WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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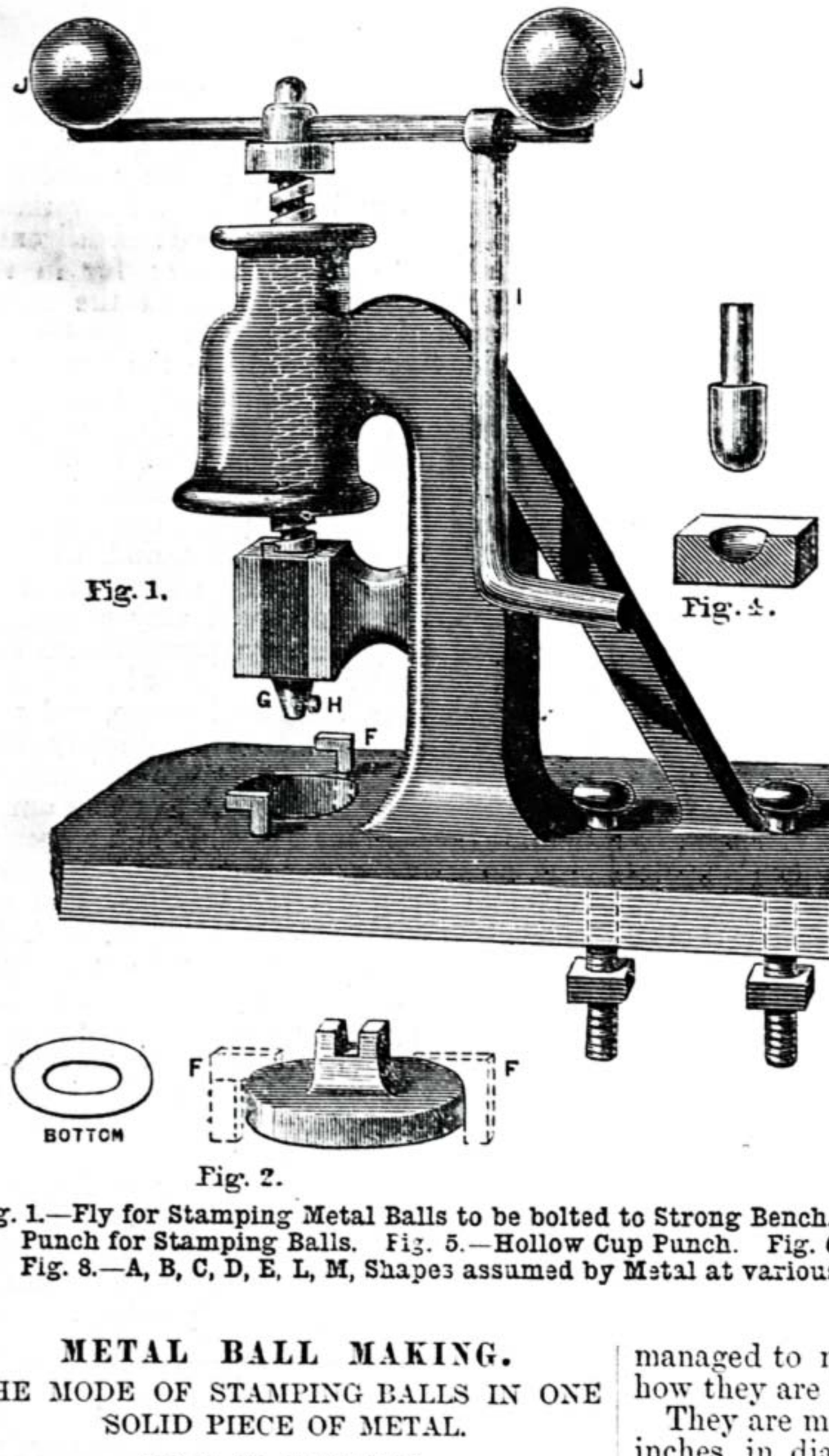


Fig. 1.

Fig. 2.

Fig. 4.

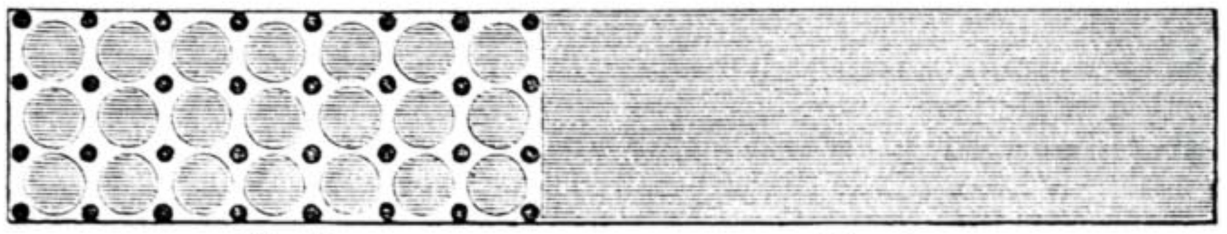
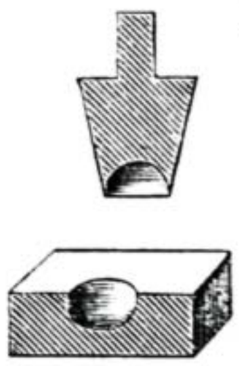


Fig. 7.

Fig. 6.

Fig. 8.



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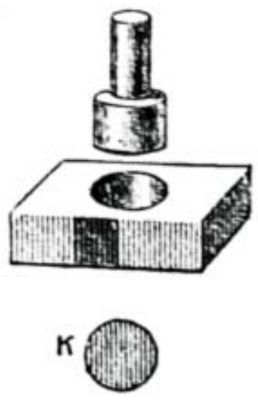

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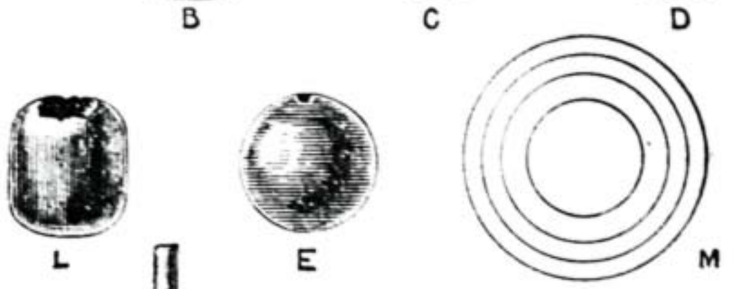


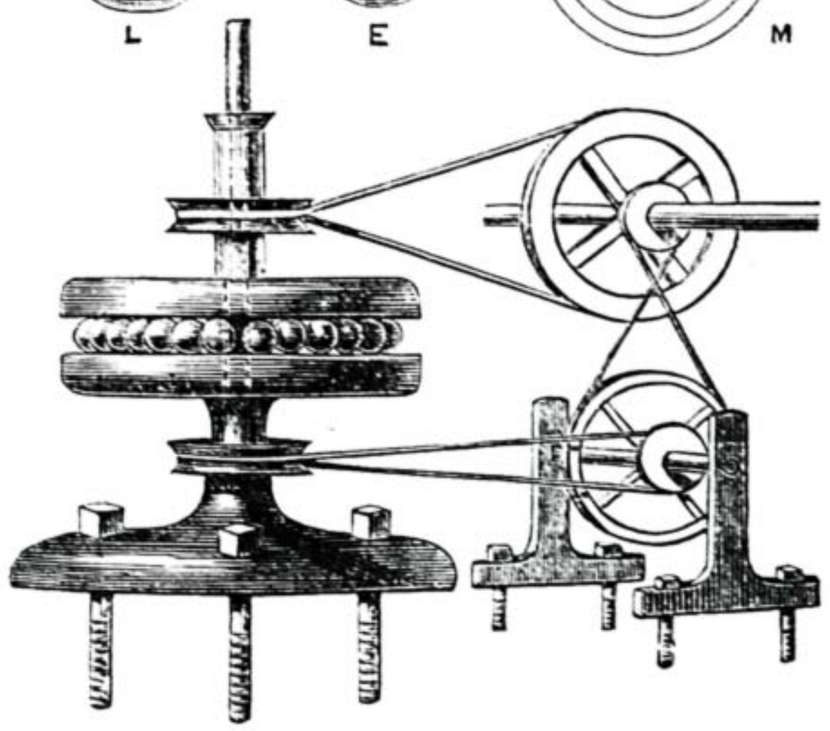


Fig. 9.

Fig. 1.—Fly for Stamping Metal Balls to be bolted to Strong Bench. Fig. 2.—Slotted Holder to carry Punch. Fig. 3.—Boss or Bed and Punch. Fig. 4.—Punch for Stamping Balls. Fig. 5.—Hollow Cup Punch. Fig. 6.—Sheet of Metal for cutting. Fig. 7.—Sheet of Metal with Places for Balls cut out. Fig. 8.—A, B, C, D, E, L, M, Shapes assumed by Metal at various Stages of Punching. Fig. 9.—Revolving Mill for Polishing Balls.

METAL BALL MAKING.

THE MODE OF STAMPING BALLS IN ONE SOLID PIECE OF METAL.

BY B. W. RAMSDEN.

BEFORE giving a description of the way to make the balls, I will just say a few words to encourage young men not to give up in despair if they do not at first manage to make a success in anything they wish to do. The first thing a youth should learn is the value of small things. A very small thing to do is to carry a small book and pencil, and, as Dickens truly says, "when found make a note of it;" it is advice which I have always carried out, and I cannot tell the value it has been to me when in a difficulty, as I enter my notes in a large book indexed, which is a fine knowledge book. When a youth of sixteen, I saw some men making some cups, and from what I then entered in my book, I made these balls twelve years afterwards—that was in 1875. At first I made a failure of it, but after a few trials I managed to make some perfect, and this is how they are to be made.

They are made in sizes from ¼ in. to three inches in diameter, and are sold by Mr. Walter Walker, of Rockingham Street, Sheffield, tool piercer and stamper, from 4½d. to 12s. per dozen, according to size. Three flies are necessary, according to size of ball required. A three hundredweight, a six and a twelve hundredweight, are the sizes mostly in use, as (Fig. 1) a very strong bench is required to put the fly upon so that it can be bolted fast, and a hole cut through to allow of the metal falling through when punched out by (Fig. 3) a tool called a boss or bed, with a slot and a hole in centre, so as to allow metal to fall out. When punches (Fig. 3) are used they are put in a slot (Fig. 2) and wedged tight with thin steel wedges, and are fastened down tight with the screw dogs (F, Figs. 1 and 2); then the top punch (Fig. 3) is fastened in the fly nose (G, Fig. 1) and screwed tight by H. The punches must fit very fine, or they will drag. Try them with a piece of good stiff writing paper, and if one side has a rough edge on screw up the boss a little on that side. When the tool is fixed get your metal; cut it in strips (as Fig. 6) 18 inches long by 12 inches wide, of No. 10, 14, or 17 Birmingham metal gauge. Put the metal under fly and pull handle (I, Fig. 1); for that work the balls (J) can be taken off, as they are not required, as very little pressure is needed. The metal when cut out will be like K, Fig. 3, and the sheet metal like Figs. 6 and 7, which show half cut out and half not. The little black dots show where smaller sizes are cut out so as to leave as little waste scrap as possible, as metal is 1s. 6d. a lb., and 10d. only is given for scrap. Having got all the blanks required, take out cutting tools (Fig. 3) and put in tools (Fig. 4): top punch in nose and bottom in boss. Do not take out the boss; just knock out the wedges. Take one of the round pieces of metal and put over the hole in bottom steel die, and pull on the handle. The first die being shallow, the balls will not yet be required. After

taking all the pieces through put them on a stout sheet iron tray and anneal them by putting in a furnace or blowing upon them with a strong blowpipe; if with pipe and gas be sure not to make them too hot all at once. Commence very gently, and increase until the full heat is put upon them, so as to get them a good cherry-red but no more; then allow them to cool. Be very careful not to let any cold water fall upon them, or they will be full of cracks. When cold they are ready for the second punch (Fig. 8, A); then anneal as before. Put on ball to fly and use punch (Fig. 4), which will make them like Fig. 8, B. The process of annealing is again gone through.

A lathe, such as is advertised in WORK, must be brought into use. Chuck the metal cups (Fig. 8, B), which will be just like a thimble in shape. As lathes have been so clearly described in WORK, it is no use repeating it here. True the edges, and with a burnisher turn over the edges as Fig. 8, L; when in that shape the hollow cup punches (Fig. 5) are brought into use, which is just the same process as the other, only hollow top punches instead of round ones being used. When as round as can be got take them and put them in a revolving mill, as Fig 9, which has two pulley wheels, revolving the plates with balls top and bottom in opposite directions, which gives them a beautiful polish and even surface. A spring in the top part of the mill above small pulley presses down the top as they get into shape, thereby ensuring them being perfectly round. After first punch is used use plenty of oil; keep a pot of oil in reach, dip in your finger, and wipe top and bottom punches, which will ensure them leaving the dies easily.

If fancy balls are wanted the pattern must be cut in the dies, and the machine (Fig. 8) cannot then be used.

If any questions require answering, I will be pleased to receive them and give them my best attention in "Shop." If a hydraulic press is used the balls can then be done at once with only once lighting, as they will come out like Fig. 8, B, and by inverting in hollow cups after lighting would be like Fig. 8, E. I know of no firm in England which uses one in the silver plate trade; in America they are all made by that process.

PLAIN AND DECORATIVE HOUSE PAINTING.

A PRACTICAL TREATISE BY A LONDON DECORATOR.

INTRODUCTION.

AT no period of the Victorian era has there existed a spirit of more earnest inquiry for such knowledge as will enable the worker to know the true from the false in all matters concerning the application of art to industry than that which characterises the present time.

Since the year 1851, when the Great Exhibition in Hyde Park demonstrated to us so painfully, but, as it has proved, beneficially, our inferiority in the artistic aspect of our manufactures as compared with that of many other nations, a change has transpired which, although becoming but gradually apparent to the community at large, is none the less of a vital and extraordinary nature.

In no department of industrial art has this change and progress been more marked than in the design and production of decorative materials and wall hangings. As testimony to this, twenty years ago wall papers of purely home design and manufacture were but little used; to-day, however, we find British decorative hangings and fabrics able, not only to maintain their commercial position in our own country, but to compete successfully, both for artistic excellence and superiority of manufacture, with similar goods in foreign markets.

Although, by reason of the able editorial proclamation in which the general scope, aims, and ends of WORK were placed before the world of workers, any lengthy introduction of these chapters to its readers is rendered entirely superfluous, I will claim a short space in which to explain the mode selected for the treatment herein of this wide and comprehensive subject.

By a three-fold division of our theme, an arrangement is obtained whereby the compiler hopes to tender knowledge and practical assistance forthwith to all the various sections of workers, under one of which all house painters must come—to the apprentice, the improver, the amateur, and to the operative, wage-earning house painter. Believing in the importance of every craftsman and worker understanding the source and nature of that which he uses, ere he receives instructions how to use it, I purpose in the first part to treat on the elementary processes and materials of my subject, which will especially appeal to the young workers, both "amateur" and professional. In the second division will be taken such useful and decorative branches of house painting, known as graining, marbling, bronzing, gilding, hand polishing, etc., written for those operatives who are desirous of extending their capabilities beyond what is technically termed "brush work." In the third part the most advanced portion of modern decorative house painting will be both practically and theoretically considered. As being the most likely course to help the journeyman craftsman, this part will contain directions, accompanied by illustrations where necessary, for the decoration of a modern residence, with chapters especially devoted to the study of colour and its application to buildings. A consideration of the most useful and popular decorative materials and their treatment will here, appropriately, be placed before the reader; and, without dipping too deeply into the theoretical or philosophical aspects of decoration, the writer will endeavour to so ground the earnest worker in principles of decorative truth and beauty that he may himself be able with some degree of confidence to discriminate between the true and the false, and to be able to give a reason for the faith that is in him.

