WORK

An Illustrated Journal of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

EMPLOYÉS of the Montrose Foundry Works are to be put on an eight-hours day without any reduction of wages.

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Before the strike at the Homestead Works, Pittsburg, Mr. Carnegie, it is stated, made a daily profit of nearly £1,000.

* *

A new process of warping and beaming takes the yarn direct from the cop or bobbin and winds it upon the ⅜ in. skewer, entirely dispensing with the spools used in creels for warping.

* *

Pneumonia has been cured by the administration of oxygen gas. The relief was immediate, and the cure rapid. WORK subscribers will note in view of the coming winter.

* *

A new application of diamonds consists in fixing them on gun-barrels to aid sighting, even in dim light. We can understand that some advantages are to be secured, but the materials are costly.

* *

Rumours of a strike among 20,000 cotton spinners in Lancashire against a five per cent. reduction in wages are being circulated. It is also said that some of the coal-miners intend coming out on strike this winter.

* *

A prize of 3,000 francs has been offered by Baron Léon de Lenval, of Nice, to the inventor of the best adaptation of the microphone in an instrument to improve the hearing of deaf persons.

* *

An army of 9,000 milkers are engaged in milking 84,000 cows, from which they extract 42,000,000 gallons of milk per annum to supply the wants of London. Still, we import large quantities of Swiss milk.

* *

Railway companies in India have adopted the "Pintsch" oil gas for lighting. Its production takes place at Howrah and Allahabad, and also on some of the Bombay lines. This is another blow to the castor-oil industry.

* *

In a new process for colouring photographs no paints are used. All the colours are produced by chemicals. Silver prints, enamels, opals, opalines, etc., can be treated at a small cost, and be made to show as though the colours were photographed direct.

* *

Yarn-spinning promises to become a profitable industry in China, where one factory, on the borders of the Yangtse-Kiang, turns out about 130,000 yards of cloth weekly. The machinery is English, but the operatives Chinese.

* *

Brewers are now on the look-out for hop substitutes to put into beer. The wholesome effect of the hop on health has been proved, but we cannot say the same of its substitutes. Beer drinkers should be watchful, too, and see that those substitutes are as wholesome as hops.

* *

A substitute for indiarubber has been discovered by Dr. N. A. Tilden, in a product obtained from turpentine. The material can be vulcanised, and resembles pure Para rubber in every way. M. Bouchardet has found that the product may be obtained by heating the turpentine.

* *

Hot springs are to be utilised in Boise city for heating the buildings. These springs are situated about a mile from the city, and the water in the wells is always at boiling heat. A 6-in. pipe is being laid to convey the water to the city, and it is estimated that this mode of heating will be much more economical than using coal for that purpose.

* *

What becomes of all the ships? Last year sixty-eight vessels, comprising 49,100 tons, sailed from some port or other, and were not heard from again. Of the total thus passing out of record 28,500 tons were British. Of the total tonnage lost only 12 per cent. were constructed of steel, while 41 per cent. were of iron, and 47 per cent. were wood and composite vessels.

* *

A new invention for assisting a locomotive in climbing steep gradients consists of a grooved wheel keyed on the driving axle, and surrounded by a coil of a fixed cable. The groove is of the same diameter as the driving wheels, and the cable lies in the centre of the track, being kept in position round curves by means of guides. The hold on this cable prevents the driving wheels from slipping.

A recent test, with the object of obtaining the velocity of a 250 lb. shot fired from an 8-in. gun with a charge of 81 lb. of hexagonal prismatic powder, is said to be one of the most satisfactory tests made in the history of modern ordnance. The standard set down for these conditions is 1,700 ft. per second, or at the rate of about 1,200 miles per hour. The electrical measuring instruments used showed a velocity of 1,702 ft. for the first shot fired; this came so close to the standard that further tests were considered unnecessary.

* *

For conveying coal through pipes—a method for which has been patented—the coal is pulverised and mixed with an equal weight of water; it is then pumped through pipe lines like petroleum. It is then allowed to settle in vats, the bulk of the water drained away, and the residuum pressed into bricks and used as fuel. Mr. Andrews says that he has pumped coal "mush" 300 miles at five miles an hour, and that a 12-in. pipe will deliver 5,000 tons of coal a day.

* *

In a new method of hardening copper castings, small quantities of metallic sodium are introduced into the molten copper, and thus the dissolved gases are eliminated, and the copper rendered more compact and hard. A marked improvement is shown by the introduction of 0·1 per cent. of sodium. Potassium and lithium have this property also, but sodium is cheaper and is more easily handled. In melting the copper a covering flux is used, consisting of about one part sodium carbonate, two parts powdered anthracite coal, and a small quantity of common salt.

* *

Magnesium light for lighthouse purposes has shown results more brilliant than any obtained from the electric light. The apparatus employed is about 7 ft. high and 3 ft. in diameter. Inside is a blast evaporator which blows air over pumice-stone strongly charged with benzol. This benzinated air is sent through fine magnesium dust and becomes charged with it. It then issues through a tube, and is burned in a small flame, which gives a brilliancy estimated at 40,000 candles. The apparatus is controlled by clockwork. The consumption of magnesium dust varies from ½ oz. to 1¼ oz., according to the lighting power, and costs from 6s. to 10s. for ten hours.

INEXPENSIVE CEILING DECORATIONS.

BY A LONDON DECORATOR.

PAINTED ceiling decoration has a province to fulfil, in connection with decorative art and progress, of no small importance. No portion of the modern-built residence or public building offers more scope for the legitimate display of ornament and colour than does the ceiling; and no other position displays its structural or applied embellishment at all times to an equal advantage therewith. So far as one's personal observation goes, however, this most important factor of a decorated apartment is the one least studied and cultivated by the average painter-decorator. Some reasons for this apparent neglect come readily to the mind. The difficult and fatiguing circumstances attending its execution, for instance, are always present. Again, at the present time the custom of covering the ceilings of reception rooms in new buildings with ornamental sections of metal and plaster relief-work is very prevalent, and, indeed, is spreading rapidly.

I am not here disposed to run a tilt with all ceilings of this description. They have some advantages; but, generally speaking, these advantages are not of a kind conducive to an artistically decorated room. An elaborate mass of relief ornament spread upon a ceiling does not constitute house decoration, and when, as we may see advertised, some of these productions consist of a jumbled mass of ornamental chaos, arranged irrespective of style, no minor art prophet is needed to cry "Shame!" on their claim of being *artistic decorations*. Between a ceiling of the aforesaid description, introduced by the builder for cheap show and quickness, and a ceiling decorated with one of the modern applied relief materials by the decorator, there is a wide difference. In the first case the ceiling is a veritable decorative "white elephant;" in the latter instance it is simply part and parcel of a decorative interior, arranged in harmonious keeping with the wall decorations, the furnishing, and drapings.

What, then, may be considered the salient points of successful ceiling decoration? To answer this query with regard to any particular instance necessitates a definite acquaintance with the apartment of which the ceiling treatment must be a section of the harmonious whole; nevertheless, there are a few features common to all satisfactory examples. For instance, although but a *division*, its treatment in form should be *complete in itself*; there must be an expression of balance throughout, of unity and flatness—a decorative picture, of which the cornice must be the distinctive boundary and frame. However ornate the design in its completeness, there should also be portions of comparatively plain surface—not only to serve as a foil for the ornament, but to relieve the eye from physical weariness. Without repose, there is no art. Turning from line and form to the domain of colour, we may have a ceiling decoration with its colour as the outcome of the wall treatment, or as a direct harmonious contrast to the prevailing tone of the room.

The flat, plastered ceiling—to which description this paper is closely related—presents great possibilities for painted ceiling decoration where time and cost are not the chief consideration. But the highest productions of the artist, a phase of decorative art popularly described as "painting angels on the ceilings," is usually far removed from the sphere of our general environment. Nevertheless, between the extremes of, on the one hand, a "fine art ceiling painted in oils," and, on the other hand, of a glaring display of whitewash, there is a wide range for the introduction of ornamental line and colour. *Flat ornament—i.e.*, without shade or shadow—is the class of embellishment that lies most within the powers and opportunities of the average operative or amateur decorator; and in executing such work, the humble and much-abused stencil must, perforce, play an important part.

It is generally recognised in the trade that estimating for decorations pure and simple is not an easy task; and in dealing with an ornamental *ceiling* the governing authority must, indeed, be "wide awake" to obtain results financially as well as artistically successful. So much depends upon the actual experience and ability of the craftsmen employed, since, however able the employer, the practical execution of his own designs would be a commercial impossibility. But given, on the part of an employer, the designing and directing powers, in conjunction with a trained faculty for colour, and, on the part of his workmen, the aforesaid zeal and ability: then the stencil process may be productive of charming but inexpensive ceilings.

The accompanying design will give point to my dissertation, since any smart and careful craftsman could be trusted to execute it, in *tempera*, upon the flat of a good-sized room in a couple of days. The advantages of this simple treatment are numerous. The adaptability to a ceiling of any reasonable shape or size, the scope for a little effective colour display without "lowering" the apparent height of the room, and the inexpensive means of covering or connecting the whole surface, are all practical points worth studying; whilst a dozen different variations of the one theme could well be executed in colour harmony with their respective apartments, and yet without any two of them being noticeably alike. Whatever the purely artistic shortcomings of this class of design, or of the ornament herewith submitted, its practical advantages have been fully established in connection with the work for which it was recently designed, and where it was satisfactorily executed by a careful and experienced journeyman.

Now a few notes to assist any ambitious amateur reader of WORK in the execution of my design. Upon the accompanying page we have disconnected corner ornament in simple stencil effect of black and white. It will be found, on reference to the *connected* design, that the corner has been so drawn that four sections of it will join

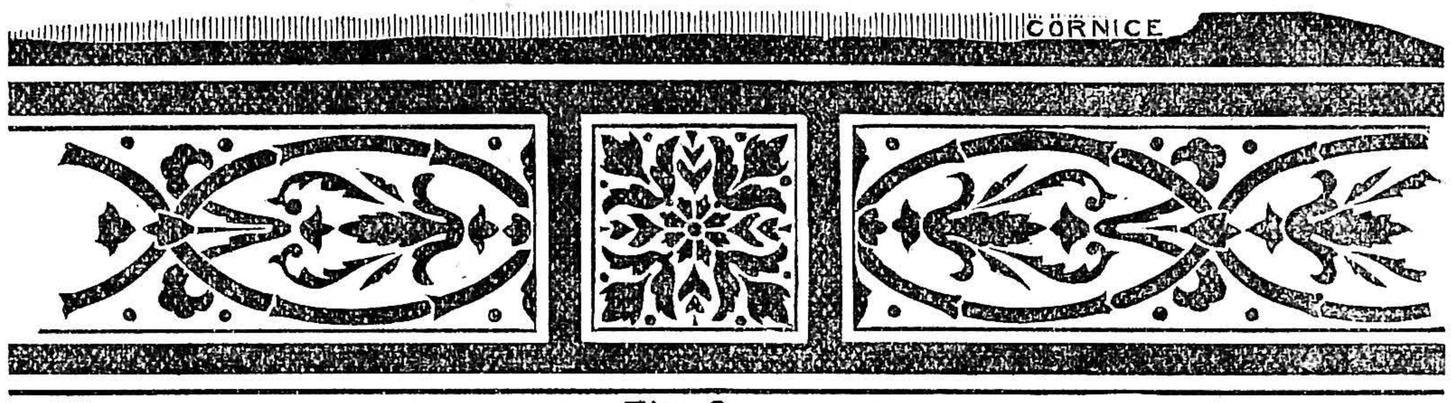


Fig. 2

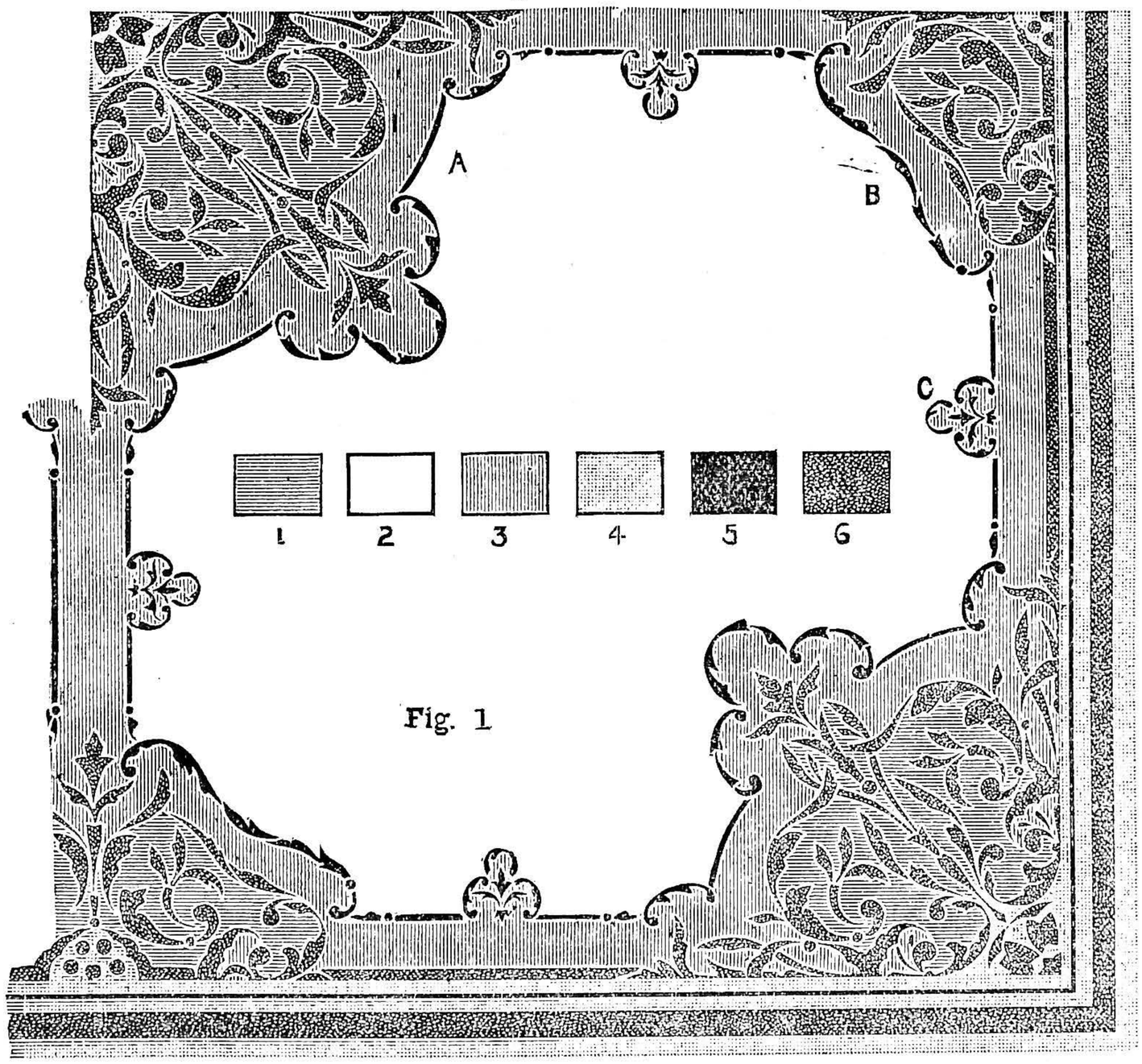
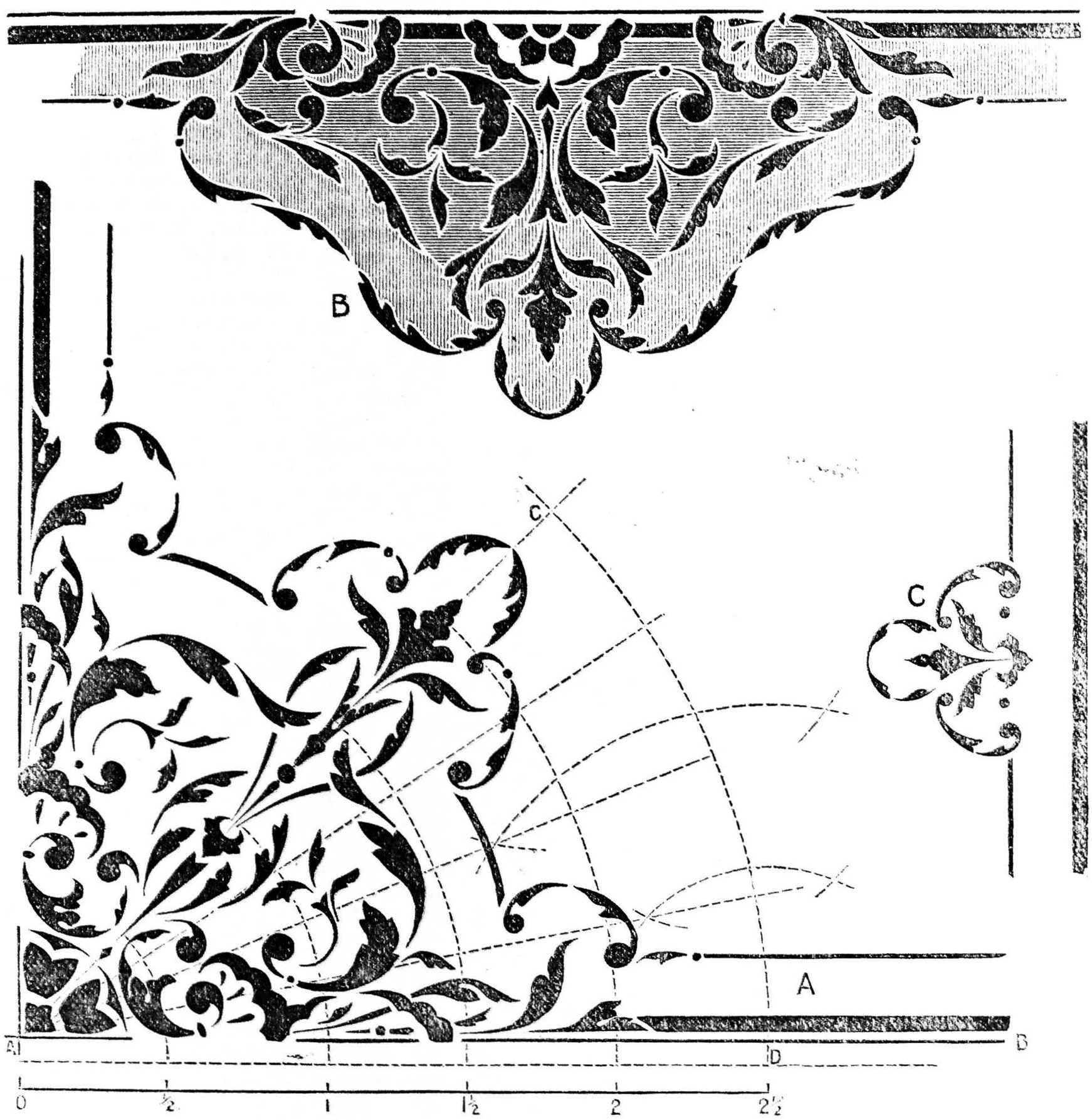


