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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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MY DOUBLE MUSIC STAND: HOW I MADE IT.

BY O. B.

WANTED a music stand, but beyond the conditions I required it to fulfil I knew very little indeed. The conditions were these: First, it must be well within the compass of an amateur to make; secondly, it must accommodate two performers; thirdly, it must be adjustable in height; and, lastly, when made its appearance must be equal to parlour society. I cast about in my mind for a type to work by, but I could remember having seen nothing that just met my needs. The only stands that I was familiar with were the portable folding umbrella-like arrangements and the heavy reading-desk form; but these did not suit me. I required one handsomer than the first, and less cumbersome than the last. So there was nothing for it but thinking the subject out for myself; consequently, donning my studying cap and finding refuge in my studying chair, I began to work, when slowly and phantom-like there arose the image of the stand I wanted. Snatching my pencil I hurriedly sketched its features, and so the more firmly impressed it on my mind; then at my leisure, by the wonderful powers which even the humblest workman

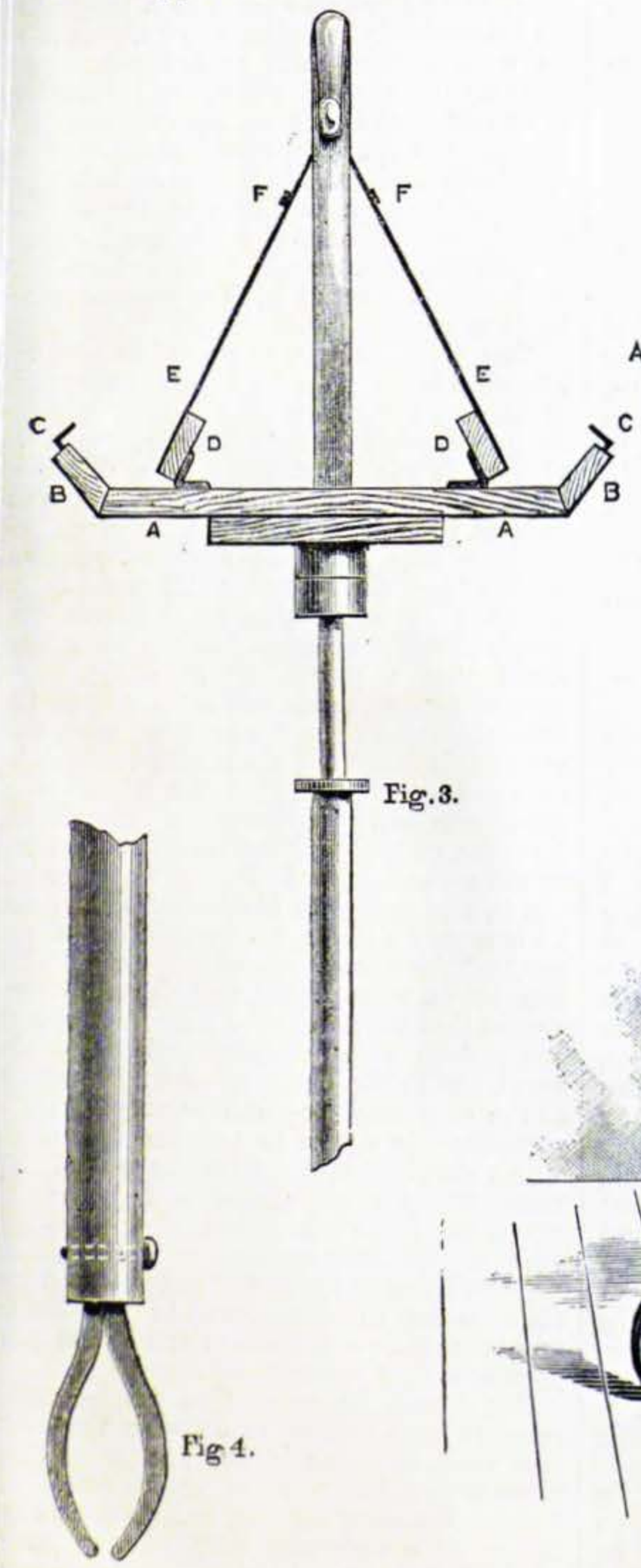


Fig. 3.

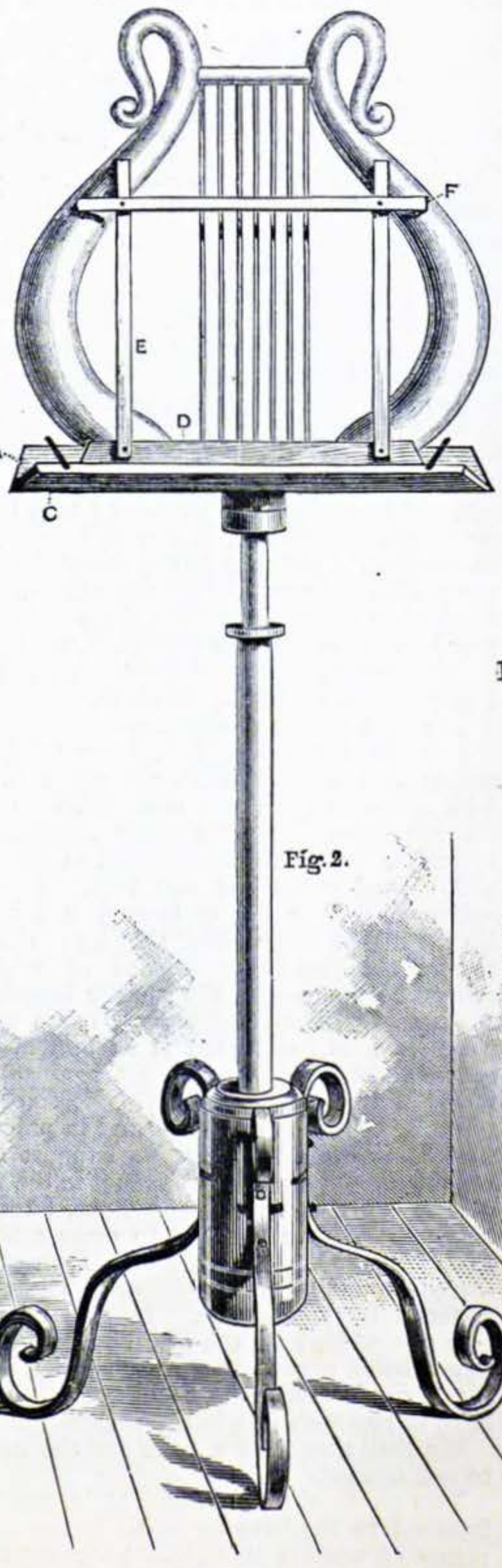


Fig. 1.

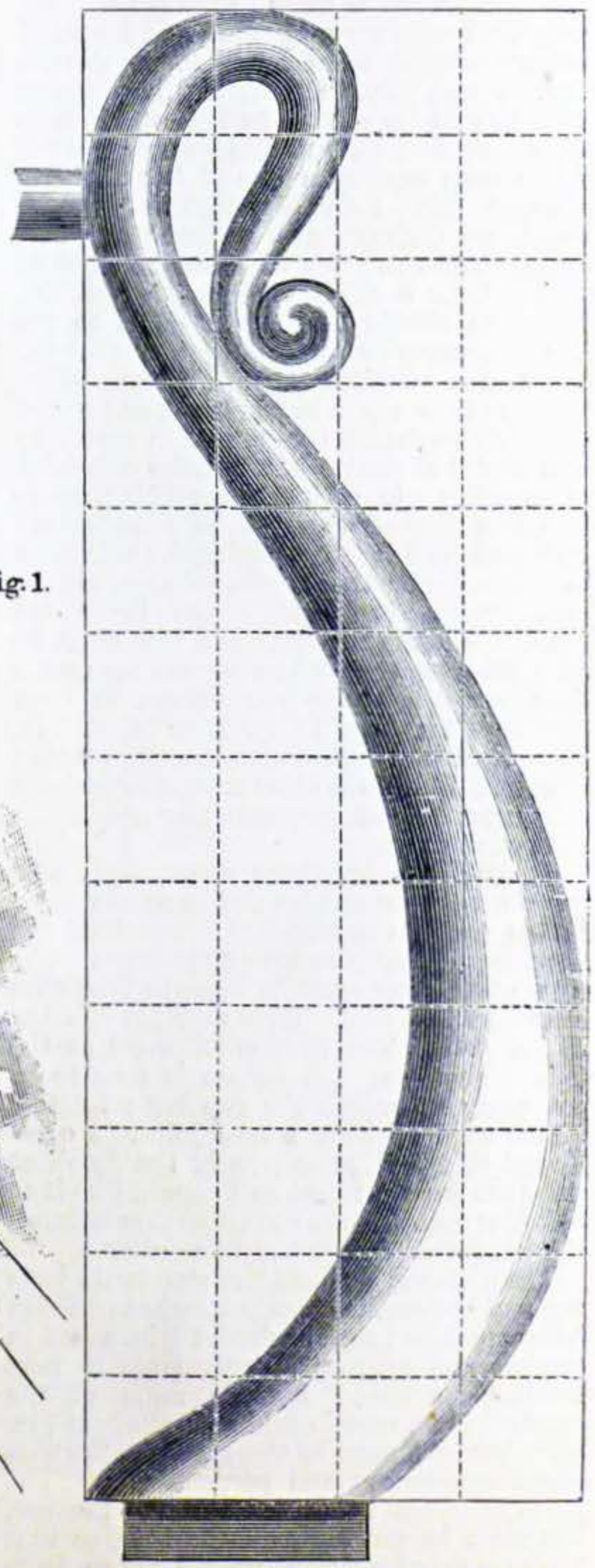


Fig. 2.

Fig 4.

Music Stand. Fig. 1.—Side of Music Rest (half size). Fig. 2.—Stand Complete. Fig. 3.—Side View of Rest. Fig. 4.—End of Sliding Rod in Tube. Lettering in Figs. 2 and 3 is merely intended to show correspondence of parts in each diagram.

possesses, I, by slow degrees, materialised the idea and produced the thought in concrete form. The illustration (Fig. 2) will give a general idea of the stand. It so fully meets all my requirements that I have thought that perhaps others who are both mechanical and musical in their tastes would be glad to get a hint.

I found in working, however, that had I obtained a hint here and there I might have done better and have saved some trouble, and with that view before me I write this article.

As it will be seen, the music rest is somewhat in the form of the conventional lyre. One side (Fig. 1) should be struck out on a piece of cartridge paper the exact size, and then be cut out as a template. If one has practised freehand drawing no difficulty will be experienced; but for those not so experienced I have drawn the side to scale one half size, so by simply doubling the squares any one can draw it full size.

Plane up a piece of mahogany 1¼ in. thick, and lay the template on it, and carefully mark it out on the wood. Now, when I got as far as that I was puzzled to know how I should cut wood so thick to the shape. My tools were not very numerous, and I seemed to have nothing more likely to do it with than a fret saw. Consulting a practical man, he said he should just use such tools as he had, and that nothing would answer better than cutting a line of holes with a brace and bit. I was surprised to find how simple my difficulty now became; in a few minutes the two sides were cut roughly to form. With a chisel, spokeshave, and file, the wood should be brought down to the line; let them be worked together that the curves may be alike. Carefully mark where the bar at the top is to be placed, and with a half-inch centrebit bore a hole in each; be sure that the centre of the holes coincides. Draw a line ¼ in. each side the hole; up to this line the edges must be rounded off, whilst the one inch containing the hole must be left square; the reason of this will be seen further on. Before the limbs are rounded off, the tenon at the foot must be cut; great care must be observed here, as if they are not alike the lyre will not be true. The base must be 16 in. × 10 in. × ¾ in. Draw a central line and mark the place of mortises. When the sides are put in position they must be both perpendicular and in line with each other.

For the top bar, turn down a piece of wood with a pin at each end to fit the holes in the top of the standard. See that the shoulders of the pins are quite square. The sides of this bar must be planed off so that in section it is oval. Glue and pin the bar in its place. The portion of wood at the hole which was left square is now to be cut away to match the top bar; by this means we shall have a neat joint. I overlooked this, and consequently the finish at this part is not so neat as I should like it to be. Our mistakes are not altogether failures, if by them others are taught wisdom.

The distance between the standards, both top and bottom, is exactly 3 inches. Seven holes must be bored or drilled ½ in. apart in the bar and base, sufficiently large to take small brass rods. I made mine of the stoutest brass wire I could get, say about ⅛ in. Care here too must be observed that the rods stand equidistant and perpendicular. The holes must not be drilled through the bar, but must be put through the base, so that the rods may be pushed up. After we have fitted the parts together, but before the standards are glued in their places, the base must be finished. Cut two pieces of wood the exact length and thickness of the base and 1½ in. wide. The edges of these must be planed off at a small angle, as shown in Fig. 3.

To make a good joint the shooting plane must be sharp and finely set. Perhaps it would pay many an amateur to get the shooting done by a joiner. Take four pieces of the brass rod 3 in. long; flatten down one end for about an inch so as to make it wider and thinner than the other part; file out the hammer marks and polish; on the other end cut a screw thread; now bend them at right angles, and screw them into the edge of the base. They are for the purpose of clipping the music on the stand as on a piano. The edges and corners of the base can now be rounded off, the standards glued in, and all worked off with fine glass paper.

Turn two pieces of wood, one to receive the top of the support or leg with a pin turned on it to enter a block; the other as shown to receive the other part of the leg and the feet. Boring the holes so that the whole thing shall stand perpendicular will, perhaps, be the most difficult part of the whole business.

Feeling this, I took mine, after having turned them, to a joiner. It looked all right whilst he was doing it, but when the thing was put together it was like the tower of Pisa. I turned it now one way and then another, and got it to look true when one was facing the stand, and tried to persuade myself it did not matter for falling over a little in the other direction; in fact, I almost think I went so far as to persuade myself it looked very well. But try as I could *I knew* it was not upright, and that it *ought* to be, so I had no peace of mind until I took it to pieces and rectified it. It is well, I think, to let *ought* rule, not only in the moral, but in the mechanical world. To rectify the matter I did what should have been done before—bored from the opposite end, then, with the humble appliance of a red-hot kitchen poker, I managed to make the hole true.

The leg I made as follows:—

I procured 2 feet of 1-in. brass tube, or, rather, iron covered with brass, and 2 ft. of ¾-in. ditto. To make a neat finish to the lower portion, I took a short length, say 1½ inch of brass tube that would fit into it, and turned down one end true. I then soldered this to a disc of brass just a little larger in diameter than the leg; this I put in the lathe and finished off with a central hole to receive the smaller length of the leg. Out of ⅛ sheet brass I cut a strip 8 in. × ½ in., and bent it in two in the centre and bellied so as to act against the inside of the larger tube. This is fixed to the tube by a pin (Fig. 4). I find in practice that it is quite sufficient to support any weight likely to be placed upon it in the way of music, and is for many reasons, I think, better than having a screw to press against the sliding rod. From a smith I procured three iron scrolls for legs as shown; these are fastened by two screws. If two lugs or ears are welded to the scroll between the screw holes, curved to fit the wooden boss, it will render the legs much more firm. I have shown such ears in the illustrations.

We shall now need a rack for the music to rest against.

Two pieces of wood 11 in. × 1¼ in. must be fastened to the base by small hinges; two pieces of wood 9 in. × ¾ in. × ⅛ in. must be riveted to each, with a similar bar riveted to the top. Care must be taken that the distance between the rivet holes in the top bar and in the hinged flap must be exactly the same. The stand is now complete with the exception of painting the feet and polishing the woodwork. When this is done it will be found to be a most useful and even elegant adjunct to a musical home.

"LINING UP."

WITH A FEW CONSIDERATIONS ON ART AND ITS TEACHERS.

MEANING OF "LINED-UP" TOP — LEGITIMACY OF CONSTRUCTION—PRACTICE AND THEORY—WHY PRACTICAL WORKMEN LOOK COLDLY ON THEORISTS—ART OVERDONE—WEAKNESS OF SOME ART DESIGNS—THE WORKMAN AS A JUDGE OF ART PRINCIPLES.

THE meaning of a "lined-up" top is too well known among cabinet makers to require any explanation to any craftsman; but to the amateur, or even the professional critic of woodwork, who, in too many cases, is merely a theoretical individual, neither the technical expression nor the work involved may be understood. Perhaps it should also be added that the amateur critic, even though he be one who poses as a teacher of art principles in books (mostly published at his own expense), will probably denounce lined-up tops as a sham, and therefore to be eschewed by all honest workers. His argument in the main would run somewhat thus:—The effect of lining up being apparently to give thickness to the wooden slab, to make the top of a sideboard, a chest of drawers, or other piece of furniture look thicker than it really is, the operation must be deprecated.

Now, were lining up resorted to with the intention of even tacitly implying that a top so finished is throughout of equal thickness, no justification of the practice could be urged. It would evidently be a dishonest construction contrived for the express purpose of deception. I would, however, ask if those who have the slightest practical knowledge of the subject could possibly be deceived by any lining up, however cunningly it might be done. It can be understood that a person who, in ignorance, jumped to the conclusion that a top is the same thickness as on the moulded edge, and afterwards found out his mistake, might be disposed to imagine that the intention of the worker had been deceptive. Should he, however, on that account blame the artisan or the manufacturer? No; I would rather put it, that owing to his limited knowledge he is merely a living exemplification of the motto, "*Honi soit qui mal y pense.*" He imagined a wrong thing, and therefore concluded that the worker—I refer not only to the artisan who actually manipulated the wood, but to the designer or draughtsman, as the case may be—was actuated with a reprehensible desire to produce something which should convey a false impression. To those who are acquainted with joinery or woodwork in its minor and finer branches, such as furniture making, as distinguished from building and architectural construction, the idea that lining up could be regarded in any other than a decorative detail is so preposterous that it verges on absurdity.