In these competitive days, when the much vexed question of amateur *versus* professional comes so often to the front, the operative painter may venture to inquire how far this giving of common technical instruction to both the two divisions of workers can fairly be justified. Our answer is this: That at such times as we live in, of advancing education and widely diffused literature bearing upon all trades and callings, the facilities of obtaining knowledge are, and should be, common to all sorts and conditions of men. That "a little knowledge is dangerous" in matters of decorative practice, every professional decorator, who has had dealings both with clients possessing that "little"—derived probably from the "art column" of a fashion paper, or a couple of terms at a school of art—and with those customers who lay claim only to the usual attributes of education, common sense, and observation, will fully bear me out. Again, that in consequence of the almost total decay of the apprenticeship system, in the great Metropolis particularly, there is a very urgent necessity for technical instruction in the higher grades, especially of house painting; and, although there exist at present various aids for the young worker, we have no hesitation in saying that these chapters in so cheap and popular a work will meet, to some extent, that very definite want of the painting trades. It is the writer's experience and belief that *decorative* supply will and does *create the demand;* and the more extensive the spread of knowledge on the subject, so will its practice and employment, therewith, proportionally increase. No apology can be needed if this knowledge and instruction is hereby extensively tendered to the so-called "amateur" class of painters.

John Ruskin, speaking on progress in life and art-workers generally, has expressed himself upon a very vital point somewhat in these words: "When," said he, "I hear of any young man as one giving promise of much success in his vocation, I invariably inquire whether he works hard and diligently at such profession or calling; for in the answer to this will be found the surest criterion of his future career."

Herein, therefore, will lie the success of the practically disposed reader of these chapters. Natural faculty and ability are of little avail unless supplemented by diligent and painstaking efforts. Technical instruction can but strive to point out the most direct way to the best ends, and, whether actuated by motives of direct profit or recreation, the results will very materially be governed by his own perseverance and application, in short, hard work!

Introductions, I am well aware, and preliminary disquisitions on the history that attaches to certain crafts are objected to very strongly by some readers, and I am of opinion myself that the pages of a magazine such as WORK are, perhaps, not the most desirable place for the ventilation of the latter. Nevertheless it is useful, and, indeed, necessary, for those who undertake to write on subjects that will from their nature occupy some considerable space in their treatment to foreshadow what that treatment will be that the reader may be enabled to comprehend in some measure what is to be placed before him. In my own case I have made my preliminary remarks as brief as possible, and in my next, I shall enter at once on the consideration of the sources, nature, and qualities of all materials used in house painting.

BURGLAR ALARUMS:

HOW TO MAKE, WORK, AND MAINTAIN.

BY GEORGE EDWINSON BONNEY.

THE BATTERY—THE LECLANCHÉ BATTERY—THE AGGLOMERATE BATTERY—THE GASSNER DRY BATTERY—ARRANGEMENT AND MAINTENANCE OF BATTERY—LAYING THE LINE WIRES.

The Battery. — Several types of battery have been used in ringing electric bells. These I hope to notice when dealing with the general subject. I now only describe the "fittest"—that is, the one in general use all over the world where electric bells are used, and its latest and most successful rival. It won't do, on a job like this, to employ an experimental battery. We must have one that we are sure of—one that has been tested by long experience. The battery must be reliable, ready to work at all times, and capable of maintaining its efficiency for long periods without attention. Some forms of battery choke themselves, so

to speak, with crystals whilst they are at rest; others send up fumes or salts to corrode their connections, and cause failure just when the battery is wanted; others are soon exhausted, and do not recover their strength. It is clear that these will not do for electric alarums.

The Leclanché Battery.—This battery, invented by the late M. Georges Leclanché, has stood the test of many years' practice as the best battery for ringing electric bells. Each composite cell is made up of (1) a glass outer containing cell charged with a solution of sal-ammoniac, into which dips a rod of zinc to form the positive element; (2) a porous inner cell charged with a mixture of broken carbon and small lumps of manganese peroxide, surrounding a cube, or a plate of carbon, to form the negative element. The whole arrangement is shown at Fig. 37. The outer cell may be of any other ware, such as china, porcelain, stoneware, or glazed earthenware; and the pot may be of other shapes than that shown in the sketch. It is charged with a half-saturated solution of sal-ammoniac—that is to say, sal-ammoniac (ammonia muriate) is dissolved in warm rain water until the water is saturated; then it is diluted with an equal bulk of rain water. Ordinary well, spring, river, or pump water may be used; but rain water is best. The zinc rod is cast with a stout piece of copper wire projecting from its upper part to form a connection with the carbon of the next cell. This wire is coated with warm gutta-percha, or with tarred tape, from the zinc to within two inches of its other end, which is left bare and clean to make connection with the binding screw of the carbon. The whole, together with an inch of the zinc rod at the top, is coated with Brunswick black. The inner cell is made of white porous earthenware. A prepared strip of carbon is set upright in the middle of the cell, and then closely packed with a mixture of equal parts by bulk of gas carbon, broken to the size of peas, and lump peroxide of manganese of the same size, all dust being sifted out of the mixture. The surface of this charge is covered with a thin coat of pitch to keep it in position, and two holes are made in this pitch seal after it has cooled, to allow the gases formed whilst working to freely escape. The strip of carbon is selected just wide enough to slip easily into the cell, and long enough to stand with its upper part about one inch above the top of the cell. This part is soaked in hot melted paraffin for some time; then allowed to cool. When cool, a few holes are drilled laterally through the paraffined top; a hole is drilled in the top near the middle to receive the end of a tang of a binding screw; the top part is inverted in a mould; and melted lead is poured in to form a head having a good contact with the carbon, and to hold the binding screw. The head, and a strip of carbon just below it, are painted with Brunswick black, and this, together with the paraffin, prevents the lead head being corroded away with the ammonia fumes formed in working the battery. The cells are made in various sizes, but most vendors sell three stock sizes, numbered respectively 1, 2, and 3. All do not agree in the sizes apportioned to the several numbers, but the following may be taken as generally correct:—

No.	Size of Porous Cell.	Size of Carbon.
1.	5in. by 2in.	6in. by 1¼in. by ¾in.
2.	6in. by 2¼in.	7in. by 1¼in. by ¾in.
3.	6½in. by 3in.	7½in. by 2in. by ⅝in.

No. 1 will take about 6 ounces of the carbon mixture; No. 2 will take about 8 ounces of the carbon mixture; and No. 3 will take about 10 ounces of the carbon and manganese mixture to charge each cell. Manganese peroxide costs about 6d. per lb., and broken gas carbon about the same, if bought retail in London, but is much cheaper in some districts. The various parts of the battery may be bought and put together. Their cost may be nearly estimated as follows:—

No.	Porous Cell.	Carbon Capped.	Zinc.	Glass Cells.	Porous Cells charged.	Battery complete.
1.	4d.	1s. 0d.	5d.	0s. 9d.	1s. 8d.	3s. 0d.
2.	5d.	1s. 3d.	6d.	1s. 0d.	2s. 2d.	4s. 0d.
3.	6d.	1s. 8d.	8d.	1s. 3d.	3s. 0d.	5s. 0d.

Sal-ammoniac costs 1s. per lb.

With respect to the size and number of cells required to ring an electric alarum, we must be guided by the work to be done. If the bell is a large one, and wound with thick wire, or if several bells are connected to one battery, we should use No. 3, or largest size cells, to furnish a sufficient volume of current. No. 2 cells will ring a 4-inch bell fairly well, and three of these coupled in series will be all sufficient for an alarum system in an ordinary-sized house furnished with one bell only. If the bell has to be rung through a long line of wire, or through a line of fine wire, we must add more cells in series to overcome the extra resistance. All users of electric bells are agreed that it is false economy to stint battery power.

The Agglomerate Battery.—This is only a new form of the Leclanché. The porous cell is dispensed with, and the manganese and carbon mixture is made into agglomerate blocks by machinery, under enormous pressure. The usual capped carbon plate is enclosed between two of such blocks, which are kept pressed together by crossed rubber bands, the loops of the bands serving as a holder for the zinc rod, as shown at Fig. 38. When these were first introduced, they were thought to be superior to the old form of Leclanché, but it is now found that their sole recommendation lies in offering less resistance to the current. In practice they are said to be more troublesome than the old form.

The Gassner Dry Battery.—This battery bids fair to rival the Leclanché, and oust it from its long-sustained high position of being the premier electric bell battery. Each cell is complete in itself, instead of being a composite cell made up of inner and outer cell. There is no porous cell, nor any outer cell of glass, porcelain, or other breakable material. Each cell of the battery is made of thick sheet zinc, and this forms the containing case as well as the positive element of the cell. This case is nearly filled with a paste composed of zinc oxide and gypsum, moistened with a solution of zinc chloride. A capped cube of carbon, bearing a binding screw on its head, forms the negative element in the centre of the case, where it is surrounded with the conducting and exciting paste. The whole is sealed over with some dark composition resembling marine glue. It will thus be seen that there is no liquid to spill, nor any required, as the porous mass is moist enough to excite the zinc, and retains its moist condition for any length of time. The cells may, therefore, be laid on their sides in racks, as wine is stored; or turned upside down without impairing their working qualities. They may be placed in any convenient position, regardless of the temperature of the room in which they are located. As to power and constancy, they take their place cell for cell side by side with the Leclanché, doing equal work, and recovering their normal strength, in equal time. Here, however, they possess an important superiority. When a Leclanché cell is quite exhausted, we have to take it to pieces, clean, and perhaps renew the zinc, and renew the porous cell, with its contents. When a Gassner cell is exhausted, we have only to send a strong current of electricity (such as that from a battery of Bunsen cells) through the cell from carbon to zinc for about an hour to regenerate its contents and make the cell even more powerful than it was when first constructed. I hope to go into this part of the subject more fully when I treat of electric bell batteries. The battery has stood the test of nearly three years' practical work, and is fast growing in favour. The wholesale agents in London are Messrs. Mayfield, Cobb, and Co., 41, Queen Victoria Street; and the batteries are also sold by Messrs. Gent and Co., Faraday Works, Leicester. Fig. 39 shows the round form of cell used in this battery, and this is sold at 5s. per cell.

Arrangement and Maintenance of Battery.—Fig. 40 shows how an electric bell battery is connected up and arranged. It will be noted that one wire, A A, leads *to bell*, and this is connected to the carbon element of the battery. The wire leading from the zinc of this cell is connected to the carbon element of the next cell, and the wire from the zinc of this to the carbon of the last cell of the series. A wire leads from the zinc of this cell to the line wire, B B, *from bell*. This method of connecting cells to form a battery is called connecting in series, and is always the method adopted for electric bells. It is immaterial which wire is connected to the terminal carbon or zinc, for the bell will ring equally well whether we connect the wire coming direct from the bell to the zinc or connect it to the carbon. The path of the current is, however, from zinc to carbon.

I have shown the battery of three cells in a box; but it is not necessary to thus enclose them. It is, however, usual to place Leclanché cells in a box, for several good reasons. A box protects the cells from accidental blows, and from dust. It also serves as a check to meddlesome children and servants, for the box may be securely fastened, and the wires brought out through the back or side. I have not shown the cover and one side of the box. Both of these are hinged to each other and to the bottom, and the cover opens from the back. When constructed in this way, the cover and side fall down when opened, and allow free access to the cells for adjusting screws or seeing the condition of the battery. If made for a Gassner battery, it will be advisable to partition off each cell with a thin partition of wood to prevent accidental contact. Half-inch deal, or pine, or any other wood may be used in its construction, and the outside may be stained, painted, grained, or polished, as taste may dictate.

In arranging a suitable place for the Leclanché cells, it should be borne in mind that they work best and last longest when put in a moderately cool and damp room, such as a cellar, or in a washhouse. In dry situations the solution rapidly evaporates, and the salts creep up the sides of the cells and over the connections. The salts formed in a Leclanché cell by the union of sal-ammoniac with zinc have a tendency to thus creep up the sides of the cells. This may be guarded against by greasing the inside of the glass cell down to water line. Messrs. Gent and Co. have their glass cells made with a narrow channel around the top, and this is filled with a composition

guaranteed to prevent the salts from creeping over. If the glass cells are allowed to get dirty on the outsides from this cause, or are left wet, or stood on a wet shelf, a part of the current will be lost by leakage. Cells must be looked to from time to time, and all such causes of leakage stopped; at the same time, the loss of solution from evaporation must be made good. It is not necessary to add sal-ammoniac when water is added to make good this loss. Use clear rain water if procurable.

Some makers do not amalgamate the zinc rods used in a Leclanché battery, but I have found that they work best when amalgamated. To do this, well clean them in hot water with some washing soda; then dip them in dilute sulphuric acid, and rub some mercury well into the rods, with an old rag as a rubber. If the zincs turn black soon after the battery has been set up, and there is a strong odour of ammonia from the battery, together with white specks on the porous cells, we may suspect a leakage either between the cells and elements of the battery, or in the outer circuit; this must be promptly detected and repaired, and the zincs cleaned up again.

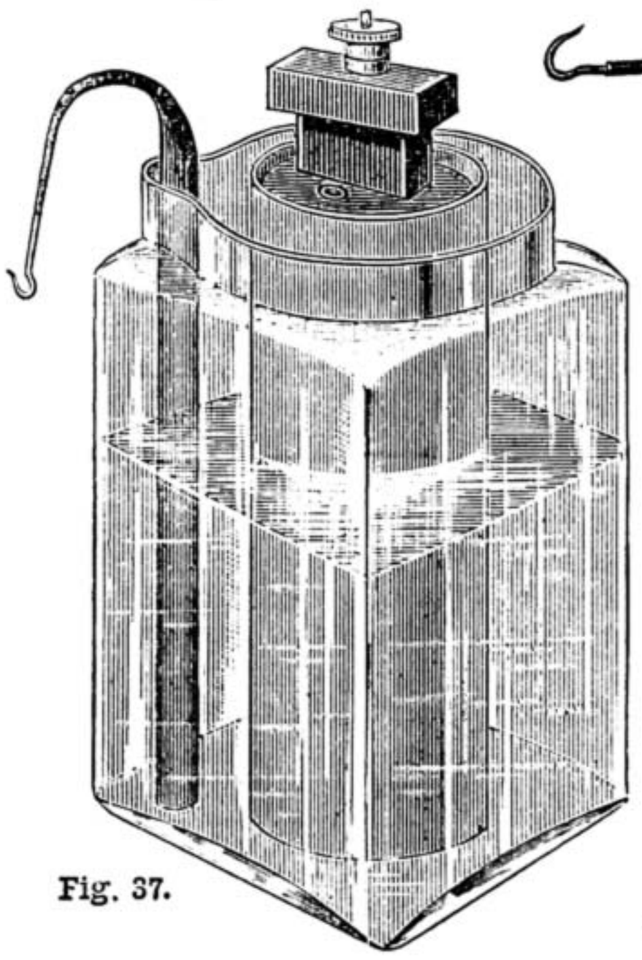


Fig. 37.

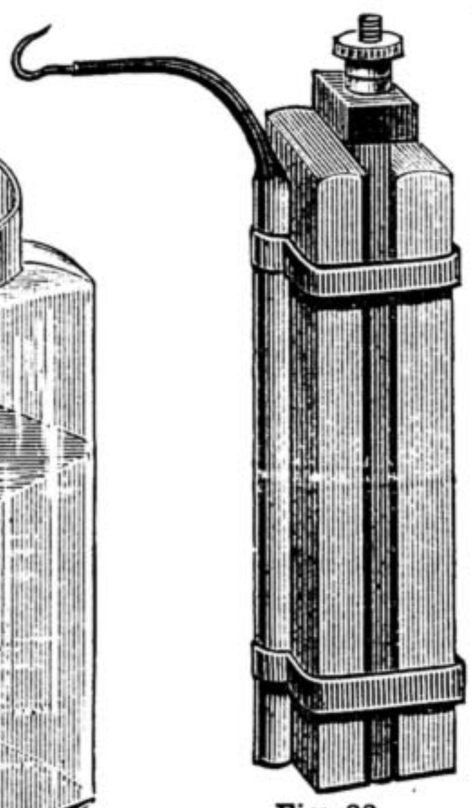


Fig. 38.