Fig. 1

Ceiling Decoration. Fig. 1.—A, Corner and Central Ornament; B, Large Break; C, Small Inner Break. Fig. 2.—Outside Stile with Stencil Border and Patera; for use on large Ceilings, in conjunction with the same Ceiling Design. Colours represented:—1, Light Electric Blue; 2, Ivory White or Cream; 3, Pinky Buff; 4, Deep Cream; 5, Bright Red; 6, Old Gold Colour.

up into a pleasing centre ornament—thus answering the double purpose of corner and centre. To draw this ornament, which I have shown at about 1½ in. to the foot, take a piece of drawing-paper large enough for the *whole* corner. Take point A, at the extremity of line A B, as a centre, and mark off the curves at every 6 in.; now divide the corner or angle, C D, into four equal parts, and connect each with point A. By this means any worker with a very limited talent for drawing can enlarge these small designs to working size, since, with so many points fixed for us, each bit of ornament is easily placed in its particular and corresponding division. Having drawn in correctly the half of the corner, mark over the outline with charcoal, fold it over at the central line, and rub an impression of the charcoal on the opposite half. Now pencil over the charcoal duplicate, and the corner is complete. To transfer it to the cartridge-paper for stencil cutting, rub the back of design with dry powdered blue or red, pin the drawing - face upwards, with the cartridge-paper beneath it, to a smooth table-top, and mark over the design with a hard wooden point. I have explained this well-known process for the benefit of the learners and younger readers, and, inasmuch as th directions for drawing the corner apply to the other ornaments, it is well worth the space it occupies.

Let us now assume the worker has a set of the stencils marked A, B, and C, and wishes to operate on a ceiling in the quickest and most economical way. In such an instance, the ceiling can be finished with a decided cream tint all over. The four corners may be stencilled on in "old gold" colour of ornament (No. 6), and light blue (No. 1) outer fine line and break. The large side-breaks being put in also, and the centre chalk lines snapped across the middle of the ceiling, we can now stencil in the centre and join up the margin lines with the old gold and blue. By referring to the connected sketch, it will readily be seen that the ornament, if used in this simple way, will not appear so large as when used with the coloured stile. An ordinary room ceiling worked on these simple lines is but a summer day's work for a good workman. Let us now take the more elaborate treatment I have given for a little explanation. To make my estimate of "one man, two days"—a correct one for this—other stencils and aids are necessary. We require a thick paper or card template cut to the outer edge of the small outer ornament, and a stencil for putting in the blue and pink (see colour key). To make the latter, stencil the ornament on to a second piece of cartridge, and then cut out the background, but *leave a ½ in. space between the two colours of pattern and background.* The horizontal lining shows where the blue stencil is cut to, and the down lines the space requiring to be pink.



Ceiling Decoration. Fig. 3.—Plan for making Stencil.

The methods of execution are almost identical in all variations, but where the pink stile is used we cannot ground the ceiling all over with cream, as in the previous instance. First take the template of the extremes of corner and break, tack each to the ceiling, and mark around the curves with a blacklead; treat the centre in the same way, and then connect all these with the straight lines. We have now divided the ceiling into panels and stiles. Now tint in the cream panels, and put in the straight bands of the pink stile. Next stencil in the ornament with No. 6, and No. 5 for fine scrolls. When all is complete of this portion, take the background stencil, and put in the blue and pink. The joining together of the margin and fine stile lines completes the work, as shown. Tint No. 4, a full cream, I have put outside the ornamental work as a simple stile, with 1½ in. line of stencil colour. This latter feature will be very useful where there is no plaster cornice; otherwise it would not be called for. Figure No. 4 (in black and white) is a suggestion for an ornamental stile. For a large public or semi-public room the coloured treatment suggested by connected design would alone scarcely be sufficiently ornate, since it must be remembered that the plain space between every corner and break ornament would be *much more in proportion than appears with the design.* I should, in such a case, carry a stile of old gold all around the ceiling, next the cornice, making it much fuller in colour and slightly greener than No. 4 tint and 1 ft. in width. At the corners and centres the square pateras would be introduced; the stile stencil border (running *outwards* from the middle of either side), as well as the wide marginal lines, would be best stencilled in a medium terra-cotta shade, and the fine inner line a soft blue tint.

As before stated, any ceiling colour scheme must depend, first, upon the nature and use of the apartment, and then upon the decorative treatment of the room in its entirety. The colours here given require somewhat careful balancing, and would not suit for a room having but little colour on the walls. But whether worked out in self colours, different shades of creams, soft terra-cottas, or even grey upon a cream ground, the display will be well worth the labour. Let the doubters remember that in such a case it is better to err upon the side of simple and quiet colourings than to get doubtful colour combinations. The tints suggested with the connected drawing will correspond to those on the present "Alabastine" sample card in the subjoined order: No. 1 = tint 9; No. 2 = 17; No. 3 = 4; No. 4 = tint 7, darkened with a little dry umber; No. 6, for stencilling, I recommend to be made from white lead, turpentine, and Japan gold-size in equal parts to working consistency, then stained with a little yellow

ochre in oil and blue to a soft but decided old gold colour. It will be found that this "flatting" paint works much better for stencilling with than would water-colour. No. 5, a soft full red, used only for lines and ornament separating the cream panels and pinky stile, should also be made of white flatting stained with a little vermilion or Venetian red. I hope that any of WORK's readers finding a difficulty crop up will duly seek advice through "Shop" corner.

BOTANY AMUSEMENT.

STUDENTS of botany who desire to preserve permanent impressions of leaves of trees and plants can do so in the following simple manner:—At any druggist's get a pennyworth of bichromate of potash, and put it in a 2 oz. bottle of soft—that is, rain—water. When the water has dissolved as much as it will of the potash, pour off the clear liquid into a shallow dish. On this float a piece of ordinary writing-paper till it is thoroughly saturated. Let the paper be hung on a piece of string in the dark until it gets nearly dry, when it should be in colour a bright yellow. On this put the leaf, and under it a piece of black cloth and several sheets of newspaper. Put these between two pieces of clean window-glass of the same size, and hold them together with spring clips, similar to those used for holding letters or bills, which can be purchased at about 1d. each. Expose to a bright sun, placing the leaf so that the sun's rays will fall upon it as nearly perpendicular as possible. In a few minutes it will begin to turn brown, but it requires from half an hour to several hours to produce a perfect print. When it has become dark enough, take the paper and immerse it in a dish of clean water, which must be changed every few minutes, until the yellow part becomes perfectly white. The print can then be mounted into a scrap-book.

ELASTIC MOULDS.

THE best material to use for elastic moulds, very frequently required in the arts, is glue or gelatine. Good fish glue will answer the purpose in many instances as well as gelatine, and has the important advantage of being cheaper. The material is dissolved, like glue, in a vessel placed over the fire in a pot of water, being stirred during the process. To each pint of the material it is necessary to add $\frac{3}{4}$ pint of water and $\frac{1}{2}$ oz. of beeswax. The material is ready for use when about the thickness of syrup. The pattern or model from which the mould is to be taken must be carefully oiled with sweet oil, and then the composition is poured upon it while warm, but not boiling. After having time to set, it is taken off the model. In using the moulds thus made, when the model is small, it is well to keep it in the hands, which gives facility for shaking the mould while the plaster is poured, so as to drive it well into the crevices. The plaster used should be fine; and in order that it may harden and set quickly, about $\frac{1}{2}$ oz. of alum should be added to each pint of water used in mixing it. Before using an elastic mould, it should be carefully oiled. Great care is also required in mixing the plaster and watching it when in the mould, for if it be allowed to remain long enough to heat the mould, the latter will be destroyed.

EASILY MADE FOLDING TABLE.

BY J. THOMPSON.

THIS little table will form a very ornamental addition to the furniture of a drawing-room. It is not difficult to make, and when folded, only occupies a space of 8 in. in width. It is intended to be painted with enamel paint, the tint being chosen to harmonise with the furniture in the room. The best material for making it will be a piece of dry well-seasoned birch.

Fig. 1 is a side elevation of the table, showing half of one flap folded. Fig. 2 is an end elevation, showing the table folded. The height is 2 ft. 1 in., and the diameter of the top is 20 in. The top is formed of three boards, the centre one being 6 in. broad, and the two sides, or flaps, 7 in. broad and $\frac{3}{4}$ in. thick. They should be planed level and gauged to thickness. The edges must be planed straight, and the three boards fixed together by two temporary backs. Then mark out the circle, cut the edges to the mark, fix it on the face-plate of a lathe, and turn the edge, forming a small quarter-round moulding on the top side. If a lathe is not available, the edge can be finished square, cutting it with chisel and rasp, and finishing with glass-paper.

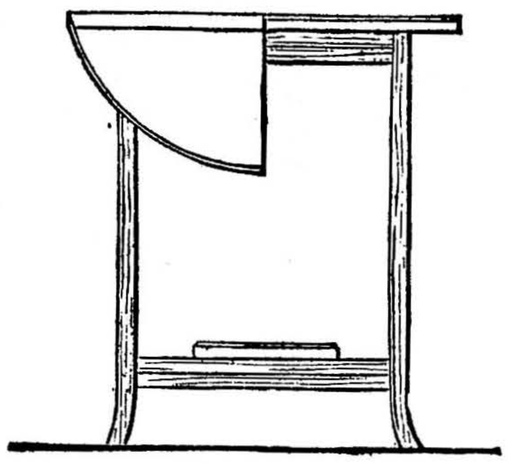


Fig. 1

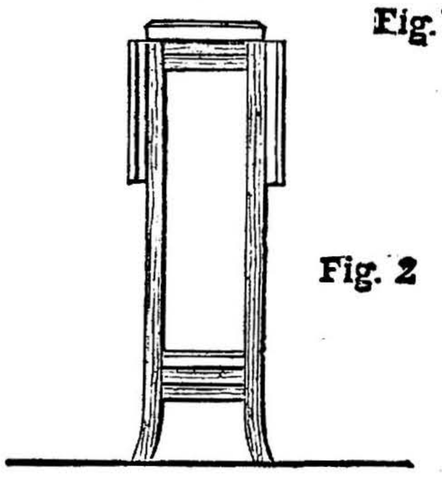


Fig. 2

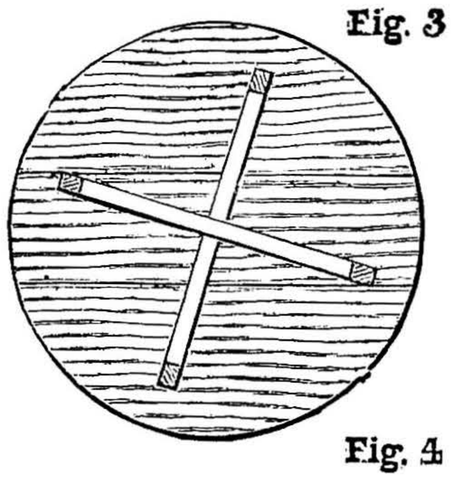


Fig. 3

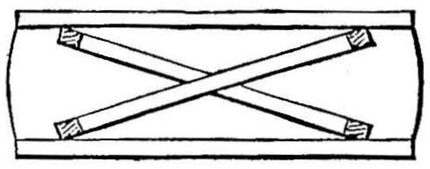


Fig. 4

Fig. 1. — Side Elevation of Table. Fig. 2.—End Elevation of Table. Fig. 3.—Plan of Under Side of Table-top open. Fig. 4. — Plan of Under Side of Table-top folded.

The legs and frames are 1 in. square, the lower end of the legs being curved outwards. These can all be cut from one plank by a bow or keyhole saw. Then dress them up, gauging them to one size, and take off the sharp arris at the corners. The four pieces for frames must be made the same size. The legs are framed together 16 in. wide outside, the joints being mortised and glued. The mortises are $\frac{3}{4}$ in. deep, and the tenons should be accurately fitted and the joints glued. Pins may be put through; but if the tenons are well fitted they are not necessary. The rails in one frame are made to fit just under those of the other frame, the bottom rail being $3\frac{1}{2}$ in. from the end of the legs, and the top one close under the table-top. It will be better to make the legs of this frame a little longer at the top, and cut them off when the joint is dry.

The two sets of frames are fixed together in the centre by a screw passing from the top frame into the bottom one, a thin iron washer being inserted between them. The screw-heads must be countersunk, so as to be clear of the table-top, and the small stand fixed on the lower frame. This stand is 8 in. diameter, turned and moulded on the edge similar to the top, and is fixed to the frame by glue and screws passing upwards through the frame. One set of legs is then glued and screwed to the under side of the table-top (as shown in Fig. 4) in an angular position, the screws passing upwards and about $\frac{1}{2}$ in. into the top, so that they are not seen. The heads must be countersunk, so as to clear the lower frame. The lower frame is arranged to open at right angles to the upper one (as shown in Fig. 3), and must have a stop to prevent it opening any further. It will be noted, by referring to Fig. 3, that when in this position the flaps will be held up by the frame. I omitted to state that the legs of the lower frame must project upwards to the same height as the others, to hold the flaps level when open. The flaps are fixed to the centre part of top by brass hinges. These must be let into the edges flush; they are fixed on the under side, and are not seen when the table is open. A stop will also be required to prevent the frame closing further than shown in Fig. 4. Before fixing the frames to the top, the frames must be carefully smoothed at the joints with a plane set very fine, and the top and the whole must be finished as smooth and level as possible, as the smoother it is finished the better will be the appearance when painted. It should have three coats of enamel paint of approved colour; a painted or stencilled ornament may be applied to the top, if desired.

WATCH AND CLOCK CLEANING AND REPAIRING.

BY A PRACTICAL WATCHMAKER.

REPAIRS.

To Tighten the Hand Work. — It sometimes happens that when a watch is cleaned and put together again, the hands are *too easy*. Thus, the watch itself may go all right, but the hands occasionally lag behind, and make it appear to a casual observer as if it had stopped and gone on again without anyone touching it. To remedy this, the set-hand-arbor, which passes through the hollow arbor of the centre wheel, must be tightened. The safest way to do this is to hold it by the square in the pin-vice, and resting the arbor upon the boxwood in the vice, trace several burred rings around it with a hard steel edge, such as a graver or square burnisher edge, upon the part which fits into the centre-wheel. If the cannon pinion only is loose upon the centre arbor, it may be tightened by taking a hair from the watch brush, and passing through the pinion before pushing it on. Afterwards the projecting ends of the hair must be broken off short with the tweezers.

