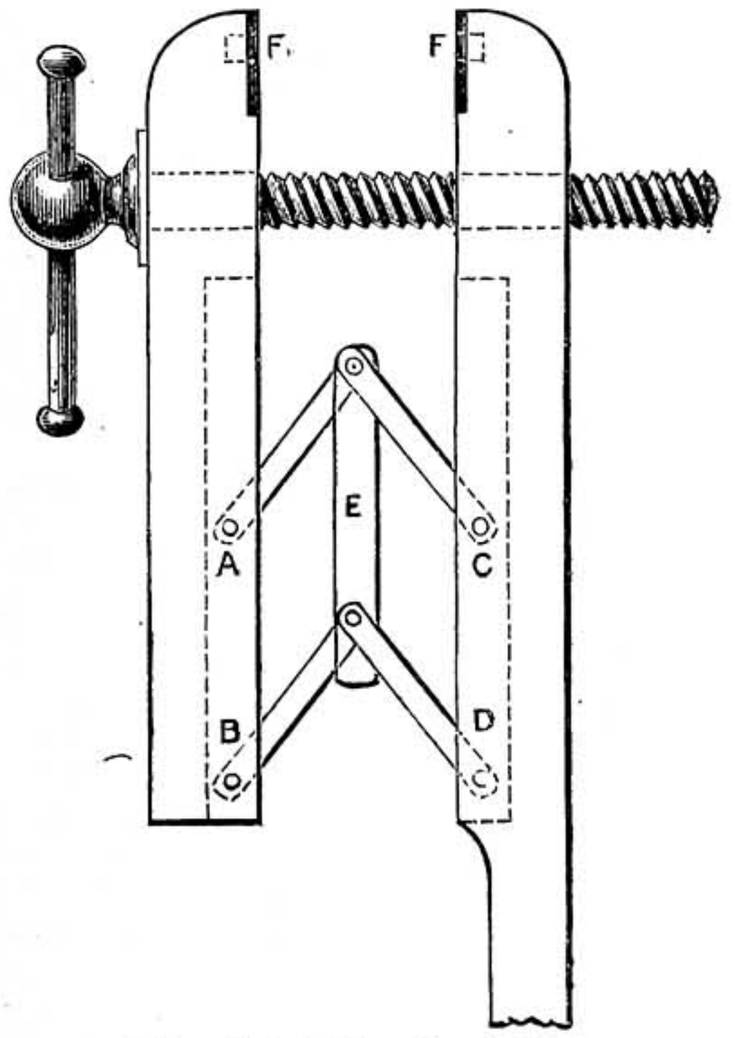
It would be needless to enumerate more, as anyone of the above will supply almost everything required, and will readily send their catalogues and price-lists to anyone writing for them. They will also supply rubber tyres at from 2s. 6d. to 7s. 6d. per lb. Considerable changes have been made in the form of tyres during the last year or two, but with this I have nothing to do at present. I am merely showing the reader where parts of bicycles may be purchased.

A PARALLEL-ACTING BENCH-VICE.

BY J. CHARLES KING.

All contrivances to economise time and trouble in every-day shop work mark the impatience naturally felt at work that is irksome, producing nothing by its action, simply regulating other actions of tools. This must have been felt by wood-workers with the ordinary vice fixed at the back ends of benches.

The smiths have long used parallel vices, and know their merit. The cabinet-makers' and the coachmakers' vice in general use is something like the accompanying illustration, but it has a regulating blade at the bottom of the shifting jaw, which moves in and out of a mortise in the fixed jaw—parallel with the vice screw. It has a number of ⅜ in. holes in its length for an iron pin to be put in every time the work that is gripped varies with opening of the jaws. This little job of pinning and unpinning and repinning to widths of stuff to be gripped wastes a woodman's time



A Parallel-Acting Bench-Vice.

materially. If there is much vice work, two or three days in a year—half a week's work—are wasted, and nothing to show for it at the year's end.

If you are careless about pinning the vice parallel, the jaws do not grip properly, the work is held insecurely, and the screw worn out by unfair strain on the threads; and the process, after all, is one of guesswork as to what will be parallel. An automatic parallel adjustment is shown applied to the ordinary woodman's vice with wooden jaws, the action of compound levers from fixed points in the jaws effecting this to any width opening of the vice. There are nine light blades of iron. A, B, C, and D are four points for fixing double blades of iron 1⅛ in. by $\frac{3}{16}$ in. These, it will be seen, point upward, and are held to an upright blade, E (1⅛ in. and $\frac{3}{16}$ in.), all the parts being truly adjusted for lengths. When the vice jaws are closed, these blades shut up into recesses boxed out of the wood of the vice jaws shown by dotted outlines. The length of the blades may be: for upright piece 10 in., for diagonal pieces 8 in. The middle blade is, of course, held between the double diagonal blades by rivets

admitting of free movement of parts jointed together.

Why these compound levers should produce a parallel action, and set and rigid fixture of the jaws, however tightly they are screwed, may amuse some young workman to investigate.

A useful contrivance for gripping bolts and flanged iron or brass-work, is to have the iron plates of the jaws and part of the wood mortised out, as shown at F, F. It serves also to hold set-pieces of rubber or leather, used for galling-pieces.

OUR GUIDE TO GOOD THINGS.

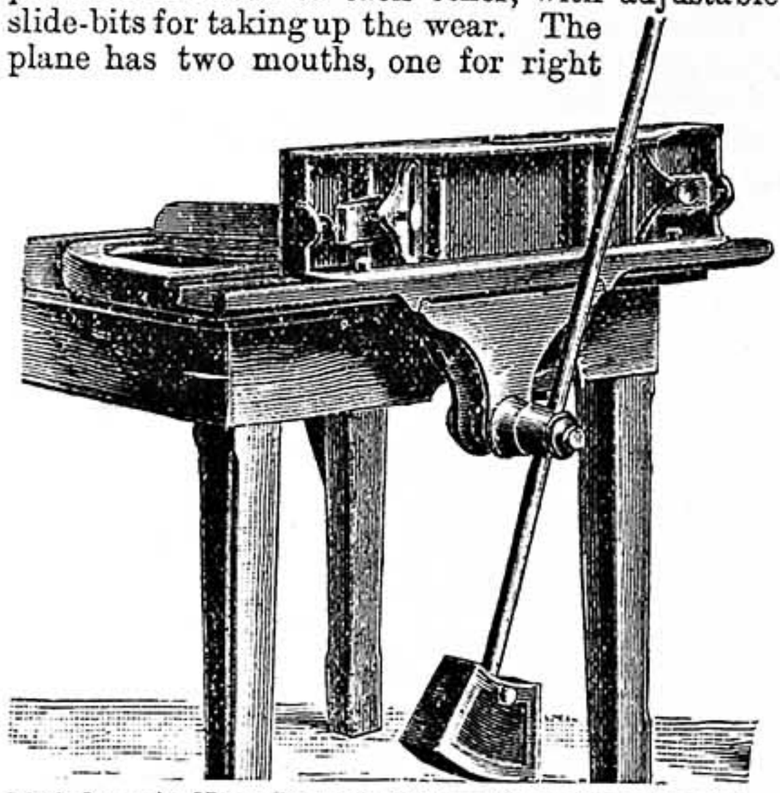
*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and 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 anyone 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.*

22.—"THE MACHINERY MARKET AND EXPORTER."

OCCASIONALLY a Part of this publication reaches me, and this I am bound to acknowledge. It is published monthly at 6d., at 181, Queen Victoria Street, E.C. It has been in existence more than twelve years. It should be seen by all who are interested in machinery. In addition to information of a trade and practical character to be gathered from this journal, much is to be gleaned from its advertising pages, of which there are about seventy in the journal proper and its monthly supplement.

23.—HUTCHENS'S NEW PATENT MITRE MACHINE —THE "ECLIPSE."