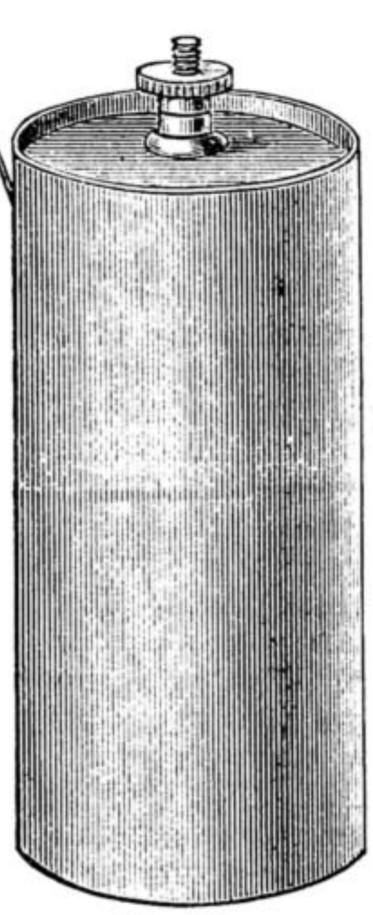


Fig. 39.

it, so that he may be awakened at the first alarm, and be able to switch off the current as soon as he can after the alarm has been given, for the burglars may promptly decamp and be left uncaptured if the bell continues to ring for some time, and so alarm them with its din. The main line from the bell to the main-line battery should be of No. 20 copper wire, coated with indiarubber, and double cotton-covered. This may be had covered with any colour of cotton to match the painted woodwork or the ground tint of the wall-paper, at a cost of about 12s. 6d. per 110 yards. Run bells, the wires can be run along the tubes provided for this purpose, the old system wires being drawn out as the electric bell wires are drawn in. If different tints of cotton are used in covering the wires, one colour of covered wire should be used to go from the bell to the main-line battery, and from this outwards to the end of the line. The return wire should have a different tint, and thus the going and return wire can be easily recognised, a matter of importance in connecting them to the various contacts. Be careful, in driving the staples, not to cut through the covering, nor to abrade this when drawing the wires tight through holes or around corners. Let all be done neatly, out of sight as much as possible, and out of the probable course of the housemaid's broom.

From the main line, several branches will be thrown out towards the various points of contact. If each room is connected to a separate indicator, one of the wires will be connected to the outgoing main from the battery, whilst the other will go direct by a path of its own to the indicator and bell. Each point of contact must have its own two wires; one from the main battery

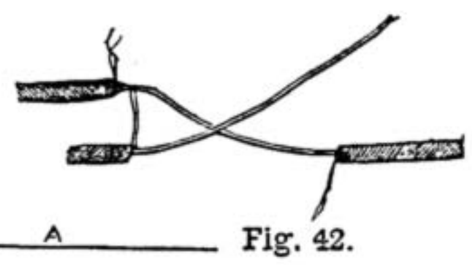


Fig. 42.

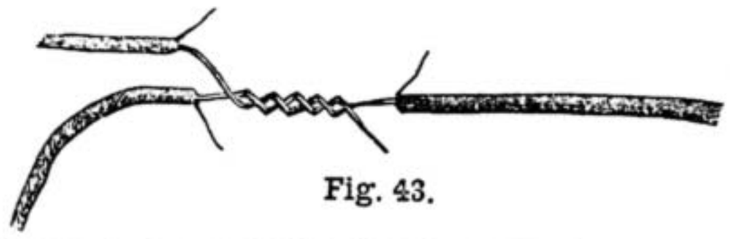
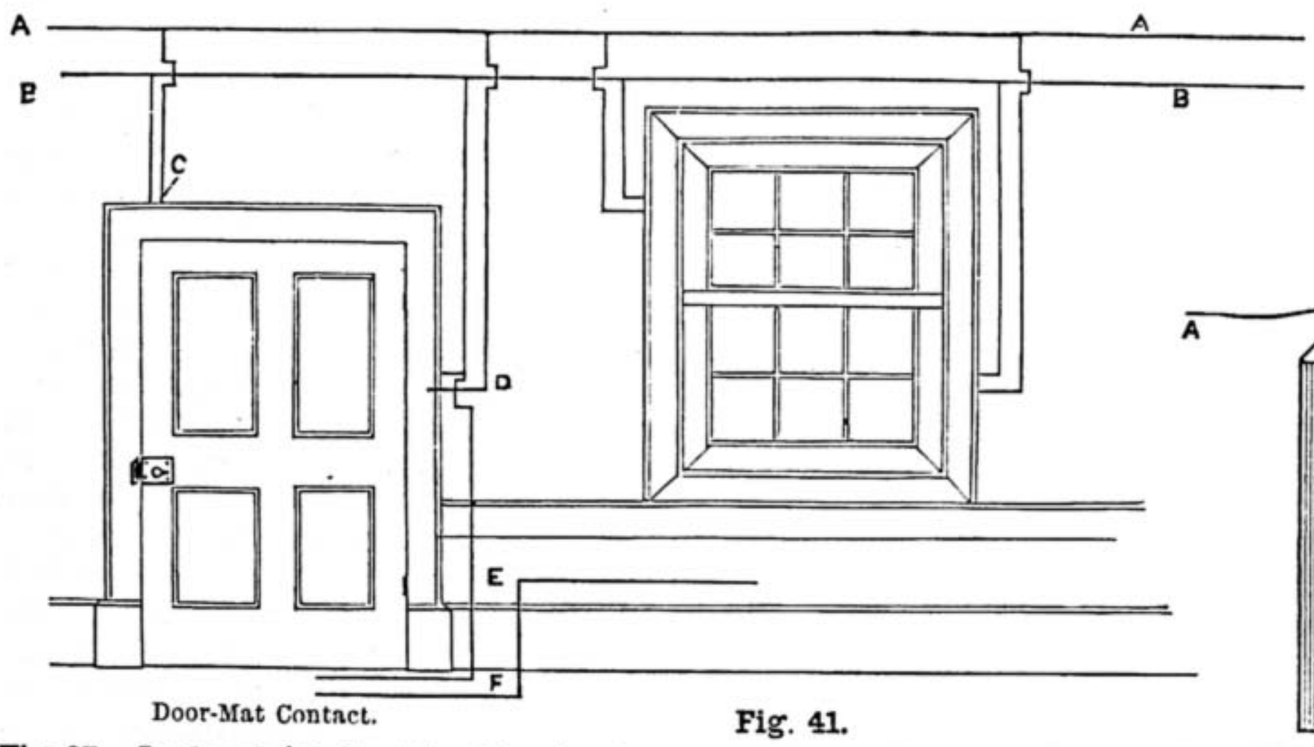


Fig. 43.



Door-Mat Contact.

Fig. 41.

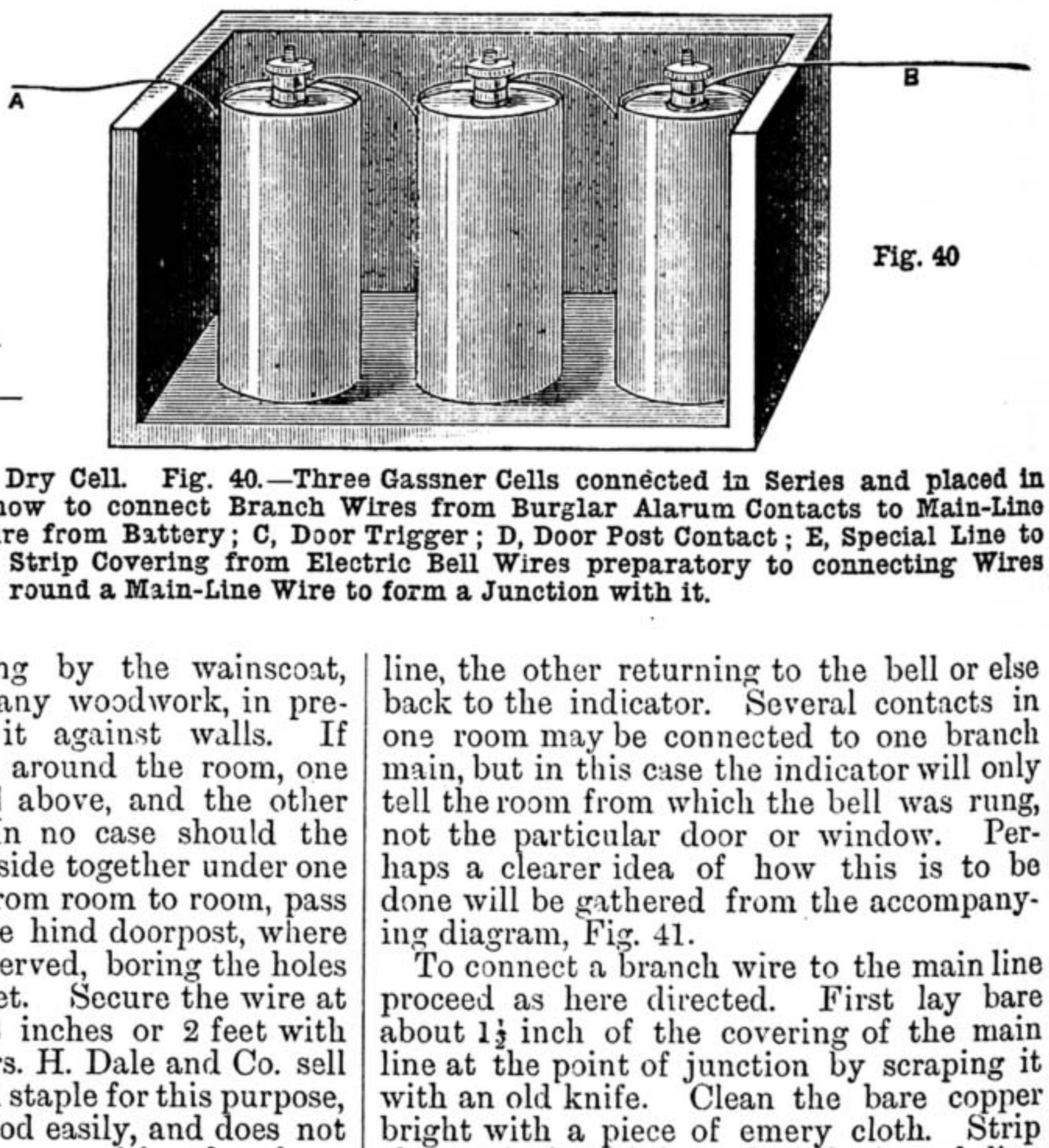


Fig. 40

Fig. 37.—Leclanché Cell. Fig. 38.—Agglomerate Block. Fig. 39.—Gassner Dry Cell. Fig. 40.—Three Gassner Cells connected in Series and placed in Box—A, Wire from Bell; B, Wire to Bell. Fig. 41.—Diagram showing how to connect Branch Wires from Burglar Alarum Contacts to Main-Line Wires of Electric Bell—A A, Main-Line Wire to Bell; B B, Main-Line Wire from Battery; C, Door Trigger; D, Door Post Contact; E, Special Line to Indicator; F, Door-Mat Contact. Fig. 42.—Sketch showing how to Strip Covering from Electric Bell Wires preparatory to connecting Wires together. Fig. 43.—Sketch showing how to Twist End of Branch Wire round a Main-Line Wire to form a Junction with it.

Laying the Line Wires.—Before laying the line wires, we must not only decide upon a place for the battery, but also a position for the bell. This may be on a wall, or in a cupboard in the master's room, or in that of a trusted man servant. The local battery, to work the bell through a relay, should be in the same room with the bell, and not far off from it. If a Gassner battery is used, the cells may be enclosed in an ornamental box of small dimensions, and the bell may be mounted on the same box. If the Leclanché is chosen, a cupboard near the bell may be utilised; or the wires may be brought through a wall or partition from a closet or other anteroom. The bell should be near at hand to the person in charge of the line wires along by the wainscoat, the skirting, or by any woodwork, in preference to pinning it against walls. If there is a chair rail around the room, one wire may be carried above, and the other beneath the rail. In no case should the wires be laid side by side together under one staple. In passing from room to room, pass the wires through the hind doorpost, where they will be least observed, boring the holes with a fine long gimlet. Secure the wire at intervals of about 18 inches or 2 feet with small staples. Messrs. H. Dale and Co. sell a hard, sharp-pointed staple for this purpose, which enters the wood easily, and does not readily bend. Where provision has been made, in building the house, for a system of line, the other returning to the bell or else back to the indicator. Several contacts in one room may be connected to one branch main, but in this case the indicator will only tell the room from which the bell was rung, not the particular door or window. Perhaps a clearer idea of how this is to be done will be gathered from the accompanying diagram, Fig. 41.

To connect a branch wire to the main line proceed as here directed. First lay bare about 1½ inch of the covering of the main line at the point of junction by scraping it with an old knife. Clean the bare copper bright with a piece of emery cloth. Strip about 2 inches of the end of the branch line wire, and clean in a similar manner. Lay

the two wires together, as shown at Fig. 42, and twist the end of the branch wire around the clean part of the main wire, as shown at Fig. 43. Drop a little melted composite candle, or a little powdered resin, on the joint; run a hot tinned soldering bit along the twisted wire to tin it; then follow with a drop of solder; wipe the joint with a rag to get off any trace of soldering flux remaining; cut the loose ends off close to the wire; and then cover the whole with a few strands of soft cotton dipped in melted paraffin.

In my next I will endeavour to show several forms of door and window contacts, and how to connect these with the bell and battery.

A CHEAP BELL CHUCK.

BY F. J. GOODACRE.

WHILST fully admitting that a row of chucks in burnished gun metal or brass has a very effective appearance, yet there are no doubt many of "ours" who are unable to pay the high price demanded for them. For instance, a 2-inch bell chuck made in gun metal is to be had at 14s., and is probably not dear if the actual cost of labour and material be taken into consideration. Iron chucks of this class may be made from castings, but there is then a considerable amount of labour involved in finishing them—labour which many persons have neither the time nor inclination to undertake.

Probably there are few persons who have not noticed, at one time or another, the "reducing sockets" used so extensively by gas and water fitters for connecting large pipes to those of smaller diameter. These may be obtained up to 6 inches in diameter at the large end, and with the other considerably reduced. These are just the shape for bell chucks, and being of wrought iron, and averaging about ¼ inch in thickness, are of very great strength.

Assuming that it is desired to fit up a 2-inch bell chuck, and that the mandrel nose is ¾-inch thread, a reducing socket of the size known in the trade as 1½ inch by ⅜ inch will be required. Mount this by the larger end on a face plate, or in a self-centreing chuck; or, if neither of these happen to be available, turn a piece of wood to fit the inside of the socket. Assuming that the piece now runs true in the lathe, the first operation consists in turning out the existing gas thread in the smaller end, thus enlarging the orifice until it is of sufficient size to permit of the ¾-inch tap being introduced. In tapping, it is as well to bring the back centrepoint up to the end of the tap, so as to ensure the thread being accurately cut. This having been accomplished, a small recess should be turned in the end, as shown in the illustration. (Fig. 1.) If the foregoing operations have been carefully carried out, on screwing the rough chuck on the mandrel, it should run truly and bed nicely against the shoulder. Set the lathe in motion, and with a graver or point tool mark two rings on the circumference of the chuck. Each ring is to be divided into six divisions. Drill and tap with ¼-inch thread each *alternate* division in the two rings, taking care that the three holes in one ring are midway between those in its fellow. If the divisions are marked with a punch, the back centre can be used, placing its point in one mark, when the one opposite can be drilled with a tool in the lathe, and so on until the three holes in each ring are completed. By this means the proper position of the holes is ensured, it being important that, when the screws are put in, each set of three should meet accurately in the centre. The chuck now only requires to be furnished with screws to complete it. It is hardly worth while for any workman to make these, seeing that they may be purchased at Nettlefold's at the very low price of fourpence per dozen. The heads require cutting off, and a square should be filed at the top of each one, the opposite ends being slightly coned, as shown in the figure. The screws should be made a medium fit in the chuck; neither tight nor loose; but so that they may be readily turned by the fingers. For light work a spanner is hardly necessary, but will be useful for heavy work, and can easily be made by drilling and filing a square of the required size in a small piece of iron or steel.