To Repair the Winding Work. — In Geneva watches, which have seen much wear, and especially those which were never carefully made in the first instance, the ratchet teeth are found very often to be partly worn off, and the point of the click which engages with them in the same

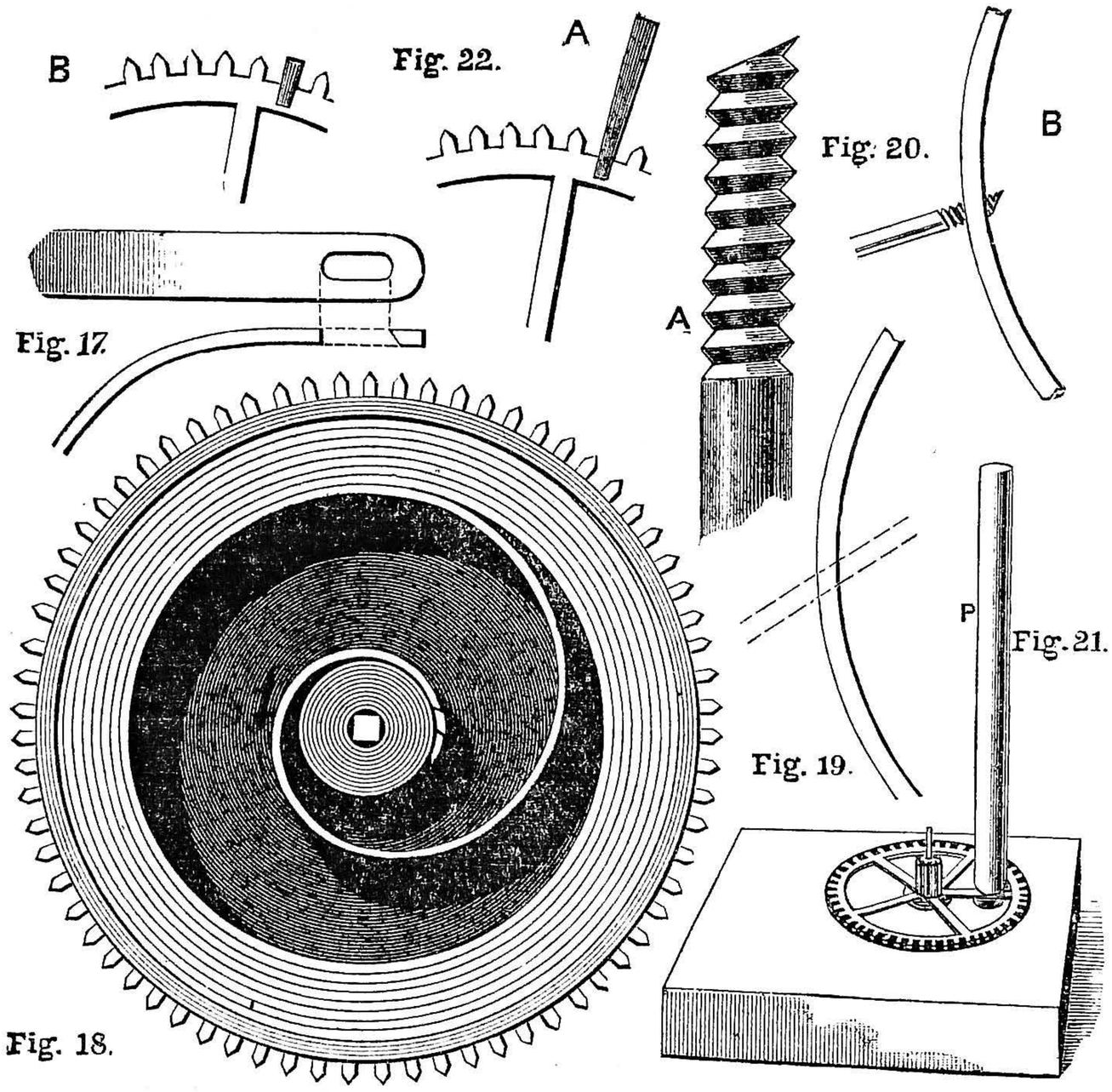
condition. In these circumstances it is liable to fail, and run back in the hand during the act of winding, and endanger the mainspring and other parts of the watch. In a ¾-plate watch, the remedy is easy. Holding the ratchet in the sliding tongs (brass-nosed if you have them), a triangular file must be applied carefully to file up the teeth to their right shape again, after the manner of a saw sharpener. The click is then to be filed up with a suitably shaped file, and both replaced, when the evil will be cured. In a bar watch, the ratchet and click must be served in the same manner; but on putting it together, it will probably be found that the click will no longer reach the ratchet teeth. To make this right, the brass of the bar must be carefully reduced on the edge with a flat file, till the click spring lays in close. In filing, the bar is held in the fingers, and rested upon a piece of cork in the vice. When this is done, the brass cap which covers the ratchet will probably require filing up also. In filing up clicks, be careful to leave the parts which engage with the ratchet teeth as smooth as possible.

To Fit a Mainspring.—After taking the watch apart, take out the old spring, and break a small piece off (about ¼ in. long). Stand this piece up in the barrel against the side, to see if the old spring was of the right width. The top of the spring should be *nearly* level with the bottom of the groove into which the barrel cover snaps. If correct, obtain another spring the same width and thickness (they will gauge this for you where you buy the spring), and proceed to wind it in the barrel to see if it is of the right length. This can be ascertained by the fulness of the barrel when the spring is in. When the spring is in the barrel, and unwound, it should occupy rather more than one-third of the space between the rim of the barrel and the edge of the arbor when in position. The outside end of the new spring must be shortened till it fulfils this requirement. This done, hold the extreme end of the spring (about ⅛ in.) in a flame till it assumes a dull red, and let it cool again. This has the effect of softening the steel. Place the spring over a hole of the steel stake, and, taking a punch rather smaller than this hole, punch it through the spring. Enlarge this hole with a broach, and elongate it in the direction of the length of the spring with a small round or square file. Then bevel off the edge which catches on the barrel hook to a knife edge, so as to hold better, and finally round up the end nice and smooth. It can then be wound in and oiled properly.

Fig. 17 shows the shape of the hole in the spring to hold properly on to the barrel hook. Fig. 18 shows a mainspring in a barrel, from which the correct length may be judged.

If, on taking off the barrel cover, the outside end only of the spring is found to be broken, and the break is not more than one inch from the end, the same spring can be used again, especially if it is in good condition. A mainspring is said to be in good condition when it opens out nicely when taken out of the barrel, and lies flat. If cramped, it indicates a soft spring. But it seldom happens that a spring breaks so near to the outside end. If the inside "eye" of the spring breaks, no attempt should be made to use it again, and nine springs out of ten break near the "eye" when they go.

To Put in a New Barrel Hook.—This is a repair frequently required, especially in those watches not provided with stop-work. In some common watches various "dodges" are seen in place of the hook and hole in spring. If any such is present, discard it, and proceed to punch a proper hole in the spring, and put in an ordinary barrel-hook. It is a great mistake to put in a steel hook, under the impression that it gives extra strength. A well-made brass hook will outlast many steel ones.



Watch and Clock Cleaning and Repairing. Fig. 17.—Shape of Hole in Spring. Fig. 18.—Mainspring and Barrel. Fig. 19.—Direction of Hole for Hook. Fig. 20.—Shape of Hook. Fig. 21.—Trueing a Wheel—P, Punch. Fig. 22.—Putting in a Tooth.

If the old hook is not already cut off or pushed through, proceed to cut it off quite level with a sharp knife or graver. Having done this, with a pointed chamfering tool carefully dot a centre for the hole, and selecting a drill rather smaller than an ordinary pin, drill the barrel through in a slanting direction, as in Fig. 19. Then with a tap carefully cut a thread in this hole, being most careful to work easily, and not break the tap in. To work a tap easily, after each half-turn in, turn it a quarter back, to free it and allow the oil to flow; also keep it well supplied with oil. When tapped, take an ordinary brass pin (these are good hard wire), cut off its head with the nippers, put it in the pin-vice as before described, and taper *slightly* and smoothly till the end just enters the hole in screw-plate corresponding to the tap used. Then keeping it well oiled, cut a good full thread upon it. Try this in the hole in barrel, and if correct, and a tight fit, cut off the superfluous brass and shape it as shown at A (Fig. 20), and make it such a length that when screwed up home and quite tight into the barrel, it is like B in the same Fig. Then with a peg clean out the oil from the hole, wipe the brass pin, and finally screw it in. Up to this point it is still held in the pin-vice. Now release it, and with a slitting file cut it off flush outside, and finish with a smooth file, taking care not to injure the barrel teeth. The hook should project inside the barrel little more than the thickness of one coil of the spring.

To Tighten a Barrel Cover.—Sometimes, when a spring breaks, the shock expands the barrel, especially if the latter is thin, and the cover will no longer snap on tight. In such a case take the stake figured on p. 357 (Fig. 9), screw it in the vice, and with the hammer gently tap the edge of the cover on the under side, hitting it flat. Hold the cover in the left hand flat upon the stake and slowly revolve it, giving perfectly even blows all round. This will spread it, and leave no marks if carefully done.

To Repair the Stop-work.—In ordinary Geneva watches, if the stop-work goes wrong, take off the star-wheel and screw, and discard it altogether. But be careful, in the case of the bottom barrel pivot running in a hole in the plate, to keep on the stop finger, or the square on the arbor will surely cut the bottom pivot-hole large, and cause the barrel to run out of truth and foul the plate or the centre-wheel. In watches where this precaution has been neglected, and the hole has cut badly, the centre of an old English minute-hand, or anything else having a square hole which can be made to fit the arbor, can be placed upon it as a protection, and prevent further cutting.

To Straighten a Pivot.—Hold the wheel in the fingers of the left hand up to the light, and revolve it. This shows the extent and direction of the bend. Then in the right hand take the brass-nosed pliers, and grip the pivot firmly, using the eye-glass, and bend it straight. This is the safest method I know, and seldom breaks the pivot. Avoid all hammering or pressing with steel tools.

To Straighten an Untrue Wheel.—Run it in a pair of callipers or in its pivot holes, and make a slight mark on the arm next to the bend, say where the rim wants bending up. Take a piece of boxwood, and make a hole in it to accommodate the pinion or arbor so that the wheel may lay flat on the wood. Also make a slight hollow under where the centre of the arms comes. Place the wheel in such a position that the arm next the place where the rim requires to be bent up is over this hollow, and take a round-faced punch and give the arm a gentle tap. This has the effect of raising the rim. Repeat till correct. Fig. 21 shows the arrangement. This method can be safely applied to all wheels, including steel 'scape wheels and

balances, though in the latter cases a brass punch must be used, and very gentle taps.

To Replace a Broken Tooth.—Take a square file and reduce the stump of the old tooth level with the wheel; then, with the slitting file, cut a notch exactly in the centre, and a trifle wider than the tooth. Where possible, cut this notch of a depth equal to the height of the tooth. This done, file up a brass pin flat on both sides till it pushes tight down to the bottom of the notch. Then with a little killed acid (the merest touch) moisten inside the notch and on the pin, place a minute dot scraped from a stick of solder on the place, and gently heat over a spirit lamp flame or with a blowpipe; it will run in solid. It is then like Fig. 22, A. Cut off the brass pin and file level with rest of teeth on edge, as at B; flat it down nicely top and bottom, and burnish with the burnisher gently, and then carefully shape up the curves with a fine "side" file. The tooth can then hardly be detected from the rest.

If a barrel tooth is broken, the safest way is to drill a hole, and screw in a steel pin, afterwards shaping up as before. In this case, soldering in a brass tooth is hardly safe, though the steel pin does not look so nice. If a 'scape-wheel tooth is broken, do not tinker it up—get a new wheel.

To Bush a Pivot Hole.—In the course of wear, especially in common watches, the pivot holes wear large, and cause the wheels to rock, and possibly foul the plates or the other wheels. To remedy this, procure some "bouchons" from the material shop. Select one which fits on the pivot tightly, and screw it in the pin-vice. Take a broach and carefully open out the old pivot hole, keeping it quite upright, till the small part of the "bouchon" fits tightly; then tap it in gently till the end just comes flush with the plate, or cock, on the other side, and with a sharp bend break it off close. It is cut round, nearly through, for that purpose. A slight tap with the face of the hammer or a punch, to bruise it a little on each side, prevents it coming out. This done, gently turn a small pivot broach round in the new hole till the pivot goes in easily and drops out with its own weight. Give it as little side shake as possible to be free. This applies to a brass hole of a third, fourth, or 'scape wheel. If it is a centre wheel or barrel hole that wants bushing, a different method is resorted to. In a very common watch that is not a particular job, the hole may sometimes be closed by going round it with a "botching" punch—a punch with a round face—and afterwards broaching the hole out smooth to fit the pivot. This, however, is truly a "botch," and is not recommended. Better proceed as follows:—Broach the hole out as large as convenient, and slightly bevel off the edge on both sides with a round chamfering tool. Get a piece of large brass wire and file down to fit the hole. Cut it off on both sides and file it flat, then with the round-faced hammer or a punch, rivet it in well, and finally smooth off level. The old hole will then be filled up with solid brass. It must now be re-drilled. The possessor of an uprighting tool or a mandrel can do this easily, quickly, and correctly, by centring from the other hole, with the plate or bar screwed in position, and bringing down the top or back centre, as the case may be, upon it. The repairer who has neither of these useful appliances can take a pointed chamfering tool, and centre it as nearly as possible by the circumference of the piece of brass he riveted in. This, as a rule, can be done very nearly correct. It must then be carefully drilled and opened out to fit the pivot.

The above reads like a formidable task, but in reality is very soon done, and makes a good sound job.

NEAT CASE FOR PLAYING CARDS.

BY W. D.

I FANCY that a great many readers of WORK will be fond of a game at cards. We cannot be always at work; we must play sometimes, and no doubt a game of whist, nap, twenty-fives, etc., adds to the enjoyment of the home fireside when the evenings are dull and dreary.

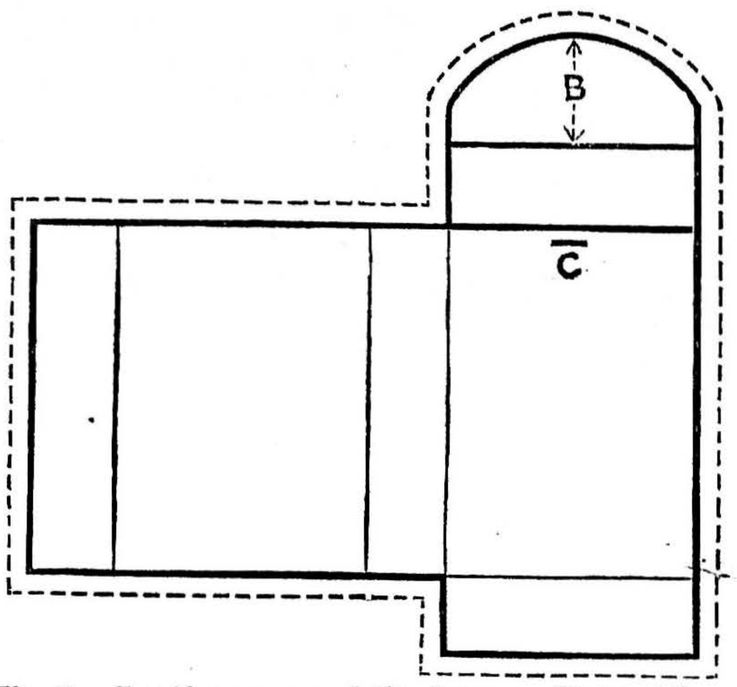


Fig. 1.—Leather-covered Card-case. Heavy Lines indicate Cardboard; Light Lines, Scoring for Folds; Dotted Line indicates the Leather.

I have many a time been asked to make one of a party for whist, and not unfrequently, when the cards were produced from a drawer or a corner of a shelf, have I heard, after the host had counted them over, the remark, in a rather injured tone, "I say, my dear, there are some of these cards lost. Look if you can find the rest; they must be there!"

It is a pity when such a thing happens; the evening is sure to be spoiled; someone loses his or her temper, and the visitors have an uncomfortable evening, which, with a little care and trouble, might have been otherwise. I do not want to blow my own horn, but when I produce my pack it is always complete, for the simple reason that I keep them in a case—a case covered with leather, with my name in gold letters on the front.

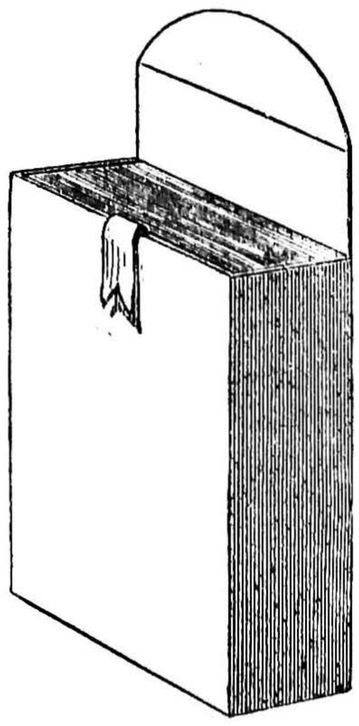


Fig. 2. — Perspective View of Case with Flap open.

As this case was made at home, without the aid of any special tools, I will now proceed to give instructions for making a similar one.

The first thing which is required is a piece of Bristol board or cardboard, about two-sheet thickness. The cardboard could be had a fancy colour, or it might be lined with a fancy paper, but I think that a plain white surface is quite fancy enough; indeed, I think that it is to be preferred, as it will harmonise with any colour of leather which may be used for the outside of the case.

The size of the cardboard will depend upon the size and thickness of the pack of cards. My pack measures exactly $3\frac{1}{2}$ in. × $2\frac{1}{2}$ in. × $\frac{3}{4}$ in.

The easiest manner to arrive at the exact size is to take a piece of paper, such as a sheet of note-paper, and lap it round the cards, which should be held tightly and evenly in the hands in the meantime. It should be folded over at top and bottom and rubbed with the fingers, and afterwards cut out with the scissors to the shape given in Fig. 1. The plain line shows the paper, and is half the size of my own pack.

Now cut the cardboard to the heavy lines in the figure; this will give the case with the bottom. The flap shown at B, with the double arrow running through it, must be cut separately. When this is done, turn the card over and mark off with pencil and straight-edge the light lines in the figure; these should be carefully drawn from the paper shape, with the aid of compasses or dividers. When marked out satisfactorily, take a sharp penknife and place the straight-edge close to the line and draw the knife gently from top to bottom, allowing it merely to cut the skin of the board; or, in other words, to "score" it, as we say in the trade. When scored it should fold up easily, the sides and bottom just meeting nicely. The flap piece must be cut to shape with the scissors.

A piece of silk ribbon or tape, about half an inch broad and about three times the length of the case, should now be procured. The colour should be chosen to harmonise with the leather. Make a cut at C with the knife, taking care that it is in the centre and about half an inch from the top; pass the end of the ribbon through the cut and glue it down to the cardboard—half an inch will be enough to hold it in place. Before cutting out the leather see that the glue-pot is boiling and that the glue is in good condition.

The best leather for the purpose is what is known in the trade as paste-grain roan. Of course, any thin leather will do, but this is to be recommended, as it is easy to work, has the appearance of morocco, and if a little care is taken it will be almost impossible to detect the joints.

The colour of the leather will be according to taste, but I would suggest dark purple. Cut out the leather from the paper shape, one-eighth of an inch larger every way (see dotted line in the figure).

When the leather is cut out it must be pared thinly and very carefully round the entire edge. This may be done with a penknife, but it will be much easier if the operator has a shoemaker's knife. A piece of glass or a smooth flat stone will also be required. Lay the leather upon this and work the knife from the body outwards. The aim should be to have the leather pared for one-eighth of an inch all round. The leather should now be glued all over on one side with good warm glue; it need not be very thick—rather, I should say, it must be thin.