But it may be urged that the foregoing remarks have nothing to do with the practical work of lining up, and that in making them theory has received undue attention. I should be sorry for this, as I conceive that theory is a necessary part of any good worker's technical education. Practical men are met on all sides by theoretical objections to their methods of working, by teachers

who, without in any way disparaging or impugning their good intentions, are too often singularly deficient in practical training. I do not now so much refer to manipulative skill as to those numerous considerations by which every man who earns his living by his work, *i.e.*, professionals as distinguished from amateurs, must be influenced. I would ask all artisans engaged in any artistic craft, if it is not because of the neglect or ignorance of the circumstances under which things are made, that many writers on art applied to manufactures fail to produce a good effect; nay, I will even go further and say, that they hinder the spread of technical education and the study of applied art. They excite a feeling of antagonism in the minds of those they would teach by assumption of superior knowledge. They may be acquainted with art principles in the abstract, and so far they are deserving of respect, but when they, at the same time, make statements which every craftsman knows to be incorrect about mere mechanical details, the inference too naturally follows, that the man who holds forth on art and craft knows no more about the one than the other. His influence is gone, and instead of benefit being derived from his acquaintance with and exposition of art principles, harm is done, if not by an outspoken protest, at least by a dogged sullenness which will not listen to anything bearing on art. Now this should not be. It is a lamentable state of affairs, but is it not true? Why is it that the craftsman does not respond so freely as those who wish to, and doubtless can teach him much, would like? Why are the efforts, often, I must confess, put forth in all sincerity, not responded to with more cordiality? Is it because the artisan—please note I do not use the word "working man" or "mechanic," but artisan, the artist worker—is so sunken that he will not learn? or is it that he imagines he has nothing to learn beyond the "bread and cheese" portion of his trade? Truly, one not acquainted with the workers, the artisans, the designers, the employers of artistic skill, might excusably think so, if only the utterances of the professional æsthete be regarded. I unhesitatingly say, that were our would-be teachers a little more familiar with the every-day requirements of practical work, with its demands, with its commercial considerations, and if they would regard these when endeavouring to raise the standard of our artistic productions, they would have no reason to complain of having the cold shoulder turned to them. Is that not so, my brother working men, fellow craftsmen, even though we may work in different departments? Would any one of us object to learn from any source whatever anything that could improve our manufactures? I venture to say no; but we are not inclined to learn from any one who dogmatises on art, and at the same time shows his ignorance of practical work, or what I have called the mechanical details of work. Can we do anything but laugh at the art professor who wants to lecture to craftsmen, not boys at school, but grown-up men who must *work*, not play, and because they won't attend his *afternoon* classes thinks them apathetic? The professor in question might have got men to listen to him had he suggested *evening* lectures, but even then surely it would be more charitable to suppose that though the spirit is willing the flesh is weak, and that men do get too tired to listen to theory after working all day, instead of charging them with indifference to refining influences. If they did an honest day's work, doing that which their hands found to do with all their might, surely that was better than listening to "art" talk, most of it, without doubt, very incomprehensible. We, who have any practical experience of the exigencies of work, know too well that the real cause why artistic productions are not more common is not because the worker will not or cannot take the necessary pains, but because the public, *i.e.*, the purchasers, will not encourage them. No, they will sneer at the modern worker, advise him, but they will not pay a fair price for good honest work, and none are greater sinners in this respect than the so-called patrons of art. This may seem a serious charge, but I would ask any artistic tradesman if it is not unfortunately too true. Let him put his best work into any preliminary design, and how often is he not mortified by the huckstering spirit that shows itself in the patron. This, however, is by the way.

No one recognises more readily than I do that both the worker and the theoretical exponent of art occupy legitimate places in the sphere of labour, and it is much to be regretted that they do not sink, if possible, their differences with the view to acting more in harmony. The workers have to some extent been benefited by the teachings of the professors and writings of those who have opportunity of becoming students of art, though not of applied art, but their efforts have been dwarfed by their having failed to grasp the conditions under which things are made. Art is just now the fashion, and is being done to death; attention to art is very well in its way, but in urging its claims many who are enthusiasts, either from love of it or for monetary considerations, are tending to produce a revulsion against it among our actual workers, upon whom after all its application principally depends. Let them take a friendly word of warning, and not cause these to loathe the very name of art by their insistence on it as being the end and aim of every manufactured article.

Surely, a thing, whatever it may be, of any artistic merit should not proclaim the art or artifice by which it is vulgarly recognised as an artistic production. If we look at the stilted affected designs which one sees occasionally bearing the names of leaders of public opinion on art, the bewildered student, who with an intuitive perception that truth and honesty of purpose are the true principles on which art is founded, may well be disposed to think the contrary.

Now all this may seem dreadfully "Philistine" and to proclaim the outer barbarian, but artisans in whatever craft I ask you is it not time that we should have our say in the world of art? The literary art student, or, if he prefers it, art worker, has, from circumstances which need not be enlarged on, hitherto almost alone had the ear of the public, but now that we have WORK, a real technical journal not devoted to any one branch of labour, and in which professional and amateur meet on common ground, it will be our own fault if, however feeble our pens, we do not give forth our opinions. We, whatever our trade or craft, have opportunities of being familiar with its practical side, and to give the British worker his due, he is not so deficient in intelligence as to be necessarily one whit behind the theorist in true perception of art principles and their application to his own special avocations.

On these grounds I have, therefore, ventured to digress to some extent from the practical consideration of "lining up," and I can only hope that none of the foregoing remarks will be in any way misconstrued to mean that due attention should not be given to art in relation to manufactures, only it must be done in a manner consistent with common sense.

(*To be continued.*)

THE TENANT'S GREENHOUSE.

UNATTACHED TO THE SOIL AND REMOVABLE AT PLEASURE.

BY GEORGE LE BRUN.

FRONT END OF HOUSE—DOOR—RIDGE BOARD—ROOF SASHES—FINIAL—IRON STAYS—FLOOR—SHELVES OR STANDS FOR PLANTS—DISPOSAL OF RAIN-WATER—PIT FOR SURPLUS WATER.

THE front end of the house is put together in a similar manner to the back (as described in the previous paper), but two upright pieces are required, and they are placed at a sufficient distance apart to admit of a door 2 ft. wide being hung between them. This door is lined with matchboards in the lower panel to correspond with the rest of the house; the upper part is filled in with glass, a sash bar dividing it into two panes. The door stiles are cut away above the belt rail to a width of 2½ in. in the usual glass-door manner. The wood for the door should be 1½ in. thick, and a suitable width would be 4 in. for the stiles and top rail, and 7 in. for the belt and bottom rails. The door is best hung to open outwards, as it is then out of the way when attending to the plants. Fig. 10 shows the framing of the front end, in the square opening of which, above the door, a fanlight is hung on pivots.

A ridge board is now put on of 7-in. by 2½-in. wood; it must be bevelled on the top edge to the rake of the roof, and, when in position, project the thickness of the roof sashes above the framing of the house ends. It is secured by means of iron plates, two at each end, screwed on as shown in Fig. 11. A fillet 1 in. square is put along the entire length of the ridge board on each side for the sash ends to rest on. (A, in Fig. 11.)

The roof sashes come next. They are made in four sections, two for each side, and project two inches over each end of the house, and the same distance over the sides; the four end stiles must therefore be 6 in. wide. The inner stiles may be 3½ in. wide; they are grooved on the upper side to allow of the water running off, and so preventing leakage to the inside; a bead covers the joint, and projects midway over these grooves. This mode of jointing is shown at Fig. 12.

The finishing of the ridge is given at Fig. 13, and a design for cutting an ornamental ridge board of a simple and easy design at Fig. 14, Fig. 15 being an alternative design for the same purpose, which, however, is far better fitted to be cut in zinc than in wood. A finial is placed at each end of the ridge to form a finish; it may be of any design to suit the builder, from a simple piece of turned work to an elaborate octagonal, a design for which is given at Fig. 16.

Two iron rods are put across the house in the inside, about 4 ft. from each end, one end of the rod having a snap head and washer, the other a nut and washer to allow of tightening up. These rods are best put through the top rails of the framing; they prevent any tendency of the sides to spread from the outward thrust of the roof, and

they can be utilised to hang pots or baskets from.

The house being put together, the inside demands our attention, and the first call upon it is the floor. Now we will eschew wood, it holds water and rots easily, and utilise whatever may be most handy in the way of concrete slabs, slate, or cement; in any case we will require joists, or sleepers rather, of 5-in. by 2-in. wood, cut to fit between the sides of the sill, and levelled down so as to come even with the top side of it. If concrete slabs are used for the floor, the sleepers must be put at sufficient distances apart in order that the edges of the slabs may rest evenly upon them; while, if a cement floor be decided upon, rough slates or boards can be utilised to form a bearing for it, and the sleepers put in accordingly.

The width of the greenhouse (8 ft.) allows of shelves for plants nearly 3 ft. wide along either side, and the mode of supporting these tables is given at Fig. 17. One leg only is used, the inner end of the support, or table rail, resting on the belt rail of the house, into which it is checked and screwed. The shelves are spanned with 3-in. by 1-in. stuff about 1 in. apart.

Instead of allowing the rain-water from the roof to run off on to the ground and go to waste, it can be utilised for watering the plants with, and so we will run a neat zinc gutter along each side of the roof, having a slight fall towards the closed end of the house, from which end of the gutter a pipe, 1¼ in. diameter, is taken inside (by boring the end sash stile), and led into a tank or cistern underneath the table. This tank will have a tap from which to draw a supply of water when required, and an overflow pipe to carry off surplus water, and so prevent any chance of flooding the house in the event of a very heavy rainfall. This overflow pipe should be 2 in. in diameter, and may be led into the nearest drain, or, if that is inconvenient, a large hole may be dug in the garden and filled with broken bricks to within a little of the surface; over the bricks lay a few boards, and level up with earth. The overflow pipe may then be led into this hole, which will absorb all the surplus water that is likely to reach it. A sketch of this cistern arrangement is given in Fig. 18, in which only the pipe from one gutter is shown; the pipe from the other gutter is taken inside the house in the same way, brought down under the table, and led under the belt rail of the framing across the end of the house to the tank. A large tub or barrel can be used instead of a square tank if it is found to be handier. The overflow pipe must be led under the house before the floor is laid down, or it may be taken out through the end if that method suits best; in fact, many minor alterations can be made to suit individual tastes.

To get rid of the surplus water, a pit should be dug in the earth about 4 ft. deep and 30 in. in diameter. The pit should be filled up to about half its depth with brickbats thrown loosely in one on the other. On this some brushwood should be thrown to prevent the entrance of the earth, with which the pit is filled up, and a 2-in. drain pipe should be set in the earth extending from the surface of the ground to the brickwork. The free end of the overflow pipe should be introduced into the drain pipe, and the mouth of the latter closed round the pipe with cement or some other suitable material.

Pits made and filled in this manner are most effectual for carrying off surplus water, and by the interior arrangement described water for the plants is always at hand except in very dry seasons, when showers are few and far between, and any dirt or annoyance from drip round the house is utterly prevented.

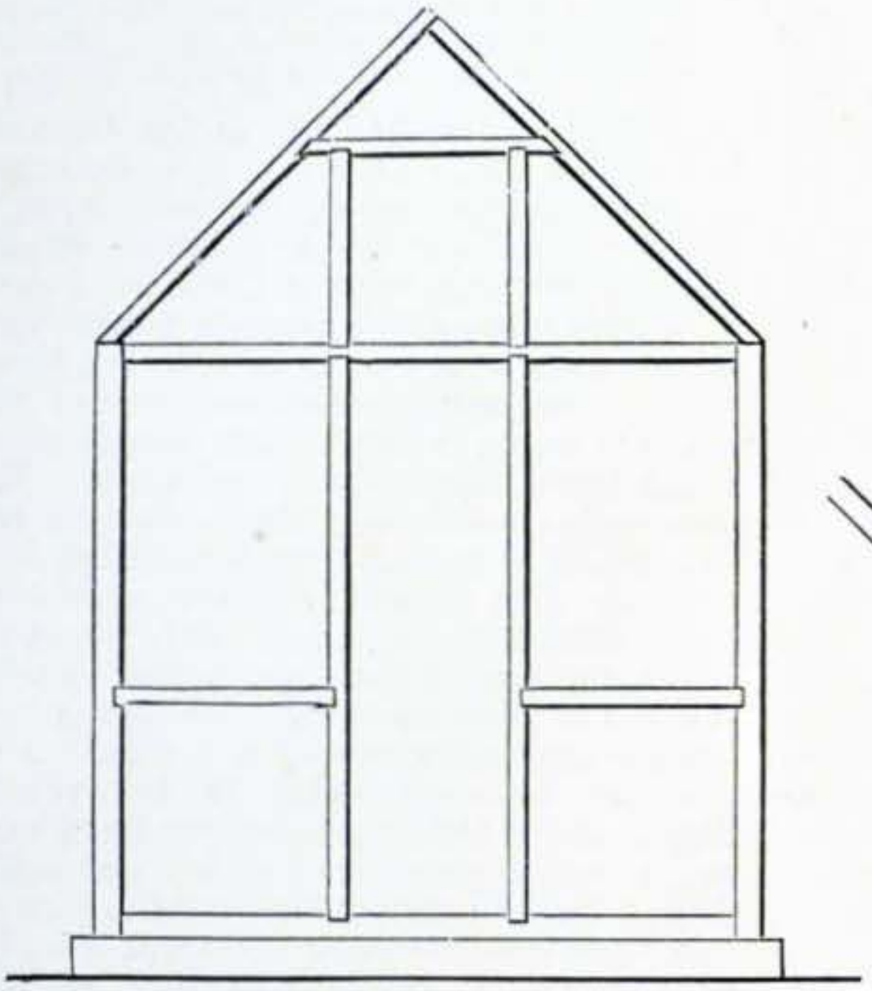


Fig. 10.

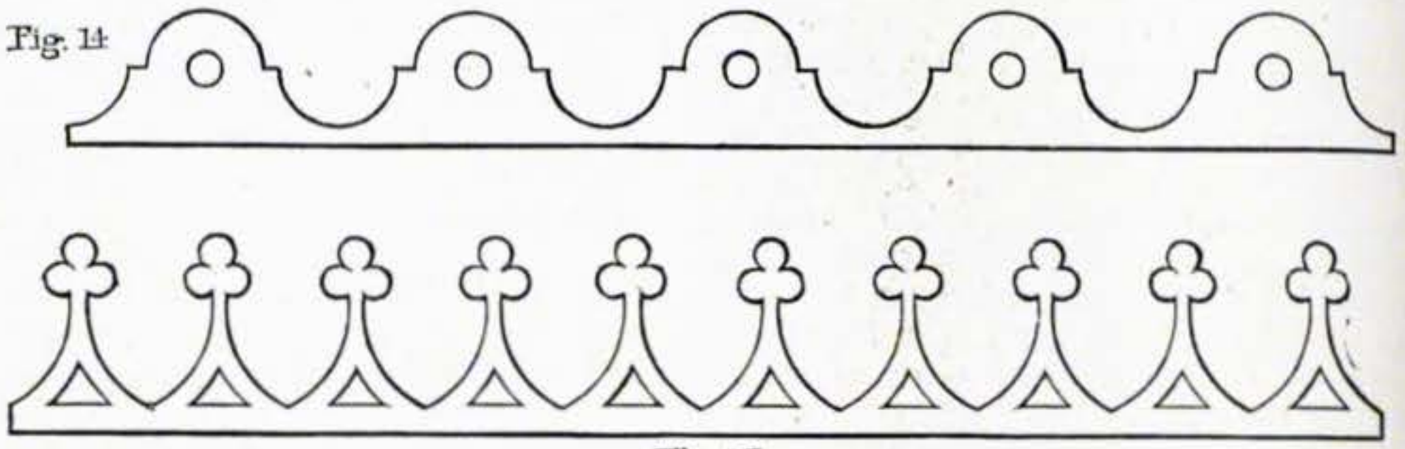


Fig. 14

Fig. 15

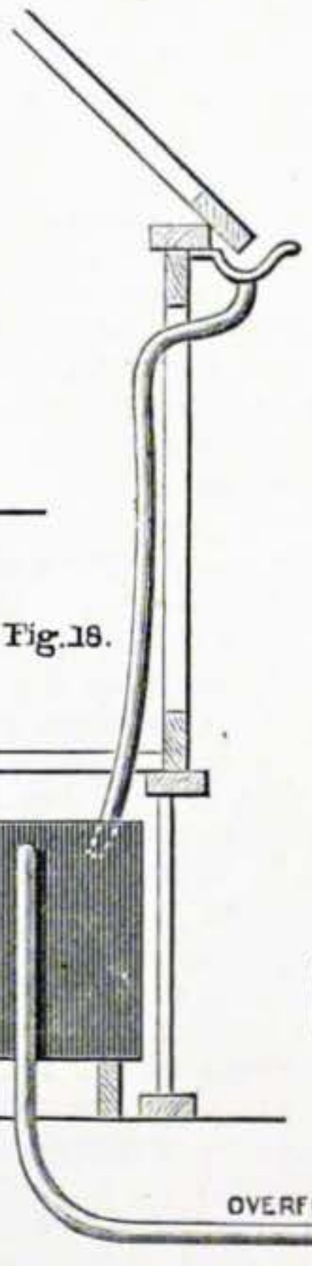


Fig. 18.

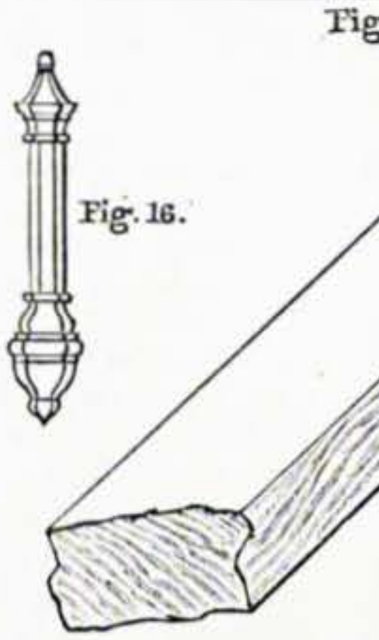


Fig. 12.

Fig. 16.

Fig. 11.