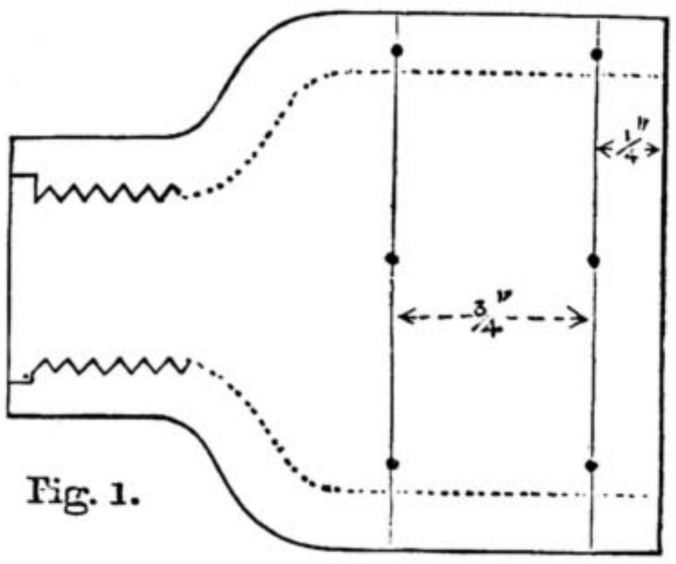


Fig. 1.

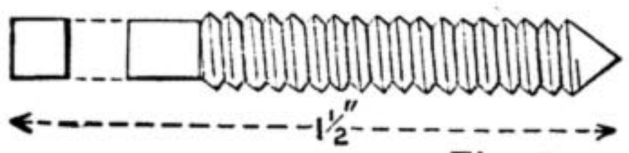


Fig. 2.

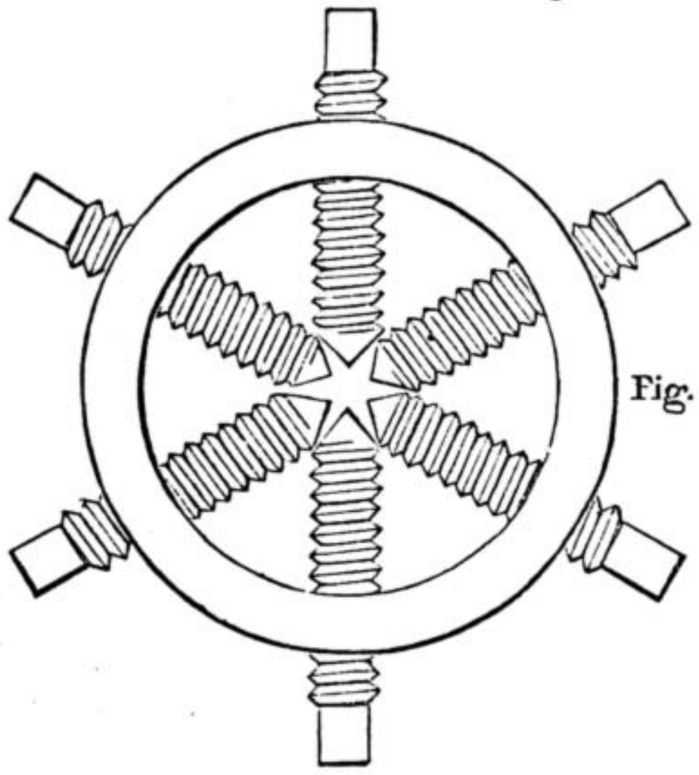


Fig. 3.

Fig. 1.—Socket Tapped for Mandrel and Marked for Screws. Fig. 2.—Screw. Fig. 3.—Front View of Chuck complete with Screws.

A shaving may be taken from the mouth of the chuck, and the body turned up bright and smooth, if it is thought desirable; but a very good plan is to give the outside one or two coats of black enamel.

If a 4-inch chuck, say, should be required, it will not be possible to obtain a socket small enough at its "reduced" end to fit the mandrel. It is easy to get over this difficulty, however, by plugging up the end entirely, and then drilling out afresh to the size required for tapping.

The total cost of this chuck (2-inch) should not exceed one shilling, exclusive of time and labour, and when finished it will be found of great value for holding many articles whilst being turned. For large drills it will be found even better than a self-centreing chuck, as with a little practise it can be adjusted to run dead true.

SOME FACTS ABOUT MAHOGANY.

BY DAVID DENNING.

MAHOGANY is a wood so well known, so generally used, not only by the cabinet maker, but by others, that we are almost naturally inclined to regard it without any particular interest. We take it as one of the common materials of daily household use, and looking round our rooms we can hardly conceive the time when it was unknown. Nevertheless it is to all intents and purposes a modern introduction, comparatively. Not till well on towards the middle of last century was it in anything like general use, although it was not unknown at the end of the sixteenth, when it is stated to have been brought to this country, not as part of the cargo, but as portion of a vessel which had "got into lumber," and had been repaired with it. To Sir Walter Raleigh is credited this first importation, and little could the great Admiral have imagined that the timber he found useful would one day be found to possess qualities which should lead to its general adoption as a furniture wood.

Evidently, at first it did not appeal to popular taste, or possibly while mens' minds were excited with the idea of discovering an Eldorado, whence gold in unlimited quantities could be had almost for the trouble of taking it, the notion of importing bulky timber may have seemed too ridiculous. If it was an age of strength it was also an age of rudeness, almost of barbarity, when domestic comforts as we understand them were little thought of. Going back in fancy to those "good old times" we can well imagine that any one who proposed to import mahogany because of its beauty would have been looked on as a man whose schemes were not worthy of serious consideration. Even were the wood appreciated, how could it be brought over in sufficient quantity to make its sale remunerative in the little vessels in which the navigators of those days sailed on their half-marauding, half-trading expeditions? Any cargo must necessarily have been such that it could be stowed in a small bulk. Whether a few logs may have been brought over from time to time or not, after Raleigh used the strange new red wood to repair his leaky vessel, it certainly was not much heard of in this country, though it is reported that the Spaniards employed it for ship-building purposes in the sixteenth century. It seems probable that Raleigh availed himself of this wood simply because it was handy and known to be suitable, just as, had the repairs been effected in Britain, oak would have been the most convenient wood. Truly these old seamen found an Eldorado, but not such as their greed-inflamed imagination suggested. By discovering the products of other lands—nay, by their discovering in the first place the other lands beyond the seas—they have done the world more good than had they only and solely come across the mythical golden city. They searched for gold, and in so doing paved the way for modern commerce in all its extended ramifications. Whatever the quantity of mahogany that may have been brought to this country during the seventeenth

century, we seem to have few reliable details by which to trace its adoption till well on into the eighteenth, when we again meet with some tangible evidence of it during the reign of George I. A certain Dr. Gibbons, of whom I believe history is otherwise silent, had a brother engaged in the merchant service, by whom he was given in the year 1824 some pieces of mahogany, the gift being probably induced by the fact that the doctor was then having a house built for himself in King Street, Covent Garden. Whether they were handed to him with the intention of being used for decorative purposes, or simply because they were looked on as waste, is not known, but there is no doubt that they stood a very good chance of eventually becoming the latter, for the joiners refused to work it on the plea that it was too hard. Apparently the doctor had recognised its beauty, or it may have been that he only wished to have some trifle as a memento of his brother made from it. Whatever the motive, fortunately he didn't accept the builder's decision of its unworkableness as being final, for we find that he arranged with a cabinet maker named Wollaston that a candle-box—strange reminder of the primitive modes of illumination !—should be made from some of it. Wollaston also seems to have found fault with the wood on account of its hardness, from which we may reasonably infer that it was a piece of finely-figured Spanish—otherwise, had it been of the inferior bay wood, men accustomed to work in oak, the till then ordinary furniture wood, could hardly have complained of its being unworkable. Be this as it may, the candle-box when finished gave satisfaction to so great a degree that, as one writer says, "it outshone all the other furniture belonging to the doctor, who gave Wollaston the remainder" of the wood, though another writer distinctly attributes to Wollaston the credit of having "recognised the fine qualities of the material." However, without discussing whether to the doctor or to the tradesman is due the chief credit of sufficient discernment to appreciate the merits of mahogany, there is no doubt that, speaking from a commercial point of view, it is owing to their joint enterprise that the wood took at once a leading place as a furniture material. The story goes that out of the remainder of the captain's present Wollaston made two bureaus, one for Dr. Gibbons and the other for the Duchess of Buckingham. After this the demand seems to have increased, and Wollaston is supposed to have amassed a considerable fortune by the manufacture of mahogany furniture.

Within the next few years the importation of mahogany must have greatly increased, for even before Chippendale's time we find it extensively used, while the fact that Chippendale made most of his furniture from it is too well known to require comment. It is hardly too much to say that to the introduction of mahogany much of the change which took place in the fashionable styles is owing, an impetus having been given to the study of designs suitable to it; and whatever the opinions of the designs themselves, there is no question that Chippendale and his contemporaries made the most of their material. It was delicately worked up in a manner which conclusively proves that it was not regarded as a common material, but rather as one to be treated with respect. Other causes, no doubt, contributed to the improvements which took place, not only in furniture but in general household decorations during the last century, but there remains the fact that in mahogany the great designers and artisans to whom English furniture owes so much of its present position as a fine art industry found a congenial material. It may be interesting to note that mahogany, even in its commoner qualities, must have been a comparatively valuable wood, for it is not uncommon to find old articles of furniture veneered with it on a foundation of oak.

Later on, as inferior, *i.e.*, plainer figured mahogany, became a commoner commodity, the custom of veneering on it became more general, and it is rarely nowadays that one finds any other wood used for the purpose, except when for the sake of cheapness pine is used. No one, however, would think of laying mahogany veneer on oak.

Mahogany has remained, par excellence, *the* cabinet-maker's wood, although within the last few years it has fallen into comparative disuse for the best, or say the most fashionable, furniture. Various causes have contributed to this, among them the rage for the plain severe styles which for a time had sole sway, and the outcry raised in certain quarters against veneer. Unreasonable though it might be, this had great influence on public opinion, and ash, walnut, or oak, solid, or supposed to be solid, largely supplanted mahogany in popular favour. Nothing can be urged against these woods being unsuitable for furniture construction, except that in point of beauty they are not equal to mahogany. They are good enough in their way, but when it comes to be a matter of richness of colour and variety of figure, they are, to use a colloquialism, "not in it." We are, after having kept our eyes partially closed to the merits of mahogany, and sought more or less vainly to find the same qualities in other woods, just beginning to open them again, and to see that there is after all nothing like a handsome piece of mahogany furniture. Not that I would advocate its exclusive use, but do not let us remain under the impression that ash or walnut for bedrooms, walnut or oak for dining-rooms, is only to be employed if we want to have "art-furniture." This can be made in any and not necessarily the plainest wood, although there seems a certain amount of misconception about this sometimes. In mentioning the claims of mahogany it must be recollected that the style in which it was worked up, say thirty, or even twenty years ago, is not a necessary concomitant. It is not, however, all mahogany that is equally beautiful; indeed, there is hardly a wood with which we are acquainted that presents more variety than this, varying from the plain coarse Honduras to the richly variegated Spanish. It was in this latter that the Georgian cabinet makers principally worked, and when a fine piece of "city" wood can be obtained it is a thing to be valued.

The mahogany tree is found more or less abundantly in the West Indies, whence comes that known as Spanish. The best of this was formerly imported from San Domingo. Indeed, at one time, it appears as if this were the only port of shipment for, at any rate, the choicer varieties, whence the designation of "city" wood. Other islands were found to produce mahogany, some of it, notably that from Cuba, little, if at all, inferior to the old "city" wood, and from these we now import most of the Spanish. Mexican mahogany is also of good quality.

As regards figure and colour, Honduras mahogany, commonly spoken of as bay wood, is inferior, though otherwise it presents all the good qualities of the choicer kinds, *i.e.*, it is as reliable in work, and forms an excellent ground for veneering on. Most of the finest wood is cut into veneers which, according to the figuring, are known by various names, such as curls, feathers, and various fancy titles, not now so much regarded as formerly.

From what has been said about the extensive variety of qualities it will easily be understood that there is an immense range in price between the highest and the lowest. Fabulous sums have been given for choice logs, and though there are certain indications by which experts can form a fair opinion before cutting, the probable amount of figure cannot be accurately foretold. One may buy half a dozen logs supposed to be fit for choice veneers, and find them after all very ordinary stuff, while on the other hand a log from which nothing much might have been expected will supply veneers with the choicest markings. To give some idea of the high prices which logs have sometimes realised it may be said that they have sometimes reached four figures, or £1,000 per log. This seems almost incredible were it not that fine veneers are known to be beyond ordinary market figures, and to command "fancy" prices. However this may be, it has been stated on good authority that logs have been sold for the sum named. A well-known firm is reported to have given this figure for three logs, which, as was pointed out some years ago, would probably give a cost of from £5 at least per cubic foot.

It must not be imagined that all Spanish wood is finely figured, nor that all bay wood is plain, for though these are the general characteristics of the two kinds, instances are not unknown where the latter has been finely figured, indeed it is said that the three logs above referred to were Honduras. Spanish mahogany is sometimes spoken of as though the name alone would be enough to support its claim for figure, the fact being often overlooked that the stuff may have very slight markings, as most that shows any fine variety is used up in veneers. As Spanish is supposed in every instance to indicate a fine wood, so Honduras is taken as being very plain, and undeservedly so, for the quality of the timber depends very much on the situation in which the tree has grown. That from the low marshy districts in the south of Honduras is mostly plain, while that from further north approximates more closely to the genuine Spanish. In addition to American mahogany—including that from the West Indies—there are at least two other kinds, viz., the African and the East Indian varieties. These, however, even if they can be classed as true mahoganies, do not enjoy the same repute as the others, as the timber is inferior in many respects. It is also probable that other varieties from different parts of the world, closely resembling the real mahogany, find their way into the market, and are sold under its name, for we find that the natural order of plants which produce similar timber is very widely diffused in tropical and subtropical climates. Among them may be mentioned the West Indian or Barbadoes cedar, which is often used for making Havana cigar boxes.

Perhaps a glance at the subject from a botanical point of view may not be uninteresting, though it must be confessed that for workshop purposes it may not help us much; however, if it does nothing else, it will at any rate help us perhaps to understand how and why there are, for example, an East Indian and an African kind, and how

it is they differ, although generally spoken of as mahogany.

The real stuff from the West Indies and America is from the tree *Swistenia mahogani*, one of the natural order of *Cedrelaceæ*. Its growth is slow, and from the immense size of some of the trees, which often reach 80 to 100 feet in height, with a trunk 6 feet thick, it has been calculated that many of them must have been growing for approximately 200 years. As has been incidentally mentioned, those grown on low swampy ground produce inferior timber. Perhaps owing to the great difficulty of transportation from the place of growth to the port of shipment, there is an increasing tendency to deterioration in quality. The best accessible trees have been felled, and as distance from the coast increases there is less possibility of picking and choosing; the trees instead are taken as they come.

East India mahogany is produced by the *Soymida febrifuga* or Rohuna tree; as its name almost implies, it, or rather its bark, is occasionally used medicinally as a febrifuge. The bark of the mahogany tree has also been used for the same purpose.

African mahogany is the produce of the *Khaya Senegalensis;* West Indian cedar, or, as it is often familiarly called, though erroneously, mahogany, is supplied by the *Cedrela odorata.*

All of them belong to the natural order *Cedrelaceæ*, which includes many other kinds of woods, that best known perhaps being satin-wood, which, apart from its distinctive colour, bears a very marked resemblance to mahogany in figure and general marking.

Every one who is accustomed to handle it knows that mahogany is a reliable wood—pleasant to work, and susceptible of a high degree of finish. It is obtainable in large planks clean and sound, *i.e.*, free from knots and shakes. One sometimes hears that really fine mahogany is difficult to procure nowadays, or even that it cannot be got. This, however, is hardly correct, for there is no doubt whatever that by care and the payment of sufficiently high prices, mahogany of the very finest figure is still to be purchased. Naturally, it will not have the fine dark colour of old mahogany, but that will come in time, unless, indeed, the stains which, at the request of ignorant purchasers, are so freely used to give an artificial appearance of age have a prejudicial effect. Stains may produce a pleasing appearance on new wood, but it may very reasonably be supposed that the benefit is only a temporary one, and that instead of improving as time goes on the colour will be anything but agreeable. If any mode of artificial darkening be resorted to that by ammonia vapour is the least harmful, and gives a nearer approach to the colour of old mahogany than any other process. Of few woods can it be said that they improve with age, but mahogany is certainly one of them; but to let old Father Time have fair play the wood should be simply oiled, or at most French polished without any staining. Of course, I do not refer to that very inferior wood, which hardly deserves the name of mahogany, so largely made up into furniture in the East End of London, and either coloured a fiery hue, or, if it is made up into "second-hand stuff," a dirty brown. The natural colour of such wood can hardly be spoilt, but on the other hand the practices that prevail to give it a good colour, or what is supposed to be such, cannot be spoken of in terms of commendation.