When glued lay it flat upon the table, glued side uppermost; upon this lay the cardboard with the scored side down, being careful to have the one-eighth of an inch margin even all round. Now turn it over and rub the leather down with the hand. This done, turn over again, pack the ribbon out of the way, and bring the two sides together neatly, and turn down the one-eighth of an inch margin, rubbing it well with the fingers to make it stick. Turn up the bottom in the same manner. Next turn in the margin at the top of box, making a

little cut at the corners to make it lie neatly. Now drop the pack of cards into the box, lay the small piece of cardboard flush with the top of the box, and bring over the flap, rubbing it down; throw it back again and turn in the margin. This must be all done quickly, as the glue will soon dry.

Cut another piece of leather to cover the flap and joint, and to extend one-eighth of an inch into the box. This must fit nicely inside the flap, and, of course, must be pared round the edge. Make a small cut at the top edge of the flap through the leather, and pass a small piece of ribbon (doubled) through, and glue down the ends inside. Now glue the piece of leather and lay it neatly inside the flap, and make sure that it sticks well all over. The box or case is now finished, as far as making is concerned, and should be set aside to dry.

When it is dry, a line should be marked round the edges about one-sixteenth of an inch in. This could be done with the back of a table knife slightly heated, and a straight-edge to work against. While doing this the cards should be inside to make it solid, otherwise the sides of the case would be apt to fall in when a little pressure would be applied. It should now be varnished with shellac varnish.

In use the ribbon is drawn out and laid over the top, the cards are dropped in all at once, and the ribbon is taken by them to the bottom, leaving one end hanging out. This is laid over the top of the cards, then the flap is brought over and tucked in between the cards and the side of the case, the little bit of ribbon standing upright. The cards are now perfectly tucked into the case, free from dust and dirt. To take them out, the little piece of ribbon is first drawn outwards; this opens the flap. The large piece of ribbon is now drawn out. As it comes out the cards rise, and can be drawn out or allowed to drop upon the table.

I hope I have made the whole thing clear enough, and that those who try to make the card-case will succeed. It is much neater than a pull-off case, and is more easily made.

WRINKLES.

Ink for Marking Bales.—Take gum arabic, 10 lb.; logwood liquor (specific gravity 1·37), 20 fluid ounces; bichromate of potash, 2½ oz.; water sufficient to dissolve the bichromate of potash. Dissolve the gum in 1 gallon of water; strain, add the logwood liquor, mix, and let the mixture stand for twenty-four hours; then stir in rapidly the bichromate solution, and add a little nitrate of iron and fustic extract. If too thick, thin down with hot (not boiling) water.

Magnesia Cement is made by digesting fluorspar for some time in sulphuric acid, adding magnesium sulphate, and stirring calcined magnesia into the mixture. The cement thus made sets very hard, and is not affected by water. Articles made of it are pressed and dried by exposure to air or heat.

A new Tin Alloy for connecting metals to glass is formed of 95 parts tin and 5 parts copper. The copper is poured into the molten tin and stirred in with a wooden mixer, and the alloy afterwards re-melted. It adheres strongly to clean glass, and has nearly the same rate of expansion. It may also be used for coating other metals, and, if required, rendered more fusible by adding 1 per cent. of lead.

IMPROVED BOLT-HEADING MACHINE.

This has been patented by Mr. William H. Betts in America. A box at the upper end of the hollow column, as seen in the sectional view, contains the bolt-holding dies, preferably of steel, and having on opposite sides grooves, terminating at one end in a square shoulder and at the opposite end in recesses, so that they are adapted to form either a flat head or a head to fit a countersunk hole. These dies serve as an anvil, and

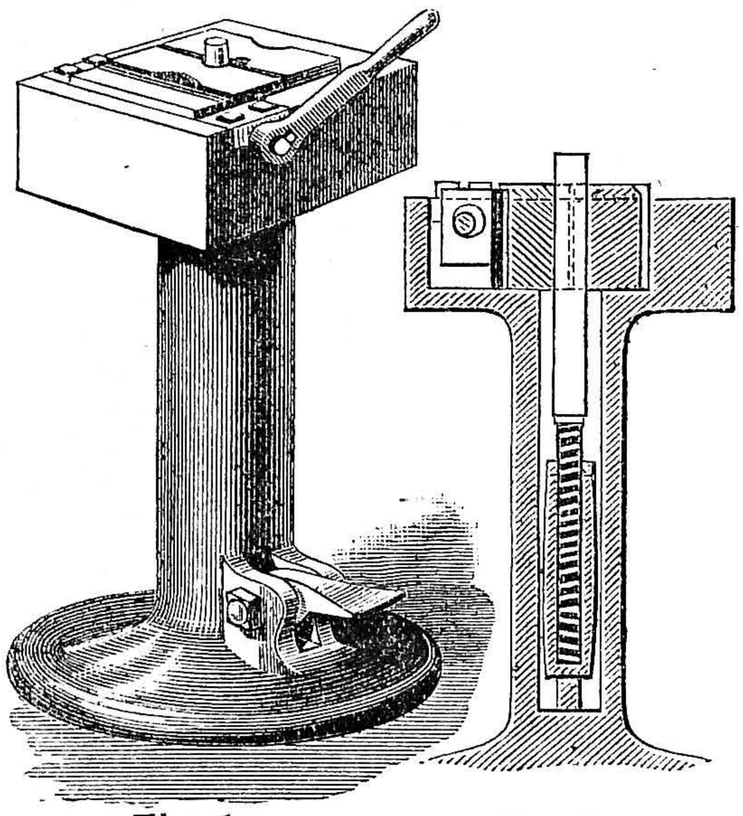
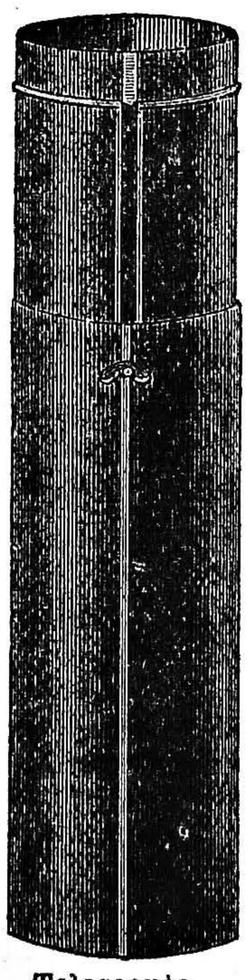


Fig. 1 Fig. 2

Fig. 1.—Bolt-heading Machine. Fig. 2.—Sectional View.

when the bolt projecting through them has its head formed, the end of the bolt is hammered down upon the upper faces of the dies. The bolt extends down and rests upon the head of an ejecting plunger, adjustable to fit bolts of different lengths, the lower end of the plunger resting upon the inner end of a treadle lever. Within the box, at one side of the dies, is a binding block mounted on a cam shaft, having a hand lever by which the shaft may be turned to force the block against the dies to hold them firmly in place. The treadle mechanism is necessary, as the bolt when inserted hot between the dies is inclined to stick.



Telescopic Stove - pipe.

TELESCOPIC STOVE-PIPE.

We illustrate herewith a novel form of stove-pipe. It is called a telescopic stove-pipe, and consists of two joints of pipe, one fitting in the other, the inner one having a slot so constructed that a bolt, compressed or loosened by a thumb-screw on the outer pipe, holds the inner pipe at any height. When the inner pipe is fully pulled out, two joints of pipe are formed, one only being formed when the inner pipe is pushed to the bottom. Any intermediate length may be added at will, and the pipe is especially so adjusted that no smoke can leak out.

SCIENCE TO DATE.

Nitric Acid from Air.—When an electric spark is made to pass in a closed vessel containing air, the amount of nitric acid formed quickly reaches a limit which is small, but if the air is caused to move by drawing a current of air through the vessel, the amount of combination may be made to reach 10 per cent. It has been suggested that, by the use of high voltage discharges in air, nitric acid may be produced even on a manufacturing scale.

Trisulphide of Boron.—Moissan has devised several methods for the preparation of trisulphide of boron. It can be prepared by the direct action of sulphur vapour on pure boron at 1,200° C.; also sulphuretted hydrogen gas acts on boron at a high temperature, forming this substance. Boron trisulphide burns in chlorine gas with a green flame, producing perchloride of sulphur and boron trichloride, and reacts energetically with most metals. Sulphur in fusion dissolves it. Nitrogen has no action on it, and it may be distilled in an atmosphere of this gas.

Phosphide of Mercury.—At the ordinary temperature phosphorus has no action on mercury, nor do they combine even when heated together in open or closed tubes. But Granger has found that if a halogen compound of phosphorus is used—such as the iodide, for example—then a reaction takes place, with the formation of iodide of mercury and phosphide of mercury. By washing the product of the reaction with potassium iodide, iodide of mercury is removed, and the phosphide is left in the form of fine crystals, metallic in aspect, having the composition Hg_3P_2.

"Nitro Metals."—The "nitro metals" are a new class of compounds recently discovered by Sabatier and Senderens. They have found that reduced copper absorbs in the cold the vapours of nitrogen peroxide, heat being disengaged during the process. The product is a maroon-coloured compound, the composition of which is represented by the formula Cu_2NO_2. This is nitro-copper. A similar compound has been obtained with cobalt. Nitro-copper reacts violently with water, giving off nitric oxide and yielding a green liquid containing copper nitrate mixed with a little nitrite. A residue of almost pure copper is deposited at the same time.

NOTES FOR WORKERS.

The fusing point of an alloy is generally lower than that of either of its constituents. Gold alloyed with 10 per cent. of aluminium follows this general rule, but when the aluminium is increased to 20 per cent., the resulting brilliant ruby alloy has a fusing point above that of gold.

The first overhead telegraph wire in France was erected in 1793 by M. Claude Chappe, to whose honour a statue is to be erected.

Soap and water, to which is added permanganate of potash or oxalic acid, is harmless to the hands and the best disinfectant there is.

Major Moore has had built a flying machine, on the model of the flying fox, and driven by a 3 horse-power electric motor.

A very handy grooved wheel for many purposes may be made by soldering two penny tin plates back to back.

A handy mallet may be made with the boy's discarded wooden horse by fixing one of the legs in the centre for a handle.

Girls' steel knitting needles (four a penny at the draper's) make small drills for a twisted brace. The handles of the girls' skipping rope, being bored right through, are handy also.

By placing the ends, in turn, of disused condensed milk cans on a hot plate to melt the joint, you may remove the remaining portion with an old knife; then melt the body seam the same way, and you have a handy piece of tinned plate, 9 in. by 3 in. It is best to clean the cans by soaking inside and out first.

Some 140 families emigrated from Manchester and Bradford about thirteen months ago to Brazil. The unhealthy climate, swamp fever, and other hardships caused the death of many heads of families, and the destitution and penury of the others. Some have been assisted back again, and the first detachment arrived here in a pitiable condition.

The largest known roof on a permanent structure is that of St. Pancras Station (M.R.), which was opened for traffic in 1868. Its total length is 690 ft., and its breadth is 245 ft. 6 in.

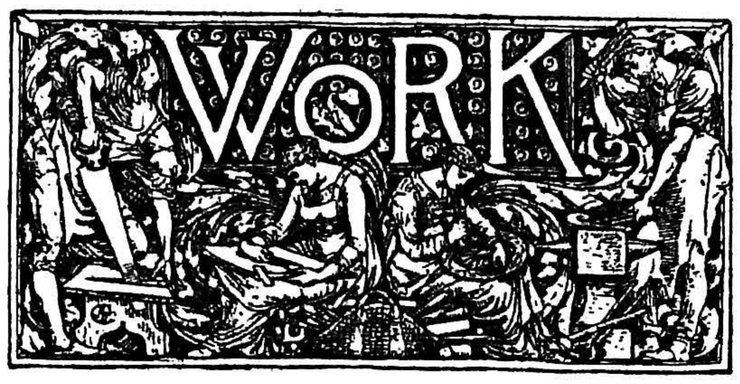
NOTICE TO READERS.

NEXT week's contents of WORK (No. 189) will include :—

NOVEL ROASTER AND BAKER.
HOW TO MAKE A RAIN GAUGE.
AMUSING PHOTOGRAPHIC EXPERIMENTS.
MAKING CHEMICAL APPARATUS.
SPECULA FOR THE NEWTONIAN TELESCOPE.
HOW TO MAKE A HALL CHAIR.
CARPENTRY FOR BOYS.

Also the first of a series of illustrated articles on British Works and Industries :—
NEEDLEMAKING — MESSRS. MILWARD'S, REDDITCH.

*** The Editor makes this intimation in the hope that readers, having friends interested in any of these subjects, will bring the same to their notice.



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

*** All letters suggesting Articles, Designs, and MS. communications for insertion in this Journal will be welcomed, and should be addressed to the Editor of WORK, CASSELL and COMPANY, Limited, London, E.C.

INDIAN METAL-WORK.—In the centre of a dark and deserted district will be found the Imperial Institute. This noble, but at present unfinished, building has been partly thrown open to the public, at a charge originally of 1s., now 6d., per head. The attraction is a small exhibition of Indian metal-work, and to those interested in that class of art productions it is well worth the price paid for admission. Many of the articles are unique. Specimens of Jeypore enamel can be seen in perfection, and the one matchless vase of Jade, encrusted with rubies and emeralds, is—along with the spoon (whose bowl is made from an emerald)—worth all the trouble of a visit. We note with pleasure and approval that most of the articles have clear and bold labels attached—a detail of great importance this to those who have few sixpences to spare for the purchase of a catalogue.

UTILISATION OF NATURAL FORCES.—We are surrounded by evidences of natural forces. Our earth maintains a well-balanced and well-regulated motion around the sun and on its own axis by the force of attraction. Whether magnetic or not has not yet been proved. In its passage it receives light and heat from the sun, and electric force is developed in its atmosphere. The force of gravitation holds terrestrial objects in position against contrary centrifugal force. Gravitation gives weight to the mobile element named water, and the movement of this element from a higher to a lower level in rivers furnishes us with a source of natural force. Yielding to the force of attraction exerted by the sun and moon, the waters in oceans and seas rise and fall in the form of tides, which also provides another natural force. The atmosphere of the earth is also always in motion, as the air expands under the influence of solar heat or contracts in cooling. This gives us the force of wind. During the progress of his civilisation, man has learned to utilise some of these forces and bend them to his will. The movements of the winds and of the waters have been specially useful to him in the past, and there is great promise of their extended use in the future. In the past, the movement of water from a higher to a lower level in rivers and streams has been utilised by means of overshot, undershot, and breast water-wheels to turn and work machinery in mills and factories built on the river banks. The introduction of turbines has extended the use of this natural force, but it has been circumscribed by locality, as there has been no means of conveying this source of power to a distance from rivers, except by conducting the steam itself in conduits across country. With the invention of dynamo-electric machines for the generation of electricity, the possibility of conveying the electric current at almost any distance from the generator, and transforming it through an electro-motor into mechanical movements, the field of usefulness for natural water-power has been widely extended. Already we read of towns being electrically lighted with current obtainable from dynamos driven by turbines actuated by the falling waters of distant rivers, and there is no reason against the extension of this practice. As the current may be used for this purpose, it may also be extended to other purposes in which electro-motors can be utilised. Our enterprising cousins on the other side of the Atlantic even talk of laying the waters of Niagara under tribute for power to be conveyed to the Chicago Exhibition! By the use of high-speed dynamos generating high tension alternating currents at the source of power, and transformers at the other end to transform the high-tension current to one of lower tension and larger volume, it is possible to transmit electric force through light conductors over a wide space. Very little has hitherto been effected in the utilisation of tidal forces, but we think a future may be in store for these when broad platforms, furnished with suitable rockwork machinery, may be made to communicate motion to dynamo-electric machines, or undershot water-wheels be made to turn by the incoming and outgoing tides. The power thus obtained could be stored in accumulators and used as required for lighting and for driving electro-motors. The force obtained from the movements of the atmosphere must always be variable and uncertain, but it is as possible to get electric power from this source as from any other natural force. If windmills can be used to grind corn they may also be used for pumping water into reservoirs to be alternately used in driving turbines, or in driving dynamos to charge accumulators. Perhaps the former method of utilising this natural force would be preferable, since the variable current obtained from a wind-driven dynamo would not be the best for charging accumulators. Whether it will ever be possible to utilise the enormous quantities of high-tension electricity annually exchanged between celestial and terrestrial regions is a problem at present unsolvable, and entirely outside the range of practical science. The collection is so variable, and the period of discharge so uncertain, and also the pressure of the accumulated electricity so fitful, as to make its utilisation appear unmanageable. Perhaps some future electrician may yet discover a means for quietly drawing the charge from earth and cloud, and storing it in manageable apparatus.

BENT IRON WORK, AND HOW TO DO IT.

BY J. H.

LAMPS.

LAMPS—A TABLE LAMP—ANOTHER TABLE LAMP—INKSTAND—THE FRAMES—THE CURVED WORK—THE SUPPORTING CURVES FOR THE INKPOT—A FLOOR LAMP—ITS DETAILS—THE BOWL AND ITS SUPPORTS.

A Table Lamp.—Fig. 50 illustrates a simple mounting for a table lamp. There is a rim, *a*, round the bowl, and underneath this, and embracing the bowl closely, there is a ring of thin iron, *b*, of ⅜ in. in width. This ring should be bent, and soldered or brazed, with ends lapping, say, to the extent of ⅜ in. or ½ in., and the joint neatly filed. To this ring the first scrolls, A, are fastened, each other, and riveted or soldered at the centre, where they cross. Small curves, F, F, may be added or omitted. The main series of curves being secured to the ring B above, and to the curves D, D below, it is only necessary besides to stiffen the central part by introducing a ring at *c*, binding the curves to it with wire.