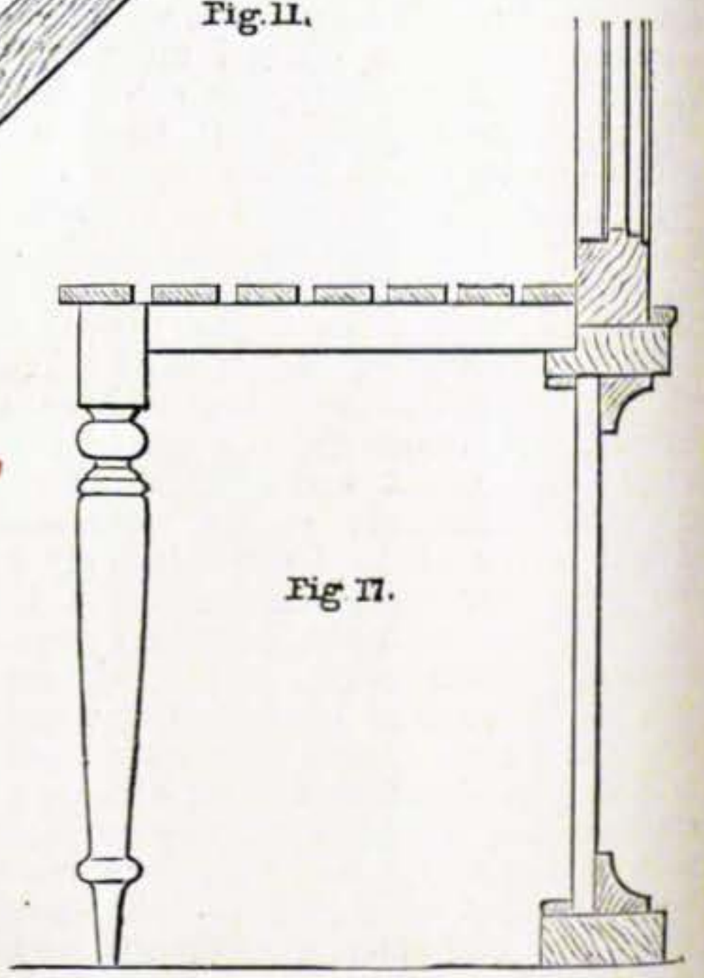


Fig 17.

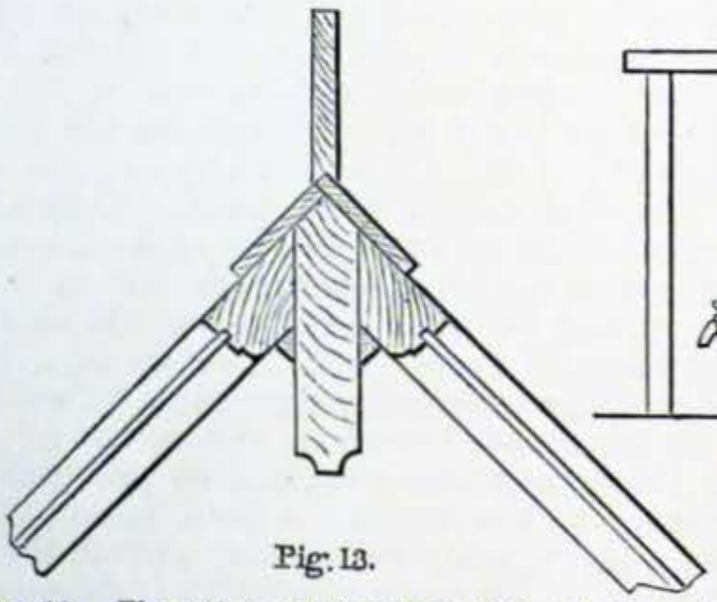


Fig. 13.

Fig. 10.—Elevation of Framing of Front End. Fig. 11.—Mode of Putting on Ridge Board. Fig. 12.—Details of Joint of Roof Sashes. Fig. 13.—Details of Ridge in Section. Fig. 14.—Cut-out Ridge Board. Fig. 15.—Alternative ditto. Fig. 16.—Octagonal Finial for End of Ridge. Fig. 17.—Details of Inside Shelves. Fig. 18.—Section showing Cistern for Rain-water with Mode of Collecting and Disposing of Overflow.

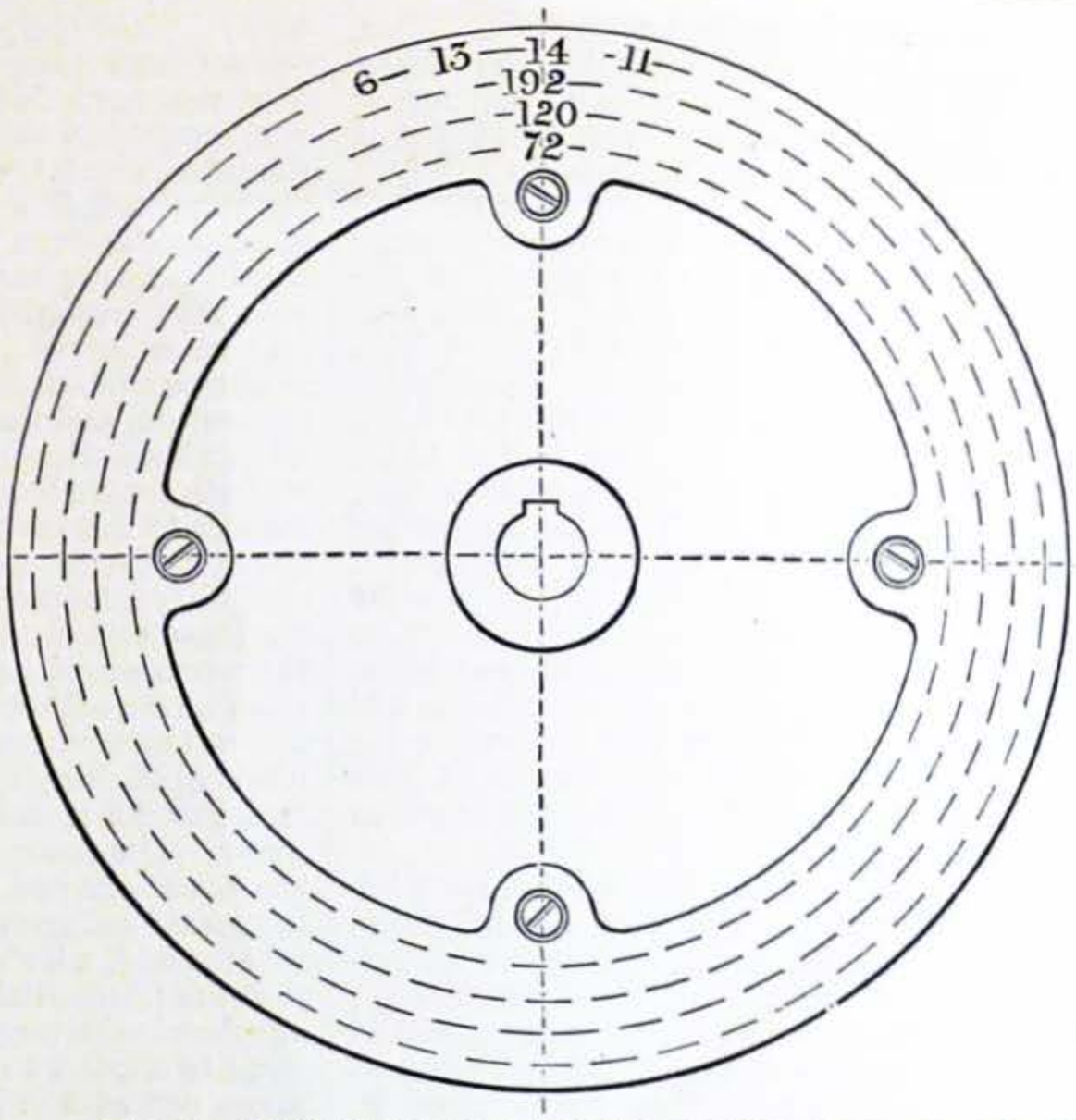
LATHES AND TURNING APPLIANCES.

BY F. A. M.

VI.—The Worm Wheel and Tangent Screw.

When wheel cutting is to be done by means of the division plate, it will often be found that the required number of teeth cannot be produced by means of any of the circles

at command. Clockmakers' dividing engines, which have large horizontal division plates, on which are drilled a large number of circles, may contain every number that is at all likely to be required in clockwork, but the 5-in. lathe pulley cannot well contain more than six or seven circles; and if the table given with the paper on the division plate be examined, it will be seen that none of the eleven circles of holes given there can be divided by the prime numbers 11, 13, 17, 19; yet this table is only carried up to 20. Had it been continued still further, many other numbers would have been found which would not go exactly into any of the eleven circles of holes; and therefore it would have been difficult, with these numbers only at command, to cut wheels having 11, 13, 17, 19, etc., teeth. The worm and wheel about to be described may be considered a universal dividing engine, inasmuch as that, with a little contrivance, it will cut any number of teeth whatever.



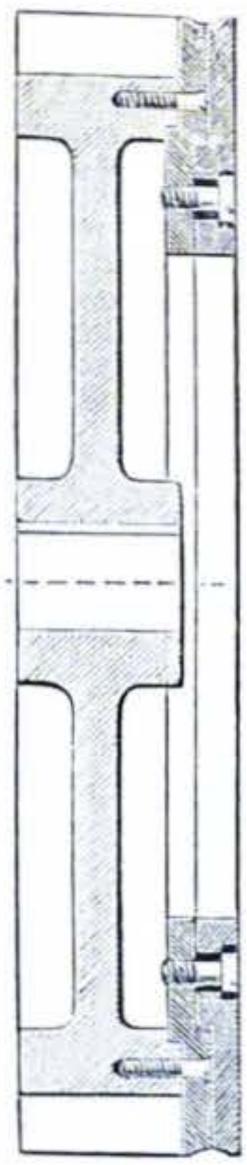


Fig. 26.—Worm Wheel and Gear Wheel: Front View. Fig. 27.—Ditto: Section.

In ornamental turning it will not be necessary to go beyond the powers of the division plate to find an unusual number. Yet the worm and wheel, otherwise called the tangent screw movement, with segment stops, is of as much importance as in metal work, because it provides for a very slow movement of the mandrel, and also enables the workman to confine this movement between two circular stops, called segment stops, so that he can drill or cut out only part of a circle. Fig. 24 will give an idea of the way in which the tangent screw and worm wheel is generally arranged upon the ornamental turning lathe, where there is no back gear. There is a circular fitting upon the small end of the pulley, accurately turned, and the worm wheel has a shallow recess which fits upon this, and then the two are fixed by screws put in from the left. The tangent screw is underneath, and it is turned by the upper one of the two square heads seen. The lower square commands an eccentric, by means of which the frame carrying the screw can be raised, so that the screw will gear with the wheel, or can be lowered out of the way when the band is in use.

The writer's lathe is fitted with back gear, which made it inconvenient to attach the worm wheel as in Fig. 24; also the bolt upon the face of the large gear wheel (by means of which this wheel and the pulley are caused to revolve together) does not clamp them immovably, and might even come to allow a little shake between the pulley and wheel. It was therefore necessary to attach the worm wheel to the large gear wheel in front of the pulley (see Fig. 25). The worm wheel cannot well be less than $\frac{3}{8}$ in. thick, and there may be some difficulty in getting it in; but it will certainly

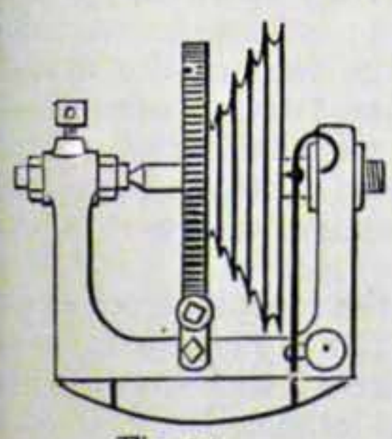


Fig. 24.

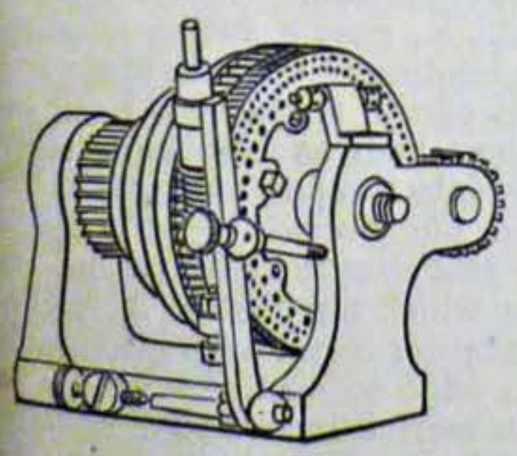


Fig. 25.

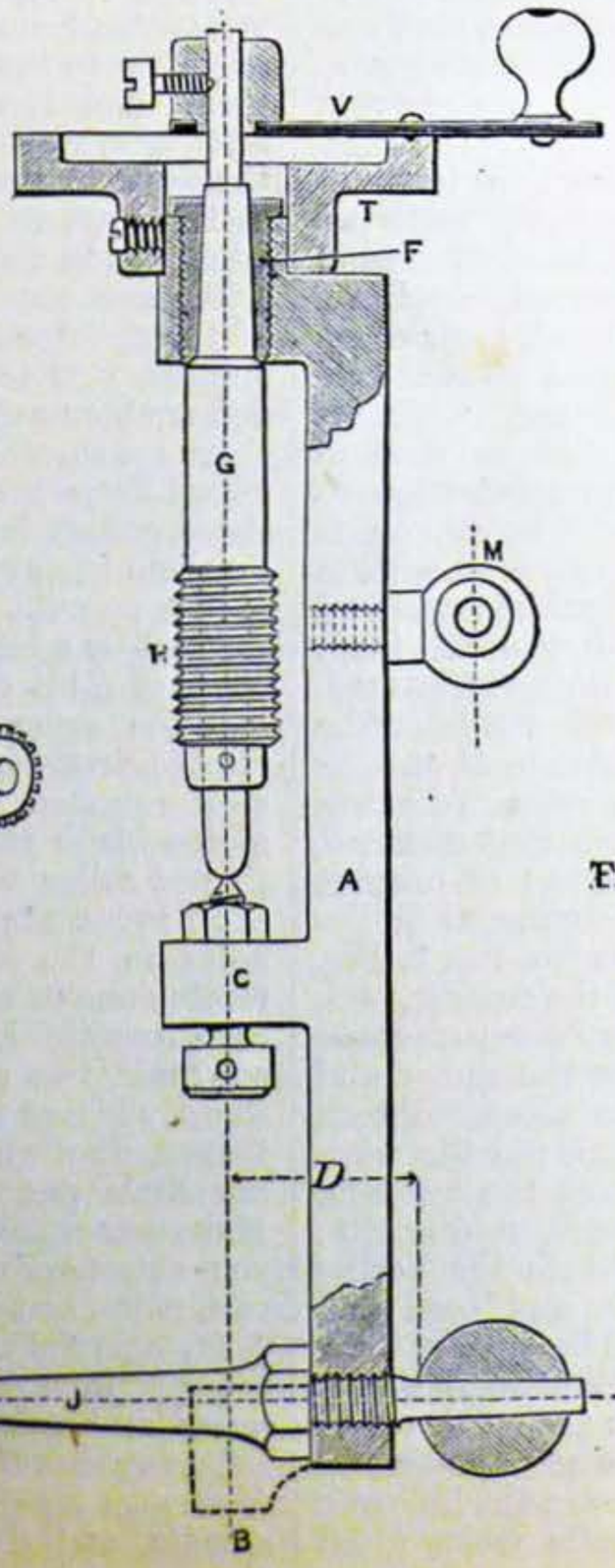


Fig. 28.

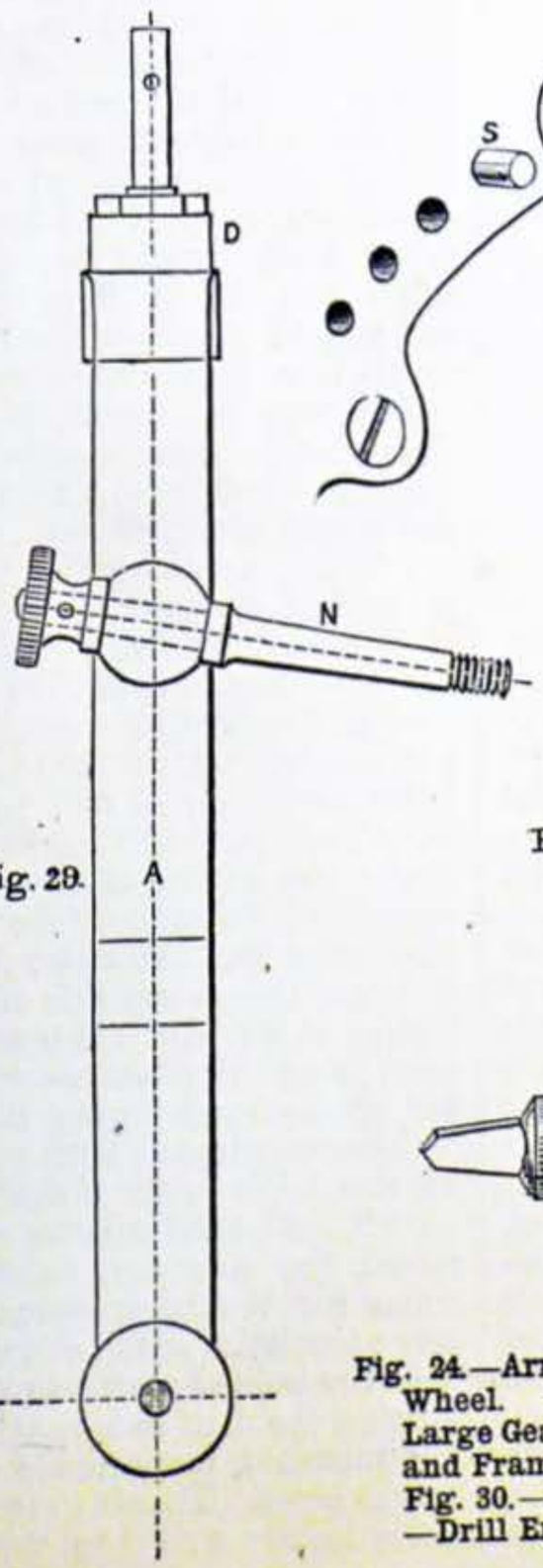


Fig. 29.