Very much more might be said about mahogany, and there can be little doubt that the intelligent worker would occasionally derive more pleasure from his work—or from his materials—did he know a little more than is commonly the case about them. By way of a few suggestions on mahogany in this direction the foregoing remarks are offered to those who take some interest in knowing all—or at any rate something—about everything they come in daily contact with.

It is not, however, only as a furniture wood that mahogany is useful, though naturally the choicer varieties are reserved for this purpose. Its use in ship-building has already been referred to, though, notwithstanding the fact that its durability is so great, it does not receive the highest class at Lloyd's, a fact which may be accounted for by the best sorts not being employed for the purpose.

BICYCLE PLATING, BISMUTH, AND BLOODSTONE.

BY GEORGE EDWINSON BONNEY.

Bi.—The prefix "bi" means two, and is synonymous with the prefix "di." Thus dioxide and binoxide have the same meaning, viz., two atoms of oxygen.

Bicarbonate of Potash. See *Potash.*

Bicarbonate of Soda. See *Sodium.*

Binoxide of Mercury. See *Mercury.*

Bisulphide of Carbon. See *Carbon Bisulphide, etc. etc.*

Bicycles.—New bicycles are usually sent to the plater in pieces, fresh and clean from the maker's hands. The various pieces are cleaned and treated as pieces of steel to be plated.

If the spokes of the wheel are sent separate, they should be slung together with stout copper wires so as to form a ladder of spokes, and these hang in the dipping and bath solutions. The rim of the wheel is plated in sections when the bath is not large enough to take the whole wheel. These sections must be so arranged in the bath as to cause the deposit on one section to overlap the ends of the other section. Old bicycles must be taken to pieces. Every part that can be unscrewed must be separated and cleaned separately. Clean first with emery, then with a leather buff charged with Trent sand, and polish off with Sheffield lime. As high polish as can be obtained should be given to each part, and then they should be transferred to a strong potash bath to remove all the grease. It is sometimes advisable to brush the pieces in the potash liquor, then rinse them and scour by hand. They are then again rinsed, placed in the acid dip, well rinsed in clean water, and transferred at once to the plating vat. As it is not always practicable to take the wheels to pieces, these may be plated entire. When the parts are plated they are rinsed in clean hot water, dried, and finished with lime, that is, well polished with Sheffield lime applied on a dolly revolving in a lathe. The wheels are polished by hand with chamois leather.

Detailed information on this subject, illustrated with diagrams, is given in Mr. A. Watts's book on "Electro-deposition," to which the reader is referred.

Bismuth.—Chemical symbol Bi., combining weight 210, specific gravity 9·8. A reddish-white metal of a highly crystalline and very brittle character, found with the ores of nickel, cobalt, copper, and silver. It melts at a very low temperature, 507° Fah., and expands so much on cooling as to occupy $\frac{1}{32}$ more space when cold than it does whilst in its melted state. When strongly heated, it burns with a blue flame and forms an oxide of bismuth. It dissolves freely in nitric acid. Bismuth is an important ingredient in the composition of fusible alloys and soft solders, its presence contributing largely to their fusibility. See *Fusible Alloy, Stereotype metal, Type metal, etc.*

Bismuth is electro-positive to copper, silver, mercury, platinum, iridium, osmium, gold, antimony, and carbon. It is electro-negative to tin, lead, cobalt, nickel, iron, zinc, manganese, aluminium, and magnesium. Plates of bismuth, I must not omit to say, form the positive element and plates of antimony the negative element in some thermo-electric batteries.

Bisulphite of Carbon. See note on *Carbon Bisulphite* and *Brightening Solution.*

Bloodstone.—The name given to the stone used in the manufacture of best quality burnishers. It is generally supposed to be a variety of a native oxide of iron. Mr. Bloxam in his book on metals, says: "*Red Hæmatite* has been so called from the Greek word signifying *blood*, on account of its dark red colour, and is sometimes erroneously called *bloodstone*—the true bloodstone being a dark green variety of silica (*heliotrope*) with red spots. In appearance it is the most striking of the ores of iron sometimes appearing in rounded masses, having externally a liver colour with considerable lustre, and internally made up of layers having the appearance of the thick shell of some huge fruit, or of bundles of fibres which look like petrified wood. The specific gravity of this variety is about 5·0. Such specimens are, in general, remarkably hard, and are useful for burnishing metals."

The lumps of this substance that are used for burnishers are held in the ends of metal tubes by solder. See remarks on *Burnishers.*

THE KALEIDOSCOPE: ITS CONSTRUCTION AND APPLICATION.

BY THOMAS RICHARDSON.

The Compound Kaleidoscope.

The engravings which accompany the present article illustrate a new type of kaleidoscope, combining in one instrument many important properties, which may be briefly stated as follows:—

In the simple form a defect was referred to which mars the symmetry of the picture, caused by the interposition of a blank space at the junction of each direct and inverted image, equal to the thickness of the glass of which the mirror is composed. In the present case this is obviated by silvering the first surface of the reflectors in place of the posterior surface, so that each image merges directly into the adjoining one, forming, when the reflectors are placed at any angle which is an *even* aliquot part of a circle, a series of sectors arranged with beautiful regularity round a common centre; the number of sectors being always equal to the number of times that the angle formed by the junction of the mirrors is contained in a complete circle, or 360 degrees. The reflectors are so mounted that the angle can be varied at will, and clamped in any position, within a limit of 72 degrees, by means of a

pair of milled heads (A and B, Fig. 5) at the back of the instrument, which actuate a pair of pinions sliding in vertical slots, and working in racks attached at each end to the inside of the case. The mirrors recede from each other at their upper edges on turning the head (A) in the same direction as the hands of a clock move or clockwise, and approach each other when the head is turned contra clockwise. One of the reflectors is shown at the extreme limiting angle in Fig. 2. In order to produce annular or arched and rectilinear pictures, the reflectors are moved apart at their lower edges by a motion the reverse of the preceding, and of which it is quite independent, viz., by turning a milled head (C, Fig. 5), which is secured to a pinion rotating in bearings at each end, and moving in opposite directions a pair of racks attached at their ends to the arms (K), which support the reflectors. A second milled head (D) acts as a clamp. The reflectors can thus be separated to a distance of 2 inches, and parallel to each other, as shown in Fig. 1, any intermediate position, either oblique or parallel, being obtainable on turning the heads A or C as required. The whole instrument is capable of being rotated through an arc of about 170 degrees, the rings shown at X (Figs. 1, 2, and 5), secured to each end of the instrument, being supported by the uprights (V), the upper ends of which are hollowed to fit the rings, thus

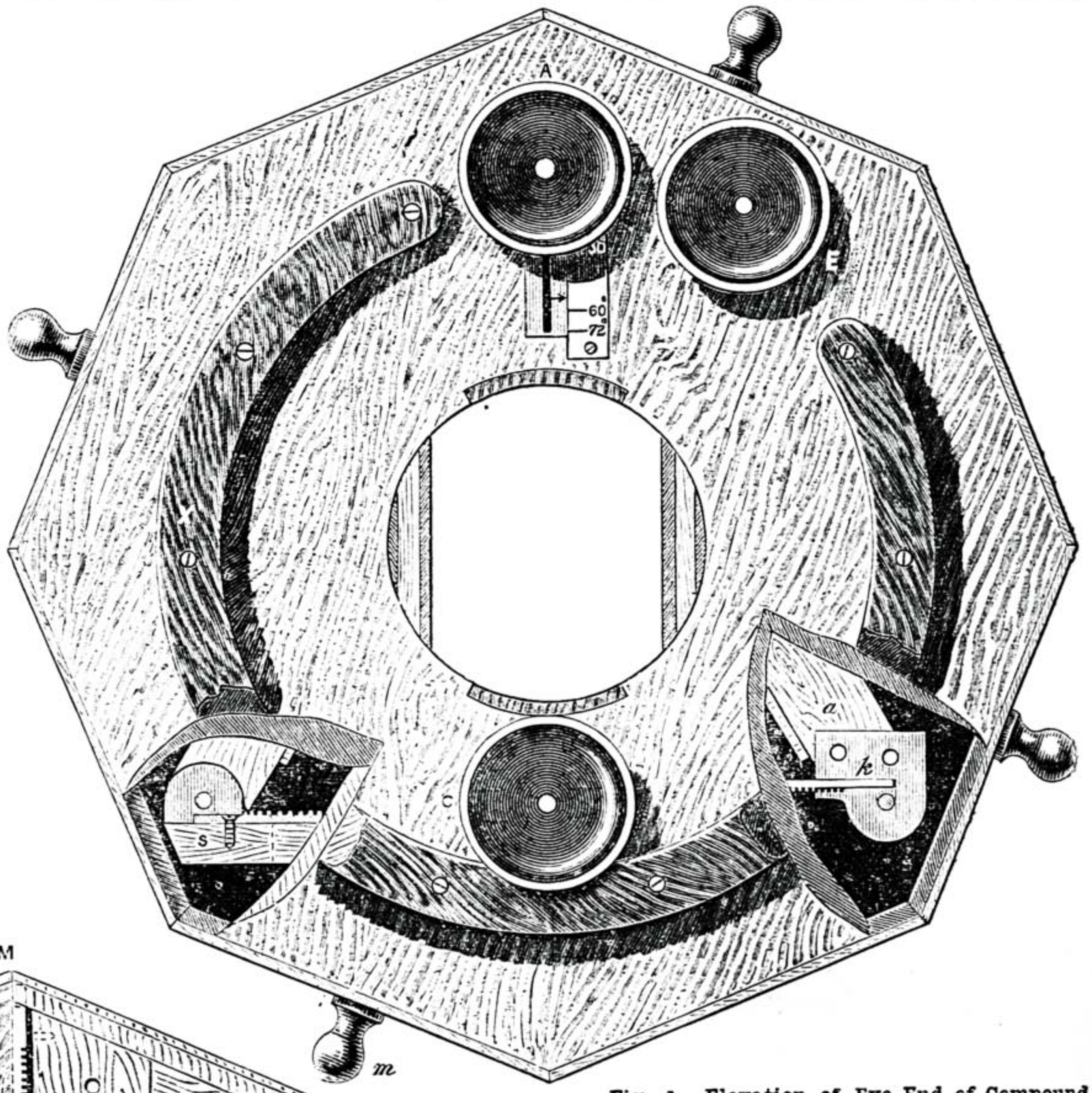


Fig. 1.—Elevation of Eye End of Compound Kaleidoscope, showing Mirrors parallel to each other, with Portions of the End Plate removed to show Method of attaching Rackwork and Slide to the Arms which carry Reflectors. (Scale, half size.)

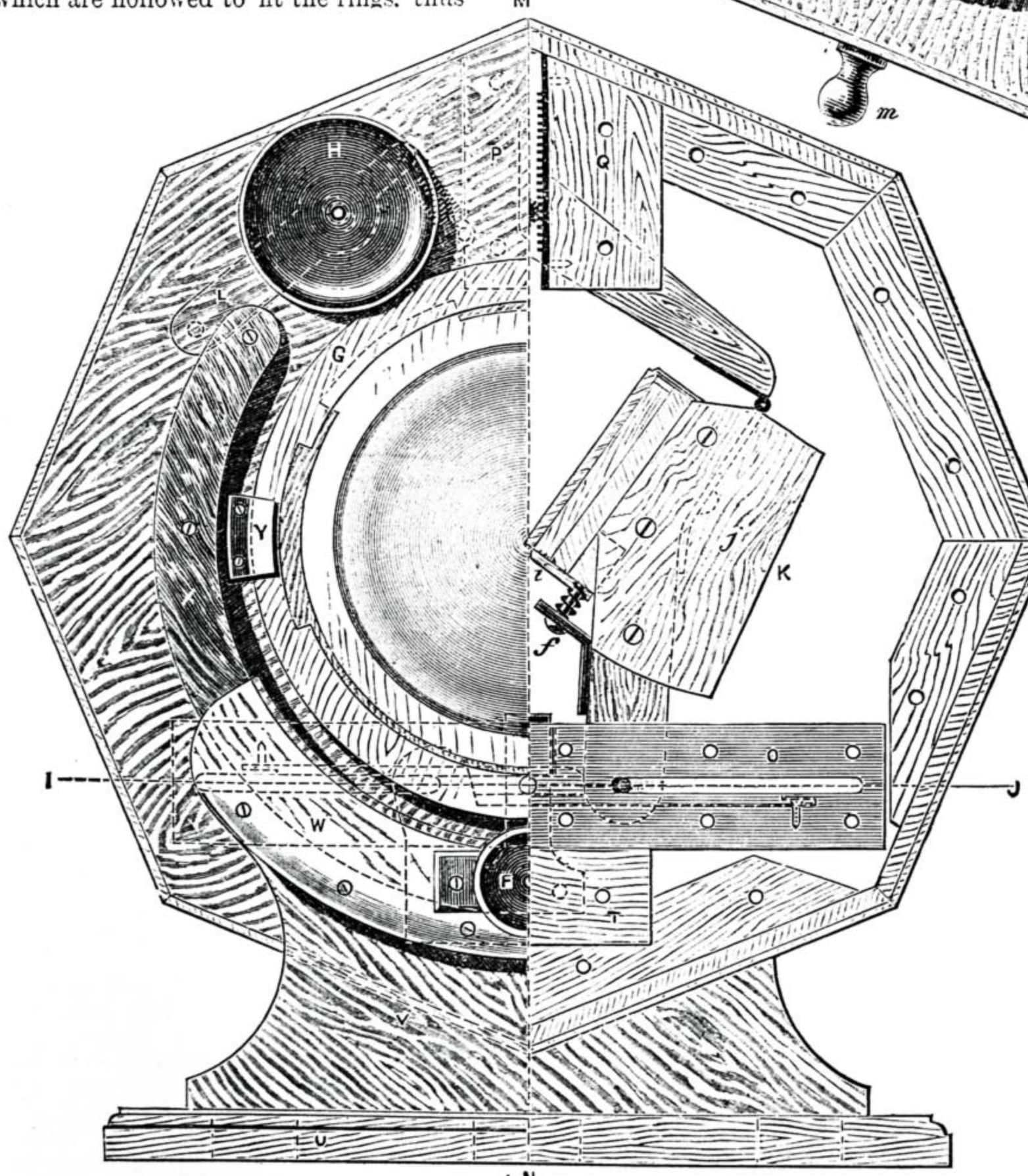


Fig. 2.—Elevation of Object End. One half of the End Plate and the Slotted Vertical Plate P is removed to show Interior. (Scale, half size.)

forming a bearing, and the necessary leverage is provided by the handle seen at *m* (Fig. 1). By means of a milled head at F (Fig. 5), this motion can also be arrested to admit of the picture being copied. The object box is enclosed in a carrier (G), which allows of continuous, clockwise rotation, through the medium of a small rubber-covered disc of wood (H, Figs. 2 and 5), actuated by a milled head, seen at E (Fig. 1), the tension of a coil spring applied to the end of a lever (L, Fig. 2) being sufficient, on turning the disc, to transmit motion to the carrier. In addition to the advantages already enumerated, other accessories, rendering the instrument still more complete, will be described and figured in due course. Meanwhile, sufficient explanation has been given to make the reader conversant with the motions of the several parts before us, and we may now turn our attention to the various details involved in its construction.

It may be argued that were the instrument constructed entirely of metal, the mechanism necessary to produce the several motions recorded above might have been enclosed in a circular tube of very much smaller dimensions than the one here presented; but to have carried out the idea in a confined space would have required an amount of precision in the use of tools seldom attained by any but professional hands. Sacrificing space in order to avert the exclusion of the amateur mechanic, I have endeavoured

to so combine wood and metal in its construction as to avoid having recourse to any particularly delicate mechanical operations, the pieces composing it being on that account relatively larger than would be the case if of smaller compass, as it is much easier to file up a level surface an inch wide than one of half or quarter that width; and the same remark applies with equal force to woodwork; therefore, wherever possible, pieces of wood having a small sectional area should be prepared in lengths of 12 or 15 inches.