Another Table Lamp.—A stand differently

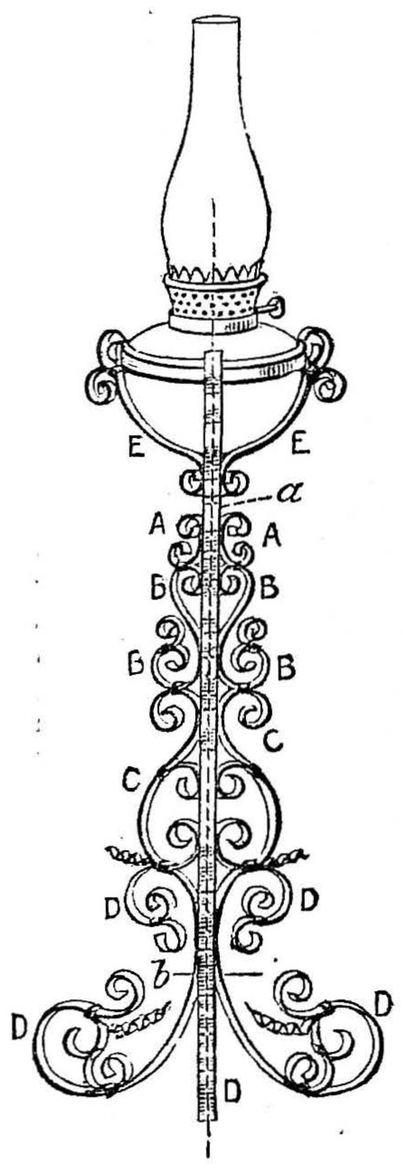


Fig. 51.

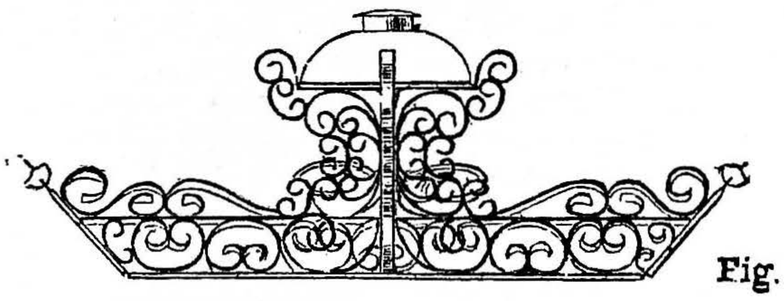
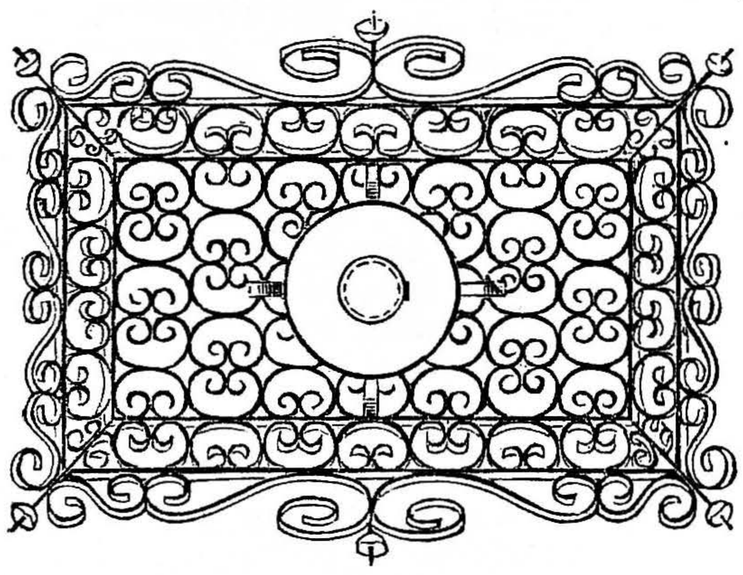


Fig. 52.



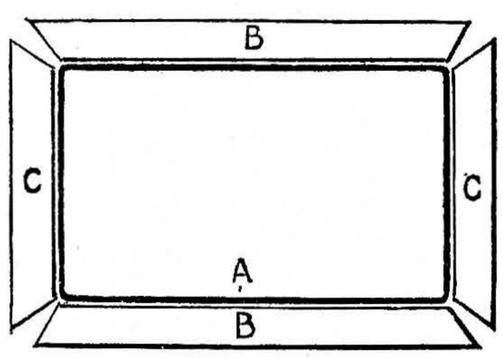


Fig. 53.

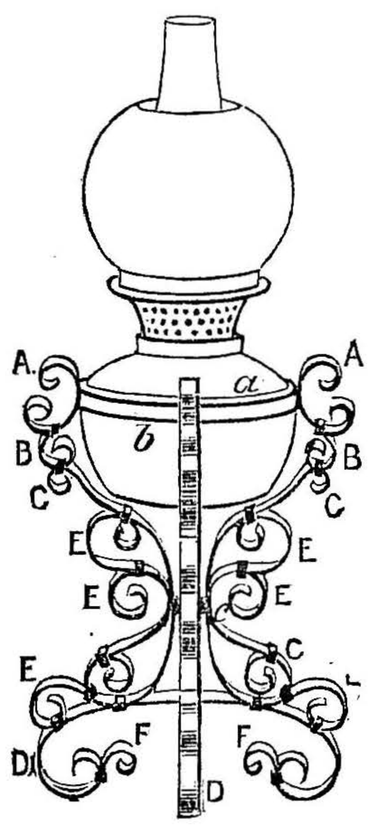
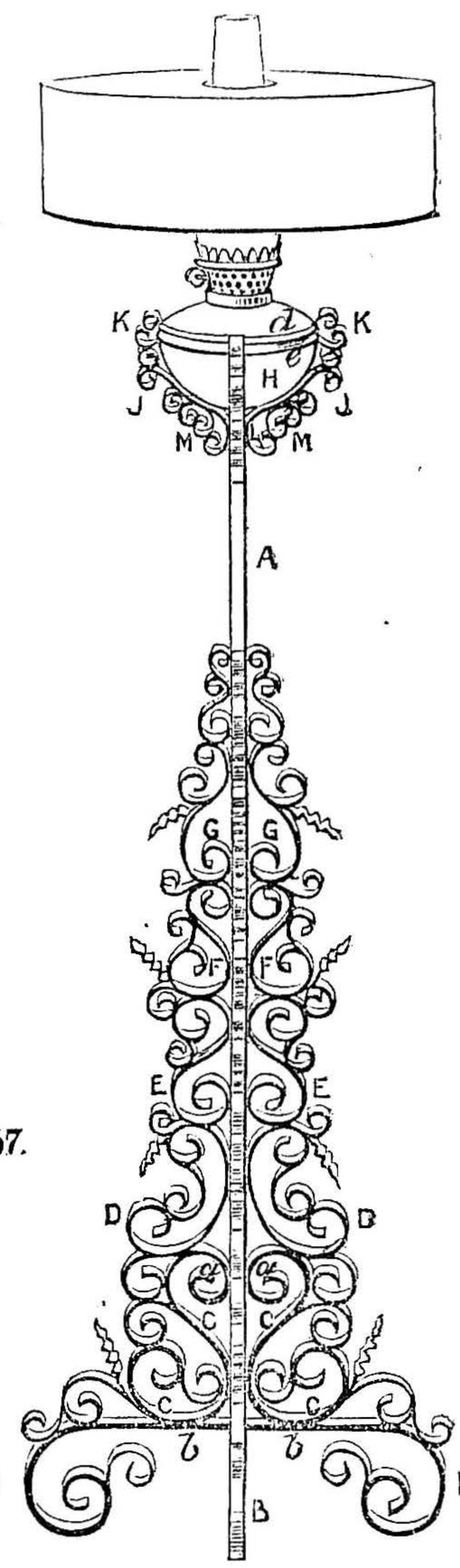


Fig. 50.



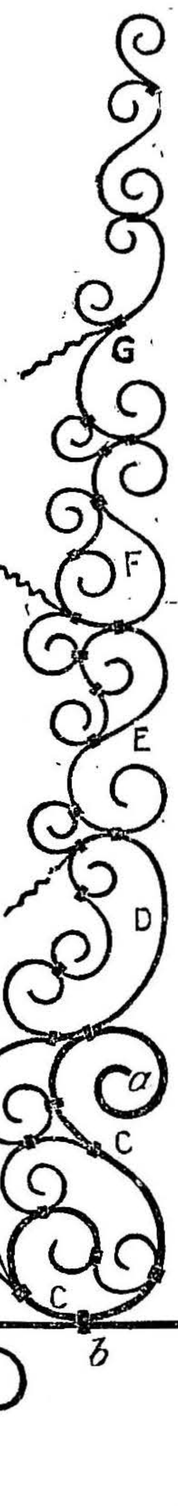


Fig. 57.

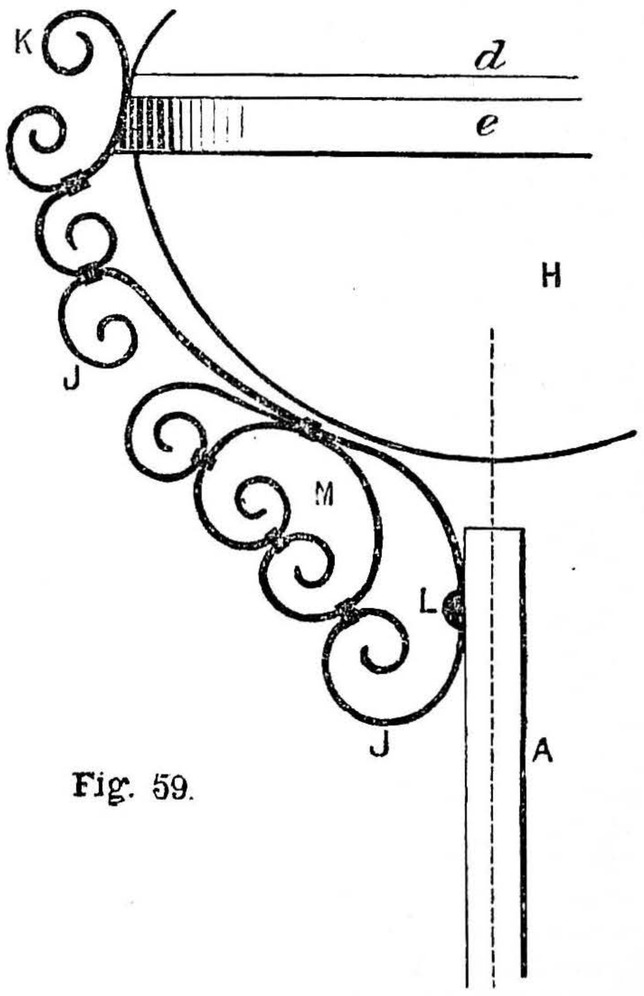


Fig. 59.

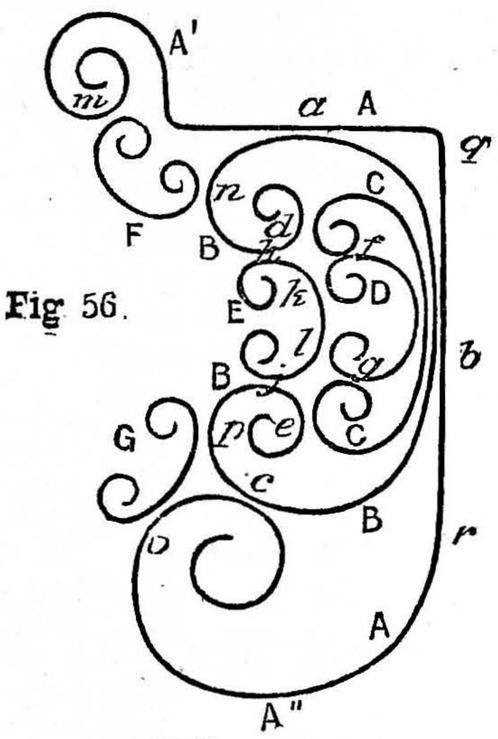


Fig. 56.

Fig. 55.

Fig. 58.

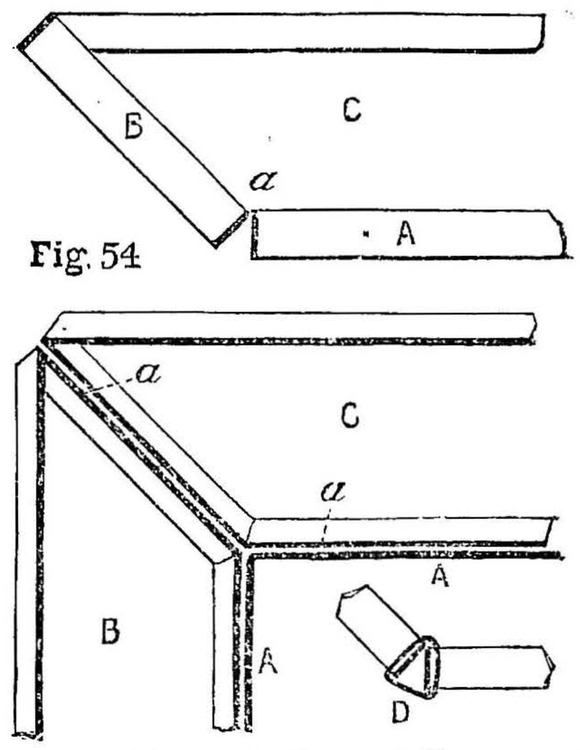


Fig. 54

Bent Iron Work. Figs. 50 and 51.—Table Lamps. Fig. 52.—Inkstand. Fig. 53.—Main Frames separated. Fig. 54.—Enlarged View of Corners of Frames. Fig. 55.—Enlarged View of Scroll. Fig. 56.—Enlarged View of One Series of Supporting Curve. Fig. 57.—Floor Lamp. Fig. 58.—Enlarged View of Scroll-work. Fig. 59.—Enlarged View of Iron-work round Bowl.

Lamps.—There is scarcely a limit to the tasteful ways in which common lamps can be mounted. Glass lamps sometimes come out of their seatings, the cement giving way. Or they can be taken out and mounted in bent iron. But it is better to make use of copper bowls, because there is always some risk of cracking the glass in the work of mounting.

with wire crossing at the joint. There may be three or four sets of scroll-work. I have shown four in the figure. The continuation of the scroll-work is in detail as follows:—A short curve, B, fastened with a clip to A; a long curve, C, reaching from B to the foot D, and fastened to B and D; short curves, E, E, E, fastened with clips to C and to D. There are two double curves, D, crossing

constructed is shown in Fig. 51. The lamp is taller, and the thin iron is supported with a central rod, *a*, of $\frac{5}{16}$ in. or ⅜ in. square. To this there are attached four series of scroll-work; the main scrolls are A, B, C, D. There are also minor scrolls and tendrils. The rod *a* terminates at *b*, below; at the top it ends close beneath the bowl of the lamp. The bowl is enclosed with

four scrolls, E, fastened with wire to the encircling ring, and riveted or soldered to the top end of the rod *a*.

Inkstand.—A combined inkstand and tray is shown in Fig. 52. There is a good deal of work in it, but it forms a fitting companion to one of the table lamps, mounted in bent iron.

The Frames.—First there are the main frames, five in number. These are made in thin strips. They are all bound together so effectually with each other and with the curves, and there is practically no weight upon them, that there is no need at all to make use of stout iron for them. The frames are made by bending the thin strips to the proper angle, which is not important, so long as the angles of all are alike. Fig. 53 shows the bottom frame, A, the side frames, B, B, and the end frames, C, C, separated, and laid down flat. The union of each frame can be made either at one corner or about the centre, by riveting, brazing, or soldering. In Fig. 54 one corner of the frames is shown enlarged and slightly separated, in order to render the method of their union clear. It is seen that the frames do not come into contact throughout the whole width of the iron strips, but only at the keen corners, *a*, *a*. To make them meet, the strips would have to be set to a bevel, which would be a troublesome job; and more than that, the curves that are fitted within the side and end frames, B and C, would have to be set to a corresponding bevel. The binding together of the frames and curves will make a perfectly rigid job, even though there is contact only along the edges. The frames are fastened together with clips, as shown in section at D (Fig. 54).

The Curved Work.—Now all the interspaces of the frames are filled up with curves of the form shown enlarged in Fig. 55. At every point of contact with each other and with the frames a clip is placed. There is no need, however, to show these in the figure. Also all round the top edges of the outer frames scroll-work is fastened, the scrolls being attached to each other and to the top edges of the outer frames. At the four corners, flowers of iron or copper are inserted.

The Supporting Curves for the Inkpot.—The inkpot is supported upon four series of scroll-work, each series being set at a right angle with the series adjacent. A single series is shown enlarged in Fig. 56, with the component curves slightly separated. There is the main curve, A, upon the top horizontal portion of which the inkpot is supported, while the curving upward at its termination, A′, confines the inkpot, and prevents it from sliding off sideways. This main curve is too weak in itself to carry the weight of a large pot of ink without yielding. Both for support and ornament, therefore, a number of minor curves are fastened to it and to each other, and arranged in such fashion that they afford mutual support. The large curve, B, is clipped to A in three places, *a*, *b*, *c*, but the clip *b* is not put on yet. The next curve, C, is fastened to B at *b*, *e*. The next curve, D, is fastened to C at *f*, *b*, *g*. At this stage a clip is fastened round A B C D at *b*. Then curve E is fastened to B at *h*, *j*, and to D at *k*, *l*. Finally, the curves F, G, are fastened respectively to A and B at *m*, *n*, and at *o*, *p*. The four series of curves are now fastened together at right angles with two stout clips at *q*, *r*, around a central square rod. Then the portion A″ of the curve A is fastened to the bottom curves of the tray, with which it comes into contact, with crossing wire or with solder.

A Floor Lamp.—A floor lamp is shown in Fig. 57. These lamps have hitherto been mostly made in forged iron or in brass; but bent iron opens up a new sphere of decorative mounting for them. The ornamentation may either be wholly in bent iron, or partly in iron of stout section and partly in thin strips; the latter being preferable by reason of its superior strength.