Some account of this excellent machine, whose inventor and patentee is Mr. William Hutchens, 70, Causewayhead, Penzance, was given in page 9 of this volume of WORK, with working drawings in plan, end elevation, and front sectional elevation, and to these the reader is referred for details of the construction of the machine, of which a general view, showing how it may be fixed for use, is shown in the illustration given herewith. The machine is made in two sizes—namely, with shoot 6 in. by 3 in., and 10 in. by 5 in.; and each size has two different forms of construction — namely, with fixed and adjustable angle-plates, the machines of the smaller size being known as machines A and C, sold at £5 and £5 10s. respectively; those of the larger size, designated machines B and D, being supplied at £6 10s. and £7 respectively. Agencies and depôts for the sale of the machine, and where it is on view, have been established in London, and the great manufacturing towns of England and Scotland; and although it is not possible to give a complete list of them here, readers may obtain a prospectus giving this information from the patentee, and it may be useful to add that in London the machine may be seen at the establishments of A. C. Engert & Co., 75, City Road, and W. H. Oxenford, 51, Lowth Road, Camberwell. The patentee is constantly receiving most satisfactory testimonials, as a labour-saving machine that is easily worked, and does its work well, from picture-frame makers, carvers and gilders, and cabinet-makers, who all agree that "the machine works so easily, and cuts the moulding so sweetly, that it changes a usually disagreeable and laborious job into a pleasure, which is added to by the accuracy with which it is found the mouldings are cut." In the fixed patterns—that is to say, the A and B machines—the angle guide for the mouldings is fitted so as to be perfectly square, and firmly fastened at an angle of 45° to the plane face. In the C and D machines it has a very simple and secure adjustment by which the angle can be varied from 45° to 90°; in these machines the bed-plate is divided into degrees, and the guide has a finger-point to set it to whatever angle is required. The bed-plate and plane are of iron, each accurately planed and fitted to each other, with adjustable slide-bits for taking up the wear. The plane has two mouths, one for right



Hutchens's New Patent Mitre Shooting Machine —the "Eclipse."

and the other for left-hand mitres, so that the machine is always ready for either. The arrangement for adjusting, taking out, replacing and fixing the irons is at once simple, expeditious, and effective. The toothed quadrant actuating the plane is firmly keyed on a turned wrought spill, through which the lever of polished steel passes, leaving a wood handle at the upper end, and a balance weight at the lower end, which brings the machine in position and gives a saving to the cut.

24.—MACHINE-CUT DIAMOND PATTERN LUMBER.

Possibly some intelligent reader, who is only acquainted with the word "lumber" in the sense in which it is commonly used in this country, may think that I am going somewhat out of my way in talking about such stuff here, so I may facilitate matters by explaining that in the United States the term "lumber" is applied indiscriminately to all kinds of timber sawed or split for use, as beams, joists, boards, planks, staves, hoops, and the like, and, in the present case, to boards with a worked surface for decorative purposes. The engravings, Figs. 1 and 2, show the "Machine-cut Diamond Pattern Lumber"; the former in plan, and as viewed from above, and the latter in end view. Moreover, they show the exact size of the diamonds, and are therefore to be regarded as full-size patterns. "This stuff," says the card from which the illustrations are copied, "is made by a special machine invented by us"—the "us" being the Brown Bess Manufacturing Company, Clinton and Jackson Street, Chicago, U.S., according to my informant—"the *only* machine of its kind, and each piece will match *perfectly* with all other pieces, by 'jointing' the edges to the centre, lengthwise, of any row of diamonds. *Size* of each piece, 8 ft. long by 6 in. wide and ½ in. thick. *Price* 10 cents (about 5d.) per *running* foot of 6 in. in width, *net cash;* crated and delivered f. o. b. (free on board) Chicago, in orders of not less than 6 pieces. *Send for Sample.*" I have been particular in sticking to the text of the card, because my correspondent, Mr. Jas. Rollison, Armstrong, Kansas, U.S., evidently thinks it a big thing in wood-working, asking, as he does, on the card: "Can they (*i.e.*, British workmen) make it over there (*i.e.*, in the United Kingdom) and keep up with Yankees?" (This, please note, is Mr. Rollison's term, not mine.) His letter, which accompanied the card, runs thus:—"Mr. Editor, I send you this card to show you the latest Yankee notion in wood-working, as your paper is considerable in that line. I thought you might give it to some wood-working establishment and let them try to make such. If I were nearer to you I would send you a sample. I am not much of a scholar, but you must excuse me. I will send a sketch of a very useful wood article in course of time. Some of your wood-workers can make it easy. I do not want to see the English mechanic dropping behind; but in some things they are. I receive some stray numbers of WORK out here. It has a good variety in it." Well, Mr. Rollison, we are agreed in wishing to see the English mechanic still to the front, and hence the existence of WORK. I gladly introduce a reproduction of the card you send, partly in acknowledgment of your thoughtful kindness in doing so, and partly for the benefit of chip-carvers, who may like to work the pattern on facias, uprights, rails, edges of shelves, etc. There is not the slightest difficulty in contriving a machine to work the surface as shown in Fig. 1, for its principle lies in sending a shallow V-tool, whose edges are inclined to one another at a wide angle across the surface of the wood, first in one direction and then in another, thus making V-shaped grooves, which are inclined at the same angle to the edge of the wood under treatment. Apply this principle to a machine in which a number of V-tools of the same size and pattern move in parallel lines, and you get directly at the method in which the work is done. Similar patterns in a variety of designs might be made by altering the angle of inclination of the grooves to the edge of the wood, or by leaving an interval between each cutting tool.

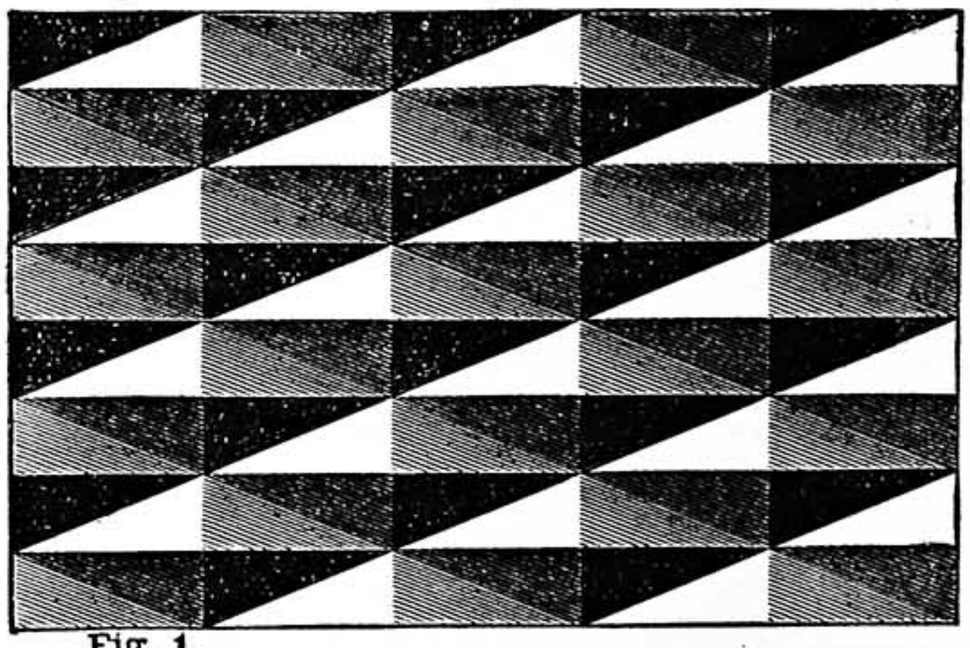


Fig. 1.

Fig. 2.

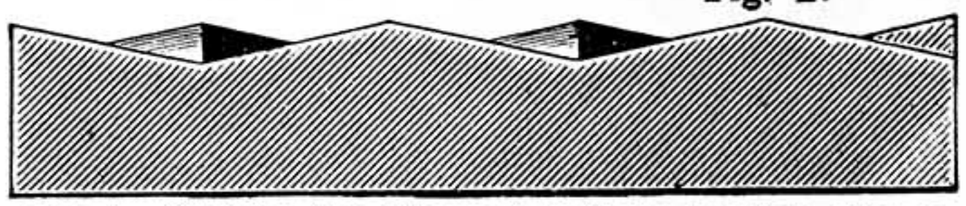


Fig. 1.—Machine-Cut Diamond Pattern Lumber, shown in Plan and as viewed from above. Fig. 2.—End View of ditto.

25. — ATKINSON'S LINESMAN'S GALVANOMETER.

Electric bell, telephone, and telegraph linesmen, who are not overburdened with a surplus of cash, will be glad to know where to get a galvanometer or current detector at a low price. A very useful linesman's galvanometer is made by Mr. H. Atkinson, 137, Stamford Road, Handsworth, Birmingham, and sold by him at the modest price of half a guinea. As it measures only 3½ by 3 by 2 in., it may be said to be a pocket galvanometer; but it is by no means a toy. The outer case is of teak, well jointed and polished. The dial is of brass, on a blackened background, and is enclosed in a thick bevelled glass frame. The coil is mounted on ebonite supports fixed to a brass plate, and all the mountings are of strong polished brass. The needle is of the dead beat type, soon coming to rest when the instrument is disconnected, thus rendering it valuable for detecting leakages in line wires, and testing the condition of battery cells.

I can recommend this neat and nicely-made instrument to such of the readers of WORK who may require such an appliance, as it is not only effective, but cheap also, as may be judged from the comparatively low price that is asked for it.

THE EDITOR.

SHOP:

A Corner for Those who Want to Talk It.

*** *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.*

II.—Questions Answered by Editor and Staff.