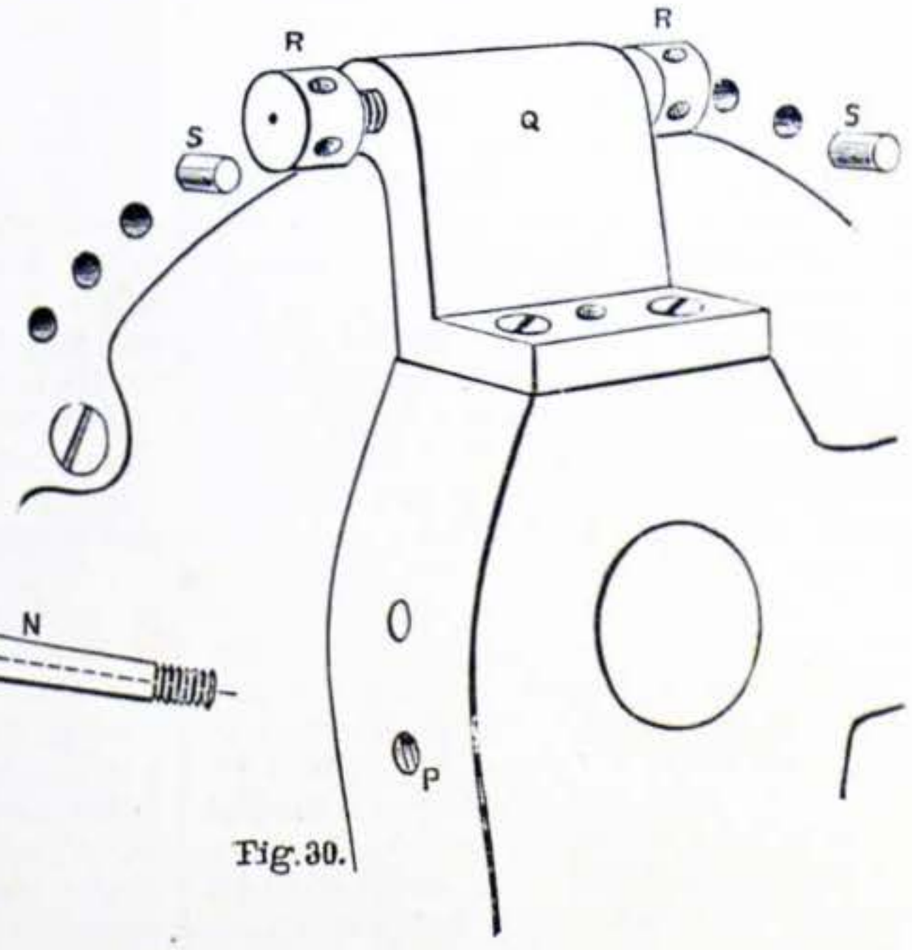


Fig. 30.

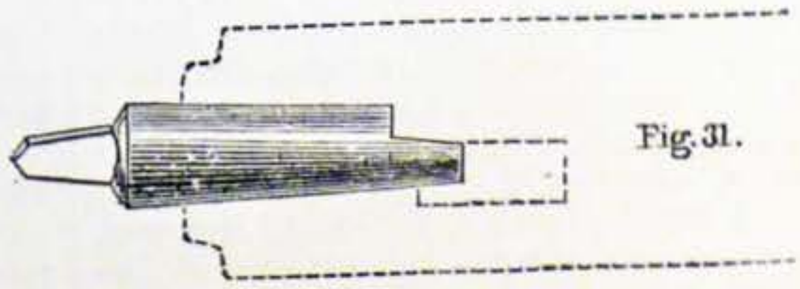


Fig. 31.

Fig. 24.—Arrangement of Tangent Screw and Worm Wheel. Fig. 25.—Attachment of Worm Wheel to Large Gear Wheel of Pulley. Fig. 28.—Tangent Screw and Frame: Side View. Fig. 29.—Ditto: Front View. Fig. 30.—Segment Stop and Pins Enlarged. Fig. 31.—Drill Enlarged.

be impossible to get the tangent screw in beneath it. However, its frame can be easily fitted into the ball of the index peg, which will suit very well, since they will not both be used at once. Besides, it will be very easily removed and put away for safety when not wanted.

It would be difficult to fit such a worm wheel into one's own lathe without a second lathe to work with. It would be still more difficult to cut the teeth of the worm wheel perfectly. The amateur is not advised to attempt that part of the work; he may have a worm wheel fitted and cut for about 50s. He can then correct it himself, make the tangent screw and frame, and then, by means of the worm wheel, he can drill the front as a division plate. This is the work now about to be described, not, however, with quite so much detail as the former paper contained, since no one should attempt such a piece of work who is not already something of a workman.

Figs. 26 and 27 are a front view and section of the front gear wheel of a 5-in. back-geared lathe, showing how the worm wheel was attached. The worm wheel is 7 in. in diameter, and the ring is rather less than 1 in. wide. (It would have given room for plainer figures if it had been $1\frac{1}{8}$ in. wide.) There are four rows of holes. The *first* is $6\frac{5}{8}$ in. diameter, and it has holes which divide it into 6, 11, 13, and 14 equal parts. Six is contained in the other circles, but it is often required, and is easier to pick out quickly in this circle. Every hole of the 6, except the zero or starting hole, is marked with a (6), so that it is easy to pass from one to another. Every hole of the 11 divisions is marked (11), and every hole of the 13 but the first (13); every hole of the 14 divisions (14). The first or zero hole is not marked, as it is easy to pick that out, and from it to divide the circle into 2, 3, 6, by the 6 divisions; 7 or 14 by the 14; and 11 and 13 besides. Thus you only have to keep to the holes marked 11 for 11 divisions, or to those marked 13 for 13, etc.

All the holes are about $\frac{1}{12}$ in. in diameter, so that it would not have been possible to divide still further the same circle into 17 and 19 without the holes clashing, *i.e.*, cutting one into another in certain places. The *second* row of holes contains 192, which contains multiples of 8 and 12; also it is twice 96, and it is much used in "double counting." The figures 192 are stamped over the zero mark of this row, and numbers are placed at every 12 holes, dots above (or outside) the holes at every third, and inside opposite every fourth hole. The circle is $6\frac{1}{4}$ in. diameter. The *third* row has 120 holes, chiefly useful because it enables one to divide the circle into 5, 10, 20, etc., divisions. It is therefore figured at every twelfth, and has a dot opposite every sixth and third hole. This circle is $5\frac{5}{8}$ in. diameter. The *fourth* and last circle contains 72 large holes, about $\frac{1}{5}$ in. in diameter and $\frac{3}{8}$ in. deep. These are intended to hold the segment stops—little steel pegs which fit the holes, and project from the plate about $\frac{3}{8}$ in., so as to meet and be arrested by the head of adjustable fixed screws, and so confine the revolution of the mandrel within certain limits. There is, however, a short shoulder upon the index peg (described before, see Fig. 6, page 92), which fits into these large holes, and allows of their being used in connection with the index, which is useful, because 72 contains 9 and 18, which the others do not. It is marked at every eighth and fourth hole.

Looking at Fig. 4, it will be seen that the worm wheel is made as two flat rings, which are screwed together by four cheese-headed screws passing through four lugs or ears inside the rings. The first ring is strongly riveted by six rivets to the gear wheel, after having been carefully fitted to the circular fitting. It has itself a circular fitting, into which the second half of the plate must fit very exactly. The four screws are, however, purposely fitted with a slight amount of play in the plain holes, so that they shall not control the set of the second plate upon the first half. It is, however, confined by the circular fitting, which ensures the two halves remaining rigidly concentric. The gear wheel, with the worm wheel attached, should now be chucked perfectly true in a wheel-cutting engine, and the edge cut with 240 teeth, inclined to an angle of 2°, which will leave them very nearly 11 to the inch, the pitch of a $\frac{5}{8}$ Whitworth bolt. At this point the amateur may take the work in hand himself.

First take out the four screws, turn the front plate half round, and replace them, taking care to examine the fit or correspondence of the teeth all the way round; when this correspondence is as near as possible, fix the screws, and then you will see how near to truth your worm wheel is. Dividing engines are not perfect; of course, too, it is very easy to chuck the worm wheel a little out of truth, which would cause the teeth to be closer together on one side than on the other; and you will very likely find a tooth edge projecting $\frac{1}{50}$ in. in one direction one side, and $\frac{1}{50}$ in. in the opposite direction on the other side of the wheel. Observe carefully whether you have "split the difference;" if not, release the four screws, and do so.

Here it may be pointed out that as one object of the four screws is to enable one to fix the outer plate in four different positions upon the inner so as to equalise any error in the spacing of the teeth, it is necessary that the number of teeth chosen should be a multiple of (*i.e.*, divisible by) four: for instance—had we to deal with seventy teeth we might have turned the plate half round and found the teeth correspond, but if we had turned it one quarter round, their edges would have been "at sixes and sevens."

The tangent screw or worm, with its frame, will now be described as seen in detail in Figs. 28 and 29, its application to the headstock appearing at Fig. 25. A is the frame, a casting of brass, cast with a projection, B, shown dotted at the lower end of Fig. 28, intended to aid in the chucking, and cut off as soon as the turning is finished. File up the back or straight flat side of the casting, then measure the distance, *D*, on your lathe from side of ball to centre of worm wheel, subtracting $\frac{1}{8}$ in. from that distance, scribe the height of the centre of tangent screw on both ends of the casting as it lies on the flat back, and also on the lug, C, Fig. 28; now file up one side of the casting, and, laying it on that side, scribe across these lines to get the centres for the screw and for turning and boring the piece. Punch and bore centres at both ends, put the work in the lathe with B against the running centre, and turn up the neck, D, Fig. 29; round the shoulder, substitute the boring collar for the back centre, and bore and screw the hole for the coned bearing, F; now drill the hole at C for $\frac{1}{4}$-in. Whitworth screw, putting the drill in through the collar on to the punched mark made where the scriber marks cross. This is to ensure the hole at C being in line with the spindle when fitted into F. Take the piece out of the lathe, cut off the projection, B, and tap the hole at C from that end. Now turn the coned bearing, F, of brass, not forgetting the short conical shoulder, which is quite essential. Turn up the spindle, G, fit F upon it, at first tightly, so that you can turn up the outside of F, and thread it; or it may be driven on another mandrel; or, better still, the neck, D, might be cast so much longer that the piece, F, might be turned there, bored out, screwed, and cut off, and then the part, A, screwed to fit it. Make two long ferrules, H, to fit into G; both should be threaded alike with eleven threads to the inch and both of cast steel, one of these to have oblique grooves filed out to form it into a kind of hub; it is then hardened and used to equalise the teeth of the worm wheel and bring them to fit the plain screw. Make the small centre screw and nut at C and harden its point; turn the piece, J, of steel, fit the point into the index ball, and fit it into the frame with a $\frac{3}{8}$-in. screw. The piece, K, screws into the base of the headstock just like the ball, and through it goes a $\frac{1}{4}$-in. screw with a milled head and pointed end, which takes into J and ensures that the frame shall be held firmly and without shake; the piece, K, should be far enough away to allow J to pass it when the frame is taken out of the ball, otherwise K would have to be removed every time. Now make the ball, M, so that the screwed end of N shall come opposite the casting of the headstock, where the $\frac{1}{4}$-in. tapped hole, P, Fig 30, is bored to receive it; see also Fig. 25. It is by means of the milled head on the screw, N, that the frame with the tangent screw it carries is brought into close contact with the worm wheel, or released so that it can be turned down or taken out altogether. At Fig. 30 are seen the segment stops, S, S, in the innermost row, consisting of large holes. At Q is seen a forging firmly screwed upon the top of the headstock; it leans backward so as nearly to touch the face of the division plate, and it carries two capstan-headed screws, R, R, easily adjusted, against which the segment stops abut: the piece, Q, is not in the way, and remains where it is even when not in use.

We now come to the most interesting part of the apparatus. The top of the frame and spindle, G, rise clear of the worm wheel, and enable us to fit a large collar, T, of which there are several, on to the circular fitting D, which keeps it concentric with the spindle; these collars have small binding screws to fix them in any position. On the upper end of the spindle, G, goes a spring handle, V, secured by a binding screw; the arm of V is made of a bit of the blade of a hand saw, and the square hole at the large end is riveted firmly into the boss; there is a little steel rounded pin riveted into the middle of the blade just over the edge of the cup-shaped collar, which pin acts, in fact, like a short index peg, for it can drop into shallow holes in the edge so that the handle can receive one or more turns exactly, or half a turn, one-third, one-fifth, etc., or one and one half, two and one third, etc. etc. By slightly lifting the little knob-handle as it is turned, the spring bends enough to allow the little peg to pass without touching. Make any number of these collars you think you may require, say five; fit each on to D, turn it up, and divide the edge by drilling 5, 7, 11, 12, 13 shallow holes, one row in each collar; provide each collar with a fixing screw, and lay them aside.

To equalise the teeth of the worm wheel, drive the hardened ferrule, H, upon the spindle, and fix a small pulley upon the

upper end of the spindle, so that you can drive it from the overhead motion, then bring up to cut by turning the screw, N, and take care that the mandrel is quite free to revolve, as it must do, while the cutting is done. Continue cutting till the mandrel has made several revolutions and till the teeth of the worm wheel are touched almost all over; then take out the four screws, turn outer plate half round, and repeat the cutting; then return to the first position and cut again, then to second position, till the teeth coincide in both. After this turn plate one quarter round and continue the process till the teeth correspond in all four positions; be patient here, and persevere, for a week if necessary, and when you have got it right you will have made a most valuable addition to your lathe.

Now the holes of the division plate may be drilled upon the front of the worm wheel. A drilling spindle and overhead motion will be required, also a slide rest. Make a very short drill, which should be turned up *in its own drilling spindle* to an angle of about 18°; it need not project more than ¼ in., so as to be as stiff as possible. The drill is shown enlarged at Fig. 31; it is flat, point of the usual form, but sides bevelled off with the file, then hardened and sharpened on an oil-stone; try it on a spare bit of brass, and when it cuts perfectly be very careful not to break it till the whole of the work is done. You will require a second and larger drill made to a sharper angle for the larger holes. The small holes may be ⅛ in. deep and $\frac{1}{12}$th diameter at the mouth. There must be a stop on the slide rest to regulate the depth, so that each hole will be of the same size and depth.

The principle on which the divisions are obtained must now be explained. If between every hole the tangent screw were given one turn, then, since the worm wheel has 240 teeth, and at every turn of the handle the screw passes one tooth, therefore we should divide the circle into 240 divisions, and the last turn would cause the drill point to drop again into the first hole. Evidently, if between each hole we gave the screw 2, 3, 4, 5 turns, we should get $\frac{240}{2}$, $\frac{240}{3}$, $\frac{240}{4}$, $\frac{240}{5}$ numbers of holes=120, 80, 60, 48 holes; on the other hand, if we give $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ turns, we get $\frac{240}{\frac{1}{2}}$, $\frac{240}{\frac{1}{3}}$, $\frac{240}{\frac{1}{4}}$, $\frac{240}{\frac{1}{5}}$, = 480, 720, 960, 1,200 holes. Therefore, whatever number of holes or divisions you wish for, divide 240 by that number, and you get the turns or part of a turn of the handle of the tangent screw which you must make between each cut.

Applying this rule to the numbers chosen for our division plate (see p. 153), we have

$$\frac{240}{72}=3\tfrac{1}{3};\ \frac{240}{120}=2;\ \frac{240}{192}=1\tfrac{1}{4};\ \frac{240}{14}=17\tfrac{1}{7};$$
$$\frac{240}{13}=18\tfrac{6}{13};\ \frac{240}{11}=21\tfrac{9}{11};\ \frac{240}{6}=40;$$

so that to divide the inner circle into 72 we must between each hole give the tangent screw 3⅓ turns, and the use of the divided collars becomes apparent.

In the same manner the tabular statement just given shows the number of turns that must be given to the tangent screw between each hole in order to divide the inner circle into 120, 192, 14, 13, 11, and 6. I have endeavoured to make the explanation as clear and complete as possible, and I do not see how it could well be made plainer; still, if any reader fails to understand anything that has been advanced, I will endeavour to give him fuller information through "Shop."

The following table shows how many turns are required for any number up to 50:—

Divisions.	Turns.	Divisions.	Turns.	Divisions.	Turns.	Divisions.	Turns.
2	120	15	16	28	$8\frac{4}{7}$	41	$5\frac{25}{41}$
3	80	16	15	29	$8\frac{4}{29}$	42	$5\frac{5}{7}$
4	60	17	$14\frac{2}{17}$	30	8	43	$5\frac{25}{43}$
5	48	18	$13\frac{1}{3}$	31	$7\frac{23}{31}$	44	$5\frac{5}{11}$
6	40	19	$12\frac{12}{19}$	32	$7\frac{1}{2}$	45	$5\frac{1}{3}$
7	$34\frac{2}{7}$	20	12	33	$7\frac{1}{11}$	46	$5\frac{5}{23}$
8	30	21	$11\frac{3}{7}$	34	$7\frac{1}{17}$	47	$5\frac{5}{47}$
9	$26\frac{2}{3}$	22	$10\frac{10}{11}$	35	$6\frac{6}{7}$	48	5
10	24	23	$10\frac{10}{23}$	36	$6\frac{2}{3}$	49	$4\frac{44}{49}$
11	$21\frac{9}{11}$	24	10	37	$6\frac{6}{37}$	50	$4\frac{4}{5}$
12	20	25	$9\frac{3}{5}$	38	$6\frac{12}{19}$		
13	$18\frac{6}{13}$	26	$9\frac{3}{13}$	39	$6\frac{2}{13}$		
14	$17\frac{1}{7}$	27	$8\frac{24}{27}$	40	6		

Remembering that our collars are divided into 5, 7, 11, 12, 13 divisions, and looking through the fractions in the list, we find we could divide into any of these numbers except 17, 19, 23, 27, 29, 31, 34, 37, 38, 41, 43, 46, 47, 49. Now, although these numbers, and those others which would be discovered to be beyond our range if the list were continued, might, very likely, never be required; yet these, and, in fact, any number whatever, can be obtained by a little trouble. Take, for instance, 239 divisions, one short of 240; here it would be necessary to give between each cut $\frac{240}{239}$ turns, that is, one whole turn and $\frac{1}{239}$th of a turn. This is an extreme case, but it could be managed by making or buying a paper scale having on it 239 divisions of about $\frac{1}{3\frac{1}{2}}$ in. in length, so that the length of the strip would be some 8 or 9 in., the circumference of about 3 in. Take the dividers set to about $\frac{1}{3\frac{1}{2}}$ in., and step them along the edge of a piece of paper, cut off the strip when you have made 239 marks, and your strip should be about 8 in. long. Now prepare a collar of hard wood, fit it upon D, and then carefully reduce its external diameter, till the strip will just meet round the edge; fix it there with fine pins or tacks (gum might alter its length). Now between every cut make one whole revolution and one division. By carrying the divisions on to the upper surface, and making a mark on each one as it is used, mistakes may be avoided. The general rule would be, divide 240 by the number of divisions required, reduce the fraction if possible, let the collar be divided into a number of divisions equal to the denominator, and count between every cut as many of these divisions as you have units in the numerator.