Its Details.—In Fig. 57 the central pillar, A, must be stout, not less than $\frac{1}{2}$ in. square. It is riveted at the bottom to the two crossing curves, B, B, made of iron $\frac{1}{2}$ in. × $\frac{1}{8}$ in. The curves C, C, made of stout iron of similar section, are riveted to A at *a*, *a*, and to B at *b*. Thus a good foundation is laid for a firm and steady stand. The upper work may be of thin iron wholly. The main scrolls are D, E, F, G. These are firmly bound to the central pillar, A, with clips, made to embrace at once the four corresponding scrolls that lay against the four faces of the bar. I need not figure the minor scrolls nor the tendrils, but Fig. 58, which illustrates a single series, shows the way in which each series is built up. Clips, of course, will be employed at all points of contact.

The Bowl and its Supports.—The lamp bowl, H, is of copper, provided with the usual beading, *d*. A ring of iron, *e*, fitted underneath and around this, supports the bowl; and the scrolls J, K, carry the ring, and are fastened at L to the pillar, A. This particular work may be of thin iron, but it is better to use that of stouter section, as $\frac{1}{2}$ in. × $\frac{1}{16}$ in., or $\frac{3}{8}$ in. × $\frac{1}{16}$ in. The lamp bowl will be steadier than if carried by thin strips. A single series of these curves is shown enlarged in Fig. 59. The two curves J and K are riveted together, or else secured with clips. If difficulty is experienced in making a firm job of this union, then substitute a single curve for the two. The principal point to be noted here is the union of the four curves, J, to the pillar, A. These curves are brought down a considerable distance below the end of A, say a couple of inches, so that two rivets can be got in to unite them firmly. Two rivets will pass through from side to side at, say, 1 in. or $1\frac{1}{4}$ in. centres, to hold the curves which come upon opposite faces, and two will pass through from the other sides at right angles with these at the same centres; but, say, $\frac{1}{4}$ in. above or below the others, to hold the remaining two curves. The long open space is then filled in with a small scroll, M.

LABOUR AND CAPITAL MEN.

MR. GEORGE LIVESEY.

Mr. Livesey acquired more than a mere local reputation towards the end of 1889. It was then that the gas-stokers of the South Metropolitan Gas Company, of which Mr. Livesey is the chairman, struck work and entered upon the bitterest struggle known in the conflict between labour and capital. The position that Mr. Livesey was compelled to take up through the struggle must have been extremely distasteful to him. On the one hand, he was represented as the most uncompromising foe of the worker; while, on the other, he appeared to capital as the best fighting man that had yet arisen on its side. He was denounced in unmeasured terms by the labour party, and he was lauded to the skies by the opposing party. In his own heart, however, he would have preferred, had circumstances permitted, to appear in quite another *rôle*—viz., as the friend of the worker.

This is Mr. Livesey's true position in the labour world, and only the blinding spirit of partisanship can represent him in any other light. He recognises the severe lot of the worker, and is willing to promote whatever scheme may seem to his judgment sound and likely to meliorate that lot. It is in profit-sharing that, in his opinion, the solution of our industrial difficulties lies, and for the wider acceptance of this view he has used the influence of his strong character and high position. Nay, more, he would go the length of allowing workmen, when possible, to sit on the boards of directors, and so have a voice in the management of undertakings that they are now interested in as mere wage-earners. Thus much has Mr. Livesey stated as a witness before the Royal Commission on Labour, of which he is also a member; and when a man in his position, representing a company that sometimes employs over 3,500 men, says even this in public, he must be prepared to make concessions to labour that capital is not habitually given to make.

It was these expressed views, revealing, as they do, a rather interesting attitude, that induced us to make further inquiry into Mr. Livesey's treatment of his company's *employés* and into his opinions upon aspects of the labour question generally. In passing, we may state that he was born in London and practically brought up in the gas works, where his father was secretary and manager. In 1848 he himself entered the service of the company, became its engineer in 1862, secretary as well as engineer in 1871, director in 1882, and chairman in 1885. In 1888 he offered a site and building to the Camberwell parish for a public library, and in October, 1890, the Livesey Library was opened. In Greenwood's "Public Libraries" we read that, "at the opening of the library, the donor stated that Camberwell had been more or less his parish for half a century, that he had received much kindness at the hands of working men, and that, having enjoyed some prosperity, he held it to be his duty to do something to brighten their lives. He had accordingly given them a public library." Mr. Livesey is also a prominent temperance reformer, and is sometimes afraid that higher wages and increased leisure will mean to too many men more drink. However, the present position he is assured cannot last, and a way must be found for making the interests of labour and capital identical.

There must be a real partnership between capital and labour, and a fair division of profits between the two—that is his belief; and to make that partnership as real and the division of profits as fair as possible, he is prepared, as we have already said, to have labour represented on boards of directors as well as capital. Just now it is capital only that is represented, and it is in this respect that profit-sharing schemes, so far as they have been adopted, are so one-sided. No capitalist before has made so generous a claim as this for labour, and curiously, it comes from the man who, more than any other, has been held up by certain organs of the Press as an inhuman suppressor of the rights of labour.

There are difficulties in the way, however—"practical difficulties," to use Mr. Livesey's own words. First of all, Mr. Livesey is afraid that, though he individually is in favour of labour representation on boards of directors, capitalists generally are very far from being so minded. Many an employer may, from prudential motives, be quite willing to grant his men a percentage of the year's profits. It is not a difficult thing to do that; it is often a very wise thing, inasmuch as it offers an inducement to the men to so work as to make the profits as large as possible. It is a very different thing, however, for an employer to take his men into his confidence and his counsel, and, in the absence of perfect trust between employer and employed, an impossible thing. In the condition under which businesses are now conducted, it would be in the power of the men to wreck a business when their knowledge of it was as minute and entire as their master's. Another difficulty lies on the side of the men.

With their present methods, Mr. Livesey is of opinion that the representatives they would appoint would most likely be the best talkers. So far there seems to be ground for this apprehension. In the labour movement the men that

have been placed in the lead seem to be those that are gifted with the power of expression. This process of selection is, however, not confined to the labour movement. We find it in politics. To rise to distinction in that sphere, a man must be able to make a good speech. Perhaps too much importance is laid upon this point, and perhaps we might be better served if there were less necessity for so much talking. The best business men are not necessarily the best speakers, and the best men to represent any interest on a board of directors are the men of business capacity. Another difficulty emphasised by Mr. Livesey lies in the fact that employers by having their capital invested in the business are absolutely bound to stick to it. Workmen, on the other hand, may be under one employer to-day and another to-morrow. They are thus chiefly interested in present prosperity and in present large profits, which may be distributed to the future detriment of the concern.

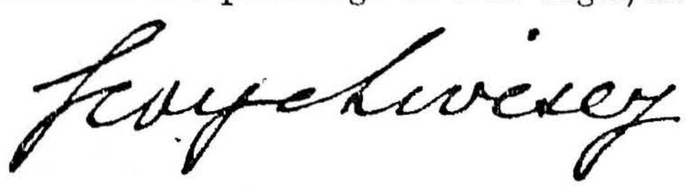
The employer, again, in consequence of his capital being locked up in the business, is in a position different from the workman, who is far more free to leave at any time that suits his purpose. "The workman's interest, in fact," to use Mr. Livesey's own words, "is to get as much out of the business in the shape of present profit as possible, whereas to do so in some cases might prove detrimental. For instance, the plant might suffer, and its future earning power be diminished, if too much profit were taken out. It is, therefore, the interest of the proprietor to spend a sufficient portion of the profit of the business in keeping the plant and everything connected with it up to the mark, so that its future earning power may not be impaired. One way of getting over this difficulty is to require, in the case of, say, a gas company, that the men's representative be also a shareholder. The qualification of an ordinary director is the holding of a considerable amount of shares, and the same rule might well apply to the workmen; though, of course, the qualification must be much lower, but sufficient to prove their practical interest in the concern."

These are the "practical difficulties," in Mr. Livesey's opinion—what may be called the fear of the capitalist that the men might betray him, strengthened by prejudice and a want of a proper method of selecting representatives—that stand in the way of placing the keystone on any profit-sharing scheme—viz., labour representation on the board of management.

The foregoing is the length that Mr. Livesey would like to be able to go; we shall now point out how far he, or rather, his board, has gone. In the South Metropolitan Gas Company's Act of 1876 there is a curious clause, whereby the dividend payable to the shareholders increases as the price of gas decreases. Being of the nature of monopolies, gas companies, like railways, have by the Acts incorporating them been restricted to the payment of dividends at the rate of not more than 10 per cent. This hard-and-fast rule with the development of these huge concerns is apt to become embarrassing and to impede their financial working. Accordingly, Mr. Livesey hit upon a device which is embodied in the Company's Act of 1876, and which is the basis of the profit-sharing scheme in operation amongst the company's *employés*. By this the standard price of gas is fixed at 3s. 6d. per 1,000 cubic feet, and when gas is at this price the company may pay 10 per cent., the standard rate of dividend. For every penny above 3s. 6d. that is charged for gas a reduction of ¼ per cent. must be made from the dividend. Thus, if gas be 3s. 7d., the company may pay no higher dividend than 9¾ per cent.; if 3s. 8d., then only 9½ per cent.; if 3s. 9d., then only 9¼ per cent.; if 4s., then only 8½ per cent.; and so on, the highest dividend payable decreasing ¼ per cent. with every increase of a penny to the price of gas. With every penny taken off the price of gas, then ¼ per cent. may be added to the dividend. If gas be 3s. 5d., the dividend may be 10¼ per cent.; if 3s., 11½ per cent.; if 2s. 6d., 13 per cent.

Thus it is to the interest of the shareholders to lower the price of gas as far as possible. It is also, of course, to the interest of the consumer, who benefits under this scheme to the extent of £5 for every £1 paid in the shape of extra dividend to the shareholders. Under this sliding scale, thus established by Act of Parliament, no recognition is taken of the *employés*, who have thus no special concern in the price of gas. To remedy this defect, the directors, in October, 1889, offered the workmen a share in the profits in the form of a percentage on their wages, and to be calculated on the principle of the sliding scale, the percentage to rise when the price of gas falls and to fall when the price of gas rises.

Mr. George Livesey.
(From a Photograph by Elliott and Fry.)



The starting-point in the profit-sharing scheme is 2s. 8d., and for every penny taken off the price of gas from this point 1 per cent. is added to the wages of the *employés* for distribution amongst them. During the last two years the price of gas has been 2s. 3d., therefore the percentage payable to the men has been 5 each year. It thus becomes to the men's interest to produce the gas as economically as possible, and this is in accordance with the interests of the general public and the shareholders. By care the men's interest might become very great, for they can leave their bonuses in the hands of the company to accumulate at the rate of 4 per cent. compound interest. There are other aspects of this scheme that we should like to treat upon, but must defer doing so for a later number.

Up to the end of June, 1891, the amount divided amongst the men under the scheme was £22,909 14s. 1d.; and the highest amount received by an individual is £33; many have received between £20 and £30, and an average amount is £14. About half of the total credited to the men at the end of each June is withdrawn during July, the remaining half being left in the business.

The next sketch in this series will be Mr. Thomas Burt, M.P.

TRADE: PRESENT AND FUTURE.

IVORY TRADE.—The Sheffield ivory cutlers are working short time, but there is activity in the pearl trade.

FILE TRADE.—In Sheffield the file trade is improving.

TOOL TRADE.—There is little doing in saws and shipbuilding tools.

METAL TRADE.—The price of copper has been irregular, prices varying between £43 11s. 3d. and £44 16s. 3d. Refined and manufactured sorts are steady, tough cake at £47 15s. to £48 5s.; best select, £49 to £49 10s.; Indian sheets, £52 to £53; strong sheets, £56; and yellow metal sheets, 4 15/16d. per lb.

STEEL TRADE.—The crucible steel trade in Sheffield has slackened. Common spring steel and octagons for India are in good demand, and there is a better inquiry for wire rods. The rolling mills are better employed. There is no alteration in the price of Bessemer material and hematite, and common forge irons remain unchanged. No business of any weight is being done in the Lancashire steel trade. Steel boiler plates continue to fluctuate in price, but rule at about £7 for best qualities, common at £6 15s., and tank plates at £6 5s.

SHIPBUILDING TRADE.—Mersey shipbuilding yards remain inactive. At Barrow briskness has apparently come to an end.

COTTON TRADE.—Operatives will resist the proposed 5 per cent. reduction of wages. Notices have been sent out by all the leading employers in the various centres, with the exception of Bolton. Our Rochdale and district correspondent writes:—The results of the last quarter's working have been declared by forty-four companies in the district during the past few days. Of these, seventeen announce a profit and twenty-seven a loss; only nine of the whole number have made sufficient profit to pay a dividend.

GUN AND RIFLE TRADE.—The decision of the War Office, that all pistols of the Adams or Enfield pattern now in possession of the army shall be exchanged for those of the Webley pattern, which have interchangeable parts, has found Messrs. Webley & Sons, of Birmingham, employment for three years past. Already 24,000 weapons have been supplied. The contract is not expected to be completed for another year, although two hundred hands are daily employed in the manufacture of the revolvers.

SILVER TRADE.—Some of the leading Sheffield houses are fairly busy.

CUTLERY TRADE.—A German firm at Solingen has placed an order in Sheffield last week for 200,000 dozen pairs of fine pearl scales.

WATCH TRADE.—The watch industry has hardly known worse times. The Lancashire Watch Company have reduced their working hours to eighteen per week, with notice of a reduction of 25 per cent. on the wages earned. This the keyless hands resist. The English Watch Company (Birmingham) talk of entirely closing one or more of their departments.

ENGINEERING TRADE.—The Lancashire engineering trade is worse. Only about one-third the usual staff is employed, while several firms of machinists are working short time. Boiler-makers are not in quite so serious a position. Well-informed individuals do not expect a revival for two years.

IRON TRADE.—Prices are firmer in the pig-iron branch, but only a small amount of business is being done. The manufactured iron trade shows no signs of improvement, while both iron and steel founders are necessarily feeling the lessened activity in the engineering trade. In the Midlands a much better tone prevails, and three extra furnaces have been set to work recently to meet the increased requirements.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

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

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.*

I.—LETTERS FROM CORRESPONDENTS.

£700 from a WORK Notice.—QUID PRO QUO writes:—"Of course, WORK is a trade paper. Its purpose is to pay its owners and to serve its supporters. I think no craftsman's paper ever published, either in England or America, so well fulfils its aims. I say aims; I mean, to give the highest forms of elementary and advanced instruction to its readers, as well as regain the initial outlay of its capital. I have left out Continental trade papers, where there are any published—few and far between—pretentious and fribbling writing, mostly, to be attributed to defects of language. All have passed under my purview in the course of forty years' professional and practical experience. I candidly put WORK above all. Now, to come to my point. There is no doubt WORK has done good by stealth, and deserves a stealthy return (I am dignifying an outcast term in our language). A gentleman recently remarked to me, '*I have got orders for £700 for my patent that was in* WORK, and I never knew it had been noticed by one of its writers till shown it. Of course, I do not suppose all this came of the notice, but it must, undoubtedly, have done me good, and I will try and make some return for the unexpected favour. I should like a copy of the very accurate illustration of my invention, which took me by surprise when I first saw it.' As I was the writer and sketcher, unknown to the inventor, I told him that the electros of all the engravings in WORK were for sale at Messrs. Cassell & Co.'s, and that he might buy them or even have his circulars printed by the firm, in a way to ensure satisfaction, at a reasonable price. He had not thought of it, so said he would adopt the idea, and it would be a *quid pro quo* that would still leave him under obligation to WORK."—[We print this letter, and are glad to find that any sum approaching £700 has been made out of a notice in WORK. From inquiries made, we find that the article referred to was the "Dividing and Revolving Flower-pot and Tub for Heavy Plants and Trees," on page 391, No. 181, of WORK. This testimony should be gratifying to our readers and advertisers alike, as affording some indication of the influence of WORK.—ED.]

Book-keeping.—ONE IN DOUBT writes:—"A friend has told me that a knowledge of book-keeping is of more use to an educated girl than typewriting in working along in life, and the pay better. I constantly hear about book-keeping as one of the mysteries of figuring in account-books. Why should there be any mystery in these days of enlightenment? Is book-keeping to be made as obfuscating to a learner as chemistry or geometry, algebra or botany, are all made by the professors of those sciences, especially those who write books pretending to explain them to beginners? I know that every trade requires its own system of Dr. and Cr. account keeping, some very simple; for others, a single-entry system serves, while others, again, need a double-entry system. Now, there are numberless guides and A B C's to book-keeping that fail to help a beginner, but often disgust him at starting, by the writers trying to prove how clever they are—but they are not clever enough to write clearly and explain palpably what is so necessary to a starter in life, who wants to know how the balance-sheet proves the books to be correct, or the books prove the balance-sheet to be correct, and to readily test and find out any error in one or the other, if it appear. My experience has been with a large manufacturing firm with diversified products, and at times Government contracts; at others with a large estate, farms, pedigree stock, timber mills, and brick grounds, buildings, etc. In both cases large numbers of men had to be supervised, drawings made, stock inspected, machinery altered or newly designed, and the books balanced weekly, with comparative statements shown half-yearly. Now, this had to be done by one man, but it certainly was simpler than double entry, yet as correct as is that system. I have often wondered if the simple system adopted was better than the mysteries of book-keeping professed to be taught by books on the subject."