Bricks.—Penybryn.—Without any particulars or idea of your proposed method, it is difficult to give you a definite reply, but as a user of bricks for more than twenty years, I may say that unless your plan is cheaper and stronger than ordinary bricks, you will have a difficulty in getting it introduced. Many kinds of patent bricks have been brought out, but during last year I visited many buildings in various towns in this country and abroad, and did not see any of them in use. There is often a difficulty in getting the ends jointed properly, and if your plan involves any extra work at this point, the walling will cost more. The quality of the mortar has much to do with the strength. I have seen walls thrown down which fell in a solid mass, and in which the bricks were separated from the mortar joints with great difficulty; while in other cases the bricks have come quite clean from the joints when thrown down. Nevertheless, if you can make them, and they can be walled as cheaply and are stronger than ordinary bricks, there is no reason why you should not patent your idea. You must first ascertain whether your idea has been previously patented; and if not, get provisional protection for nine months, during which time you can bring them out, and see how they are taken up, before going to the expense of a patent. You will get much valuable information on taking out a patent in Vol. I. of Work; or if you like to send me particulars and a stamped envelope through our Editor, I will tell you if your idea is practical. I will promise you not to make use of or disclose your idea.—M.

Repairing Old Chair.—C. J. W. (*Brecknock Road*).—To soften the glue in order to take the chair partially to pieces, would not be the plan usually adopted by a cabinet-maker. If it is imperative for you to soften the glue, it must be done with moisture and heat. It will be a very tedious job if it is practicable—and this I am inclined to doubt. Any way, it is hardly likely to be worth the trouble. Your best plan will be to cut through the tenon at the joint with a fine saw. If the tenon is a good one you will have no difficulty in reframing with dowels. Should the tenon prove to be rotten, chisel it out, and fill up the mortise with a sound bit of wood. If the parts are put together neatly, no one will be able to detect that anything has been done, and the frame will be as strong as ever it was. Possibly an expert might be able to manage without taking the frame apart, but without seeing the chair, I am unable to say positively. The plan recommended is thoroughly workmanlike, and you can hardly adopt a better.—D. D.

Repairing Veneer.—C. J. W. (*Brecknock Road*).—Probably the best way to re-lay the broken veneer will be to insert a little hot glue under it. Then press the veneer down, and keep it down by pressure till the glue has set. Read the article, "Hints on Repairing Furniture," page 658, No. 93, Vol. II. of Work.—D. D.

Use of the Word "Patent."—R. H. (*Southport*).—Provisional Protection does not entitle you to use the word "Patent" on your articles. You have no legal right to use that word till the patent has actually been granted. If you make use of it before that time, any rival maker who may feel himself aggrieved has power to institute proceedings against you. Still, the thing is not unfrequently done, and the danger of interference in the shape of an action at law is generally very small. But we are bound to warn you that by using it you incur a certain risk.—C. C. C.

Heat in Perkins' System.—H. H. (*Cambridge*).—I am not able to give you any definite instances of the occurrences mentioned in my reply to a previous querist on the system of hot water, but a high authority on hot-water work—viz., Chas. Hood, F.R.A.S., F.R.H.S., etc., etc.—speaking of high-pressure systems, after describing them, says:—"The temperature of these pipes when thus arranged can be raised to a very great extent; for being completely closed and all communication with the atmosphere cut off, the heat is not limited as usual to the point of 212°, because the steam which is formed is prevented from escaping, as it does in the common form of hot-water apparatus. The most important consideration respecting it, however, is its safety; for most persons are aware that steam when confined beyond a certain point of tension becomes extremely dangerous, and in this apparatus the bounds of what has hitherto been used in other cases are very far exceeded. . . . The average temperature of these pipes is stated to be generally about 350° of Fahrenheit's thermometer; but a most material difference of temperature occurs in different parts of the apparatus, amounting sometimes to as much as 200° or 300°. This arises from the great resistance which the water meets with in consequence of the extremely small size of the pipe, and also from the great number of bends or angles that occur in order to accumulate a sufficient quantity of pipe. . . . The temperature of the coil, however, is what we must ascertain if we wish to know the pressure the apparatus has to sustain, and thence to judge its safety, for by the fundamental law of the equal pressure of fluids, whatever is the greatest amount of pressure on any part of the apparatus must also be the pressure on every other part. Now, the temperature of this apparatus is found to vary, not only with the intensity of the heat of the furnace, but also with the proportion which the surface of the coil bears to the surface which radiates the heat. In some apparatus, if that part of the pipe which is immediately above the furnace be filed bright, the iron will become straw colour, which proves the temperature to be about 450°. In other instances it will become purple, which shows a temperature of about 530°; while in some cases it will become a full blue colour, which proves then that the temperature is 560°." (Hood on "Warming and Ventilating," pp. 137-8.) Now, even supposing that the pipes only reached to the lowest of these three temperatures—viz., 450°—this would be quite hot enough to scorch textile fabrics *if laid upon it*, or to scorch paper if close to it. But it appears that this is not so much a source of danger as the extremely high pressure which such a heat indicates, for at a temperature of 560° the pressure is 1,150 lbs. per square inch, and with an increase of 50° the pressure is immediately raised to 1,800 lbs.; and a further increase of temperature, 40°, raises the pressure per square inch to 2,800 lbs.; so that any circumstance which causes the fire to burn more briskly than usual may at any moment increase the pressure to an enormous amount. The pipes are stated to be proved to a pressure of nearly 3,000 lbs. per square inch, but as pipes are always proved cold, this does not in any way prove what pressure they will stand when heated; but it is certain that it is nothing nearly so great, iron becoming much weaker as its temperature is raised. Hood further says (pages 146-7):—"This invention undoubtedly exhibits great ingenuity, and could it be rendered safe and its temperature be kept within a moderate limit, it would be an acquisition in many cases, in consequence of its facile mode of adaptation. Its safety would, perhaps, best be accomplished by placing a valve in the expansion pipe, which, from its large size, would be less likely to fail than one inserted in the smaller pipe. If this valve were so contrived as to press with a weight of 135 lbs. per square inch, the temperature of the pipes would not exceed 350° in any part." You will be able by the information now given to examine your pipes, and form an opinion as to sheer safety; probably, the precaution of a safety valve as suggested has been adopted.—R. A.

French Polishing.—A. H. (*Maidstone*).—You cannot do better than to read the articles and "Shop" answers on "French Polishing" which have appeared in Work. Consult the Indexes to Vols. I. and II. These will give you more than any book.

Hardware.—J. C. (*No Address*).—Obtain as many things as possible from one factor, who would give you very nearly as good terms as the manufacturers (the latter possibly might not care to execute a very small order), and you would save something in carriage if you reside far from London. You could obtain the screws, nails, bolts, and general ironmongery from Messrs. Harding & Sons, Long Lane, London, S.E.; lamps, etc., from Messrs. Falk, Stadelmann, & Co., 43, Farringdon Road, London; oils and colours from Messrs. Chuck, Lockett, & Co., 10, Norton Folgate, London, E.—T. W.

Lettering on Opal.—J. B. C. (*Coatbridge*).—This is work executed by means of acids, burning, and other mechanical processes. You will never get any colours to stand unless they have been specially prepared and burnt in at the ornamental glass works. The heat from gas is the cause of the mischief of which you complain. Give the work to a Birmingham firm.—H. L. B.

Shocking Coil.—Curious.—I cannot clearly understand the drift of your letter. If you have made some shocking coils in the past, and all these have worked well, I see no reason why the last two should fail in giving similar results. It appears to me, however, from your letter, that you expected to get shocks from the primary wire of your two last coils, and, because you did not get shocks as you expected, you suspect something wrong in the coils. Surely, you did not get shocks from the primary wires of your other coils! If you get more than you can stand out of the secondary coil, that should fully satisfy you. If you put more wire on the secondary coil, as you suggest, the shocks from this will be stronger with the same battery power. Cartridge paper is too thick to use as an insulator between the layers of the coils, and shellac is too stiff. Use instead some foreign post paper steeped in paraffin wax. I do not know anything about the other apparatus mentioned by you. Perhaps it was part of an electrical conjuring trick.—G. E. B.

Electric Bell Manuals.—N. B. (*Highgate*).—You will find "Practical Electric Bell Fitting," by Mr. F. C. Allsop, 165, Queen Victoria Street, a useful book. "Electric Bells, and all about them," by T. R. Bottone, may also be useful to you. As you will not be able to localise and repair all defects by reference to books, you will do well to submit your difficulties to us, and get helped out of them through the medium of Work.—G. E. B.

Bath.—Windermere.—I see no reason why you should not construct a bath as you suggest, providing you intend doing all the work yourself, for if you have to pay for bending and drilling the iron, rivetting together, etc., you might as well buy a tinned iron one right out. You will have a difficulty in getting a sheet wide enough of the gauge you will require, viz., 22 ft. or 24 ft., as few ironmongers keep sheets of that gauge more than 3 ft. wide. You also speak of giving it a coat of bath enamel; it would require at least three coats to make a good job of it, and four or five would be better still; let each coat get thoroughly hard before applying another. The way you suggest of bringing the water to the boiler is all right; you should also take a branch pipe out of the pipe leading to the boiler to supply the bath with cold water. It is a pity you could not have the bath lower than the boiler (which, from your sketch, I take to be an ordinary washing copper), for then you could have supplied both hot and cold to the bath without having to dip it out, as I presume you intend doing.—R. A.