To those who contemplate engaging in the project, I would suggest at the outset the production, on cardboard, of a full-size drawing, with the aid of the description, where necessary, so that the dimensions of the several parts can be obtained without the trouble of further calculation. Further, as being principally of wood, every care should be exercised in its selection, nothing being allowed to pass muster, especially where lathe work is concerned, except well-seasoned, close-grained mahogany. In the pieces composing the support and sides of the case a more open grain is admissible, although if it is intended to be French polished, it would be well to have the outside of uniform grain throughout for appearance' sake.

Before attacking the woodwork generally, there are a few trifling patterns of the brasswork which it will be well to prepare, so that the castings (which should be thoroughly sound) may be ready to hand when wanted. They comprise patterns for the milled heads shown in Figs. 1 and 5. First turn a pattern for C (Fig. 5); as this will be moulded shank downwards, the latter must be tapered slightly from the point upwards, omitting the hollow shown in the diagram, as also the groove on the edge, which must be tapered in the same direction as the shank. The same pattern will serve for the heads A and E; $\frac{1}{16}$ in. all over the surface must be allowed for turning. One pattern each is also required for the heads B, D, and F, and a plate into which the latter is screwed ($1\frac{3}{4}$ in. long, $\frac{5}{8}$ in. wide, and $\frac{1}{8}$ in. thick), with a circular boss cast on one side as shown. Other materials in metal required are some pieces of brass tube: one piece for sliding pinion, $7\frac{1}{2}$ in. long, and $\frac{1}{4}$ in. outside diameter; with a piece to slide over this $5\frac{1}{4}$ in. long; a piece for the stationary pinion, $7\frac{1}{2}$ in. long, and $\frac{1}{4}$ in. outside diameter. To support the arms which carry the reflectors we require two pieces $7\frac{1}{8}$ in. long, and $\frac{1}{4}$ in. outside diameter; two pieces $5\frac{1}{4}$ in. long, to fit the exterior; and two pieces of steel rod ($8\frac{1}{4}$ in. long) to fit the interior. The best material for the latter would be silver steel wire, such as is used for drills and taps, and sold in 12-in. lengths by dealers in watch and clock materials.

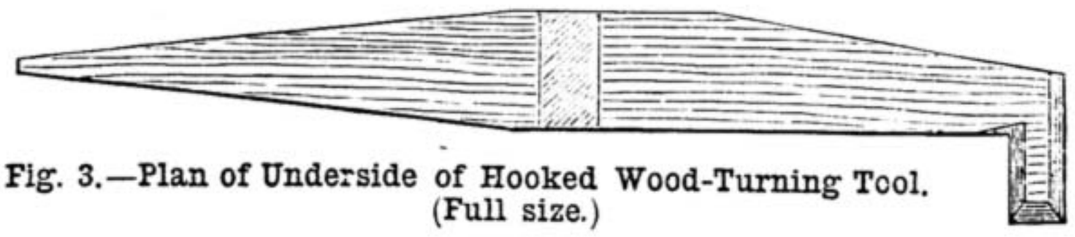


Fig. 3.—Plan of Underside of Hooked Wood-Turning Tool. (Full size.)

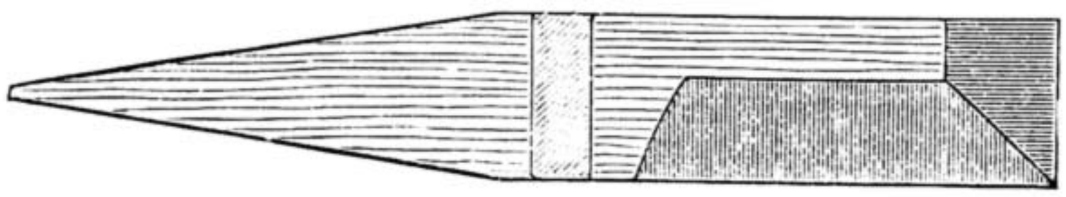


Fig. 4.—Plan of Underside of Side-Cutting Wood-Turning Tool. (Full size.)

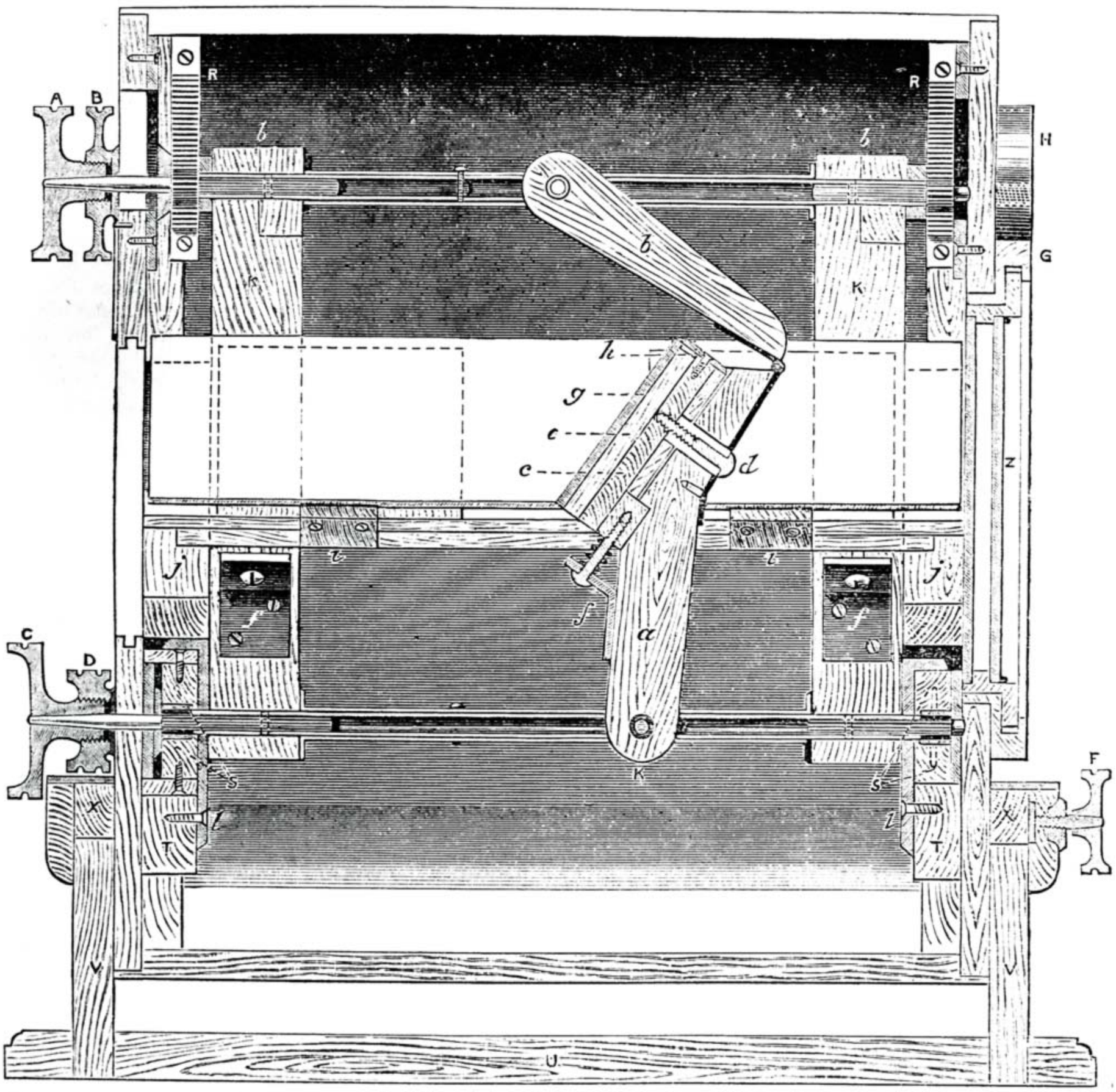


Fig. 5.—Sectional Elevation on Line M N in Fig. 2, showing also Portions of Interior (Mirrors Inclined) and Section through Centre of Arm. (Scale, half size.)

The rackwork figured has thirty-seven teeth in 2 inches, and the pinion wire has twelve leaves. One length of pinion wire and three pieces of rackwork 7 in. long are required. They may be procured from Messrs. James Lancaster and Son, opticians, of Birmingham. A letter enclosing P.O. for 3s. 6d. would, I am persuaded, meet with prompt attention, if addressed to the above most obliging firm.

We will commence operations by turning the carrier for the object box G (Fig. 5). For this we require a piece of specially sound, close-grained mahogany, $5\frac{1}{2}$ in. square and $\frac{3}{4}$ in. thick. At $\frac{5}{8}$ in. from the edge, set off four holes, one at each corner; bore these to pass a $\frac{1}{4}$-in. screw, and countersink them, so that the heads shall not be less than $\frac{3}{8}$ in. below the surface; if necessary, level the other side, and fix to the true face of a hard wood chuck. Having trued up the face, find the centre as it spins, and scribe a circle with the compasses, $4\frac{1}{4}$ in. diameter, which is the size of the opening in the object end of the case; outside this circle turn down to a shoulder, barely $\frac{5}{16}$ in. deep, so that when in position it may not project beyond the edge of the opening into the interior. Scribe a line $\frac{1}{2}$ in. beyond the shoulder, and remove it from the chuck, replacing it with a piece of $\frac{3}{8}$-in. deal, 7 in. square; true up the face, and bore to fit the part already turned on the carrier. Cut off the superfluous corners of the latter, and if not sufficiently tight to drive by friction, fix with a couple of screws an inch or so from the centre. Thus secured, true up the face and the edge square with the same to $5\frac{1}{8}$ in. diameter. Now scribe a centre line across the face, and sink a recess $\frac{1}{4}$ in. deep and $4\frac{3}{4}$ in. diameter, with a groove flush with the bottom, bored with a special hooked tool shown as viewed from the underside in Fig. 3. Another tool, which may be made by grinding a firmer chisel at the side, as in Fig. 4, will be found most suitable for finishing the interior portion, which may next be bored to $3\frac{3}{8}$ in. diameter. Using the centre line as a guide, set off an

opening at each side, as shown in Fig. 2, and carefully remove a portion of the outer edge of the groove with a dovetail saw and gouge, so as to admit a similar pair of projections on the object boxes, forming what is known as a bayonet joint. Each end of the case is formed of a piece of mahogany, which, for convenience' sake, we will distinguish by the term "plate." These plates measure $9\frac{1}{2}$ in. across the corners, and $8\frac{13}{16}$ in. across the flats. The back plate at the eye end is $9\frac{3}{4}$ in. square, and $\frac{1}{16}$ in. thick to commence with; one face is dressed with a trying plane until it will lie without flexure close to the true face of a wood chuck, on which it is to be mounted by a screw at each corner. To ensure the plate being left of the same thickness throughout, a straightedge must be diligently used to test the surface until it is quite level; then reverse it on the chuck, and reduce it with equal care on this side also to a thickness of $\frac{5}{16}$ in.

Here I must pause to mention the necessity to provide a steel scriber, having one end sharpened to a needle point, and the opposite end like a turning chisel. Mark the centre lightly and exactly at this point with the cutting edge; mark the centre line, M N, right across the grain, and $2\frac{3}{16}$ in. below the centre; scribe the line, I J, perpendicular to M N. We also require three circles on this face of $9\frac{1}{2}$ in., $4\frac{1}{4}$ in., and $2\frac{3}{4}$ in. diameter, respectively, the last-named being the size of the opening for the eye-piece. It may now be bored out, and a groove produced on its edge of the same character, and to serve a similar purpose as in the carrier, the whole being made as smooth as possible with the finest glasspaper.

Following the same directions with the front plate, set off the centre lines and a circle $4\frac{1}{4}$ in. diameter; after removing the central portion, work carefully up to the line, so as to fit the carrier neatly; the surface which comes in contact with the latter to be finished by rubbing with a piece of Nixey's blacklead, in order that the carrier may slide smoothly within it.

WHY FURNITURE IS VENEERED.

WITH REMARKS ON SOLID WORK, ETC.

BY DAVID ADAMSON.

I MUST altogether dissent from the remark about it never being "worth while to buy furniture veneered with mahogany, for a little extra cost may procure the same articles in solid wood," as it is quite inaccurate, if it may be assumed, as I presume it may be, that the furniture, whether solid or veneered, is to be good, that is properly made and finished. If it is to be only common Curtain Road stuff, then certainly the case is rather different, for rubbish can be had at almost any price.

The fact is that the cost is not altogether regulated by the wood being veneered or not, *i.e.*, so far as labour is concerned. It depends far more on the value of the veneer. Now, if we are to understand that any article veneered with finely figured mahogany is to be had made solid of equally finely figured wood, I am afraid the difference in cost would rather startle any one. On the other hand, presuming that the fine veneer is laid on a mahogany base, as it generally is in good work, and that this or a comparatively plain mahogany is worked up solid without veneer, then the solid form would be very much less than the other. Hence there is no cause to wonder at a solid oak table having been obtainable at a smaller price than a veneered one. Given equally good wood to serve as a foundation for veneering on, or to be finished without veneer, it stands to reason that a veneered piece of furniture will cost more than a similar article unveneered. It cannot, however, be expected that a really choice wood—I refer, of course, only to the more valuable kinds—is to be used solid. To do so, apart from other considerations, would be simply a waste of material, or if this is too sweeping an assertion, let it be said that few would be willing to pay the enormous difference in cost for any ordinary article to be made of solid wood fit for high-class veneers.

If, as sometimes happens, pine is the wood on which the veneer is laid, and the veneer not of the most costly, then it would not be incorrect to suppose that a plain solid mahogany article would cost a little more. In the one case we have a fine, handsomely marked surface with a pine backing, in the other a plainish piece of wood, but solid. Of course, the notion of pine may not be agreeable to some, but there is no doubt that for many positions it is quite suitable; and that apart from its softness, it is, when selected with care and proper knowledge, by no means to be despised. I do not advocate its use as a foundation for really fine veneers, but I must confess that for comparatively cheap work, it seems to me that there can be no more objection to veneering pine than to staining pine, say, walnut or mahogany colour, and polishing it. The greatest purist hardly objects to the latter; indeed, some of them rather suggest that it is a very appropriate way of finishing pine furniture, but why veneered pine should not be equally so, I am at a loss to understand. The only reason can be that those who object to it have had the misfortune to meet with some uncommonly bad specimens of furniture of this kind, and that on them they have too hastily formed opinions. The critic of woodwork frequently does so, or those acquainted with the trade of the cabinet maker would not be so much amazed as they are sometimes with the extraordinary statements made with all the confidence of an intimate knowledge of the subject. That good and bad furniture is made cannot be disputed, but the former is always to be had by going to respectable cabinet makers and paying a fair price for it. The individuals who, without any practical knowledge of the subject, but with an overweening confidence in their own ability to distinguish between the false and the true in quality of wood or workmanship, and it may be added, actuated by an unhealthy desire to pick up bargains, rely on their own judgment, are principally to be credited with the immense quantity of slop furniture which is made and sold. It is not made for sensible people, but for the other sort; and as according to the sage of Chelsea, the majority belong to this other sort, it would be very remarkable if a certain proportion of furniture as well as other things were not prepared for their special delectation.