British Museum Gold Collection.—H. S. G. (*London, W.*) writes:—"It is to be regretted that the keeper of the gold ornament room in the British Museum does not prepare a popular handbook to the collection of gold ornaments he has in his charge. 'Early Christian Art in Ireland,' by Margaret Stokes, and 'Indian Arts,' by Sir George C. N. Birdwood, are the sort of books we mean. At present, the amount of information that a visitor can obtain is very slight indeed—in fact, it is restricted to what he can gather from some very small labels on the articles and from two-thirds of a page in the 'Guide.' This extravagantly generous treatment of the valuable collection works out, as far as space is concerned, to this: that for some fifteen show-cases, each one containing over fifty articles, space for description is given equal to half of one of WORK columns. Such a state of affairs nearly, if not quite, spoils the good the collection might do from an educational point of view. While the handbook is in preparation, and as a small item on account, will it not be possible to give a little more space in the 'Guide,' if only four or five pages, such as is devoted to the engraved gems? From those few pages some information may be derived, if they are carefully written. One last word, and that is: This book will be for the use of young students as well as of the public. It ought not to be forgotten that technical education is increasing, and for that good purpose many of these books are required, in order to let the young workmen know what has been done in the old times."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Drilling Machine.—DRILL.—The Kinographic apparatus will, I think, suit your purpose. It is made by E. Hines, Norwich, and is arranged to work from a lathe. If you write him, he will, I think, supply you with what you require. If he cannot supply you, try Thos. Robinson & Son, woodworking machinists, Rochdale.—M.

Mixing Clay.—WORKITE.—I should think the machine will answer your purpose, but it may require the material to pass two or three times through to thoroughly mix the colour. If you write to Messrs. Smith, Powers & Co., Priory Works, Coventry, they will send you an illustrated price list, and tell you if it will be suitable for your purpose. If not, try Hartley, Arnous, & Fanning, California Works, Stoke.—M.

Bicycle.—NO NAME.—The shape of the frame is to a great extent a matter of individual taste; but, personally, I should prefer the Diamond frame. The same applies to the steering; but here, again, I would prefer the socket arrangement. I have a Diamond frame with socket arrangement, which has been in use three years, and is, practically, no worse. I should recommend you to have cushion tires. The pentagon frame is also recommended by some riders as the best.—M.

Sign Writing.—J. F. (*Leyton*).—Articles on Sign Writing appeared in WORK, Nos. 1, 2, 4, 11, 13, 17, 19, 23, 30, 34, 39, 43, 44, 45, 47, 49, and 51.

WORK.—J. S. E. (*Armagh*).—The price of WORK in which the articles on the Quarter Horse-power Engine appeared (Nos. 106, 110, 121, 125, 131, 136, 141, 145, and 149), posted to Armagh, would be 1s.

Aquarium.—G. W. E. (*Armley*).—An article on an Aquarium and Fountain combined appeared in WORK, No. 31.

Sewage Problem.—IDEA.—Your views, if very concisely put, might find room in the limited space of "Shop." Thanks for warm approval and recommendation of WORK.—ED.

Cast Steel Forks.—TOM DOCTOR.—You do not say where your forks need repairing.

Incubator.—A. J. (*Leytonstone*).—I cannot tell you how to make a Mann's Simplex Atmospheric Incubator, having never seen one; but if you purchase Nos. 143, 150, and 151 of WORK (post free, 4½d., from publishers), you will probably find something to your liking. If not, write again, and I will endeavour to help you.—LEGHORN.

Incubator.—T. J. B. (*Heywood*).—Your plan for water supply is an improvement on my original method as given in my article in No. 143; but in No. 150, p. 731, Vol. III., you will see I have already published an arrangement on the same lines as yours for keeping a constant level in the evaporating tray, but much simpler. If you adopt this, your troubles will vanish. Am glad to hear you have been successful, and hope you will now have still better results.—LEGHORN.

Harmonium Fittings.—R. B. (*Glasgow*).—Messrs. Dawkins, Charterhouse Street, Holborn Viaduct, London, supply the internal fittings you require for harmonium, and will give you particulars as to cost.—G.

Artificial Fly Making as an Employment for Women.—FLY.—Looking at the ordinary scale of payment for women's work, this may be considered as fairly lucrative, but the amount earned must, of course, depend on the skill and facility of the worker. In the chief centre of the fishing-tackle trade—Redditch—there are several places in which the art might be learned for a premium. But, as the young ladies mentioned by FLY seem to be in London, they may prefer to learn the art nearer home. In the suburbs of London there is a lady—one of the best fly dressers in this country—who, if I am rightly informed, takes pupils. FLY might, in the first place, communicate with Mr. Chas. Laigh, fishing tackle manufacturer, Redditch (mentioning this periodical), who would, if all matters seemed satisfactory, smooth the way for the intending pupils with this lady or elsewhere. It should be remembered that some natural aptitude is required for this art, and, before taking more expensive steps, it might be well for the young ladies to make sure that they possess it. They might get "Ronald's Fly-fisher's Entomology" (published at the *Fishing Gazette* office, Fleet Street, London), which gives thorough information in the *modus operandi* of fly-making, what feathers to get, etc., and by its instructions test their powers. Or they might do more than this. In the opinion of a practical tackle maker, a girl with a real turn for the thing might, from such a work as this, alone, and without lessons, gain sufficient proficiency to obtain profitable employment—which is to be found in London, Manchester, Redditch, and some few other places.—S. W.

Telescope.—JUPITER has a telescope with a 2 in. object-glass and, approximately, 34 in. focus, with an eye-piece 9 in. long, and wishes to know what is the highest magnifying power eye-piece, and what should be the power of eye-piece for general astronomical work. A local "Shoptician" (excuse the ancient joke) informs him that a power of 60 diameters would cost 15s., and that it is immaterial what length the telescope is as regards power. In reply, I will say, first of all, that the value, as a rule, of the local optician's opinion on matters optical is *nil*. They are watchmakers, who sell spectacles and absolutely know nothing of optics, and, even when they do understand the subject, one has to keep his wits working when doing business. Some time ago I was asked 20s. for a simple lens, which, afterwards, I got from Birmingham for 9d. As JUPITER concluded, the optician was altogether in the wrong with reference to the magnifying power of object-glass. The diameter of the object-glass has nothing to do with its magnifying power, but its length of focus everything; but the diameter is of equal importance, as that determines its light-grasping power. An object-glass of 48 in. focus will magnify with a given eye-piece twice as much as a 24 in. with the same eye-piece. Judging from the length of the supposed eye-piece—9 in.—I conclude that the telescope is not an astronomical one, and that the 9 in. draw-tube, with "an eye-piece at each end," is simply a tube carrying the eye-piece and also an erector. To determine this without taking the instrument to pieces, does the instrument show a terrestrial object in its proper position, or inverted? If the former, then it is intended for terrestrial work. For celestial work we want as much light as possible and to have as few lenses as we can work with, seeing that a measure of light is absorbed in passing through the glass. JUPITER asks, "What is the highest magnifying power eye-piece?" Well, there is no "highest power" limit; or, at least, the only limit is the power of the skilled worker. In a general way, 100 to the inch is as much as an object-glass will bear, seeing that whatever defect the object-glass may have, it, too, will be magnified. To determine the magnifying power of the eye-piece, its focal length must be multiplied into the focal length of the object-glass—for example, suppose the object-glass is 34 in. and the focal length of the eye-piece is ½ in., then, with such an eye-piece, the object is magnified sixty-eight times. "What is the power of eye-piece for general astronomical views?" This question can only be answered in a general way, seeing it is not definite in itself. For a general survey of the moon or the nearer planets, use the highest power your object-glass will admit; but for the distant planets or nebulæ, then a low power must be used, as we want all the light the object-glass can grasp. As to the price of an eye-piece, the optician spoke from a catalogue. I know a firm who advertise all powers at 15s. If JUPITER intends buying his eye-piece, I advise him to send the draw-tube, with the focal length and diameter of object-glass, to Lancaster, Colmore Row, Birmingham (I have no interest whatever in mentioning this firm beyond that I have repeatedly had work done by him, most satisfactory in execution and price), stating the power you need, and I think you will get what you require at a most reasonable price. Should JUPITER prefer making his eye-piece, he may find the information how to proceed on p. 598, Vol. III., of WORK. It may be said, in passing, that often the eye-pieces sold are greatly exaggerated as to their magnifying powers. I think I have answered all the points in JUPITER'S letter, but should any other difficulty arise, I shall be glad, if possible, to answer it in "Shop."—O. B.

Wood Letter Work.—A. S. (*Burnley*).—This subject awaits treatment in WORK. If a capable worker who could write on the subject would communicate with me, I should be obliged.—ED.

Dry Collodion Plates.—JAN AND SHILLING.—Any dealer ought to be able to procure the Hill-Norris collodion dry plate for you on your informing him of your requirements as to rapidity. Should you meet with any difficulty, write to the manufacturers—the Birmingham Dry Collodion Plate and Film Co., Ltd., Yardley. By the way, should you reside in Birmingham, Mr. W. Tylar would be able to supply you.—G. P.

Preserving and Mounting Birds and Fish.—J. H. (*Battersea*).—Ward & Co. publish a book on Bird Stuffing, price 1s. For Fish Stuffing, see WORK, Vol. III., No. 117, p. 206.—F. H.

Oxygen Generators.—OXY.—In reply to OXY, I wish to say that I am preparing a short article on the subject, which will, I trust, meet his case. It will be in the hands of the Editor at an early date.—O. B.

Re-tinning Copper Pans.—J. E. J. (*West Witton*).—To re-tin copper pans, first of all you must get the grease off. To do this, light a fire of coke or charcoal—preferably the latter—and place each piece separately on it till all the grease is burnt off. If you use a forge, be careful not to blow too hard, and not to allow the goods to get red-hot. Some wash the coppers with a strong lye of soda and potash water to get the grease off, but it is not

such a good plan as the fire. The articles must next be well washed inside with strong spirits of salts, and afterwards rinsed with water; then scoured well with some "scale" from round the blacksmith's anvil, using a piece of carpet as a rubber. The articles must be well cleaned, or the tin will not adhere to them, but it is not necessary to get off all the old tin. It will be as well to finish scouring with a little sharp silver sand, using a handful of tow to rub with. After scouring, wash each piece well, and rub a mixture of salt and whiting over the outside; this protects the copper from the fire, and makes them easier to clean afterwards. The articles are then ready for the actual tinning, but before commencing several things must be got ready. Some pure tin must be run out in strips for convenience in using, some sal-ammoniac must be pounded in a mortar to a coarse powder, a piece of sheet iron should be bent round to the shape of the handle of a stew-pan, and made slighly tapering, so that it will slip on tight and leave a little at the end of the handle to catch hold of, as the handles get very hot whilst on the fire. A "tinning-rod" will also be required. A good form for this is a $\frac{3}{16}$ in. or $\frac{1}{4}$ in. rod, bent round at one end into a series of concentric rings till of a diameter of about $1\frac{1}{2}$ in., and at the other end a simple ring to hold it by. All may now be considered in readiness to commence. Slip one of the sheaths on to a handle, and place the article on the fire, blowing gently. Sprinkle a little of the powdered sal-ammoniac into it; take a stick of pure tin, and rub on the article enough to melt an inch or so of it; warm the tinning-rod in the fire, dip it in the powdered sal-ammoniac, and rub the tin well all round the article, turning it about on the fire to get all parts of it equally hot, and every now and then sprinkle sal-ammoniac in it. When tinned all over, warm it up, and then wipe the surplus tin out with a piece of tow. Wipe quickly all over before the tin "sets;" if it should "set" in any part before you have finished, it must be warmed up again. After tinning, scour up inside and out with silver sand, and polish inside with flour and outside with crocus powder.—R. A.

Phonograph.—W. H. (*Hartlepool*).—Articles on the Phonograph appeared in WORK, Nos. 167, 169, and 174.

Restoring Leather Couch Covering.—E. E. (*Northampton*).—An upholsterer would probably advise you to have the couch re-covered, for I believe the usual opinion is that any attempt to re-dye leather thus used will end in making matters worse. A correspondent of WORK, however, told us some time since that he had used Jackson's varnish stains for this purpose with good results. If you should not make his plan succeed, you might at least freshen up your faded leather with white of egg or a very little thin French polish brushed lightly over; or with one of the "kid revivers" sold at boot-shops.—M. M.

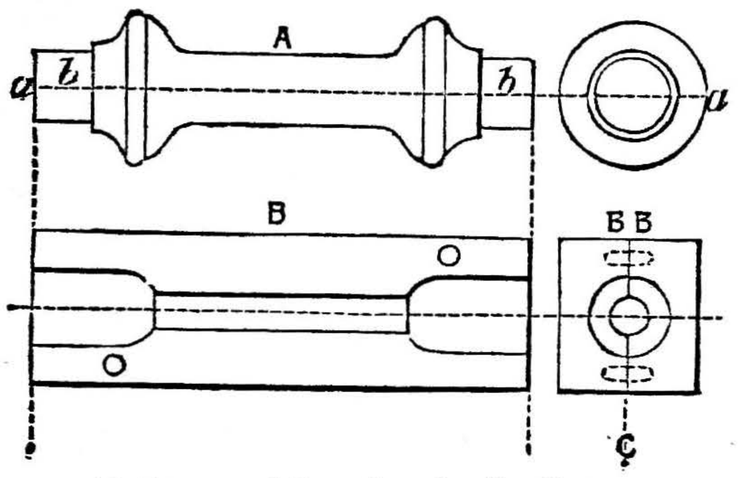
Rubber Brake.—FROST.—Rubber to rubber does not make a satisfactory connection when applied as a brake. There is too much adhesiveness, and the action of the brake would be a sort of jumping, not a sliding, motion. Suppose such fault did not exist? Your design would have to be altered as regards the rubber plugs, as the pull on them would be so great that they would be wrenched out of the case. Your Fig. 4 should be made to grip in the turned-in lips, with a hole through them for the rod, same as the plates in your Fig. 3. A brake such as shown would collect all the mud behind it between, and seriously impede the action of it. The reason the present spoon brakes cut the tire is not the fault of the spoon, but the hole left unplugged in the tube which forms the rod passing through the spoon. When the brake is applied the rubber bulges up into this hole, and the forward motion of the tire cuts little round pieces out of it, the edge of the hole acting as a knife. If riders would plug this hole neatly with hard wood or iron, and file smooth with the spoon, they would save their tires from this cutting. The latest brake, and one which does not cut the tire, is a piece of 1 in. tube, filled solid, or nearly so. It is about $2\frac{1}{2}$ in. long, and has the rod screwed into the middle of its length. When in position, it lies *across* the tire. While it "brakes" the wheel effectively, it, from its shape, allows small stones or other hard substances to pass under it, or diverts them to one side, without hurting the tire. Some makers cover the spoon with a thick piece of leather, which is better than the bare spoon.—A. S. P.

Triplet Safety Cycle.—J. W. N. (*Glasgow*).—The triplet safety is made by Rudge, Coventry. The machine is very fast on the road, but difficult to steer on a racing path. J. W. N. can see one of these machines in Smith's Cycle Warehouse, Wellington Street, Glasgow.—A. S. P.

Air-compressing Pump.—A. W. (*Aberdeen*).—An air compressor may be made as a piston pump with light indiarubber valves over "grid" seatings, but much depends upon the speed at which you wish to run the pump, and the pressure to which the air is to be forced. In compressing air you raise its temperature, and in some cases it is necessary to water-jacket the pump-barrel. I do not know what particular class of pump is used for the Wells light. If you write to any makers of air-compressing machinery they will give you prices and advise you. Messrs. Richard Schram & Co., 17A, Great George Street, Westminster, S.W., have a large trade in air compressors. Messrs. Tannett Walker & Co., of Leeds, also make such machinery, and there are many others, whose names you can find in a trade directory. The pressure gauge used with air compressors shows pounds pressure per square inch as a rule, but this is marked on the gauge, for some are made to show pressure in inches of mercury, and others in inches of water.—F. C.

Electric Tricycle.—W. S. (*No Address*).—Sorry I am unable to give any further information regarding the electric tricycle; neither am I aware of the motor being on the market.—A. S. P.

Gun-metal Castings.—A. F. (*Leicester*).—The figure shows the pattern, A, and core-box, B, for the hub. A may be jointed and dowelled along the line *a a*, or left solid; it does not much matter which. *b, b* are points for carrying the core made from box,

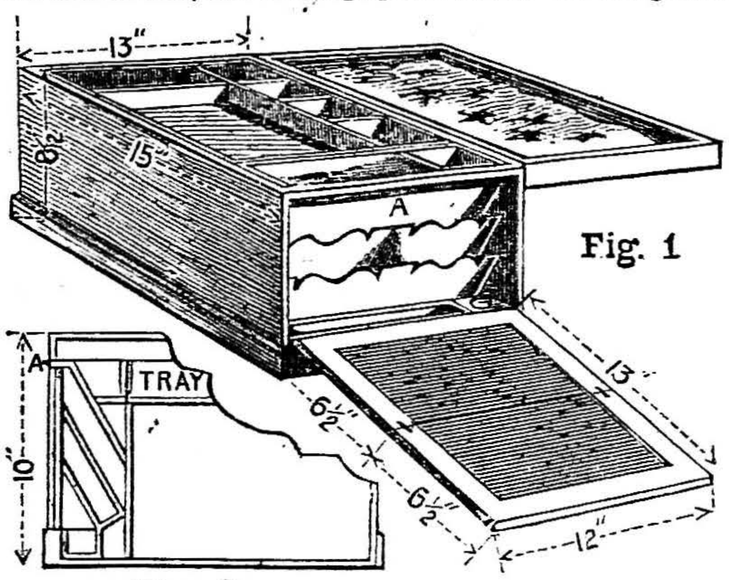


Pattern and Core-box for Castings.

B. The end view of the box is seen to the right hand, B B, jointed and dowelled at C; B shows one half the box open in the joint face, C. In the bracket shown in your letter there appears to be a boss standing out of perpendicular; if so, this must be left loose from the pattern, with a dowel.—J.

Incubator.—A. J. F. (*Bow*).—Your theory as regards working of regulator may be all right to your mind, but theory without practice is not much good. If you had tried the regulator I described you would have found it quite satisfactory. However, if you have made a regulator which is satisfactory to yourself, use it by all means, and if it is any improvement on mine I shall be pleased to have a description for the benefit of other readers of WORK who may be making incubators. Any good thing is always welcome.—LEGHORN.