Book Edges.—W. J. J. (*Southwick*).—The reason why your colours sank below the surface of your size may have arisen from various causes, and it would be difficult to tell unless I saw both your colour and your size. However, I suspect it is your colour that is at fault; you say that you used "ordinary colours in powder." Now these may, or may not, be all right. Only vegetable colours can be used for marbling, and they must be very specially ground; there must not be the slightest gritty appearance about them, or they will spread out like powder when thrown upon the size; and when transferred to the edge, they will be extremely faint, which you found. The colours, ready ground, which you ask for can be had from Messrs. Berry and Roberts, St. Bride Street, London, E.C.—G. C.

Sheet Steel.—C. E. S. (*Stoke Newington*).—Try Pfeil & Co., John Street, Clerkenwell. They sell excellent steel at moderate prices.—J.

Horizontal Engine.—A. W. A. (*Waltham Cross*).—Pocock's "Model Engine Making" is the only book I know of, treating specifically on this subject, but it is very amateurish. Hasluck's "Model Engineers' Handy-book" contains some useful information.—J.

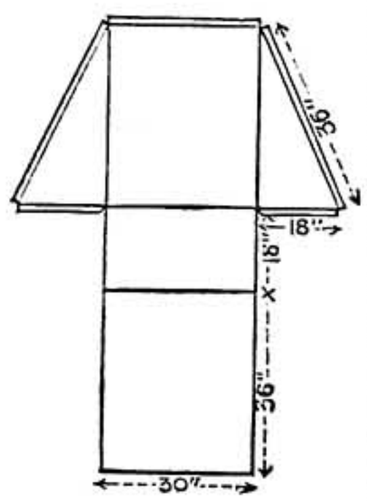
Paquelin Lamp for Plumbers' Joints.—Plumber.—The Paquelin lamp is a success for wiping joints. One of our men used it a few days ago for a joint in 2 in. lead pipe for a pump, and also for wiping the joints under a bath, waste, overflow, etc. I cannot understand why you cannot make the metal stick to the pipe. I expect the reason is that you are using too fine a solder, and get it too hot. Use ordinary plumbers' metal, two-thirds lead, one-third tin; get your pipe fairly warm with the lamp before applying the solder, and use the solder in sticks. The stick of solder acts as a spoon to keep the metal up till you have enough on the joint; then, when it is of the right consistency, go round with the cloth. When the joints are not wiped, use coarse tinman's solder.—R. A.

Inlay and Carpentry.—A. L. L. (*Farnham*).—Much has appeared in Vols. I. and II. of Work upon these subjects. A reference to the Index of each volume, which can be bought for one penny, will give the numbers and pages of Work.

Beams and Scales.—X. Y. (*Leeds*).—A beam constructed as represented in your sketch would be condemned. It would take more time to put right than it would be worth. You do not say if the machine is to rank first. second, or third class. If we take the turning load of a first-class machine as *one*, that of a second-class is *four*, and of a third is *six*. Again, you do not state if the ends of the beam are "swan-neck," "box ends," "Dutch ends," or if it has "agate" or "knife-edge" bearings. "Swan-necks" are discouraged, and will in course of a very few years be disqualified, after sufficient time has been allowed to wear out those at present in use. The friction on such, when worn or badly fitted, is quite sufficient to account for the extra weight you name as required to move it when the scales are hung on. Or, again, the "knife edges" may be thick, dull, soft, or not straight, or at exact right angles across the beam. The same may be true of the bearings in which the "knife edges" work. Any of these faults would increase the friction, which would be intensified in proportion as the load was increased, and a larger amount of "force" would consequently be required to overcome that friction and cause the beam to oscillate—the "force" being represented by a heavier weight, as in your case: half a pound being required to turn the scales instead of half an ounce. To adjust weights, measures, and weighing machines successfully, a certain amount of "touch" is required that only practice can give. You may learn much about the theory of these matters if you study Ganot's "Natural Philosophy and Physics"; also Grieve's first, second, and third stages of "Elementary Mechanics" (Longmans—1889 editions). Also get a copy of "Model Regulations," 1890, for Inspectors of Weights and Measures (1s. 6d.), and also a copy of "Notices to Candidates" for examination as Inspectors of Weights and Measures (2d.), both

published by Eyre & Spottiswoode. You may then learn what the inspector will require of a machine before he considers himself justified in stamping it as fit for use in trade.—WORKER BEE.

Lantern Stages—Making Gas Bags and Limes.—A. E. D. (*South Lambeth*).—I should advise you to read the papers which appeared in WORK, Nos. 83, 87, 91, 96. Full particulars of how to make the slide stages will be found in No. 91; and the addresses of a few firms supplying cheap condensers and objectives have already been given in reply to Opticus, WORK, No. 91, page 633, and also in reply to J. P. (*Blackburn*), WORK, No. 97, p. 733. Should any difficulty occur, write another query, giving full particulars. You also state that you are desirous of making a gas bag, owing to the prohibitive price of this adjunct to a lantern. You will find this a very difficult job, and I have never yet heard of its being successfully accomplished by an amateur, and should certainly not advise you to attempt it. It may be possible for an amateur to repair a gas bag, but the making of a new one is quite a different matter. You do not state the form of jet you intend using. If you intend to employ a safety jet, procure from an indiarubber warehouse some strong twill mackintosh cloth, either check pattern or a brownish-black, which will cost from 3s. 6d. to 4s. 6d. per yard. For an ordinary 10 ft. wedge-shaped bag you will require to cut this to the form indicated in the accompanying diagram, the measurements of each side being 36 in. long, 30 in. wide, with a couple of wedge-shaped sides 18 in. wide at the thick end, with the back of the bag also 18 in. wide. About an inch should be left on all cut sides for turning in and cementing, the cement used being a solution of rubber in benzole; or, better still, a tin of proper cement for indiarubber could be obtained for about 1s. from the tradesman supplying the cloth. An accurately made gas tap will also require to be cemented into the middle of the apex or thin end of the wedge of the bag, in order to provide the means of ingress and egress for the gas. I am very much afraid, however, that you will not be able to make a satisfactory job of it, as professionals use several appliances for making a bag air-tight which it would not pay for an amateur to obtain, especially when you can get a bag ready fitted with a tap for 45s.; this would be an extra strong one, made of three-fold thickness of stuff, and would hold sufficient gas for over two hours' exhibition. It is sold by Messrs Archer & Co., 43, Lord Street, Liverpool. The following are the quotations of a few of the leading firms for a bag of about 10 ft. capacity. It is a difficult matter to give an accurate statement of the exact cubic capacity of a gas bag when filled with gas, as the wedge shape renders them peculiarly liable to bulge outwards, thus rendering it somewhat troublesome to accurately gauge their cubic capacity. A cheap bag, measuring 36 in. × 32 in. × 24 in., is sold by Messrs. Perkin, Son, & Rayment, of Hatton Garden, for 45s.; and Messrs. Noakes & Son, of Nelson St., Greenwich, make a cheap bag 36 in. × 32 in. × 24 in. for 48s.: this can be had in strong white twill for oxygen, and black for hydrogen. Messrs. Humphrey & Co., of Stanhope St., Birmingham, sell a black rubber bag of three-fold thickness, fitted with a padlocked gust tap, and measuring 36 in. × 30 in. × 24 in., 50s.; and Mr. Walter Tylor, of 48, Waterloo Road, S.E., charges 52s. 6d. for a bag of similar dimensions. Messrs. Woods' (74, Cheapside, E.C.) price for a bag 36 in. × 32 in. × 24 in. is 70s.; and 72s. 6d. is asked for a similar sized bag by Messrs. Watson & Sons, of 313, High Holborn. If you simply require the bag for home use, you would find it much more economical to construct a wooden or metal gasometer, or vessel in which to store the gas. In construction these are somewhat similar to the ordinary gasometer of the gas-works, consisting of a cylinder, bottom upwards, sliding within a cylinder, which is filled with water in order to make it gas-tight, the requisite pressure being obtained by means of heavy weights placed upon the top of the inner cylinder or suspended from its sides. With reference to your last question, it is difficult to say how long a lime should last, as so much depends upon the skill of the operator. One operator might use one or two limes during a single entertainment, whilst another exhibitor would find one more than sufficient. With an oxy-calcium jet it is sometimes possible to use a lime a second time, provided that it is kept in a tightly corked bottle away from the atmosphere; but with a mixed jet this cannot be done, as the unused lime will crumble away.—C. A. P.



Gas Bag.

Bookcase. — G. H. (*Burton-on-Trent*). — Mr. Adamson gave, some time back, a drawing and a few details of a dwarf bookcase (without doors). Search the indexes. The mortise and tenon joint is the one generally adopted to unite the "cross bars," but halving will be strong enough for the purpose. These two forms of joint have been so frequently described that it is really unnecessary to again sketch them. If I do not note your assertion that although you "are pleased with WORK, but one has to wait such a while for an answer," you may, perhaps, believe that I intentionally disregarded it; therefore I must entreat you to watch and count each week the number of letters acknowledged as received, and then compare them with the number of answered letters which limited available space permits to be printed, and you will—or ought to—understand why *some*—not *all*—queries are held over for a while.—J. S.