It is sometimes erroneously supposed that articles of furniture are veneered solely that the profit of the maker may be unduly increased, and it is not uncommon to hear a would-be purchaser inquiring if such and such is solid, apparently under the notion that it will be worth more, or be better value if it is. I don't think any honest tradesman would hesitate to say which parts are solid and which are veneered; but sometimes the discovery that a particular thing is veneered comes too late to the user, and disturbs his peace of mind. To do what I can to restore it to any who may happen to read these pages, let me say that, if the things were sold by a good, reliable cabinet maker, or, rather, made by one, that whatever the construction is, they may be depended on. With regard to solid work, there is a point which is liable to a slight misconception, viz., when wood of the same kind as the veneer is used for the foundation; let us say, for example, a mahogany sideboard top. This, for the sake of the extra beauty of surface, might be veneered, but to distinguish it from pine, similarly veneered, it would be called a solid mahogany top, if referred to, by many tradesmen. The fact of the surface being veneered by no means prevents its being a solid mahogany top, as it really is; the error, if any, in description being merely that it is not stated to be composed of two thicknesses. I merely mention this, as I have heard of people supposing themselves to have been deceived by statements about solid wood, but almost invariably it will be found that their questions leading to them have not been sufficiently explicit to elicit a correct answer. I trust, however, I have said enough to show that veneering should not be indiscriminately condemned, and that when properly done, it is not only a judicious, but sometimes a necessary, method of working up a material. I think all the more common forms of objections to it have been discussed in such a way as to dispel from the reader's mind any prejudice he may have insensibly formed against veneering. Though much more might be said to the same purpose, we may take leave of this part of the subject, and concern ourselves with the practical work of veneering. In connection with this, I may say that many different methods are adopted, and that in competent hands they are all capable of producing good results, some better than others, but none of them utterly bad. Do not, therefore, let it be thought that if no allusion is made to some favourite mode of preparing or laying veneers, or I may go a little farther and say, that if some other is stated to be better, that it is done with any intention of inducing practised artisans to abandon their old systems of working. I am quite prepared to admit that any method which has been found in practice convenient and durable, is just as good as any which may be mentioned by me. I am not bigoted, and would let every one practise his own method, *i.e.*, any one who is competent to form an opinion, or is an experienced craftsman; so, good readers among these, don't think I wish to disturb you in your present modes of veneering, but at the same time, please remember that the operations to be described, however they differ from yours, are also quite reliable. I say this with full knowledge that the practice of veneering is subject to many variations in detail, and that men equally competent to form sound opinions differ materially in their views as to what is best; also, I cannot forget that discussions about practical methods are not always carried on with that freedom from acrimony which is desirable. May I therefore suggest, that any one who can add to the lamentably small amount of published matter on veneering, will do better by sending on an account of his methods, than by simply contenting himself with saying that the present writer "is altogether wrong." The following instructions are based on a fairly wide experience of the methods generally practised, but there is no assumption that all the methods in particular shops or

districts are known to me, and I for one shall be grateful to those who are able to suggest improvements. This, however, can only be done by experts, for veneering is a delicate operation. The present seems to be an opportune time for some addition to the literature of veneering. Many of our younger artisans are practically ignorant of the process, which in the immediate future bids fair to be more practised in connection with good work than it, till very recently, has been for some years. Unless it is performed by competent hands, it will soon prove unreliable, and without saying that the art of veneering is ever likely to be lost completely, full advantage may not be taken of its capabilities.

To the young workman—I mean the professional—I would therefore especially address myself, while I hope making my remarks so plain that they may be easily followed by the amateur who may be inclined to turn his attention to veneering. As the needs of the latter class of workers must be considered, the following instructions and remarks must necessarily contain much that may seem superfluous to those who have even a modicum of experience acquired in practical workshops, but no doubt, though I may appear prolix, they will forgive me now that I have stated the reason. If such a thing be possible, I want to help those who have hardly seen a veneer till after it is laid, who have not the slightest idea of either caul or hammer-laid veneer, or, indeed, anything about the work to set about it intelligently, with results that will neither be disappointing to themselves, nor yet afford opportunity to their most critical friends to find fault with it.

Of course, it will be readily understood that for any written instructions to be of much use, the learner's co-operation is needed, for unless this can be given the novice need not hope to profit by the plainest directions. In the practice of veneering, the beginner is sure to encounter difficulties; he must make up his mind for that, for success depends very largely on judgment as well as care and knowledge of what to do. He should not commence operations with large or costly veneers, nor attempt to lay these until he has had some practice with the commoner kinds.

This, it may be said, applies specially to the amateur working alone and not able to command the assistance usually available where several artisans are working together, in case of anything going wrong unexpectedly. The young professional's foreman may safely be trusted to see that he does not make his maiden effort at veneering with any valuable material, and, indeed, he should be guided exclusively by his foreman, notwithstanding that his details may possibly differ from anything written here. Directions in WORK are written to aid beginners, not to supersede their employer or foreman's preference for any course of manipulation, and, perhaps, they will pardon my hinting that some of them are just a trifle inclined to air their very superior knowledge of a method which they have seen described "in print." This may in itself be better, but for yourself your employer's is the best in the meantime. Forgive my plain speaking, but if you will take the advice, it may save you now and again a little unpleasantness with your "boss," in which you are sure to get the worst of it. But this is in danger of leaving me to talk of behaviour in the workshop instead of dilating on veneering, and the way in which this kind of work is done.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

86.—JONES'S STENCIL PATTERNS AND CUTTINGS.

MR. G. JONES, East Cowes, Isle of Wight, Decorator to her Majesty, and Designer and Stencil Cutter to the trade, has sent me for inspection and notice a few of his cut stencils and patterns. I have never had the pleasure of seeing patterns that can be surpassed for beauty and excellence of design, nor have I ever had the satisfaction of handling patterns as well cut and as well tied, for my readers will readily understand what an important factor tying is in stencil cutting, inasmuch as the stability and endurance of the perforated sheet, if I may apply such expressions to this work, depend entirely on the skill of the designer in this respect and the care of the cutter in confining himself precisely to the outlines of his designer, and keeping his knife exactly in the tracks thus laid down for him, jealously guarding the passage of the tool a hair's breadth beyond the termination of any two lines, whether straight or curved, that meet at a greater or less angle in any point of the pattern. Mr. Jones's patterns were accompanied by a long roll of stencillings, from plates many of which are much longer than the patterns sent, and which exhibited a boldness of design combined with delicacy of execution and manifest comprehension of the effect to be obtained when the pattern is reproduced on the walls or ceiling of a room, in colours contrasting with the ground or repeating the ground in deeper tints, that it would be difficult to excel or even to equal. It is really a matter of difficulty to single out any patterns for special commendation where all are good, but there are two to which I may call special attention, from the fact that they form part of the decorations in stencil of her Majesty's residence at Osborne, and which, on this account, may be regarded as patterns of more than usual interest. One of these is a floral ornament of great beauty and simplicity which appears on the panels of the ceiling of the Queen's private chapel, and the other an ornament of the same character, exhibiting a pleasing arrangement and adaptation of the national emblems of England, Scotland, and Ireland—the rose, thistle, and shamrock—which forms part of the decoration of her Majesty's council chamber. Mr. Jones's stencil patterns are all distinguished by numbers, and, in accordance with this plan, I may say that the former is distinguished as No. 7, and the latter as No. 10. I venture to suggest to Mr. Jones that he should have a book of his patterns in miniature prepared, in the same manner adopted by Mr. Henry Zilles, Messrs. Harger Bros., and Messrs. J. H. Skinner & Co., and others, so that intending purchasers may be enabled thus to judge of the suitability of the patterns for their purpose before giving their orders. I presume that if Mr. Jones had such a book, he would have sent me a copy of it with his stencils. With each pattern its size, that is to say, its length and greatest breadth, should be stated, and the purpose it is chiefly intended to serve. The price, also, should be named.

Some of Mr. Jones's stencil patterns are intended to render assistance in graining. These are known collectively by the name of the "Arcundian Oak Grainer," and are sold in sets, more or less, I presume, in number. The set supplied at 5s. comprises seven different patterns which are cut to follow on to any length. The directions given for using the "Arcundian Oak Grainer" are as follows:—"Rub in the work very smoothly and clean with graining colour. Comb first with coarse and then fine comb. When the work is properly dry, leather it over with a little whiting and water. Place the grainers where required, and stencil on the veins with Vandyke brown and water, care being taken not to have the brush too wet (an ordinary sash tool answers very well). You will find by rubbing the brush to and fro, instead of dabbing, the veining will come out much cleaner." For oil-graining colour, raw umber should be used, mixed with boiled linseed oil and turps. The following are Mr. Jones's directions for water-graining. Rub the work in very quickly with Vandyke brown and water, and stipple it clean. Comb and proceed as in oil-graining, except the whiting and water. If the graining is required light, place the grainers and sponge out the veins.

Reverting once more to the stencil patterns, there is one of special excellence to which I feel bound to call attention. This is pattern No. 155, in which flowers of the daisy type, conventionally treated with foliage, all symmetrically arranged, rise from a vase of simple design, but producing a remarkable effect by the clever manner in which ornamental bands in the ground colour are contrasted with the dark hue of the oak.

87.—THE NEW WATERPROOF LIQUID GLUE.

I am loath to be in any way behindhand in bringing under the notice of my readers anything that may prove to be a valuable invention, and as pressure of work on my time is so great just at present as to prevent me from making any particular tests of the "New Waterproof Liquid Glue," of which a sample has been sent me by the New Glue Company, Grange Yard, Valley Road, Shipley, near Bradford, Yorkshire, I have elicited from the Company statements which lead me to draw the following inferences with reference to the speciality they are now prepared to supply.

The New Waterproof Liquid Glue, just placed on the market, is a step in the right direction, and marks an area in advancement towards perfection so far as the production of that indispensable article glue is concerned. The trade mark "Water Glue" fairly describes its leading qualities. Being always liquid, it is always ready for use, requiring no boiling. It sets quickly, and when thoroughly dry will bear lengthened exposure to water without visibly decreasing in strength. In every household, how often have articles come asunder, the glued joints having succumbed to the invisible but deadly enemy, damp? To those who use the Water Glue, such a thing cannot happen. The amateur carpenter and joiner will find a true and trusty friend in this glue, always ready, reliable, and strong. Canoe and boat builders will at last obtain a watertight joint without the aid of the troublesome pitch pot. To builders of model yachts, the Water Glue will be highly welcome, as built models, by its aid, can now be planked up with the certainty of being watertight afterwards. For cyclists, this glue, used as a liquid-tyre cement, will supply a long-felt want. Workers in metal will find it invaluable as a means of causing leather to adhere to smooth metallic surfaces, and it can be used as a lacquer for polished metal, giving it a good colour, and being perfectly impervious to water. It is made up in tins containing 2, 4, and 8 fluid ounces, sold respectively at 3d., 6d., and 1s. per tin by all chemists, ironmongers, and oilmen.

I asked the Company to give me some idea of the merits claimed for it over Le Page's Carriage Glue, a preparation which has hitherto been found most useful of its kind. They claim that taking equal quantities of each, and comparing prices, the Water Glue is cheaper, and that Le Page's Glue is not waterproof or even damp-proof. The American Glue, if allowed to stand in a cold place, will solidify so much, that the pot must be heated by standing it in boiling water. Water Glue is always ready, and can be used for all purposes that Le Page's or any other glue can be used for. I intend myself to give this new glue a trial at the first opportunity, and I trust that those of my readers who may procure and make trial of this new article for public favour will give me an account of the results obtained.

THE EDITOR.

SHOP:

A Corner for Those who Want to Talk It.

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

I.—Letters from Correspondents.

About Work.—Genius writes:—"I was pleased when I read T. O. P.'s letter on July 13th in reply to J. P. A. I fully endorse his remarks, and I am really surprised that such wise individuals as J. P. A. should ever think of subscribing to Work. If he is such a practical man as he professes to be, why on earth, Mr. Editor, do you not put him on your staff? He would be the right man in the right place, just as Work is right, and in its right place. Work is a stepping-stone to mechanical ingenuity. By the aid of Work many will be led to think and undertake work they never dreamt of. Well, Mr. Editor, I am an amateur worker. I have been practising and inventing about fifteen years. I have made several articles all my own ideas, and was thinking of sending some of them for the benefit of the readers of Work. But, ah! I stand aside; how dare I, when such men as J. P. A. are on the scene? they will be counted as twaddle."—[Send any papers you like on approval. I do not suppose they will in any way be twaddling.—Ed.]

About Work.—W. B. (*Ince, Wigan*) writes:—"I beg to add my opinion to others who have written you week after week on the usefulness of Work, and how they prize it, notwithstanding the few dissentients who think you could do better by treating only on the subjects that are useful to them. It seems very narrow-minded indeed, considering the wide range and different desires of your various readers that you are expected to supply with information on so many different kinds of work, that you should be expected to deal only with the subject adapted to their own particular calling or liking. For myself, I think a ramble through 'Shop' is well worth the price of the whole. A fellow-clerk of mine first called my attention to No. 1 of Work through the presentation plate that was given with it—both of us do a little fretwork—and I found such useful information in it, and just the sort I had wanted a long time, that I have continued to take it ever since. I wish you every success in your work, and trust you will keep on the same lines as hitherto."

Tube Saws.—S. M. (*Skelwith Bridge*) writes:—"Seeing an article on tube saws in 'Shop,' I may say they have been in use in our trade for nearly forty years (bobbin-making). They are used to cut small circular blocks out of large timber instead of squaring with circular saw. They are made by W. A., Fell Bridge Iron Works, Windermere, and Gilkes & Co., Canal Iron Works, Kendal. They are made in all sizes down to ⅛ in. to order. The process of making is by forging a piece of steel, boring out inside to diameter required, placing on a mandrel, and turning to size. Of course they revolve when in use, being fixed in a chuck at the end of a vertical spindle. The block of wood being stationary, they would be easily used, as your correspondent F. A. M. says, as the saws are about 10 in. long. I am glad to say that I have received many useful hints from Work. I wish you success."

Correspondence.—Gauge Point (*Paris*) writes:—"I notice many questions remain unanswered. Give and take is the rule of space in correspondence in Work, I suppose. I should like to see an increase of 'give;' it only costs a little well-spent time in writing and a half-penny wrapper round it marked 'printer's copy.' It does more good to the writer in his first attempts at stating facts than the writer is aware of. It starts his latent powers of thinking with a flow of ink after his thoughts. One illustration will suffice to explain how it did good. A foreman of a large shopful of machinists and engineers noticed the superior manner adopted by one man in forging, hardening, and tempering steel springs, and said to him, 'You should write about your work.' 'But I cannot write—that is, fit to be read,' he replied. 'You are mistaken,' was the answer. 'Editors seek facts, and pay no attention to fitness of penmanship. You write mighty facts daily with your bellows, hammer, and tongs. You draw well, and chalk up your notes and marks all right that your mate can understand. Let me have those chalkings in pencil; I will see to the rest of the job; leave plenty of room between every line for my writing.' With much persuasion I got a capital succinct account of his mode of procedure that surprised me by its brevity and lucidity, also some good drawings of tools, and suggestions for improving them, and how to do it; for spring-makers make nearly all the tools they use. I wrote an introduction, added preliminary drawings, and let him tell his work tale in his own way. The subject had not been written upon technically before, but when published in a trade journal, his employer brought the work to me, with the workman's name to it, and asked if it were possible for W. T. to write so capitally. I pointed to his superior work around, and asked, 'Why not? He does more than write: he creates. This is an effort to make others as clever as himself.' He was pleased to see himself in print, and soon afterwards to get a cheque for his writings, which was what he least expected."

Incandescent Electric Lamps.—Wheatstone Bridge (*Enfield*).—Your letter has been forwarded to our contributor, who thanks you for your kind correction of his reply. You are quite right. The process described is one performed some six years ago, when the writer saw some bulbs being exhausted through tubes left in the necks of the bulbs. Wheatstone Bridge writes to correct a reply given by G. E. B. on page 157, in answer to G. K. on electric lamps for Bunsen battery. W. B. says:—"The lamp is (as regards the bulb, carbon, and connecting wires) complete before it goes to the pumps for exhaustion. The rough sketch will help to explain, as it shows the lamp as it leaves the glass-blower's hands. You will observe that the wires attached to the carbon filament are already fused into the glass. At the opposite end of the bulb there is a short length of glass tube left on, which is contracted at A. The end B is sealed to the pumps, and the lamp exhausted. The workman then plays with a fine blowpipe jet upon the tube at A, and the outside pressure of the atmosphere (as soon as the glass softens) presses it together, thus sealing the lamp. The workman then draws off the lamp, and the glass assumes the form C. On applying the jet to D it melts the glass, and he removes the lamp. He then melts the sharp point so left to a round end, and the lamp is ready for testing." You will observe that we have taken the liberty of making a few slight alterations in your communication, to render it more readable.

Glass for Electric Lamp.

Wanted, Advice.—J. J. (*Bradford*) writes:—"I have been a subscriber to your valuable paper from the first. I read it every week, and am especially delighted with the 'Shop' column; and I am now taking an opportunity of sending to ask if any reader can inform me how to make something profitable with the tools I have—jack plane, smooth plane, fret bow-saw, chisel, and saws? If so, I shall be highly delighted, for I have been at a standstill, waiting for something cheap to turn up."