Workbox.—W. E. (*Notting Hill*).—In the combined arrangement accompanying this, the desk, etc., occupies about 3 in. out of the length of the box, which is, in all, 15 in. The plinth is $1\frac{1}{2}$ in. high, and the writing-flap hinged to the top of it is of $\frac{1}{4}$ in. stuff; this $1\frac{1}{4}$ in. gives a good slope for writing. The flap is in two $6\frac{1}{2}$ in. lengths hinged to each other, and, when required for use, are made firm by two flush bolts. When folded up, they fit into the front of the receptacle for stationery, and the outside flap is fitted with a lock and key, locking into the piece marked A, so that the desk may be used independently of the workbox. Behind the plinth room is left for an inkstand and pen-groove, and above are two sloping spaces—for envelopes and postcards in the lower one, and note-paper above. These places



Lady's Workbox and Writing-desk combined. Fig. 1.—Sketch showing it opened. Fig. 2.—Section with Desk closed.

should be made to fit the articles they are intended for, blocked up, if necessary, from below. Above this, in the workbox, is a fixed tray for pins, and in the remainder of the top is fitted a movable tray, 1 in. deep, divided into compartments. All the outside stuff of the workbox, etc., is $\frac{1}{2}$ in. thick, except below the tray on three sides, where it is $\frac{5}{8}$ in., on account of $\frac{1}{8}$ in. being glued on; and the tray rests on this. The plinth also is $\frac{1}{8}$ in. thick, glued on with a mould on the upper edge: the cover is $1\frac{1}{2}$ in. deep, making the total height 10 in. It can be fitted up as choice directs. Another lock is required to fasten the workbox, and it is best to have one key to open it and the desk.—F. J.

Emigration—Bamboo Furniture Trade.—J. H. (*Birmingham*).—I do not quite relish the idea of undertaking the responsibility of advising which part of America you had better go to in order to gain a livelihood at your trade of bamboo furniture making. Even were I in a position to accept the responsibility, it would be a difficult matter indeed to properly suggest any particular part of the United States, for the reason that you omit to say whether you are a young man, or whether you are married and have a family. I incline towards believing, however, that you are a young man, and under this belief would strongly urge you not to emigrate on chances. I advise you to have a look at the penny weekly publication entitled *American Settler*, published at 24 and 25, Basinghall Street, London; from which magazine, by writing to its Editor, you may be enlightened regarding your inquiry. So far as concerns the American firms who undertake this branch of work, the best way in which I think you can discover the reliable ones is to obtain a copy of each of the four or five American furniture journals, and scan their advertisements. If the Editor will permit me, I shall be glad to transmit to you through the post (as publication will be of little use to others) the names of these magazines and their publishing addresses.—J. S.

Electric Locomotive.—H. B. (*Worcester*).—The subject of a model electric locomotive will, no doubt, appear in time, but it is far too large a question to be treated in "Shop" columns. It must also be remembered that the real machine is, at present, only in its infancy, and that a great deal has to be invented before it will drive steam off the railroad, as the present locomotive did the old stage coach. The mixture for the dry cell in Vol. IV., No. 163, is as follows: After having killed 1 lb. of hydrochloric acid with as much zinc as it will take up, you dissolve in it, when nearly cool, $1\frac{1}{2}$ oz. of pulverised sal-ammoniac, and with this liquid make a cream with plaster-of-Paris. If you then charge the cells with this, you will find it act rightly. If you look up the back indices of WORK, you will find other mixtures that may suit you better; this one was given on account of its simplicity.—J. B.

Examinations.—A. F. B. (*Selly Park*) asks a question which it is impossible to answer satisfactorily. He wants to know what examinations ought to be passed and what books read in order to become an efficient architect and surveyor. I think I am safe in saying that there are hundreds of efficient architects in England who never passed an examination in their lives, and I know that there is nothing to prevent A. F. B. or anyone else putting out their brass door-plates to-morrow and setting up as architects and surveyors. The chief examinations in architectural knowledge are those held by the Royal Institution of British Architects for the diplomas of A.R.I.B.A. and F.R.I.B.A., and the possession of these is a guarantee that the holder is a man of ability. But the passing of an examination does not make an architect; he has to have a very wide range of knowledge, including, amongst other things, architectural drawing and colouring, geometry, applied mechanics, land surveying, levelling, and mensuration. Then he has to know all about the materials and processes and "tricks of the trade" in bricklaying, concrete work, joinery, constructive ironwork, slating, painting, paper-hanging, heating and ventilation, drainage and sanitary science, plumbing, electric lighting and bell fitting, and a few other things, as well as the writing of specifications and preparation of bills of quantities. If, also, he is not a business man with a certain amount of tact and business knowledge, his architecture proves a losing game. In addition to the above "practical" requirements, there is also absolutely necessary the artistic side of the professional character, the cultivated taste which is the outcome of careful training combined with natural ability. The usual manner in which young architects are evolved is for the pupil to pay a premium of from twenty guineas to two or three hundred, according to the office he is entering, and then give his services three, four, or five years in return for the knowledge he is allowed to pick up. After he is out of his pupilage he considers himself an architect, and looks for a salary. I would advise A. F. B. to study for the Science and Art Examinations in such subjects as building construction, applied mechanics, etc. He will see that it is almost impossible to recommend books on the varied subjects named above, but the following, at all events, are valuable works: Rivington's "Building Construction," Vols. I. and II., 10s. 6d. each, Vol. III., 21s., Vol. IV., I think, 15s.; Col. Seddon's "Building Notes," about 15s.; Gwilt's "Encyclopædia of Architecture," 52s. 6d.; Gwilt's "Ancient and Modern Architecture," 12s.; Parker's "Glossary of Architecture," 7s. 6d.; Ferguson's "History of Architecture," in four volumes, varying from 31s. 6d. to 63s. each; Banister Fletcher's "Quantities," 6s.; Stoney on Strains, about 30s.—A. B.

Incubator.—D. A. (*East Cambus*).—Without more details I hardly know how to advise you. If you have followed my instructions to the letter you should get a good result, as others have done. As your chicks appear to die about the thirteenth day, I should be inclined to think your eggs are not from vigorous stock. If not, you will never succeed in hatching them in an incubator. Your perforated zinc is all right. If you will give me full details I will try and give you more explicit help, but without this it can only be guesswork.—LEGHORN.

Patents.—LEXINGTON.—If the invention LEXINGTON speaks of is of any value, he cannot be too careful in his proceedings if he desires to *create a property* in it, which, by being a property, shall be a something of value, and can, therefore, be beneficially dealt with. There is no law requiring an

inventor to apply for a patent only through an agent, and if he is wise, he will most carefully avoid the 25s. performances he speaks of. An inventor can, of course, prepare his own documents and make application himself for the grant of a patent, just as he may prepare and conduct his own lawsuit, act as his own physician, engineer, architect, or builder; but his own common sense ought to show him how far such a course is likely to be successful in either case, particularly if he is inexperienced in any of them. It would take up far more space than can be afforded in "Shop" to place all the points clearly before him, so that he may understand and realise the dangers and difficulties attendant on those who meddle with matters in which they have had no practical experience; but, in order that he may obtain some idea on patent matters, he should refer to, and read and consider, the particulars relating to patents in WORK, No. 44, Vol. I., p. 694; No. 136, Vol. III., p. 508; No. 151, Vol. III., p. 749; No. 158, Vol. IV., p. 29; No. 163, Vol. IV., p. 108; No. 174, Vol. IV., p. 285; also to No. 175, Vol. IV., p. 302. We cannot undertake to recommend a patent agent, but LEXINGTON will do well to remember that there are agents and agents, and he cannot be too careful in their selection.—C. E.

Beam Compass.—J. N. D. (*Thornley*) can obtain the beam compasses shown in No. 175 at any shop where drawing instruments are sold. I could give him addresses in London or Manchester, but these places are a long way from Thornley. Let J. N. D. take a run to either Durham or West Hartlepool, and I am confident he will soon find them. I think there is a dealer, called Harris, in Church Street, West Hartlepool.—A. B.

Patent Planing Saw.—A. R. (*Scorrier*).—The tone of your letter implies that you doubt the satisfactory working of the saw, but I may tell you that it has been at work for some time at the following places: Her Majesty's Dockyard, Devonport; Midland Railway, Derby; Great Northern, Doncaster; Great Western, Swindon; Ashbury Carriage Co., Manchester; Dan Rylands, Ltd., Manchester; and elsewhere. I give the replies to your questions in the order asked. (1) As the diameter of the saw is reduced by wear, and the cutting tooth requires resetting, the plane must be reduced in the same proportion, and be also reset, both plane and cutter teeth being set to the gauge which is sent with the saw, except in cases where, from special reasons, the timber to be cut requires a little more or less set, the difference between the set of the plane and cutting teeth always being the same, as shown in the gauge. (2) The answer to most of this question will be found in the first; it makes no difference whether the saw is 18 or 20 gauge in thickness. (3) The heat of the planing saw will, of course, be greater than that of an ordinary circular saw near the outside rim, as both the cutting and planing are done there; but, as the planing saw cuts a little slower than the ordinary circular, the difference is not found to be any serious disadvantage. (4) The manufacturers do not (so far as present experience goes) recommend planing saws of 50 in. or 60 in. diameter; but, if they should make them, they would recommend a gullet tooth of about 2¼ in. pitch. (5) The following instructions are given for sharpening the planing saw: When sharpening the saw, be careful to keep the teeth well bevelled, and in setting the same let them touch the setting gauge and not click. The knives must have a little more set than the teeth. If the saw should mark, just touch the sides with an oilstone whilst running. The plane is the same temper as the rest of the saw, but these saws are made of very fine steel, and can be made hard without breaking.—A. J. H.

Polish for Turned Ware.—YOUNG ENGLAND.—(1) Try the following plan: Dissolve 1 oz. of sandarach in ½ pint of methylated spirits; shave 1 oz. of beeswax into sufficient turps to make it into a paste. Mix the two together by degrees. Apply with a woollen cloth whilst the work is still in motion; polish with a soft linen rag or chamois leather. The work thus treated should have a highly varnished appearance. (2) Write the Britannia Company and other firms that advertise in our columns for price list. The former often have second-hand machinery and fittings on sale. (3) Sorry to learn the turning patterns you refer to have not given satisfaction. Try those issued by W. F. J. Walker, 41, St. Helen's Street, Ipswich. Second series, price 1s. 7d., comprises four sheets with about thirty designs of knobs for drawers, candlesticks, twine-boxes, spice-box of pyramidal form, vases, etc. They are spoken of very highly.—LIFEBOAT.

Spirit Varnish.—J. B. (*Accrington*).—If you buy direct from reliable firms, they, having the pick of the markets as regards gums, etc., coupled with an extensive experience, can supply you with a far better varnish than you can make yourself in small quantities. The addition of sandarach to spirits and shellac is hardly sufficient; you would gain a better result by using gum benzoin instead. I am just passing on to the Editor papers on Spirit Varnishing, which may appear in due time. Meanwhile, try the following firms in your neighbourhood—I have tried from both, and find them good varnishes, etc.—Mr. H. V. Milnes, Leeds Road Varnish Works, Bradford, and Messrs. B. Newnham, Slade Lane, Sheffield.—LIFEBOAT.

Boot and Shoe Repairing.—W. C. (*Nottinghamshire*).—Articles appeared in WORK, Nos. 112, 117, 122, 126, 130, and 137.

Umbrella.—RIBS.—An article on Umbrella Making appeared in WORK, No. 92, p. 649.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Elementary Carpentry.—WOODSPOILER writes:—"Can any reader recommend me any good, cheap work on elementary carpentry—a work that, if possible, treats both of method and the materials to be used for different jobs? and if it also treats on the choice, handling of tools, etc., so much the better. I have a good shop, and several good things therein that came to me free of cost, and think, therefore, I ought to make use of the same in my spare time. Any hints will be a help."—[Follow the articles in WORK on "Carpentry for Boys"; also "School Carpentry" series. You are bound to find in these all you want to know.—ED.]

Clockwork for Propeller.—S. C. S. (*Paisley*) writes:—"Would some kind reader tell me how to make a small clockwork machine to work a screw propeller for a small yacht, and the probable cost of cog-wheels, spring, etc.? Interior dimensions of boat: Length, 10½ in.; breadth, 3 in.; depth, 1½ in."

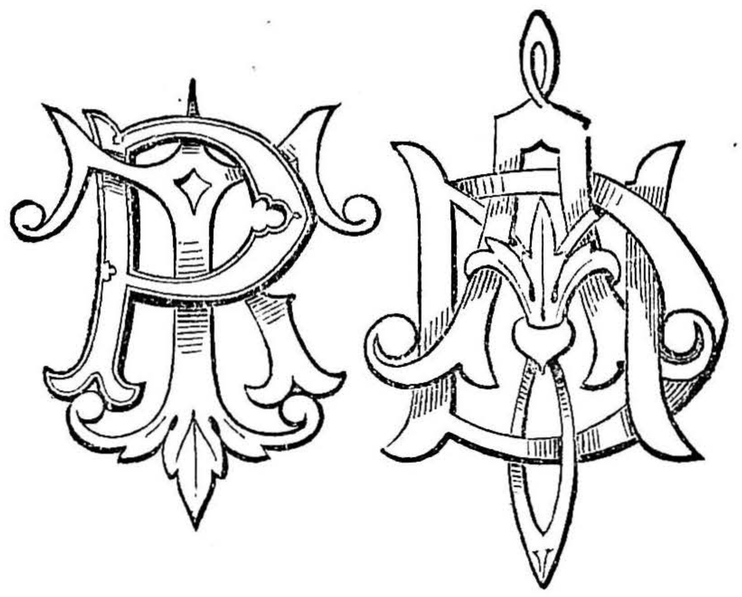
Botanical Anatomy.—W. E. J. (*Blackburn*) writes:—"Will any reader of WORK kindly inform me how skeletons of leaves are made, similar to those shown at the WORK Exhibition, and illustrated on p. 8 of the Exhibition number? It is there called botanical anatomy."

Bronze Cleaning.—A. B. (*Burslem*) writes:—"Will any reader kindly inform me of a good thing to clean bronze with?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Musical Glasses.—M. (*Bishop Auckland*) writes to MUSICAL (see No. 180, p. 382):—"These may be made from either tumblers or wine-glasses, but the latter are said to be best. They are tuned by pouring water into them, but should be selected as near the right tone as possible. Wetting the fingers with vinegar is said to give a better tone. The feet should be firmly fixed in holes bored in a piece of wood."

Monograms.—F. J. K. (*Tufnell Park*) writes:—"I send two monograms, one for R. T. (see No. 174, p. 286), and the other for A. M. D., on same page."



"R. T." and "A. M. D." Monograms.

Upholstery.—COUNTRY CABINET MAKER writes to W. W.:—"I am sorry I have been prevented answering the query of W. W. as to his stuffing, but will try to help him, if I can. The corners must be worked from the front and side, and sufficient stuffing put in to keep them up; and in stitching up, one stitch should be taken so that the needle comes down just *on* the angle: then this will keep it square. If the needle is put up in front and brought down behind the corner, the pull of the twine will tend to make a round corner, as W. W. may see by just trying the two plans. He may also find a little difficulty in turning his corners in cover. For a square corner, bring the cover from the side just on to the front rail, and secure with a couple of tacks; then make a cut up, just beyond the tacks, about three-quarters of the way up the border; then pull the front down and cut out the square piece, which will project beyond the corner, leaving only just enough to turn in, and then fold in the cut portion of the front border, and bring it down straight on the corner. I do not know if I can make this clear, for it is difficult to explain, though very easy to do; but if it is not plain, I will try and make it so if W. W. will write again. For a round corner, do not cut any out, but begin with putting one tack right on the angle, and then fold the cover in with small pleats, putting the tacks *between*, and not *in*, the pleats, until all the fulness is worked up."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—A. B. (*Waltham Cross*); W. T. T. (*St. Ives*); H. A. B. (*Middlesbro'*); T. P. (*Manchester*); SPLICE; F. H. (*Wilts*); W. & CO. (*Leeds*); T. B. (*London, W.*); ARTEMUS; C. H. (*Ipswich*); ONE IN A FIX; H. BROS. (*Huddersfield*); F. C. (*Stockton-on-Tees*); AMATEUR; G. D. C. (*Brixton Hill*); WISEMAN; A. F. (*Canning Town*); J. H. (*Edgbaston*); SHANKS; J. H. P. (*Pembroke*); T. D. (*Cambridge*); T. O. (*Collyhurst*); W. H. M. (*Airdrie*); P. J. (*Perranwell, R.S.O.*); B. R. P. (*Peckham*); J. C. (*Egremont*); A LAD; S. B. (*Upton Park*); H. L. D. (*Leicester*); H. T. W. (*Cardiff*); J. R. B. (*Newcastle-on-Tyne*); J. R. (*Glasgow*); S. B. & SONS (*Stourbridge*); F. W. (*Portadown*); BRITANNIA CO. (*Colchester*); S. W. (*Ashton-under-Lyne*); H. H. (*Bootle*); A WORKING LAD; P. E. C. (*Peterswood*); W. E. (*Notting Hill*); H. M. (*Bradford*); E. A. S. (*Greenwich*); E. R. (*Plaistow, E.*); AN AMATEUR; J. W. C. (*Polegate*); AXLE; W. D. (*Newington Butts*); W. G. (*Guildford*); S. H. B. (*Upton Park*); W. M. (*London, E.*); W. A. H. (*Redhill*); L. G (*Bradford*); AMATEUR PRINTER; T. A. C. (*Pendleton*); NOVICE; W. W. (*Sunderland*); A. M. B. (*Kenilworth*); R. H. M. (*No Address*); F. L. L. (*Richmond*); H. H. (*Ashbourne*); H. C. J. (*Gloucester*); SAW; THOMASO; AMATEUR; W. J. H. (*Lozells*); J. R. M. (*Keighley*); HARRY; G. W. R. (*Cheam*); W. P. (*Mullingar*); E. A. P. (*Beckenham*).

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