Wood-Carving Tools.—A. W. A. (*Bilston*).—The tools should be sharpened on the inside, and ground on the outside. The angle should be very acute. It would be a guide if you were to get one properly set by a carver, as you would then know better than by any amount of written description. In case you do not know any good carver, I daresay


Fig. 1. Fig. 2.

Angles for Tool Sharpening.

if you sent a tool to Urquhart & Adamson, 13 & 15, Bold Street, Liverpool, they would do what is necessary for a small sum as a favour, if you mention this Magazine. If you prefer to try for yourself, the illustration (Fig. 1) herewith will give you some idea of the angle to which carving tools should be set, as compared with that of the ordinary chisel (Fig. 2).—D. D.

Photo Tent.—R. H. (*Bradford*).—Procure four wooden uprights, ash by preference, 8 ft. 6 in. long and 2¼ in. in diameter, slightly tapered towards one end, and the other pointed and shod with iron to drive into the ground; an iron peg put through the pole just above the shoe, and projecting about 1 in. on each side, will be of assistance in fixing the poles in the ground. Two of these poles are intended for the back of the tent, and should be provided with holes protected with iron plates near the top, so that a roller background can be made to work in them in the usual manner. Into the top of each pole an iron pin is driven, leaving 3 in. projecting, through which a slot is made in order to receive a small pin to secure the whole together when set up. Four rods, either wood or iron, sufficiently long to leave a space of 8 ft. by 6 ft. clear between the uprights, and perforated to fit over the projecting pins at the top of each pole, will keep the framework in position. The distance from front to back should be about 6 ft. The whole arrangement is exceedingly simple, and can be pulled up and rolled together when done with. In use, the canvas covering will be permanent overhead, one or other of the side pieces being open according to the light required. The appearance of such a tent will be, when in use, as accompanying

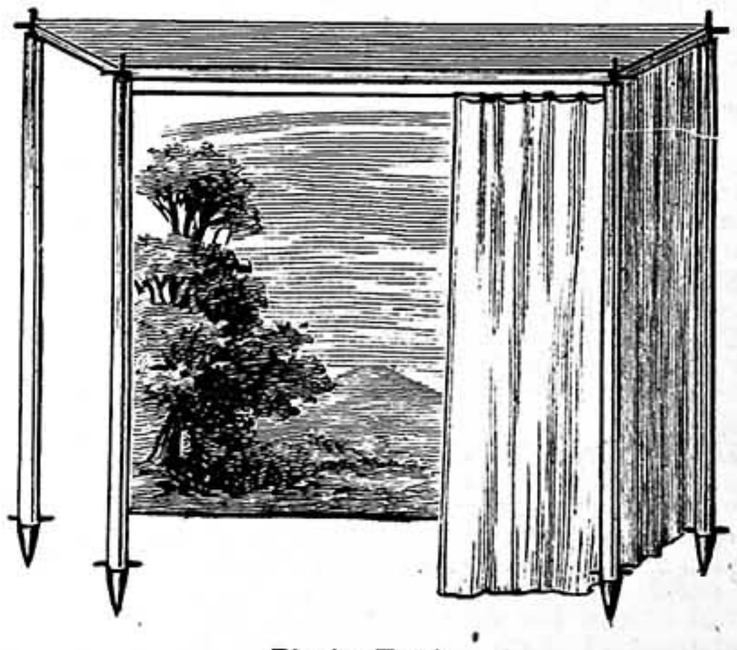


Photo Tent.

diagram. A curtain in front that can be pulled across at will, running easily on a rod, will be found a help in arranging the light. If the rod worked in a socket, so that the curtain could be pulled inwards or outwards as well as across, so much the better.—D.

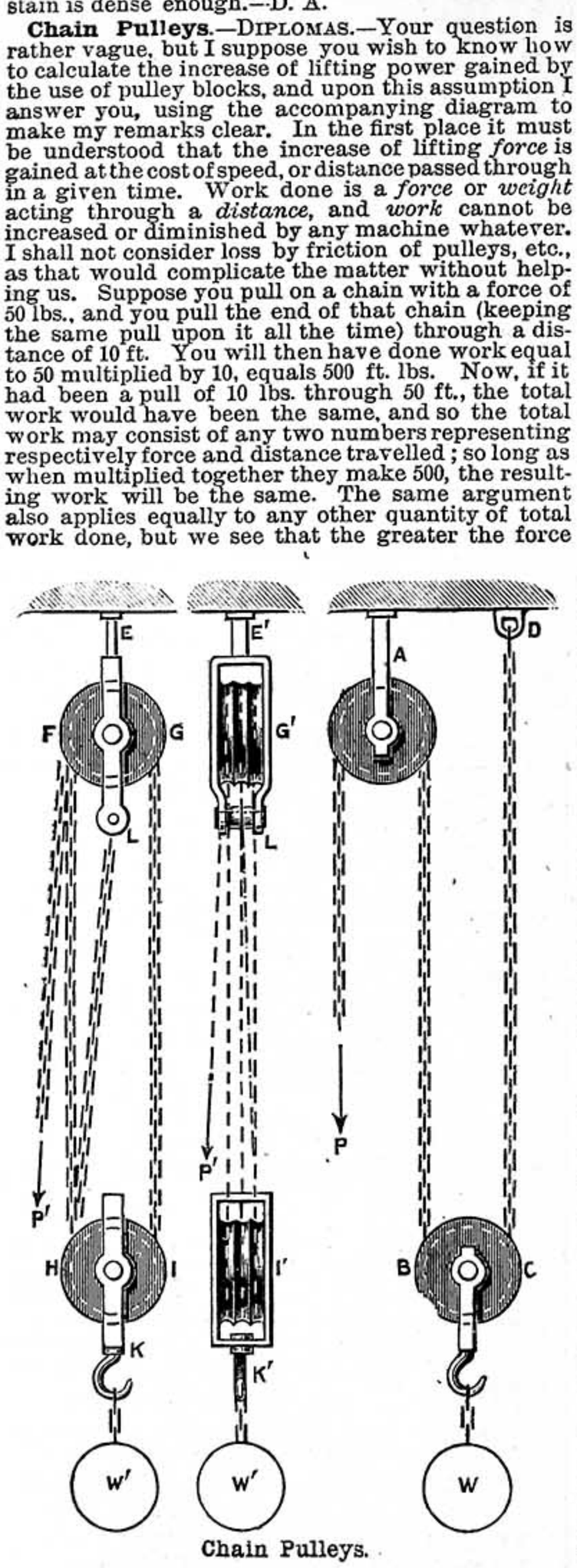
Carriage Crests and Monograms.—J. L. G. (*Norwich*).—The method of doing this and the kind of paper used to paint them on is, I believe, a trade secret. They are painted with oil colour on prepared paper. The crests, letters, or ornaments must be, of course, painted on the paper the reverse way, so that when turned over on to the panel, they will transfer right-handed in proper form. The shading of the crest or letters that should show on the face must be painted on the paper first, and the ground colours or gold put on last. Colours are sold ready for use in tubes; if too thick, thin with turpentine. To transfer the painting, you must be careful, and go all over it with gold-size and copal varnish made up in equal parts, taking care to keep well to the outer edge, with a small pencil, or camel's-hair will do. The gold-size and varnish must not be laid on too thickly, but just enough to cover. If the crest or monogram is not properly covered, some of the paint will stick to the panel and the rest draw away with the paper. When the gold-size and varnish is on the "tack"—that is, when it is nearly dry—it is ready to transfer to the panel. The panel should be first "flatted" with pumice-powder, and a pad with water to dull the surface and take the nibs off. Wash off clean, and dry with chamois leather. After getting the centre of the panel, strike with the chalk line a horizontal and a perpendicular line; thus having your chalk line struck, you will find on the back of the transfer a horizontal and perpendicular line crossing at the centre of it, which, when placed on to the panel, must come exactly over the chalk lines; then you will have it exactly square. Take care to exclude any air, and gently rub it with a small piece of cloth, so that all parts may adhere equally. Then with a wet sponge sop the paper until it moves, and gently draw it away. Pat the painting with the sponge wrung dry, wash off, and dry with chamois leather; take care not to rub too hard: and in two hours it will be ready for varnishing all over. Should you desire to varnish sooner, use more gold-size to the varnish that you transfer with; but on no account use gold-size alone, as it will cause the paint to crack and flake off after a while, and your job will be spoilt. There is another kind of transfer which is painted on very thin paper. These are treated in a different way. The back of the paper is done over with gold-size and varnish mixed, and when nearly dry is stuck on the panel; then the whole of the panel is varnished over. But this does not make such a nice job as the process described above, as it always shows a little projecting from the surface; but it is very handy, and always shows right handed—the way it is painted. I tried an experiment the other day which I found answered very well. That is: on a piece of ordinary note-paper I designed a monogram of three letters in lead-pencil, then glazed it over with ordinary gum, which, of course, should be clean and transparent. When dry, I commenced painting in the pencilled letters, which were still visible, beginning first with the shading—of course, the reverse way to that in which I wanted it to show when transferred; finally painting on the ground colour, or laying on the gold or silver leaf last. Thus you will see I have a coat of gum between the monogram and the paper, which, when wetted on the back, moistens the gum; then the paper was drawn away, leaving the monogram on the surface of the panel to which it was to be applied. Crests, ornaments, etc., can be treated in the same manner. These will have to be stuck on with gold-size and varnish mixed, and transferred in the same manner as explained in the beginning. The transfer method of heraldry is a quick and convenient way for some coach-painters and those who do not possess art and skill to paint them direct on to the panel, or wish to send them off by post. In the usual course of direct painting, herald painters first make a "pounce"—that is, they sketch the design on a piece of paper, then prick with a pin or needle all the outlines; next they get the centre of the panel, and strike with thread and chalk—called a chalk line—a perpendicular and horizontal line. They then place the "pounce" on the panel: then with pad—that is, powdered whiting tied up in a piece of fine muslin—they dab lightly the "pounce" or perforated design, then they raise it carefully; that will leave on the panel the outlines of the crest, etc., in white. They then commence to paint in colour to the lines, or size and lay on the gold-leaf and then shade it. Thus, you see, whilst you are painting on the paper to be transferred you could paint direct on to the panel with less trouble and better effect. The heraldic transfer materials can be obtained at Whittingham & Wilkins', Long Acre, W.C., and at Leigh Anderton's, heraldic painter to the trade, 67, Vine Street, Newton Heath, Manchester. By sending stamped envelope, they will forward you list of prices, etc.—C. W.