The apparatus just described will divide into as many divisions as are likely to be required with great convenience, and, with a little trouble and contrivance, it will divide into any number whatever. It will serve also to give a very slow motion by hand to the mandrel, which is often of great use. It is often quicker to use than the division plate, since one turn of the handle, two turns, or three, or one and a half, for 240, 120, 80, 160 divisions, can be given more quickly than the index peg can be moved, and with less chance of error. The tangent screw must, of course, be held close up, so that there can be no possibility of shake between it and the wheel, and then the work will proceed with certainty and despatch.

I have now put my readers who are given to lathe work in possession of much information on Lathes and Turning Appliances that, I trust, will be useful to them; and here I shall stop, for the present at all events, leaving other appliances for consideration, if required, at some future period.

JAPANESE MOTIVES FOR FRET CUTTING, STENCILS, AND SIMILAR PURPOSES.

Illustrated from Native Books.

BY J. W. GLEESON-WHITE.

II.—Of Flower and Insect Forms.

In the former chapter of this paper enough was said of the general laws of Japanese art, but little of the possibility of using it upon English articles; and yet this is a very pertinent aspect, for while there are objects that may be embellished with direct copies of Japanese ornament, others are so emphatically European in their shape and purpose that the Eastern decoration fails to combine with them, but tells distinctly as applied ornament, that might be removed with no great loss to the article so treated. For example: a modern coal box, spatter Japanese birds all over it as you will, looks always what it is; yet in such an extreme case I think a little modification of the accepted shape might bring the discordant qualities into harmony.

In woodwork—more particularly the subject to-day—we notice that the Japanese almost entirely eschew our conventional mouldings, prefer square posts to turned ones, are content to let a square rod end with a simply cut-off finish, not always longing for a little knob to decorate it. They know eminently where to leave off, and in all art the best artists have recognised the value of this critical quality.

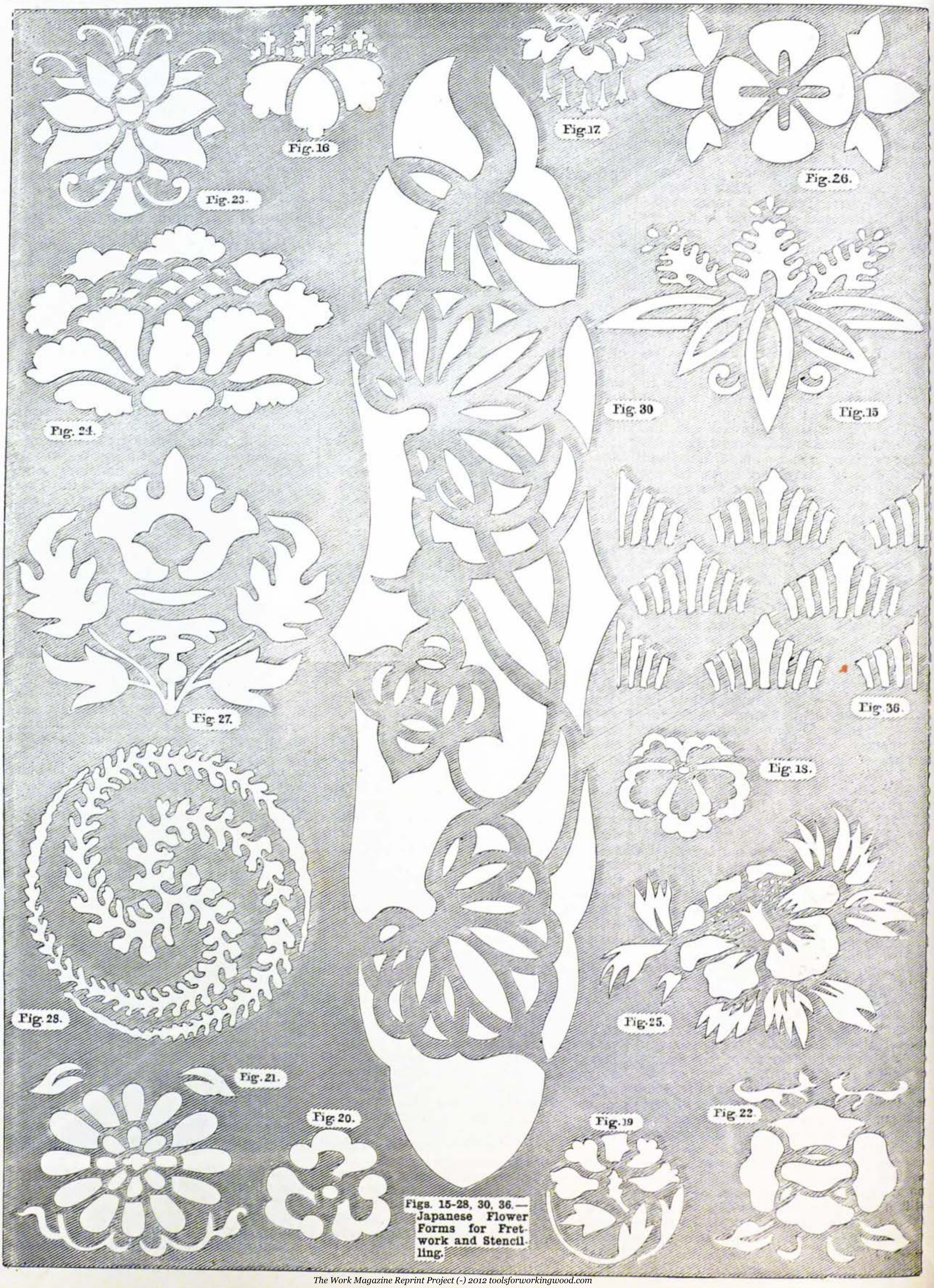
Suppression and reticence serve to display the beauty of the rest. If you lavish ornament on every part, like much modern Indian carving, the whole thing becomes a mere excrescence, and kills itself.

The value of an undecorated portion to give repose and breadth to the whole work, be it a palace or penwiper, is a quality worth trying for, and more truly artistic than any other, be it what it may.

For the designs here shown are the piquant spots that decorate the mere construction, and to be of value must be used liberally, but with great care against excess. Of the two extremes, poverty of ornament is, on the whole, better than exuberance. A thing plain to meanness is less wearisome than overloaded with meretricious gewgaws. The tendency of late has been to exceed the bounds of good taste by ever-increasing mass of details. In many of our modern restaurants and hotels we groan for a square inch of plain restful surface. Floor, furniture, walls, ceiling, are all alike a mass of design, may be good in itself, but as different from really beautiful decoration as a meadow sprinkled with wild flowers is to a bedded-out lawn. This frugality of the use of ornament allows the thing introduced to be of better quality. It is better to have a square yard of fine carving than a square mile of machine-made pattern. Better to have just two or three masses of careful design to emphasise certain portions of the work than a cheaper style lavishly spread all over it.

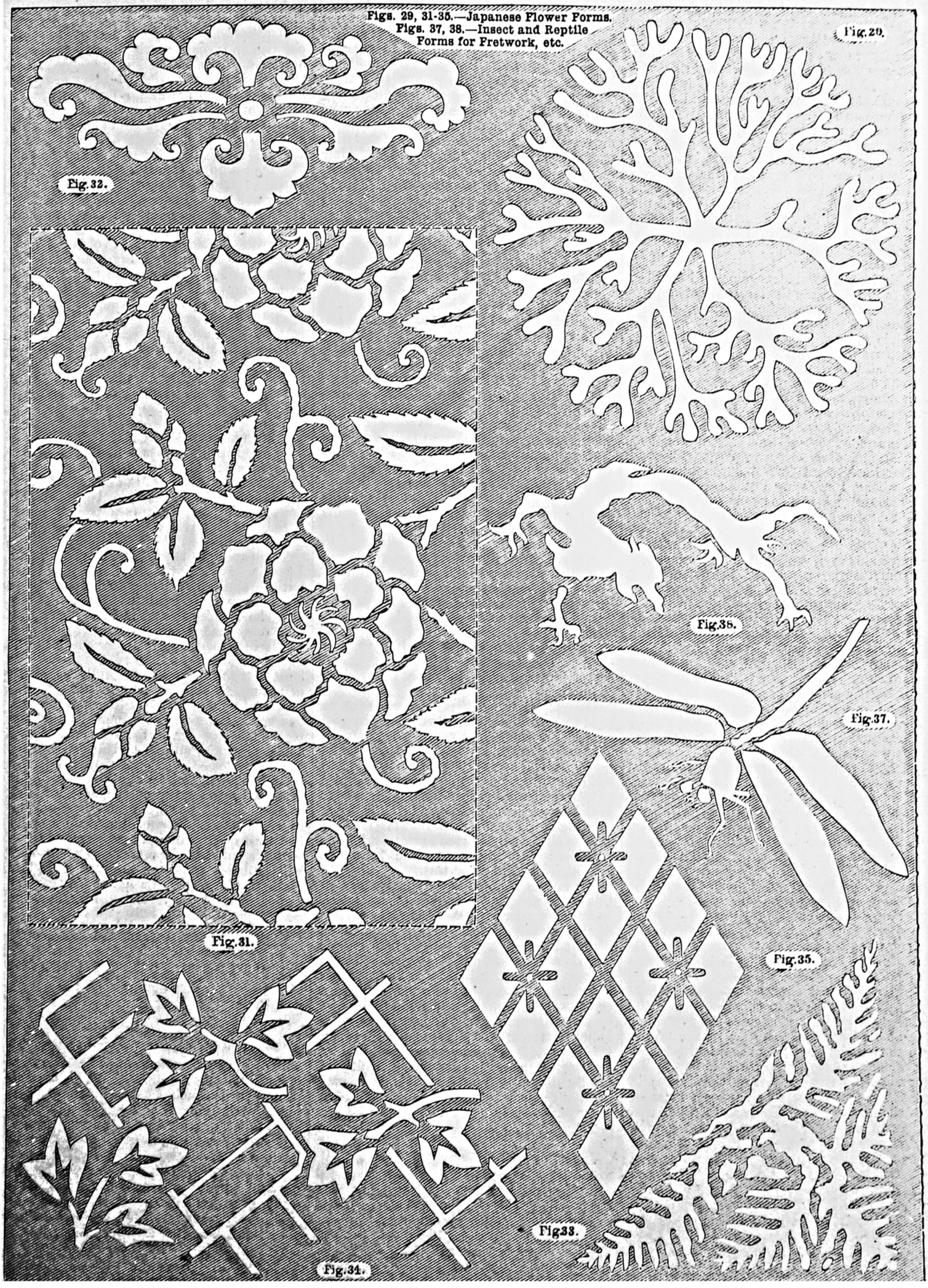
One more point is needful to reiterate, namely, the distinction between ornament and picture. And this is a fault the Japanese rarely make. They are pre-eminently decorative artists, and realise the importance of the distinction. In no aspect of the craze for the imitation of Japanese style has the difference between the true and the false been more apparent.

Because the Japanese artist suggests a picture upon his panel, and only suggests it, too often the European workman has



Figs. 15-28, 30, 36.—Japanese Flower Forms for Fret-work and Stencilling.

Figs. 29, 31-35.—Japanese Flower Forms.
Figs. 37, 38.—Insect and Reptile Forms for Fretwork, etc.



corrected what he took to be the result of mere incapacity of the Eastern craftsman, and translated the merely indicated background to a veritable landscape. But pictures are entirely distinct from decoration. Flatness is a valuable quality in conventional treatment of architectural spaces, distance an equally valuable one in a picture, and neither can interchange without detriment.

In these floral forms to-day it is instructive to note how carefully the Japanese artist has avoided pictorial representation of his subject. He has suggested all the salient points of the growth and shape of the plant, or been satisfied with a mere hint of the actual flower, but he has never tried to make it a picture.

Notice the floral ideas expressed in Figs. 15 to 31, especially the imperial crest of the Mikado, the horse-chestnut treated conventionally in Figs. 15 and 16; this beautiful object is perfectly suggested, and yet it becomes a conventional ornament, entirely decorative in itself. In Figs. 17 to 19, and 21 to 31, other flowers and leaves are expressed in similar way. Fig. 31 is an all-over design, capable of infinite extension to cover the required space. The amount of labour in a square foot of this pattern would be great, much more than in a square foot of American-Greeco-Gothic-Japanese-tag-rag-and-bobtail pattern. But the result would be also unlike. In one case a bit of good, if to some extent mechanical, art; in the other a monstrosity not worth having. Fig. 37 is a perfectly rational treatment of three simple leaves, but their geometrical arrangement makes the whole circle a masterpiece of design, easy and without effort, cut with no change of the fret saw; decorative either near or at a distance, it embodies all the good qualities of the art of design. Fig. 36 is a pattern almost meaningless in itself, yet repeated over a surface it becomes very telling in its effect. Of similar class is Fig. 35. If repeated it would be best to do it in chequer fashion, leaving alternate blank spaces the size of three sixteen smaller diamonds, thus saving the work, and gaining the larger decorative effect, the advice to secure which has already been repeated *ad nauseam* in this article. Fig. 34 is another all-over pattern, but the Japanese do not cover all the surface with such a design, as English use has it, but break up the mass by irregular portions of plain surface, vastly heightening the scheme of the whole.

And now, having noted down thirty-eight themes, how can they be best used?

For stencil plates they may be copied bodily. It is hardly needful to explain the way to cut these; but a very ingenious method, of Japanese origin, has been shown to me lately.

All stencil users know how often the bars left to strengthen the thin paper mar the design, so that in many cases the brush has to be used afterwards to fill up the breaks in the pattern caused by these said bars.

The Japanese solve this difficulty by cutting the stencil in two thicknesses of stiff but thin paper, then laying a network of the finest thread, as fine as hair, between the two papers. These being fixed together, the brush plays freely through the spaces of the net, which is of wide mesh in proportion to its size. Thus the sweep of the long line is kept, with no loss of strength in the stencil plate itself, and economy of future labour, since the one process completes the decoration.

For fretwork, there is no limit to the use of these motives; later on I hope to give working drawings of various structures adorned in this fashion, for this true fret cutting is worthy to be termed the classical method of its use. It appeals not to schoolboys or carpenters merely, but to artists. There is no reason why fretwork, properly used, should not rank among the minor arts. But to secure such a position it must be done without thought of the labour, and with care above that usually devoted to it. After many years of designing ordinary patterns, I should not like to maintain definitely that in this cut-out pattern the sole future is to be found; but I do hold distinctly, that much of the ordinary work is misapplied labour, and that if the pastime is doomed to remain only a pastime, it will be because of the low quality of its design. By this I do not, for one instant, say all designs produced are bad designs, but, as a rule, they are poorly adapted for use, and weaken the material under the pretence of beautifying it, making it less serviceable, less lasting, and, too often, in no way decorate the complete work, only ornament its several parts, and those in inadequate fashion. An inch of good decoration is better than a yard of poor ornament. A blot-book cover (to take an instance), with one of these Japanese designs worked carefully for its sole adornment, would be a thousand times better than many of the dozens of existing designs for that purpose; and as I am responsible for far more of these than perhaps my readers guess, such a statement comes at least unbiassed, and with the strength of a confession from one who has sinned even more than those to whom he is preaching.

Feeling strongly that a new future would be possible for fretwork if higher art were brought to bear on its designs, I have welcomed gladly this opportunity of showing one way to attain such a result. Here is good art and true, albeit it is foreign, and art of unusual style, in these thirty-eight examples.

For stencil work, these designs may be used to ornament panels, whether disposed as corner ornaments or centres, or produced in seeming irregularity over the surface at intervals. Nor need they all be worked in solid heavy colour; the Japanese obtain beautiful effects by shading off the colour in their stencil work, just as in their block printing they procure a result that is more akin to clever painting than printing, by this expedient of breaking into the European monotony of solid equal tint.

It may be said, to work successfully in this way needs the instinct of an artist. But every reader of WORK has more or less of that quality, if he would but make up his mind to use it. We have had artistic periods as a nation, and if now we can only encourage the individual to express himself individually, to cease to be a mere unit in a complex machine, there is hope for a new revival of genuine art. For art is not to be found in museums or picture galleries alone; when the cottage has a perception of beauty, seeking no mere prettiness, but a fit and seemly decoration, however simple it may be, that really beautifies its object, without in any way making it less useful or less serviceable, then the good day will be not far off.

The curse of the day is that each school, while proclaiming its own idols, disparages others. The Japanese lover will not love his hobby the less if he recognises the beauty of Flaxman's ornament, if he can appreciate Raphael's arabesques in the Vatican, and love and admire the attributes of periods directly opposed to his favourite Oriental models.

If those who look upon Japanese art as childish and barbaric, who think its worship a sign of degradation and decadence, are thereby impelled to revive their own admired styles, and diffuse new spirit and vitality into the well-worn mechanical repetitions of classic and later ornaments, well and good. But he loveth best who loveth well all things, both great and small; and the man who appreciates the value of a Japanese trifle at its true worth, will be better able to estimate the noble grandeur of those Elgin marbles we talk about so often and gaze at so seldom.

Above all, "clear your minds of cant." This seems an aphorism far away from our title, yet cant is as easy to acquire in decoration as theology; and because I like Japanese, there is no reason why you, my reader, should not hold it contemptible! The danger is, that people follow each other blindly, adopt a new thing because it is new or popular, and degrade themselves in the attempt to assimulate hastily an indigestible thing that needs some amount of previous acquaintance and study.

To-day the would-be art lover has only too much at his disposal, and in the multitude of good things to see and read, is apt to lose his head and try all round. For the absolute canons of good taste and good art are familiar to us all, yet because they are so often insisted upon they fail to move us, and we let trivial things seduce us from our allegiance.

This paper has been a desultory one, and I fear irrelevant in its rambling digressions, but the study of a living school of design brings in every page painful memories of our own shortcomings; and if, in a paper like this one, that reaches so many, chance words inspire a "mute inglorious Milton" to try for himself, not to follow the advice here, but to strike out manfully by study of nature, to embody new features of design and new aspects of decoration, that one good, however problematical, must be pleaded to outweigh the tediousness of so long a chat upon and around and about—mostly the two latter—the subject of this paper.