Accumulator Cells for Electric Lights.—J. C. H. (*Dublin*).—The number and size of accumulator cells required for an electric light installation are determined by the following considerations. (1) Volume of current required to light the lamps. (2) E.M.F., or pressure to force the required current through the lamps. (3) The number of hours it is intended to use the cells for lighting the lamps. Considerations 1 and 3 must guide us in the size of the cells, and the number of plates in the cells, as the volume and duration of the current will depend upon the capacity of the cells, it being estimated that 1 sq. ft. of positive plate surface will yield six ampère hours of current. Your ten lamps, of 8 c.p. each lamp, will take 280 volts of current to light them. Twelve lamps will take 336 volts of current. Find out the total resistance of the lamp circuit, employ one cell to each two volts of pressure required, and this will give the number of cells to be employed. Multiply the volts of current by the number of hours the cells are wanted, divide this by the voltage of the cells used, and you will then find the desired capacity of the cells. I think you will need 9 E.P.S. L-type 15-plate cells. These have a larger capacity than the 11-plate and the 7-plate cells. In charging these in series you should employ a current of not less than 10 ampères at a pressure of not less than 20 volts. If you had given me the size and type of your dynamo, I could have told you whether it would be practicable to charge the cells with it or not. Thin plates such as you mention are not safe to make the grids for large cells.—G. E. B.

Ebony Stain.—TREACLE PUSHER.—If you are, as your *nom-de-plume* indicates, a polisher, surely you must be aware that home-made black stains are not so good as those which are bought ready made. As you live so close to London, you will be able to buy the stain for little, if any, more than it would cost you to make it, besides getting a better article. If you are determined to try what you can do, I am afraid I cannot recommend anything to surpass the old recipe of a decoction of logwood chips and vinegar in which some steel filings have been left for a time; or, if you prefer to do so, substitute a solution of copperas for the vinegar. Good

proportions are 1 oz. each logwood and copperas in a quart of water. Apply hot. Then go over with the vinegar after the first is dry. Repeat till the stain is dense enough.—D. A.

Chain Pulleys.—DIPLOMAS.—Your question is rather vague, but I suppose you wish to know how to calculate the increase of lifting power gained by the use of pulley blocks, and upon this assumption I answer you, using the accompanying diagram to make my remarks clear. In the first place it must be understood that the increase of lifting *force* is gained at the cost of speed, or distance passed through in a given time. Work done is a *force* or *weight* acting through a *distance*, and *work* cannot be increased or diminished by any machine whatever. I shall not consider loss by friction of pulleys, etc., as that would complicate the matter without helping us. Suppose you pull on a chain with a force of 50 lbs., and you pull the end of that chain (keeping the same pull upon it all the time) through a distance of 10 ft. You will then have done work equal to 50 multiplied by 10, equals 500 ft. lbs. Now, if it had been a pull of 10 lbs. through 50 ft., the total work would have been the same, and so the total work may consist of any two numbers representing respectively force and distance travelled; so long as when multiplied together they make 500, the resulting work will be the same. The same argument also applies equally to any other quantity of total work done, but we see that the greater the force



Chain Pulleys.

applied, the less will be the distance passed through, and the less the force, the greater will be the distance passed through. Suppose with a pull of 50 lbs., you want to lift 800 lbs., the pulleys and chains must be so arranged that you pull in 16 ft. of chain, while the weight lifted rises 1 ft.; because 800 lbs. × 1 ft. = 800 ft. lbs., and also 50 lbs. × 16 ft. = 800 ft. lbs. Having described the principle concerned, I will now show the application of it. In the diagram, P indicates a force or pull applied to a chain in the direction of the arrow shown. If the chain merely passed over a fixed pulley at A, and had a weight at its other end, that weight could not exceed P, because in that case the only change which occurs is a change of *direction*, the force P and the weight would travel at the same speed, and neither gain nor loss of power would occur; but if the chain is carried round another pulley, B C, and up to a fixed point, D, and the weight W suspended from the pulley B C, there will be a difference of speed between P and W. The pulley B C rises and falls with the load, and such combinations as these are called blocks and falls, the upper pulley or set of pulleys attached to a fixed point being called the block, and the lower one the fall. Now, to raise the load W one foot, each side of the chain A B and C D must be shortened 1 ft., therefore the chain A B C D must be shortened 2 ft. by pulling that length of chain over pulley A, from which it is evident the force P must move 2 ft., while the weight W moves 1 ft., therefore the weight W may be twice the force P, for if P = 50 lbs., and W = 100 lbs., then 50 × 2 = 100 ft. lbs., and 100 × 1 = 100 ft. lbs. It will be noticed that the load lifted is equal to the lifting force multiplied by the number of lines of chain side by side, the hauling chain P, which is wound to slack, not affecting the result. A side view of a block and fall, carrying three loose pulleys on each, is shown at E, F, G, H, I, K. The top block is fixed at E. The chain passes from P round the top and bottom pulleys successively as shown, and is fastened to the top block at L. A front view is shown at E', G', I', K', and W' is the load to be lifted. It is seen that between the block and fall there are six lines of chain, each of which must be shortened a foot to raise the load W' 1 ft., therefore 6 ft. must be pulled over by the force P, which will, therefore, travel 6 ft. for 1 ft. rise of the load, the weight of which may be six times the pull P. From this we get a very simple rule to find the power of a block and fall. To find the weight that can be lifted by a given pull, multiply the pull by the number of lines of chain between the block and fall; or, to find the pull necessary to lift a given load, divide the load by the number of lines of chain between the block and fall. There are some pulleys called "differential" pulleys of special construction, and should you want to know how to calculate any particular kind, I shall be happy to inform you on receiving particulars. The above applies to all general cases. By combining two or more sets, the power is increased more rapidly: thus, if instead of hanging the load W' direct on the hook K, a similar block and fall were interposed, the power at the hook would be multiplied six times, and the total increase would be thirty-six times P.—F. C.

Frosted Gold.—H. H. W. (*Pimlico*).—From a dull surface produced by polishing with water of ayr stone, and either bluestone or powdered pumice and water, the next step is to either gild or colour the article. Mr. Bonney will tell you about gilding, and I think you will find some information about colouring in "Shop" of No. 19, Vol. I. of WORK, page 301. Once it is gilt or coloured, the thing to do is to scratch-brush it. For that you will require a pretty powerful foot-lathe, some scratch-brushes, and some arrangement to allow a mixture of beer and water to dribble over the brush and the work, while the brush is rapidly revolving. It is this process that is most in use—and it wants a workman who has had experience to get a good surface—and, in fact, this is a special thing, and in our workshop all large surfaces of coloured gold are sent to the gilder to scratch-brush. A scratch-brush on a small polishing lathe will not produce the required surface anyhow. There is another kind of dull-coloured surface sometimes used for Etruscan work, which is nothing but the colour left just as it comes out of the colour-pot. I do not suppose you want that, nor the method followed in Birmingham, which is that of a sand-blast made to impinge on the work. The results by this method are very good, and certainly give an 18-carat appearance to a 9-carat article—for a time. This answer does not do more than indicate the methods, I am aware, but for further information the Editor will have to capture a practical gilder. I, a goldsmith, have not found it worth following up, and writing as my experience dictates, my reply is: "Don't try it yourself" unless you are going in wholesale for gold work.—H. S. G.

Galvanising Staples, etc.—HOLLY READER.—To do galvanising in a small way such as you inquire about, you will want an iron pot or vessel to contain the molten zinc—say about 10 lbs. or 12 lbs. The articles to be galvanised should be, directly after forging, placed in a hot pickle of *killed* spirits; if you can boil them a few minutes it will be all the better. Anything that you can wire together and do several at a time, do so. Use plenty of sal-ammoniac on the zinc. Take the articles out of the pickle, and gently place them in the molten zinc; do not rinse the articles in water before putting in the zinc, or it will sputter all about; but the spirits will not have that effect. Keep the articles in motion till they are thoroughly hot and well covered; then take them out and shake them, and throw them into sawdust. For very small things you might make a kind of wire ladle to hold them whilst in the bath. You can tin wrought-iron goods in the same manner. With regard to enamelling iron, it is beyond an amateurs' skill, as it requires special knowledge and training, only to be got by actual experience.—R. A.

Phonograph.—C. T. B. (*Derby*).—An article on the above subject is in the Editor's hands, and will appear when room can be found for it in WORK.

French Polishing and Mount Cutting.—C. M. J. (*Perth*).—It would be impossible in the space devoted to "Shop" to answer your query fully as regards French polishing. Ere this appears in print, you will have noticed, if you read the paper carefully, that the subject is already being taken up in a series of articles, the first of which appeared in No. 105, March 21st, and in No. 108, April 11th, to be followed by others, which will give particulars such as will, if followed closely, enable you to obtain a polish such as you have seen on sewing-machine tops as French polished; though, strictly speaking, many of them are not French polished as we use the term, but are polished on a foundation of oil-varnish: a process that requires a large number to work on to make it worth one's while to adopt. Dull polishing is obtained by dusting over the polished surface with fine emery, and well rubbing with a soft rag or brush in the direction of the grain. Sometimes a little linseed oil is used with the emery, and should be done after the final "bodying up," in place of "spiriting out." Mount cutting has been treated on in Vol. II. in "Shop," pages 207, 668, 683; gilding mounts, 207; mount-cutting tool, 669.—LIFEBOAT.

Designs for Inlaying.—A. W. (*Hackney Road*).—H. Zilles & Co., 24 to 26, Wilson Street, Finsbury, have some excellent designs for inlaying, but if you want them for furniture they are not altogether in the styles most commonly met with. If you want them for your own use, and not for sale in the ordinary trade channels of your neighbourhood, they are everything that could be desired. Should you prefer to have them in the Italian or prevailing fashionable style, you cannot do better than apply to Mr. Busschotts, Park Lane, Liverpool. He has the largest stock of Italian designs in this country for fret-cutting and inlaying. If you want special designs to your own sizes, you will have to get the patterns drawn out for your own use, or you may be able to get them from some marquetry cutter in your own neighbourhood.—D. A.

Repairing.—A. V. H. D. (*Holloway*).—You should not in any case repair defective stoves with wood. You can buy at most of the large ironmongers what are called "Stove Slips." These are slips (of various widths and lengths) of cast iron, supplied for the purpose of making out a stove to a different size to what it is made, and so adapt it to an existing mantel. With one of these slips I think you will be able to get over your difficulty. Fig. 1 is a section of a slip which will suit your purpose, and if you cut it so that it will just go between pilasters, you will find it can readily be tucked up behind the smoke joint, A, Fig. 2, until it gets into position shown, and the only thing that remains to be done is to keep it there. This can be done by screwing two thin iron clips on the back of slip, as Fig. 3; by turning these clips round so that they are parallel with slip until it is tucked into its place, you can pass your arm through the register hole of stove and reach these clips, and pull them into the position shown in Fig. 3, and this will effectually hold the slip in its place. A little plaster of Paris smeared with the hand over the back of slip when it is in its place will help to improve matters. If you find you cannot reach the clips with your hand, drill a small hole in end of clips, and tie a piece of string on end of each, so that by guiding the strings through first, the clips can be pulled down in this way. I should advise you to make a pattern in wood first, and try it that way, and then, in the event of your not being able to buy exactly what you want, it would do to cast from. Your next question as to who the parting garden wall belongs to, and who is responsible for its repair, is a question that very often crops up, and unless it has been specified in the lease, can only be settled by law, there being no clause in the Building Act to cover this particular case. I think you will find the matter generally stands in this way—viz., that if you want to repair, and your next-door neighbour is indifferent if it is repaired or not, you must pay, and *vice versâ*. This is one of those cases where a little give and take is very desirable.—E. D.

Fig. 2.

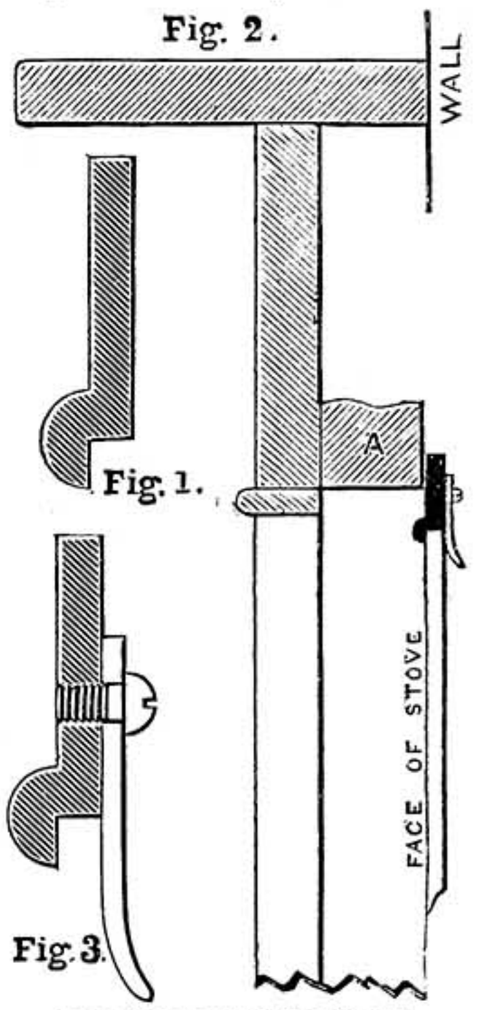


Fig. 1.

Fig. 3.

Iron Slips and Sections.

Knotting, Splicing, and Working Cordage.—H. W.—I would willingly tell you in what numbers of WORK the successive articles on this subject will appear if I could, but it is not possible for me to settle anything of this kind in advance.

How to Make a Garden Barrow.—L. P. B. (*Kew Gardens*).—Full instructions on the above, both as to size, construction, etc., will be found in No. 68 of WORK.

Bleaching Silver.—W. H. (*Reading*).—W. H. will find this matter dealt with on p. 60, No. 108, Vol. III. of WORK.—H. S. G.

Emigration.—PRÆTORIA.—Apply to John Pulker, Esq., Emigrant's Information Office, 31, Broadway, London, S. W.

Fret Machine.—J. B. (*Derbyshire*).—I have given other correspondents in "Shop" the information you seek. Refer to back numbers.

Jewel Case Catches.—H. A. (*Forest Hill, S.E.*).—These can be obtained of Mr. Child, Meredith Street, Clerkenwell. If the particular sort are not in stock, then get Mr. Bibb, West Street, St. Martin's Lane, to give a quotation to make them. A suitable piece of leather can probably be obtained at Deed & Sons, 91, Oxford Street, or at F. Cooper's, 107, High Holborn, London.—H. S. G.

Magnetic and Electric Belts.—J. O. (*Hednesford*).—The electric belts described on page 827, Vol. II. of WORK, in reply to G. F. R. (*Woolwich*), cannot be compared with the belts advertised at 5s. 6d. each, as these may be magnetic belts, made up of permanent magnets sewn on to the belts, and these do not give *electric* currents.—G. E. B.

Electric Belt.—W. H. C. (*Homerton*).—G. F. R. (*Woolwich*) inquired for an *electric belt*—that is, a belt to generate a current of electricity. I described such a belt on page 827, Vol. II. of WORK. This belt will generate a current of electricity if moistened with sour sweat or with dilute vinegar. In that description you will read—line 16 onward—"solder a length of wire braid to a copper disc of one pair, then pass it (that is, the length of wire braid) through the belt, and solder the other end to the zinc plate of the *next* pair, and so on." You will thus see that you will need as many lengths of wire as there are plates in the belt. The plates of a pair are opposite each other. The belt you have is, probably, a *magnetic belt*. These appliances only do good when *adapted* to a person's needs. I am investigating such appliances just now to discover their value as remedial and curative agents.—G. E. B.