And to hark back to our heading. As it is only by the study of the best work of others that all our work improves, and as in fretwork I know of no more worthy instances of good design than some of those here presented to our readers, to whom they will probably come for the first time, this grain of truth must be held in every way responsible for the verbiage in which it has been expressed.

"TIPS" FOR TYROS.

BY OPIFEX.

QUICK-DRYING FLAT OR DEAD BLACK.

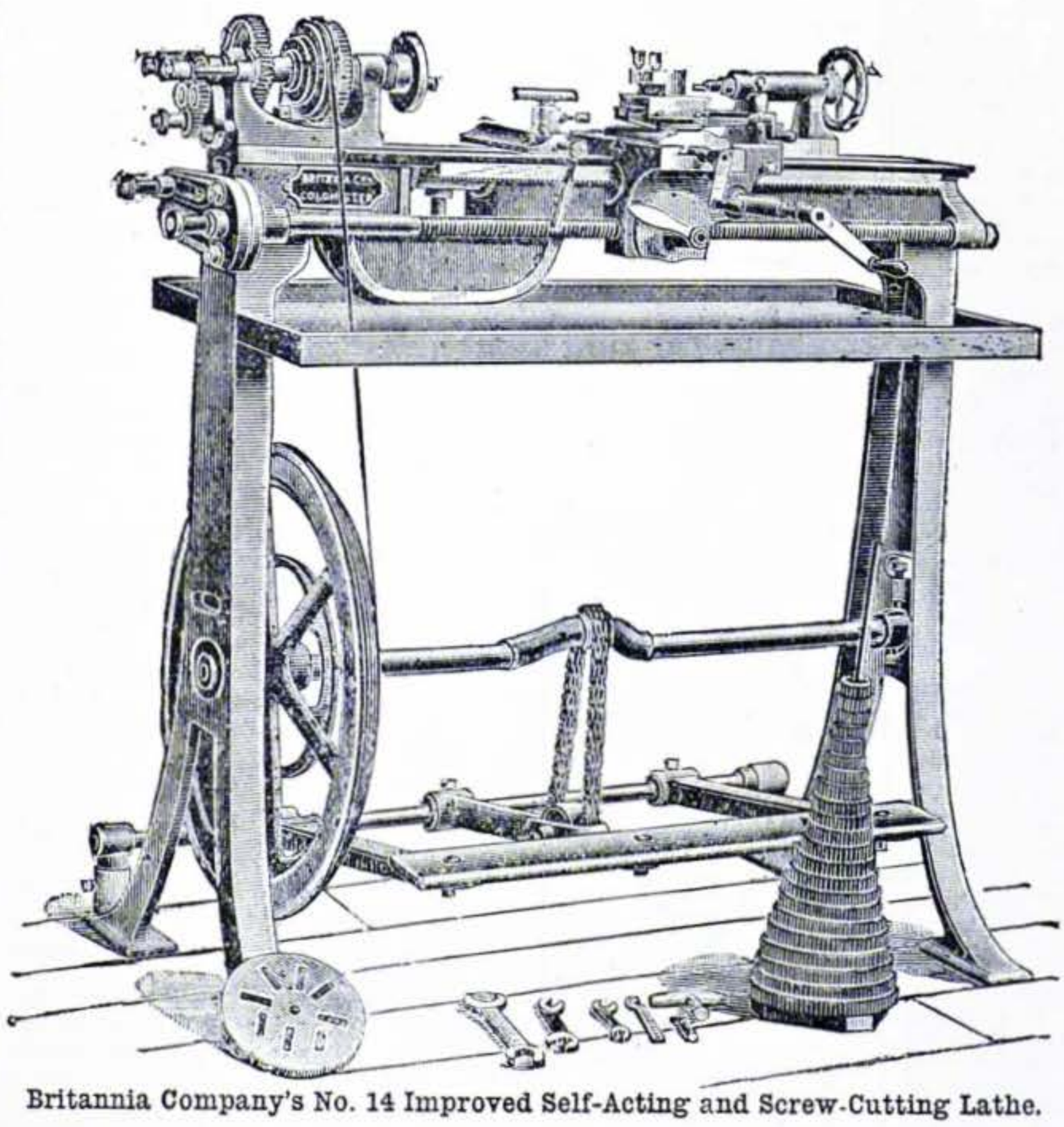
A GOOD "flat" or "dead" black which will dry in half an hour may be thus compounded:—Quarter lb. "drop" black; half pint of turpentine; a wine-glassful of black japan, well ground, and mixed with stone and muller, or with a pestle and mortar.

This is most useful for ironwork to be japanned, as "black japan" is really a brown varnish, and requires a black ground. Articles of wood, furniture, panels, etc., when blackened with this mixture, if rubbed smartly with a cloth, assume a true ebony surface, which, in combination with gilding, is most effective.

OUR GUIDE TO GOOD THINGS.

50.—Britannia Company's No. 14 New and Improved Self-acting and Screw-cutting Lathe.

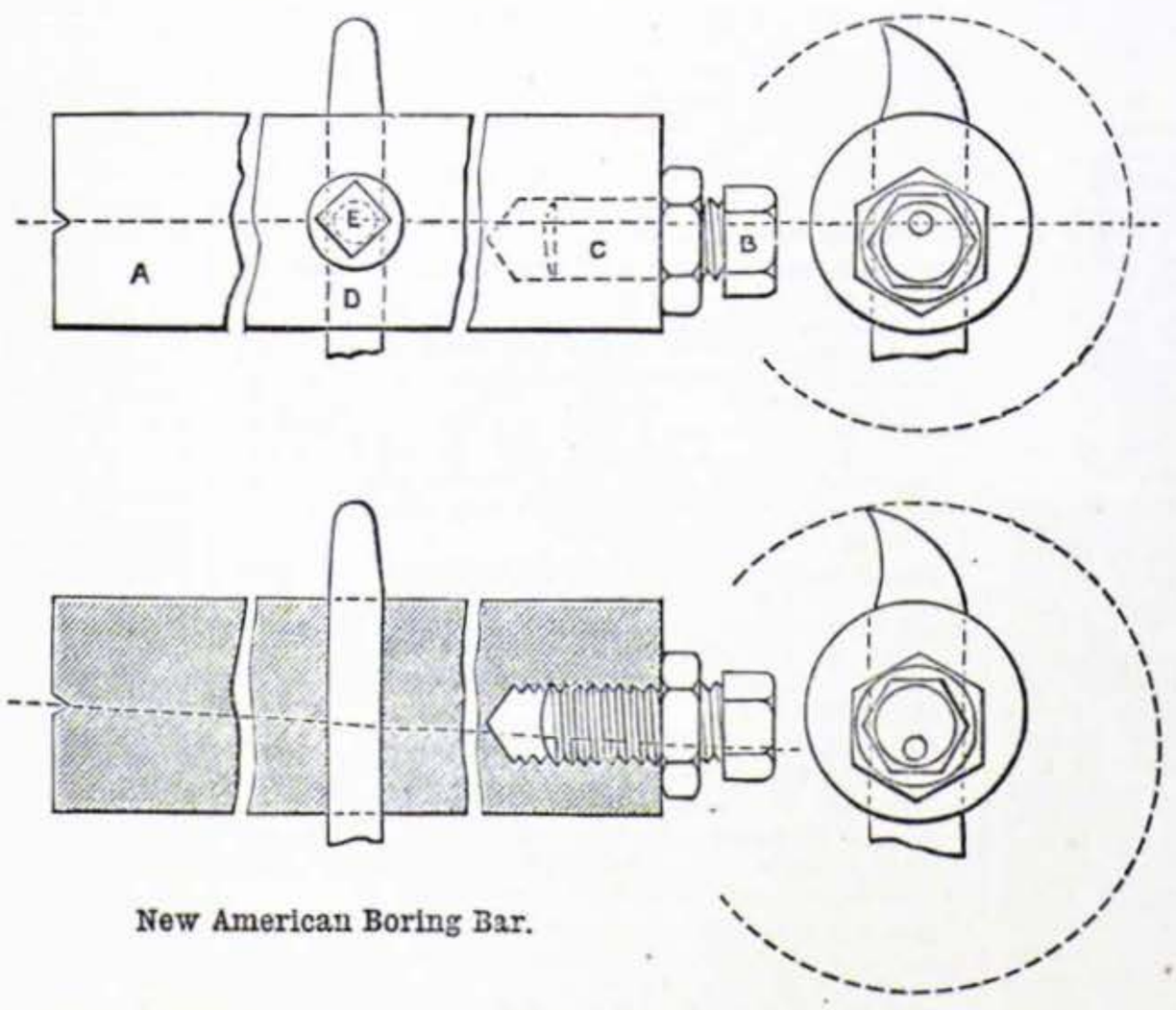
This is a well-made, compact, handy machine for amateurs, as well calculated for their purposes as the No. 16 Self-acting Sliding and Screw-cutting Lathe is for the workman to whose notice it may be fairly recommended. Similar in purpose to the No. 16 lathe, but in every respect smaller and less powerful, the No. 14 lathe is of new design of 3½ in. centre and 3 ft. 6 in. gap bed. It will admit 25 in. between centres, 5¼ in. diameter over saddle, 7 in. over bed, and 14¼ in. in the gap. The fixed headstock is well made, with back gearing hard steel mandrel, conical neck, adjusting cone at back end to take up wear and running in hardened steel collars, three speed cone pulley for gut band, and fitted with reverting gear to cut right or left hand screws. The poppet head has a steel cylindrical mandrel, a left-hand square thread traverse screw, and bright turned hand wheel; the centres are of best steel, cone fitted. The saddle is strongly made, with flush top and T grooves for bolting work and for boring, well scraped and fitted to bed, with adjustable strip to take up wear, and carries a compound slide rest of modern design, swivelling and graduated to turn swivelling tool holder at any angle. The bed is of cast iron with V edges, all machine planed, 3 ft. 6 in. long, 4¾ in. on face, 3¾ in. deep, with gap 5 in. wide and 3¾ in. deep, with bridge piece properly fitted. The leading screw is of steel, accurately cut ¼ in. pitch and 1 in. diameter, with double gun-metal nuts, disengaging by eccentric motion, and the saddle is fitted with rack and pinion for quick return motion. The standards are A-shaped, and of cast iron, the top faces being planed; the bottom surface of the bed is also planed and bolted firmly to the standards. The crank shaft and treadle shaft run in self-adjusting swivelling bearings. The latter is made with three cast-iron arms and bright turned shaft, and connected with the crank shaft, which is also bright turned, by anti-friction cham and roller. The driving wheel is 24 in. in diameter, bright turned, with three top speeds and a small speed for slow motion. A polished tool tray is neatly fitted between the standards, extending back and front to hold tools, small work, etc. The lathe has a full set of twenty-two change wheels, fourteen pitch, ⅛ in. face, face and catch plates, eccentric hand rest and two T's, spanners, keys, etc. The height from floor to centre is 3 ft. 8 in.; the approximate weight is 430 lbs. The price complete, as shown in the illustration, is £18 18s., or £19 19s. if fitted with cone speed and driving wheel with flat belt. If required for ornamental turning, as amateurs' lathes usually are, an overhead motion is supplied for £5 5s., making £25 4s. the total price if sent out with all the appliances named.



Britannia Company's No. 14 Improved Self-Acting and Screw-Cutting Lathe.

51.—New American Boring Bar.

As attention has been already called to various means for boring small cylinders in the pages of Work, it is desirable to introduce here, for the benefit of engineers, a brief notice and illustration of a new American boring bar of ingenious construction which has been recently described and figured in the *American Machinist*. It consists of the bar, A, in the end of which is the bolt, B, put in, as will be noticed, about $\frac{3}{16}$ in. out of centre. In the head of the bolt there is, as shown, a centre coinciding with that of the bar. The bolt enters into C, a chamber in the head of the bar which is threaded for its reception. By turning the bolt, therefore, a certain amount of eccentricity can be given to the cutter, D, for the purpose of gradually increasing the size of the hole that is being bored. The method is more accurate than the usual one of tapping the cutter outwards with the hammer. The amount of eccentricity given to the bolt may in most cases be less than $\frac{3}{16}$ in.; it would seldom be required more. A check nut, shown in the illustration, prevents spontaneous movement of the bolt during turning; E, in the upper illustration, is the set screw, by which the cutter, D, is pinched. To save trouble, I may as well say at once that I am not aware that the boring bar to which attention has been directed is to be purchased in the United Kingdom.



New American Boring Bar.

52.—The Boomerang: How to Make it and Throw it.

Any one who is at all curious on this subject may satisfy his curiosity by procuring a booklet, thus entitled, written, and, I presume, published by Mr. Alfred E. Beddow, 17, Cardigan Road, Richmond Hill. The boomerang is one of the weapons of the natives of Australia, and two kinds are used, one in war, which, when thrown, does not return to the owner, and the other in the chase and native games, which, after proceeding to the mark, will change the direction of its flight and return and fall at the feet of the thrower. Mr. Beddow first very clearly describes the mysteries of its manufacture, illustrating the method to be followed by carefully executed diagrams, and he then describes the mode of throwing it. He says that it has taken him several years of study and hundreds of experiments to acquire the information imparted in his pamphlet, and that any one wishing to make this singular weapon satisfactorily, without the aid of any instructions, would have to go through the same course.

53. — Calvert's Catalogue of Books on Practical and Scientific Subjects.

Many of us are frequently in want of a text-book on some practical or scientific subject, and find considerable difficulty in putting our hand on what we want. However, Mr. John Calvert, 99, Great Jackson Street, Manchester, has issued for 6d. a selected list of books on practical and scientific subjects, from the catalogues of all publishers, compiled by the editor of "Calvert's Mechanics' Almanack," a well-known and valuable annual. The list includes works on architecture and building; arts and sciences; bridge and ship building; civil engineering; decorating; education; gardening and agriculture; iron and steel manufacture; marine, mechanical, railway and sanitary engineering; mining and founding; navigation; textile manufactures; various tables and data; and miscellaneous trades and manufactures. Appended to the catalogue is a list of drawing instruments, revised to the present date. The entire catalogue is divided into sections, under each of which kindred or allied subjects are grouped together. As the catalogue cannot fail to be useful to the possessor, it should be found on the bookshelves of every workman, whether amateur or professional.

54.—Practical Mechanics.

This work forms one of the series issued under the general title of "Manuals of Technology" published by Messrs. Cassell & Company, Limited, La Belle Sauvage, Ludgate Hill, E.C., and edited by Prof. Ayrton, F.R.S., and Richard Wormell, D.Sc., M.A. The author is Mr. John Perry, M.E., Professor of Mechanical Engineering and Applied Mathematics at the City and Guilds of London Technical College, Finsbury. Its object is to put before non-mathematical readers a method of studying mechanics, that is to say, to afford an easier road to the acquirement of a knowledge of this subject than that which must be travelled by those who take up the ordinary mathematical text-books. It is written in clear and simple language, and is well illustrated by effective diagrams. It is a book that should be acquired by all young readers of Work. Its price is 3s. 6d.—The Editor.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

⁂ *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

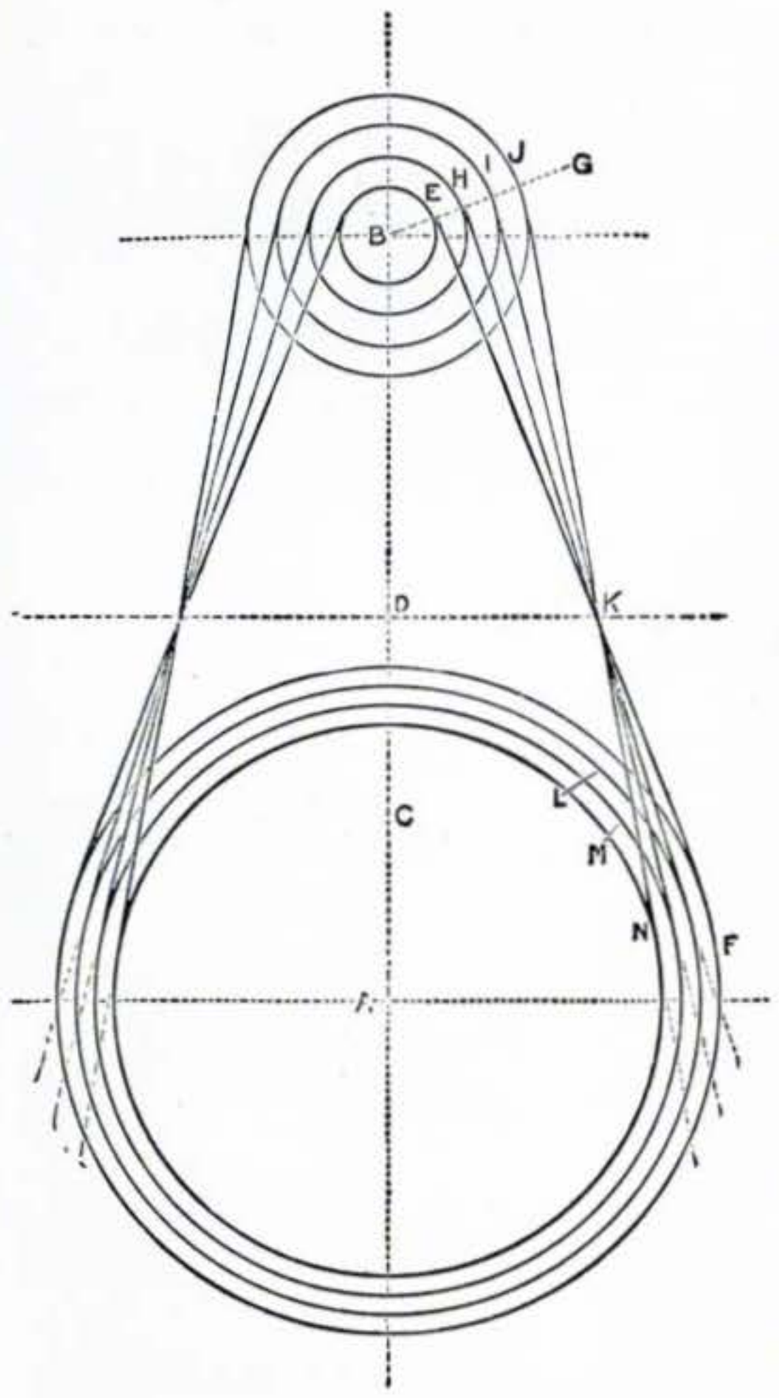
Building Construction. — PRACTICE AND THEORY BUILDING TRADES writes:—"Seeing your suggestion in 'Shop,' *re* plans, etc., for buildings, I write to say that I have been waiting for papers on this subject, and think that it cannot fail to interest a large portion of your subscribers. I think it would be well to bear in mind the fact that very few men would actually build from plans given in WORK, without structural alterations in a more or less degree, and so materials, modes, and appliances would be the principal part of the subject. I hope I shall soon see papers on this subject in WORK. I think stone masonry (monumental and building) is a subject which ought to have an early place in WORK, and I feel sure that a few papers on stone carving and letter cutting would interest many of your subscribers."