Marine Boiler.—R. A. F. (*Shepherd's Bush*).—You do not state for what description or size of engine the boiler is required. From the size of boat, I judge you may put in a boiler of vertical type, 5 in. in diameter, and about 10 in. high. The fire-box inside may be 4 in. diameter and 3 in. high. From the top of the fire-box you may carry up a number of ¼ in. diameter tubes through the water space to a space whence the chimney springs, or you can carry up a 2 in. diameter vertical flue, and place a number of cross water tubes in it, crossing each other in all directions to present surface to the hot gases of combustion. These tubes may be ¼ in. to ⅜ in. in diameter, and should be slightly inclined from the horizontal, to facilitate the circulation of water through them. Another form of boiler which presents advantages in heating surface consists of one or two coiled pipes to contain the water, and upon the surfaces of which the hot gases strike. These coils should communicate at top and bottom with water chambers, preferably of cylindrical form. Copper is the proper material to use, and it must be used for the pipes, but if the expense is in question, the shell and fire-box may be made of sheet-iron. The joints should be strongly brazed together, and the boiler tested with water pressure before you put it under steam. I do not think you will find a charcoal fire successful, and advise you to use a lamp or paraffin burner instead. Unless you have a blast, the charcoal will burn too slowly to make steam, and if you do have a blast you will find great difficulty in keeping your fire stoked. Your boiler should carry a steam dome, safety-valve, and water-gauge.—F. C.

Making Catgut.—WORKONIAN.—I am not acquainted with any book devoted to this industry. It is a very dirty one, but those who follow it in my district admit that it pays fairly well, and takes very little capital. The materials—the sheep's "ropes"—are bought from the butcher, and cleaned by turning inside out and well washing with *cold* water. All fatty matter is scraped off. A set runs to from twenty to thirty yards. The gut is twisted whilst "green," and just as we see twine twisted at a rope-walk, one end being fixed, and the other attached to a bobbin set in motion by a larger wheel. A size made from parchment scraps, etc., is afterwards rubbed over the gut, and it is dressed down with a cloth; this gives a finish, as well as serving to keep the twist in place. The smaller intestines serve for making the thinner strings. My neighbours sometimes make gut up to ½ in.: this is done by twisting several strands of intestine together. Bleaching is considered to weaken the gut.—S. W.

Electro-Plating Outfits.—E. C. (*Wells-by-Sea*).—The Gassner dry battery, and any dry material required for electro-plating and electro-gilding, can be supplied you by my brother, who advertises in WORK under the style of Bonney & Co., 19, Avenue Road, Lewisham, S.E. He undertakes to supply jewellers and amateurs with small electro-plating outfits.—G. E. B.

Induction Coils.—J. L. (*Canning Town*).—A series of articles on induction coils are in course of preparation. When these appear you will learn how to wind the secondary wire of your coil. A coil to give 1 in. spark should have 1 lb. of No. 36 silk-covered wire as a secondary coil. The primary should be two layers of No. 18 silk-covered wire. All other parts of your coil are right. See that the secondary wire is well insulated. To guard against possible faulty places, run the wire through melted paraffin wax before winding it on the primary, and baste each layer with the wax. You may wind on the secondary in three divisions, but the wire must be continuous throughout, and wound on in one direction only. The coil will be improved by a condenser of fifty sheets of tin-foil placed underneath the base.—G. E. B.

Electric Bells.—G. P. (*Edinburgh*).—You will find full instructions on making electric bells in WORK, Vol. I. A series of articles on "Burglar Alarms," including details of electric bell construction, appeared in Nos. 12, 18, 20, 27, 31, and 33. All back numbers are in print. You may also pick up several ideas from previous answers to correspondents in "Shop." Read these first, then if you do not clearly understand any part, or wish for further advice, write again, and I shall be pleased to help you. You will find an idea for an electric time alarum in No. 32, and several illustrated ideas in Vol. II., on pages 157, 175, 226, 416, 582, 699, and 723.—G. E. B.

Fixing Chalk Drawings by Sprinkling.—R. O. (*Handsworth*) can do this with isinglass dissolved in water, taking up his size with a camel-hair brush, and getting his "spurts" by using a comb. An old way of fixing chalk is with *warm* isinglass size, applied at the back of the paper.—S. W.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Soldering Delicate Gold Articles.—H. S. G. (*Battersea*) writes, in reply to NORTHERNER (see page 734, Vol. II.):—"NORTHERNER asks for a few hints on this matter, as he has failed in an attempt to solder the thin bezel of a watch and has melted it. The cause of his failure may have been that the solder was of too good a quality, although that is but a poor excuse, for a workman should watch all his work for indications of overheating all the time that he is trying to solder one part. If the solder is not in fault, as it well may be if the bezel was from a Geneva watch, then there was probably dirt or grease about somewhere, either on the bezel, on the solder, or mixed with the borax. In fact, any impurity will hinder soldering; therefore one must always take care to have everything clean and free from dust or grease, and be very particular to scrape the solder bright, as well as the edges of the work where the solder is to run. I think I should have annealed and boiled out the bezel before scraping and applying the borax, then I should have given myself a fair chance to succeed. As to soldering delicate articles generally, to be successful in that class of work is not given to everybody. Success depends (after proper preparation of the work, cleanliness, etc.) on the ability to control and direct the flame of the blowpipe. Flames to solder with are roughly divisible into two—pointed and spread: the latter is what is wanted here. It is produced by holding the point of the blowpipe a short distance away from the flame—say, ¼ in. to ½ in.—and then blowing with a very gentle and regular blast so as to envelop with a quiet flame a large portion of the article until the solder runs or the work begins to show signs of sweating, when, of course, no more heat should be given. If the foregoing is not minute enough in its details, then write again."

Dry Battery.—F. A. (*Portsmouth*) writes, in reply to ELECTRIC (see page 14, Vol. III.):—"I think the following will be of use to you for a dry battery: Oxide of zinc, ½ lb.; plaster of Paris, 2 lbs.; chloride of zinc, 1 lb.; water, 3 pints; zinc and carbon to be used as elements."

Enlarging Drawing.—A. N. F. C. writes, in answer to J. W. (*Edinburgh*) (see page 14, Vol. III.): "To enlarge, multiply, to diminish, divide, each side by the square root of 2 (=1·4142...., the nearest fraction to which in common use is $1\frac{2}{5}$)."

Wood-Slicing Machine.—DEXTER HANDY writes, in reply to W. H. (*Belfast*), who asks (see page 782, Vol. II.) where he can procure a machine for slicing wood as thin and clean as that used for bandbox making:—"La Maison Arbey, Cours de Vincennes, Paris, make such machines, and if W. H. does not hear of a maker nearer home, he may like to apply to the above-named firm. They make a fine machine which will slice wood up to ·005 metre thick by 1 metre long and ·35 metre wide—in our measurements, say $\frac{1}{5}$ in. thick by 39 in. long by $13\frac{1}{2}$ in. wide."

Draught Board.—T. C. R. (*Liverpool*) writes, in answer to J. W. M. (*Driffield*) (see page 782, Vol. II.): "Take a sheet of paper size of glass, mark width of border from each edge, and allow ¼ in. for rabbet of frame. Tick off upon inside lines number of squares, and connect points. This will give plan of board, and when placed underneath glass correct guidance for painting. For simplicity and good effect take lamp-black in oil, thin with varnish and turpentine, and by the aid of straight-edge and lining-pitch run all lines upon glass as seen through it. For width, say, squares $1\frac{1}{16}$ in., border $\frac{5}{16}$ in., and ⅜ in. band running through centre for relief or other work, as fancy dictates. When this is dry, proceed to lay in alternate squares white and green of medium depth; the border a brown leather, cigar, or fawn colour: care being taken to make colour cover solid, or it will want re-coating, as in the case of the white, and a coat of this pigment spread over the whole will give additional solidity, and act as a preservative. For frame, procure plain moulding. Stain this walnut and varnish, or German mould from picture-shop, which is very cheap, but not so durable or consistent with use, in this case being faced with composition, and liable to chip, showing the white underneath. Four shillings should cover cost of above, presuming painting done by oneself, and tools to hand. There would be no difficulty in fitting boards to legs; and any handy joiner would give estimate for so simple a construction."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. M. F. (*Elginshire*); C. R. (*Paris*); C. W. T. (*Manchester*); APPRENTICE; CARVER; PERPLEXED; C. G. M. S. (*Devon*); A. E. S. (*Glasgow*); CONSTANT READER; B. O. (*Stoke-on-Trent*); CUTLER; T. R. (*Middlesbro'*); P. P. (*Manchester*); J. B. W. (*Manchester*); T. B. (*Manchester*); F. P. (*London*); T. H. (*Bradford*); W. A. D. (*New Brompton*); CONSTANT READER; AQUARIUM FOUNTAIN; BOOKWORM; W. B. R. (*South Norwood*); J. M. (*Wanstead*); H. B. (*Brighton*); A. C. (*Burnley*); ANXIOUS; F. B. (*Tamworth*); PIANO; M. F. C. (*Enfield*); A. G. (*Sheffield*); M. P. (*Manchester*); B. Co. (*Colchester*); J. R. (*Wednesbury*); T. H. S. (*Newport-on-Usk*); STRENCHEST); ASPIRANT; P. M. F. (*Falmouth*); W. O. (*Whitefield*).

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