Small Cottage Construction.—J. R. G. (*Perth*) writes:—"I have taken in your paper since the commencement, and beg to state that my friends and myself are highly satisfied with it. It is undoubtedly the best paper published of its kind, and being so very moderate in price, many (who otherwise are debarred from purchasing more expensive books on different subjects) will welcome it. I myself have gained much valuable and useful information from its pages, and as I intend to build a little cottage some day in the country, I eagerly look forward to the sketches of cottages which I hope you will publish soon. I wish you (and the paper of course) every success, and trust I have not taken up too much of your valuable time."

Words from a Workman.—R. H. (*Preston*) writes:—"I have received the first monthly part of WORK, which I am very well pleased with indeed. Its style of composition, and construction generally, show that skill and talent are engaged upon it. A work of this description ought to have been out years ago; though never too late, it's none too soon. I wish you every success, and so will thousands of readers of Messrs. Cassell's publications, who know as well as I do that nothing ever emanated from La Belle Sauvage Yard but what was sound and good. I am sure it will prove beneficial, not only to the amateurs, but to the artisan that depends upon his skill for his daily bread. There must be a large demand for this work when it becomes more generally known, for I myself never knew of its existence before I saw the first monthly part exposed for sale. After reading the contents on the wrapper, through the window, and the name at the bottom, I had no hesitancy in becoming a subscriber. Any workman refusing to take a work relating to his business, stands as an obstacle to his further progress, and without progression he is left behind. But there are some very fair workmen who would feel affronted if another showed him a better method of proceeding with his work. A man of this sort considers himself perfect, and further improvement unnecessary. Granted he is perfect up to the present time (to-day); but is he the same to-morrow? To-morrow some inventor may bring out his idea that has taken years to develop, which may ruin his perfection, and send him to seek another employment. The old hand-loom weaver, in his happy (to-day) contentment, never thought of the morrow that brought out the steam-loom, and scattered him like chaff before the wind to seek any labouring job that was offered him. The same with the old millwright, with his square shafts and square-toothed wheels, before Watt and other geniuses were born. You will still find at the present day some remnant of the earlier craftsman in a few smiths' shops in the country, puffing at his asthmatical bellows, and using tools of the rudest description. What may be expected, he works for a low wage—not as much as a striker will get in a good shop—and where the competent average smith comes, he has to take a 'back seat.' I am particularly interested in this artificer, and shall have something more to say about him hereafter. Years ago I had the good fortune to invest a penny in a weekly periodical. It was the best pennyworth I ever got, for it not only gave me a thirst for knowledge, but it gave me the highest wage paid in any shop I have worked in, and that was the first issue of Cassell's 'Popular Educator.' That well-invested penny has given me constant employment without once being discharged, or loss of one single hour out of work for over twenty years. Had I never spent a penny on an instructive paper, I should undoubtedly be now receiving a less wage, less respected, and like many that never read, be paying the penalty by taking a 'back seat.' There are, nevertheless, a few good workmen with a very inferior education receiving the same wage as an intelligent workman, but with this difference: should a vacancy occur for a foreman, one is prepared, the other is not. And, moreover, if the uneducated workman can make a stand with his better-learned fellow workman, what would he have been if he had studied the same as they? Competition, and thousands of inventors working silently on something to astonish the world, make a man's trade like the fashions; there is always something coming out new."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Proportion of Fly Wheel.—J. P. A. (*Walthamstow*).—To obtain the diameters of the steps of the driving cone, set out the centres, A, B, of the lathe spindle and driving crank, and connect them with the vertical centre line, C. Bisect C at D, and draw D at right angles therewith. Draw the smallest cone, E, and decide on the largest diameter of the fly wheel, F, and draw and connect the two



with the line, E, F. Draw E, G, at right angles with E, F; draw your remaining cone steps, H, I, J, and draw lines tangential therewith, that is, on the line, B G, to cut the line, D, in the same point, K, and prolong. Circles struck concentric with F, and touching these lines, will be the correct diameters of the speed-pulley steps, L, M, N. I may add that this should be done to full size, as a very slight inaccuracy in setting out will vitiate results.—J. H.

Ticket Buckram for Easy Bookbinding (H. R. W., *Chiswick*) is procurable at every draper's I have tried. John Barker and Co., of High Street, Kensington, quote it at 8½d. per yard 36 in. wide, who sell also the *vegetable parchment*, 20 in. × 30 in., from 9d. the dozen sheets. Whiteley's quote it at similar prices, but I have not their estimate at hand. It is quite possible that the thick parchment used would be at least double the price of that quoted. I have given 3d. and 4d. a sheet for it.—E. B. S.

Clockmaking.—F. H. M. (*Liverpool*).—I note your wish for instructions on the making of a clock and the supply of parts of a clock in the same manner as the castings of parts of lathes, steam engines, etc., are sent out. I will see what can be done to satisfy you.

Clockmaking and Shoemaking.—J. S.—See preceding reply with regard to clockmaking. I cannot say anything about shoemaking at present.

Zinco Process.—D. T. D. (*Cardiff*).—This process is engaging the attention of a contributor, who will write a paper or two on the subject.

Boiler Making.—E. J. (*Llandaff*).—WORK is a magazine intended, God permitting, to run on, like Tennyson's brook, "for ever," as wise men understand these words. There is no intention whatever of completing it in so many numbers or parts. You will have seen that "Smiths' Work" and "Wrought Iron and Steel Girder Work" have been commenced. "Boiler Making" is on the way, and special papers are in preparation on the construction of a steam launch and a half-horse power steam engine and a boiler suitable for it.

Jewellery Jobbing.—G. H. Y. (*Southwark*).—Solutions will be found in any text-book, but I can give no certificate as to their merits. I never use them. I sell the solutions with instructions on bottle; gold, 1s.; silver, 9d.; but as I do not make it I cannot say what it is. My own opinion of all processes without a battery is that very little dependence can be placed upon them; this is only an opinion, *not* the result of experience. Hard soldering requires more care and skill, because, as a rule, the temperature at which the solder runs is very near that at which the metal to be soldered will melt. It is quite impossible, in the limits of an answer, to deal with the subject thoroughly; so that only a simple example can be given to repair a ring broken at the back of the shank—that is, the point farthest away from the head, in the majority of cases. This can be soldered without drawing the stones, but care will be required. The two surfaces to be joined must be made clean by slightly filing, and then adjusted so that they press against each other. If this cannot be done without, the ring must be tied round with soft iron wire, called binding wire, and sold for that purpose of any thickness required. Then rub a piece of borax down with water on a piece of slate till you get a mixture about the thickness of cream, and with a small camel's-hair brush paint the part to be joined with the borax. Do this carefully, as you must remember that wherever the borax is put the solder will flow. The solder used is of a little lower quality than the article to be joined, and can be bought ready made to suit any kind of work; but for the majority of cases you will find it easier and safer to use a good silver solder. Of course, the joint will show white, but being very small it is not of much consequence, and can be gilt over; and in soldering cheap gold jewellery the quality is often so poor that it will not stand the heat necessary to flush gold solder. The solder is bought in thin sheets, and the surface should be cleaned by slightly scraping with the scraper or rubbing with a piece of glass-paper: then cut the solder up into little squares, the smaller the better, and, taking up one of these little squares with the point of the camel's-hair pencil, lay it carefully on the joint to be soldered. Lay as many as you think will be required, then gently warm the solder and the ring with blowpipe flame, first laying the ring on a piece of charcoal; the borax will dry and hold the solder in position. Heat should then be gradually increased until the solder melts and flushes into the join. The article to be soldered should always be heated on each side of the joint a little way, and then a sharp blow right on to the solder will usually cause it to flush and make a good joint. The solder left on the edges should be filed off when cool, and the ring polished with threads and crocus and rouge; or it may be finished by gilding; if much borax is left about the join put the ring while hot into a pickle of sulphuric acid 1 part, water 10 parts. This will dissolve the flux and clean the ring. Of course, this cannot be done when there are any stones in it that would be damaged by the acid.—J. W. K.

Brown Bronze Colours.—L. V. (*Norwich*).—I do not know the particular powder to which you allude, but the following give brown bronze colours:—Sal-ammoniac, ¾ oz.; carbonate of potash, 1½ dr.; vinegar, 1 quart. Apply with a sponge, and repeat several times until the proper tint is obtained. Or 5 dr. of nitrate of iron in 1 pint of water. This will give every shade to black. Chocolate colour can be obtained by steeping iron wire in nitric acid (aqua-fortis) for a quarter of an hour before dipping the brass. Florentine bronze: dissolve arsenious acid (arsenic) in hydrochloric acid, and apply. Or dissolve corrosive sublimate in acetic acid.—J. H.

Silver-Steel Hand Saw.—JOINER.—When I noticed this saw I gave the address of the manufacturers, Messrs. Spear and Jackson, Ætna Works, Sheffield. If you write to them they will tell you the name and address of any retail dealer in London or your own immediate neighbourhood where you may purchase one. Doubtless, you may obtain any variety of saw, whether rip saw, hand saw, panel saw, or tenon saw, in the same material, of Messrs. Spears and Jackson. The panel saw, I can easily imagine, would be more particularly useful to you. Saws shaped as the one described are called "skew-backed" saws. The American saw to which you refer was, without doubt, one made by Henry Disston & Sons. They are excellent saws, but I think you will find the English ones to be as good. I am told that Disston himself is an Englishman, and once worked for a Sheffield firm before he settled on the other side of the Atlantic. I cannot vouch for the correctness of the statement, but merely mention it to you as it was told to me.

Violin Necks.—WREN (*Glasgow*).—There are three ways in which a violin neck should be tested as to its being in right position, viz., by looking up to back joint, which should be in line with the centre ridge of the head; along the edges of the back, with which the eyes of the scroll should be in line, and also down the finger-board to the bottom nut. When fixed, the neck should project quarter of an inch above the belly. Instructions for bending ribs will be given in the papers on violin making, which will, I trust, soon appear. The price you quote (4d.) is a very reasonable one indeed for violin cramps. You would, no doubt, entertain the same opinion if you were to take the trouble of sawing up, turning, screwing, and tapping them. Your other "hobby" is certainly a novelty. It is a pleasure to be able to give information to so old a subscriber to Cassell & Co's. publications.—B.

Silvering and Gilding Solutions. — T. F. (*Manchester Square, W.*).—The best silver-plating solution is that made with the double cyanide of silver and potassium in distilled water. Dissolve nitrate of silver in distilled water, and add a solution of cyanide to throw down all the silver as

silver cyanide. Wash this two or three times, and then dissolve with a strong solution of cyanide of potassium in distilled water. The best gold solution is made in a similar way from a neutral solution of gold terchloride. A weakly-charged Bunsen battery may be used, but it is not so good for this work as a Daniell or Smee. Further details will be given in my "Notes for Electro-platers," under the heads of "Gilding and Silvering Solutions." Information respecting the best batteries is already in the Editor's hands.—G. E. B.

Magneto Machine.—H. C. (*Newcastle*).—The two inside ends of the wire coils should be connected together. One of the two remaining ends should be connected to the insulated spindle of the coils, whilst the other is connected to the commutator or break. The braided wire from one of the handles must be attached to the frame of the machine, this being in connection with the coil spindle. The braid from the other handle must be connected to the insulated break-spring. No. 25 silk-covered wire is too large to give a sharp shock; No. 34 or No. 36 would give sharper shocks.—G. E. B.

Battery for Medical Coil.—BERNHARD.—This correspondent has made a medical coil after directions given by Mr. J. N. Urquhart, in *Design and Work*. You have given the wrong date; the article was published in Vol. IX., pp. 206-207, and first issued on September 11th, 1880, not 1881, as stated by you. If you have any difficulty in working this coil I would advise you to look up some correspondence on the subject between the author and "Diogenes" in Vol. X. of the same periodical. You do right in connecting the left-hand binding screw of the primary to the wire leading from carbon of battery. The coil may be worked with a small (½-pint size) bichromate, but a larger cell would give steadier and better results. 1. Carbons 3in. × 2in. exposed to the solution in cell. 2. Dissolve 3 ounces of bichromate of potash in hot rain-water, and add 3 ounces of sulphuric acid. 3. The carbons should not be further apart from the zincs than half an inch. 4. You will learn much respecting suitable electrodes from a pamphlet on the subject (price 4d.) from Messrs. F. Gent & Co., Faraday Works, Leicester. For replies to your last query, see correspondence above referred to in *Design and Work*.—G. E. B.

Glass for Aquarium.—TYRO (*Wheatley*).—The glass best suited to your aquarium is what is known in the trade as "32-oz." You do not, however, give the depth, which is the most important point in determining the strength of glass required, as the pressure of water upon the sides, etc., is as to its height and not to its bulk. For cementing the glass in, take 1 lb. of ordinary putty, ½ lb. of red lead, and thoroughly knead the two together into a soft mass with gold size rather thinner than ordinary putty. When of the right consistency it should leave the hands without sticking. The wooden pillars should be given a coat of varnish before glazing: the edges of the glass where the putty will touch should be smeared with gold size to ensure perfect adhesion. An article embodying a design for a handsome aquarium is in hand, and will shortly be published.—C. M. W.

Moulding of Vulcanite in Dentistry.—BERNHARD.—The moulding of vulcanite is done in plaster casts secured in metal cases. It requires a heat of not less than 315° Fahrenheit, continued from 75 to 90 minutes, this being a pressure of about 85 lbs. to the inch. I do not see that an amateur could safely undertake it in any home-made boiler. Those I use are tested to 130 lbs. pressure; hence, in twenty years' practice, I have had no accident. In metals such as gold, platinum, etc., amateurs who can use a blowpipe might do very well.—R. B. [It will not be possible to give articles in WORK on making false teeth and all that appertain thereto. R. B. is kind enough to say that BERNHARD may write to him on the subject, if he wishes to do so. If BERNHARD, therefore, will send real name and address I will give him R. B.'s address. —ED.].

Mitre Box for Picture Framing.—SCOTO-IRISH.—You will see perspective view, plan, and section of a mitre box in No. 3 of WORK (p. 37), and instructions for making it in the same number (p. 35), in Mr. Adamson's second paper on "Artistic Furniture."

Treatment of Gold Rings after Soldering.—DEAN FOREST.—Referring to AUROLECTRIC'S reply to your query in WORK No. 8 (p. 125), he omits to say that the surplus solder has to be filed off and the joint regulated with the file, and the hammer too, perhaps. It would never do to gild or polish rings direct from soldering, except for the penny ones sold on hawkers' stalls. In properly-made gold articles such a way of finishing would never be allowed.—S.

Bureau Bedstead.—H. G.—It is not possible to satisfy your inquiry in "Shop," but a short paper shall be given showing the mode of procedure to be followed in making this piece of furniture.

Telescope Making.—J. G. (*Cambuslang*).—It will require a long series of papers to deal with telescope making, and we have so many subjects on hand at present that its treatment must be postponed for some future time.—ED.

Boxes with Sloping Sides.—W. K. S. (*Errol*).—Your inquiry is answered in the preceding reply to X. Y. Z. (*Orkney*), page 173. If there is anything in it that you do not perfectly comprehend, write again. The contents of future numbers will show you that your wishes and requests have been anticipated.

Bookbinding Materials.—ANXIOUS ONE (*Ringley*).—1. The proper size to be used for finishing cloth and leather work is glaire, *i.e.*, the white of fresh hens' eggs. They should be beaten up until the whole mass is converted into a snow-white, dry-looking froth, and allowed to stand for some time. The froth will entirely subside, and leave a clear liquid as thin as water. If not wanted for immediate use the beating can be dispensed with. Put it into a bottle, with a drop or two of vinegar for each egg. Cloth-bound books require only one coat of glaire; use a sponge, and apply lightly over the whole of the back or side of the book to be lettered. A little water may be added to the glaire with advantage; it will prevent the cloth getting streaked. For leather work use the glaire full strength. Apply to the parts to be gilded only, using a camel-hair pencil or sponge according as the surface is large or small. Two coats must be given, allowing the first to dry thoroughly before applying the second. Size prepared and used as directed with good solid gold, and the tools heated to the proper degree, should make the books shine like a new sovereign. 2. For collecting the surplus gold leaf a gold rag should be used, and not that soft messy composition which some finishers make and use (often dishonestly). A gold rag is a square piece of close unbleached calico with oil sprinkled over and well rubbed into it. If any gold leaf still adheres after using the gold rag it is cleaned off with a piece of pure bottle rubber. If the rag is properly used there will be little need for rubber, but it is best to have a bit, and the little pieces are picked off before the fall, and kept in a small box in the cushion drawer. The best marbling size is made by dissolving gum tragacanth in soft water; beat it well up with a bunch of birch or small canes, and strain through a hair sieve. In all cases use vegetable colours, as mineral colours are too heavy, and will not float on the size. Marbling colours are sold ready prepared, and it is not worth while preparing one's own as they are so cheap. However, in mixing marbling colours a stone slab and muller will be required for grinding. Put a little dry colour on the stone, and a paring of beeswax; mix it up with soft water, using a palette knife; then, with the muller, grind until it has become as fine and smooth as flour paste. Scrape it off the stone, put it in a small cup, and mix with water and a few drops of gall to make it spread when thrown in the trough. The colour intended for the top will work better if two or three drops of spirits of wine or linseed oil are mixed up with it. Keep the surface of the size free from bubbles and froth while marbling, and scrape the surplus colour off after each dipping.—G. C.

Bamboo Cane and Black Stain.—O. P. Q. (*Bow*).—Bamboos may be bent without danger of splitting by heating them at the parts to be bent over a gas flame or spirit lamp, taking care, of course, not to let the cane burn while doing so. The desired result may also be got by steaming the part. Mr. F. Westbury, 183, Great Dover Street, S.E., and Messrs. Benjamin & Co., 167, Great Dover Street, are dealers in all sorts of bamboos. The former quotes for retail as well as wholesale quantities; the latter may do so as well, but not having received any reply to an inquiry addressed to them I cannot say. I have bought bamboos from Mr. Brandenburg, Queen Street, Finsbury, E.C., and have always found him very obliging and painstaking in selection. I am not, however, sure that he is still there. If not, you will probably do better by purchasing such small lots as you are likely to require from bamboo workers instead of going to the large wholesale dealers. Messrs. W. T. Ellmore & Sons, 16, City Road, E.C., will probably oblige you with any bamboos you want. I have an article in preparation which will be helpful to you and other bamboo workers. Residing as you do in London, you will find it far more satisfactory to buy black stain ready made than to prepare it yourself, almost, if not quite, as cheap, and certainly better. However, if you wish to try, boil some logwood chips in water till all the colour is extracted from them; mix this with some vinegar in which pieces of iron or steel filings have lain for a time; copperas and water, instead of vinegar and iron, are recommended by some. Concentrate and apply to the wood till the necessary depth of tone is reached. Pine is not a good wood to ebonise or stain black. The subsequent polish or varnish should have a little gas black mixed with it.—D. A.

Transfer from Half-tone Negative, etc.—W. L. (*Newton-le-Willows*).—In making a transfer from a half-tone negative it is absolutely necessary to give a grain to the stone or zinc plate. This is obtained by a variety of methods; a very popular one is the use of a photograph of network or lines interposed between the negative and the sensitive film, which breaks up the image into minute dots or lines. Another plan is to cause reticulation by applying a solution of tannic acid to the bichromated gelatine film. Gum water may be made by dissolving about twenty-five grains of gum arabic in an ounce of water, and strain; this is applied with a soft sponge. Success, however, depends principally on the skilfulness of the worker rather than on the materials used. Consult any good handbook on photo-mechanical printing.—E. D.

Photographic Sketch Portraits.—W. J. F. (*Edinburgh*) will find a half-plate camera, with a lens of not less than 8 inches back focus, suitable; but a lens of much longer focus is to be preferred. This would, of course, require a camera of corresponding length, with a necessary increase in expense. The use of short focus lenses necessitate a less distance between the sitter and the camera, causing more or less distortion of the image. The other appliances are the same as for ordinary photography, and consist of measures, weights, dishes, printing frame, sensitised paper, and chemicals, with a non-actinic light to work in.—E. D.

Etching on Zinc.—P. J. (*Royston*).—A paper on etching on zinc, for printing purposes, is in preparation.

Limelight Lantern.—LANTERN (*Dartmouth*).—A set of signals may be easily arranged between lecturer and exhibitor, and carried out by means of simple electric apparatus. If you take off the gong of an electric bell, the armature will merely buzz when the push button is pressed; and this buzzing noise may be used as a signal. A Morse sounder may also be used for the same purpose, giving out a ticking or tapping sound when the key is struck. A cheap bell, battery, wire, and push will cost about 9s. Either Messrs. H. Dale & Co., 26, Ludgate Hill, or Messrs. Mayfield, Cobb, & Co., 41, Queen Victoria Street, E.C., will quote you prices for materials. As I do not clearly understand what you mean when you ask for "a pattern or dimensions of a good strong slide carrier," kindly ask again, and explain your wants more fully.—G. E. B.

Toning without Gold.—HALF PLATE (*Manchester*).—The results, as shown by your photos, are, as you suggest, not satisfactory; but from the look of the prints, I do not think this can altogether be attributed to the toning bath, as they appear to have been produced from very poor negatives. Of course, to get the best results with lead or any other toning bath the prints must be good originally, and to get these good negatives are necessary. This, to a great extent, will supply the explanation you ask for. Never having obtained such bad results myself with lead toning, the rest is more or less surmise; but as I presume you are quite a beginner in photography, I give you, as a brother amateur, my opinions. From No. 1 having been so deeply printed it is almost a wonder you got anything discernible. It, as well as Nos. 2 and 3, was left far too long in the bath, and I think a good deal of the dirty look about them may be attributed to the too prolonged action of hypo, or possibly to insufficient washing. No. 4 is the best in tone, which is decidedly of a purple hue, and bears out the remark of the muddiness of the others being due to hypo, as the white in it is purer than in any of them. These, you say, were in all night, except No. 5, but even it was soaking in hypo for a couple of hours, or double the time for No. 4. This is decidedly the best of the lot, and to produce it you have apparently kept more closely to the instructions than you have done for the others. The colour of No. 5 is not nearly so good, in my opinion, but the print is clearer, though taken, apparently, from a desperately thin negative. There are no high lights to be seen. Judging from the stains on the back of it, I am afraid you are not a very clean operator; and no doubt you know chemical cleanliness is a very important matter in photography. I am pleased to give you these hints, but I scarcely think you would have got better results with any toning bath, unless closer attention were paid to the matters referred to. Your attempts with regard to lead toning seem to have been more of the nature of original experiments than an adherence to instructions, so that these are hardly to be blamed. You will remember lead toning was not suggested as being superior to gold; but for all that, far better results are to be got than shown in your specimens, and I hope in future you will meet with more success. Yes; camera making will receive attention.—L. J. P.

Polishing Desk.—J. T. (*London*).—Without knowing exactly wherein your difficulty in obtaining the desired polish lies, I may not be able to help you to overcome it. It would be of the greatest possible assistance in enabling questions about polishing to be answered satisfactorily, if inquirers would be kind enough to state wood and other particulars of any article they wish to finish, and, as in your case, if they would state clearly their *modus operandi*. One could then often tell the reason of failure, and what should be done. Without knowing more than I do, it is impossible, without writing a complete treatise on French polishing, which, of course, is out of the question in "Shop," to help you so fully as I should like; but perhaps the following outline of the process may be of some assistance:—Oil the work by rubbing in raw linseed oil; let it stand a sufficient time to dry in, say a day or two; then fill the grain of the wood with some filler, such as whitening, moistened with a little turps, and tinted to correspond with the colour of the wood. Clean off superfluous filling; body in with French polish, using rubber of cotton wool enclosed in a soft rag covering. Rub equally all over the surface till the wood absorbs no more polish and a fair amount of gloss is obtained, though the general appearance may be smeary. The final polish must be obtained by "spiriting off" the work, that is, continuing the rubbing and using a little spirit only on the rubber. Simple as this process reads, you may have made a dozen mistakes, any one of which would be fatal to a good result; so if you still cannot manage write more fully, and you may rely on my best efforts to help you.—D. A.

Choice of Lathe and Fret Saw.—J. H. S. (*Romsey*).—You ask whether it would be better for you to get the Britannia Company's No. 1 patent lathe and fret saw combined, or their No. 3 lathe and the separate fret saw appliance. The answer may be very much a matter of opinion. With

No. 1 you would have the best fret saw and a very small lathe; with No. 3 you would have a better lathe of more capacity and a less advantageous fret saw. I say less advantageous, because it would not have a vertical stroke. As for myself, I should certainly prefer the better lathe. A still better plan would be to have two separate machines. Have the No. 8 fret saw to begin with, and use that for a year or so; then get a lathe, and learn to turn. It is better to take up one thing at a time, and to have separate machines each perfect of their kind.—F. A. M.

Enamelling Fretwork.—CREAMY (*Gravesend*).—Of course, you can hardly expect your work to look "first-rate" when compared with the things you refer to, as you must remember they are finished by experts, while you, I presume, have not had much experience. Not knowing exactly what you have done, or wherein the work is unsatisfactory, I can only advise you in a general way. To begin with, the wood must be well smoothed; then, as it is soft, it would be well to size it, for which very thin glue will do. If this raises the grain, rub down again with very fine glass paper; this will prevent the paint being dull in parts while bright in others, though two coats of paint will have the same effect. Finally, apply the paint thinly and evenly, in more than one coat, if necessary, letting each be quite hard before another is added. If you still cannot manage, write again, and say what is amiss.—D. A.

Casting from Wood Carving.—F. S. (*Bethnal Green*).—We doubt if F. S. can find any way of moulding from wood carving more simple and harmless than by a "clay squeeze." Roll up a ball of thoroughly well-tempered modelling clay, soft enough to be completely plastic, but not so soft as to be in any way sticky, and squeeze it on the woodwork. If the carving is larger than can conveniently be taken at one squeeze, two or more may be used and fitted together before being employed as moulds. This will not give undercutting; if that has to be shown an "elastic mould" will be necessary. It is thus made:—Best gelatine, 1 lb.; beeswax, ½ oz.; water, ½ pint, boiled together in a glue pot, and poured on warm, but not boiling. In either case the carving should be oiled before moulding.—M. M.

How to Judge Woods.—W. A. (*Leytonstone*).—The information you ask would take up a page of WORK to answer. Write to J. & W. Ryder, 14, Bartholomew Close, E.C., for their work on "Timber and Trees," by T. Laslett, 8s. 11d., post free.—A. J. H.

A Seeker.—(*Pontypool*).—Your way will be to write to Mr. Bolas, Central Institution, City and Guilds of London Institute, London, E.C., and ask him if his lectures will be published, enclosing a stamped envelope for reply.—F. J. C.

Pressure in Boiler.—LANKY TOM.—The pressure at the bottom of the boiler is in excess of that at the top by the weight of the water in it; the steam between the surface of the water and the top of the boiler presses equally upwards and downwards; therefore, for the pressure on the bottom the weight of the water must be added to the pressure of the steam. The feed-pipe is placed low down in the boiler in order that the feed water may enter at the coolest place, and fall naturally into the circulation.—F. C.

Reduction of Power by Pulleys.—LANKY TOM.—Your gearing is not described with sufficient clearness for us to answer your question. A sketch would be more satisfactory.—F. C.

Registration.—D. McR. (*Inverness*).—Register the "name" as a trade-mark.—F. C.

Window Fastener.—L. A. R. (*Mile End Road*).—The cost of provisional protection is £1, if you send your application direct to the Patent Office; but in your case you should certainly employ a patent agent, for your invention may be anticipated, and in any case the specification should be drawn by an experienced man.—F. C.

Gas Regulator.—R. M. C. (*Glasgow*).—Your contrivance is ingenious, but I do not think it would be financially successful as a patent. The fixing and unfixing are against its adoption. Thanks for the sketches.—F. C.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Barbotine Work in Gutta Percha.—PADDY MURPHY (*London, S. W.*) writes:—"Will some reader of WORK be so good as to afford me in 'Shop' some hints regarding the making of imitation barbotine work in gutta percha? What implements, paints, etc., are required for the work, where procurable, etc. etc.?"

Instruction in Wood Engraving.—TOM, who lives at Islington, desires to know where he may obtain practical instruction in wood engraving.

Tobacco-pipe Making.—SMOKE wishes to know if there is a good book to be got on the subject of tobacco-pipe making, giving full instructions with prices of materials.

Bevelled Cog Wheels.—POTTER asks:—"Where could I get a cheap pair of mitre cogs (*i.e.*, bevelled cog wheels?")

Gripping with the Vice.—CROSS-CUT writes:—"I sometimes want to grip in a front bench vice a piece of veneer against the edge of the bench, and also to grip a shutter or door edgeways with the same vice. How is it to be done in an instant by a cheap and simple vice for a strong wood bench?"

Marbling Washstand Tops.—W. H. J. (*Stratford*) writes:—"I should esteem it a great favour if any reader could give me some information as to a quick method of marbling common washstand tops, as I often have them to do at a short notice."

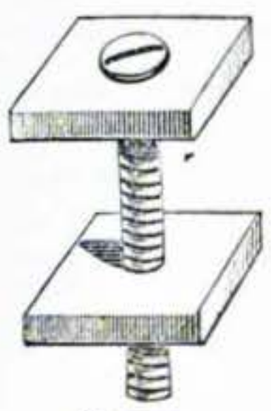
Bevels for Stair Rails.—CONE asks:—"What form of square or of bevel, different to the ordinary square and bevel, is used in trying the square or bevel faces and joints of staircase hand-rails?"

Steel.—PALL MALL says:—"Can you inform me how steel is blued for ornamental purposes for decoration of swords, etc.—namely, court swords, navy dirks, and other weapons? I only know of one firm where this kind of work is done, that is a German firm in Solingen, and if you, or any of our correspondents can inform me, I shall be much obliged."

Hand Circular Saw Bench.—G. H. L. (*Hull*) writes:—"An amateur who is desirous of making a circular saw bench (to be turned by hand) would be greatly obliged if any of your readers could give him a little information on the subject. Could I get sufficient power to cut 1 to 2-in. boards? If any of our friends could give me details how to construct a bench and the fixing of the saw, bushes, etc., I shall esteem it a great favour. My own idea is to fix the hand and wheel on the end of spindle; but I am afraid to venture this for fear I should spoil the spindle, and the whole not act."

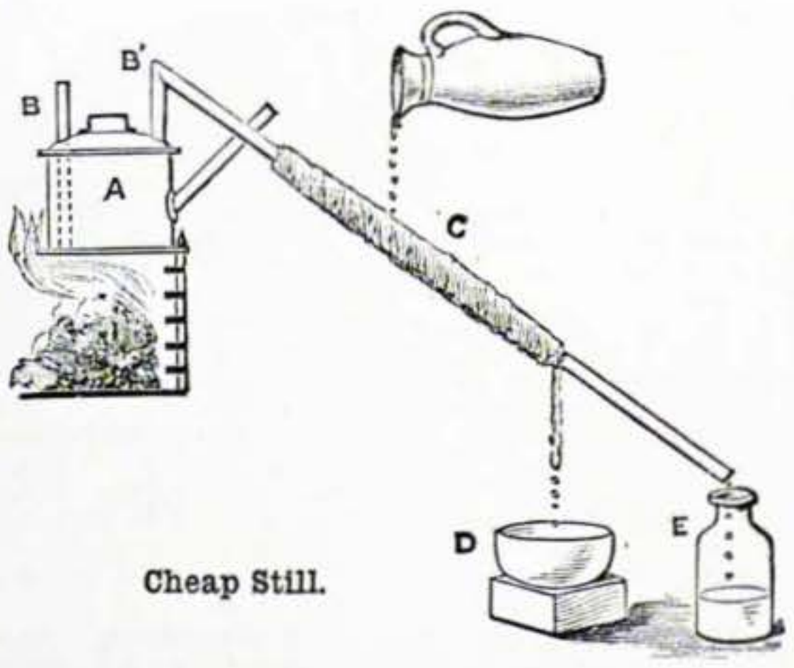
IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Violin Cramps.—J. G. (*Edinburgh*) writes in reply to E. P. W. (see page 125):—"In WORK No. 8, I observe E. P. W.'s inquiry as to violin cramps. The following is a very cheap method of making these, and gives satisfactory results:—Suppose two dozen cramps are wanted—which is about the usual number required in violin making—let him cut up a piece of ¼-in. hard wood into forty-eight pieces 2 in. square, then get twenty-four screw nails, say, 3½ or 4 in. long, and insert them up to the heads in twenty-four of the pieces; in the other twenty-four pieces, the hole must be sufficient only to allow the screws to work. The bottom piece can then be screwed up and down as required, while the other remains stationary. This drawing explains the process."



Cramp.

Cheap Still.—H. B. S. (*Liverpool*) writes in reply to BARRINGTON:—"Get a medium-sized tinplate saucepan, and bore two holes in the lid, each about 1 in. in diameter; if you can solder yourself (if not a tinman will do it for you), get a piece of tinplate tubing that will just pass through the holes; cut a piece long enough to reach to the bottom of the pan, and 2 or 3 inches through the lid when the latter is on; solder this in, so that it will nearly touch the bottom of the pan; get a longer piece of the same tubing, bent at a slight angle as shown; this will have to be done by soldering two pieces together; solder this into the other hole, only just allowing the tube to pass through the lid; when this is done solder on the lid. Your still is now ready. Put a funnel into the short tube, and pour water into it until the still is three-quarters full. Now put it on the fire, wrap a piece of tow or cotton round the long tube, allowing it to hang down a little; keep pouring water on during distillation, and it will run off into a basin at the loose end; it will be well, however, to grease the tube all round just below the cotton. Put a clean bottle at the end of the tube to collect the distilled water, and throw away the first portion that collects; the rest will be almost as pure as you can get it. If the condensing cloth is not sufficient, write, and I will describe a proper condensing arrangement."



Cheap Still.

A, Saucepan; B, B', Pin Tubes; C, Tow; D, Basin; E, Glass Bottle as Receiver.

Trade Notes and Memoranda.

THE question of the feasibility of telephonic communication between the postal authorities of London and Paris is under investigation.

A USEFUL little arrangement—"Mileson's improved screws" for drawing instruments—is well worth the attention of architects, draughtsmen, and all users of mathematical drawing instruments. By it the possibility of an instrument getting disabled through loss of the adjusting screw is entirely prevented, at the same time allowing the free use of the instrument in the ordinary way. Also, whereas with the ordinary screw the nibs of all jointed pens and inking points cannot be lifted for cleaning, etc., without removing the screw from top nib, the above arrangement ensures a saving of time in not having to remove the screw—a matter of some consideration. There is also another advantage—it acts as a sure and certain adjustment when the spring which is introduced between the nibs of jointed pens and inking points fails to perform its proper use; in fact, the spring may be done away with altogether.

THE Eiffel Tower is by far the tallest structure in the world, as the following table will show:—

	Feet.
The Eiffel Tower	984
The Obelisk, Washington	522
The Cathedral, Rouen	492
The Great Pyramid, Ghizeh ...	478
St. Stephen's, Vienna	452
St. Peter's, Rome	432
St. Paul's, London	420
The Pantheon, Paris	259
The Monument, London	213

It is a remarkable fact, illustrative of the perfection attained in modern engineering works, that all the rivet holes were drilled before the work was brought to the ground, and not a single hole was allowed to be drilled, punched, or drifted in place. If we compare this structure with our own Forth Bridge—which stupendous work appears to interest few, except engineers—we shall see cause for a little self-gratulation. The amount of wrought iron used in the construction of the famous tower is about 6,500 tons; but the last quarterly report on the Forth Bridge by Major Marindin records a total of 39,000 tons of steel as having been fixed up to that date (Feb. 28). When the bridge is complete the total will be about 50,000 tons. In addition to this, 628,000 cubic feet of granite have been already set, besides 113,500 cubic feet of rubble, masonry, and concrete work built. In this herculean task an army of men, whose number averages 3,250 per diem, have been engaged.

WORK

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