Folding Screen in Egyptian Trellis Work.—C. H. O. (*Alderney*) writes:—"In my paper, which appears in No. 18, I observe some slight errors, which may be worth correction. 1. The hinges joining the right hand and centre folds are shown on the face of the framework, instead of being on the edges of the two folds, in which position, of course, all excepting the knuckles would be invisible in the sketch. 2. The title of Fig. 1 should read, 'Details of work in centre panel of recess (half-size).' The trellis work in the lower half of body of screen is only slightly larger than that in Fig. 3, and is like Fig. 1 in pattern, excepting that the intervals between the beads are plain."

"Muntin."—R. J. W. (*Derby*) writes:—"On page 277, No. 18 of Work, Mr. David Adamson mentions the orthography of the shop word 'muntin.' I beg to say this word puzzled me for years, and I, too, looked in many a dictionary without success. One time, however, I dropped across the word 'mullion, an upright division in a window frame, and have since consoled myself with the idea that 'muntin' is a corruption of 'mullion.' I am a railway coachmaker, and should be glad of instruction in private body-making, especially the mysteries of the 'cant board.'"—[Articles on coach building, etc., are in preparation.—Ed.]

Trimming Work.—D. T. D. writes:—"Enclosed please find a query to be answered through Work. I am still pleased with its appearance, and I think it a great credit—as all their works are—to the publishers. One reader desired you to get the leaves of Work trimmed or cut, as he termed it. My advice is the same as Punch gave—Don't! Trim your correspondent's if you like, but not mine. I have more respect for Work when bound up than he has. Great success to Work and your efforts.—Please don't forget promised article on Zinco."

About Work.—Flax Spinner (*Longton*) writes:—"I am writing partly on purpose to congratulate you on the success of Work, and also to ask for a little information. In the first place, I must congratulate you on the fact that you have had the common sense to see the necessity for such a paper, combined with the pluck to venture the launching of it, and I don't think you will have any cause to regret having done so. I have been a first subscriber to more than one or two trade and technical papers, and I have always found them to split on the same rock. They have not been satisfied to treat work from a working or workman's standpoint, but, after their first temporary success, have launched out in a direction in which the average workman was totally unable to follow. Such groupings of letters as

$$T=\frac{c}{Q-q} \text{ or } V=R-\sqrt{R^2-(\tfrac{1}{2}C)^2}$$

mean nothing or so much Greek to 90 per cent. of those who take in such a paper as Work; and I hope that all articles, however otherwise meritorious, will be tabooed by you, especially as there are so many subjects of general interest that can be treated without ascending, or rather descending, to the use of intricate algebraic formulæ. I would also wish to exclude subjects requiring scientific knowledge to understand and jaw-cracking scientific terms to express. I must also express my individual objection to a lot of space being cribbed for the purpose of advertisements that do not in any way interest the average reader or trades written for—I mean those quack and medical and other notices which are nowadays crowded into almost every paper we can buy. Surely you can find enough advertisements of trade requirements for Work without offending the eye with the others I have mentioned. I expect a page or two of Jacob's Safe Cure or Warner's Oil some week. Please don't do it."—[I thank you for your commendation of Work and the manner in which the subjects treated in it are handled. With reference to the advertisements that appear in Work, I have already pointed out that differences of opinion exist with regard to these as well as on everything else that is said or done under the sun. Some correspondents say, with regard to everything that is done with respect to Work, "Pray continue to do it;" while the cry of others is "Pray don't." If attention were paid to all such conflicting opinions, Work might come out one day as a blank sheet with nothing more than the heading. With regard to every publication that sees the light, it is as well to put up with that which you may not like in it for the sake of that which appears in it in accordance with your own particular views and proclivities.—Ed.]

Engineering.—Young Engineer writes:—"I have been a subscriber to Work since it first came out, and as I see several of your readers have offered their opinions on each side, I beg to offer one on the grumbling side. Now, when the prospectus came out, it said for 'all workmen, professional and amateur.' I have before me the last number, and, so far as I can see, two-thirds of the paper is devoted to joiners and cabinet makers. Now, I am an engineer, and the only article that has appeared is 'Wrought Iron and Steel Girder Work,' by Mr. Campin, that has any direct reference to the engineering trade. I should be glad to see a few papers on 'Principles of Machinery,' 'Strength of Materials,' 'Designing Machinery,' 'Mechanical Drawing,' and other articles on engineering; and I have not the slightest hesitation in saying they would be appreciated by all those of your readers engaged in the engineering trade. I wish every success to Work, and I hope soon to see it enlarged, supposing you have to increase the price."—[Your subjects will not be neglected. You have had evidence of that in the paper by Mr. Campin. You must bear in mind that carpentry finds most favour among those who adopt practical work as a hobby.—Ed.]

About Work.—Spectator writes:—"I have taken your admirable paper from its commencement, and beg to express my unqualified approval of the manner in which it is conducted. I have noticed the fault-finding and carping spirit of some of your correspondents, and for my own part, I think if these gentlemen were to consider that the title of your paper is Work, and *not* 'Talk,' there would be less of this everlasting grumble, grumble, grumble, which, to say the least, is only irritating to the overstrung (?) nerves of poor Mr. Editor, and equally annoying to that portion of your subscribers who are not martyrs to dyspepsia, from which disease your critical correspondents are evidently suffering, if one is to judge the state of their health by their letters. I have introduced the paper to a good many of my friends, and every one of them is thoroughly satisfied and pleased with it."

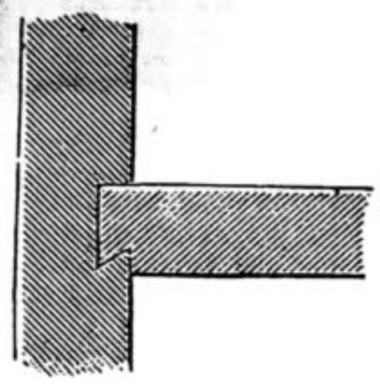
About Work.—G. B. (*Glasgow*) writes:—"Da Capo thinks there is more talk than work in Work. It must cause a feeling of sadness to think there is even one reader who can fail to recognise the literary merit of the articles contributed to your journal. They are not only masterpieces in the way of instruction, but bear the stamp of high literary ability, and have afforded me great pleasure in their perusal, quite apart from the instruction they convey. Take, for example, 'Frames' and 'Fretwork,' by J. W. Gleeson-White; 'Binding,' by E. Bonney Steyne; David Adamson's 'Old Bureau;' the 'Folding Chair,' by J. H. Moody; 'Smith Work,' by J. H.; and Fred Miller's 'Wood Carving.' To my thinking, those writers have attained the highest possible perfection, bringing into their subject all that engages the intelligent cultured mind. But I fear we may say to Da Capo what J. W. Gleeson-White says of Ruskin—the writing in this journal is 'transcendentally' above him; and I trust his remarks will in no way influence past, present, or future writers in Work."

Building Construction.—T. G. (*Hetton-le-Hole*) writes:—"I have taken in Work from the first. I like it very well, and I always recommend it to others: but I do think you will make a great mistake if you introduce building construction. There are already many works on building, so I hope you will not take up this subject."—[You are aware, perhaps, that when doctors disagree, those who are not doctors have difficulty at arriving at a decision. Your remarks are inserted to show how hopeless it is for any individual, even an editor, to please every one, and how necessary it is for him to rely on his own opinion.—Ed.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Straightening Bird-Cage Wire.—G. C. (*Leith*).—As G. C. remarks, this, though a simple question, is a somewhat difficult one in practice. It would have simplified matters very much, and perhaps save valuable space, if G. C. had intimated what plans he has tried. Greater difficulty will be experienced in straightening brass wire than iron, it being so much harder. Some time since I needed rather stout wire in straight lengths, and accomplished the work by fingers and thumbs, making it curve in the opposite direction to the curl. This was effective, but slow, and only practicable for a small quantity. It can also be done by striking it with light blows on hard wood with a wood hammer. This, too, is rather slow. The most successful plan, however, that I can suggest for large quantities of wire is to cut it in suitable lengths, and run it through a tinman's set of rollers, which is arranged with two soles under and one on the top. Perhaps G. C. is aware that there are two qualities of brass wire in the market—a soft wire, and what is known as "hard rolled," used by jewellers, etc. I should advise him to get the former. Perhaps G. C. will pardon me if I remark that brass wire is not the best for the purpose he requires; it soon gets discoloured, but worse than that, the clear musical ring which it gives when struck by a bird is said to destroy the purity of a bird's song—it picks up the sound as a false note. I have known a canary whose song was spoiled by the piping of a chicken which it had heard, and introduced into its music. Personally, I should not cage a valuable songster with brass wire.—O. B.

Fixing Tops.—E. W. (*East Sheen*).—Yes, the best way of fixing these in similar positions to that referred to is undoubtedly by dovetailing them into the ends; and you are also correct in supposing that this form of construction is independent of machinery: in fact, it is a very ordinary joint. No special tools are required. All you have to do is to mark and cut the dovetails on the ends of the tops. This can easily be done by running the gauge along, of course after you have squared them up, and then forming the dovetail with chisel. Mark off the dovetail on the back edges of the end pieces. With the square scribe lines from back to front of the inner sides of the ends. These lines serve as guides to work to, between which the wood to the required depth must be removed. This can be done with a chisel, using if necessary an "old woman's tooth," a tool with which you are doubtless acquainted, to level the bottom. Should you not know what the "old woman's tooth" is, I may explain that it is a router, and that a short description of one for home manufacture will appear ere long. The sloping side of the groove for the dovetail is also formed by cutting away with the chisel. Such, in brief, is an outline of the process, which will be more fully treated in some projected articles on dovetailing. Instead of doing the whole of the cutting with a chisel a fine saw may be run along the lines to the depth required, leaving the waste wood to be removed with the chisel. Do not cut right through to the front, unless the front edges are to be faced, and of course, whatever distance you stop from the front will have to be removed from the front edge of the dovetail on the top or shelf. In cabinet work it is only necessary to form a dovetail on one side of the tops, usually on the under side, the other being left square. The diagram here given will make this clear. You will see that it is a comparatively easy matter to get the top on the upper side to shoulder well to the end, or, in other words, to make a good fit, as all you have to do is to cut the groove straight. The appearance of the lower side is not of so much consequence, as it is not seen. The parts are to be fastened together with glue, which, however, should not come within a few inches of the front.—D. A.

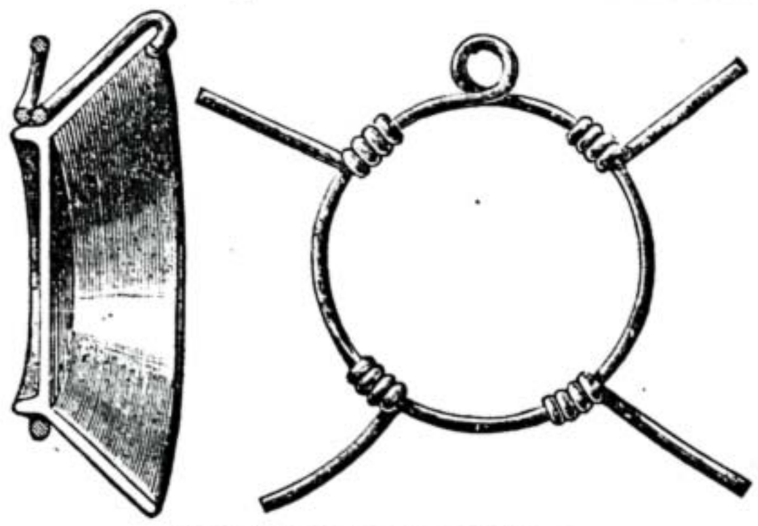


Dovetail for Tops.

Minor Carpentry.—W. H. R. (*London, W.*) writes:—"Might I ask your kind help in the following:—I am desirous of doing various little jobs at home, such as making picture frames, flower boxes, foot-stools, salt boxes, benches, and such-like odd articles; and if you would tell me the tools, with their length and weight, I should require, I should be much obliged. I notice that some saws with a rimmed back, such as butchers use, are also made use of by wood workers. Would I require such an article? What is your opinion of the patent screwdriver advertised by Harger Bros.? The tool does away with the necessity of holding the screw. It is called Kolb's 'Common-Sense Screwdriver.'"—[You shall be shown how to make the articles you mention, and a paper shall be written on a handy kit of tools for beginners. The saw with the rimmed back that you speak of is a tenon saw, and is used chiefly for cutting across the grain and for hard wood. I have one of Kolb's "Common-Sense Screwdrivers" in use. It is a handy tool, but I have been so long accustomed to the ordinary screwdriver that I prefer it to any of the patent screwdrivers.—ED.].

Insurance of Tools.—T. T. (*Kennington*) writes:—"A question I wish to ask is, Can you tell me if I can insure my tools from fire anywhere, and also, if possible, the cost of a policy? I shall feel greatly obliged if you can answer these questions in their turn."—[I do not think there is any office in which men can insure their tools. I shall be happy to consult with any who are interested in this direction as to the practicability of setting on foot a Company with this object. There are difficulties in the way; but doubtless these may be overcome. If any established industrial office, with a large staff of agents, would take the matter up and create a new branch for the development of this object, it would be the more easily carried.—ED.].

Hanging China.—G. D. M. (*Inverness, N.B.*).—It is true that one often finds the old Delft plates with holes bored through them, and a huge knot of string defacing the plaque itself; but, in addition to the risk of drilling the hole, would it not be wiser to hang it with an ordinary plate wire, sold nowadays at most china-ware shops, or, if needs be, made at home easily enough? As the diagram shows, it is but a circle of wire, large enough to slip over the rim—the foot, so to speak—of the plate, with four other pieces twisted on. These are bent



Wire for Hanging China.

over the edge to the front of the plate, and then nipped close off, say, ½ in. from margin, and may be safely trusted to support the most valuable old china. A round frame, turned to enclose the plate as though it were a mirror, is also used at times; but to me it is too heavy for the decoration of a plate, unless, indeed, it be one of the old majolica ones with a pictorial treatment, where, save for the accident of being on earthenware, instead of on a panel or canvas, the plate is to all intents and purposes a round picture.—T. G. W.

Draught Screen.—W. M. D. (*Govan*).—I am sorry I cannot possibly tell you how to make a screen of the kind you describe for the sum you do not wish to exceed, any more than I can tell you how to make a half-sovereign worth 20s. I take it from your description that you want to use Japanese leather paper, but of course common embossed wall paper will be much cheaper. Your question is, however, couched in such very vague terms that I am by no means sure of what you really do want to make. For example, though you give dimensions, you do not say whether you want a folding screen. I can only suppose you do, and you will easily see that the cost depends greatly on the number of folds wanted. With every disposition to assist all who apply for information in "Shop," it is utterly impossible to do so satisfactorily unless inquirers will state clearly what they want. If you write more fully, I shall be able to answer you more helpfully.—D. D.

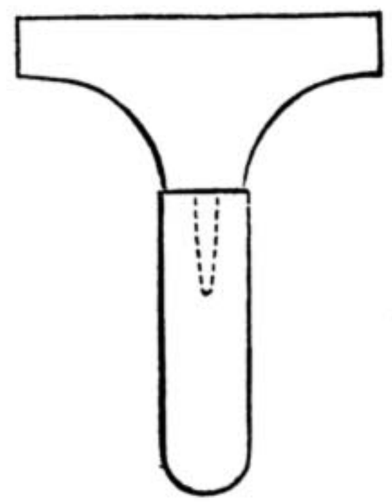
Fire Blower.—R. B. (*Colne*).—Your sketch gives a very fair idea of the thing you want, so that with the following hints no doubt you will be able to make one to suit your purpose, though, if for an ordinary fire, you will find the common bellows do just as well. I do not think the kind you want would be sufficiently useful to justify a lengthy description—at present, at any rate; but if it should seem likely to meet the wishes of any considerable number of readers, an article may be devoted to the subject. Meanwhile, you or any other reader inquiring on any point you may be in difficulty about, will be answered in these columns. Size, of course, depends on use to be made of blower, which consists essentially of a thin narrow box with a revolving wheel inside. This wheel is something like a steamboat screw or propeller, the number of blades depending on circumstances. The blades for a small one may be made of thin brass or block tin fitted into a hub or axle. One end of this projects through one side of the box and has a pulley wheel fixed to it. Near to it is another revolving wheel with a handle. A cord communicates motion from this handle wheel to the other connected with the fan. If preferred, geared wheels may be used instead. A suitable nozzle and spaces for the admission of air complete the arrangement.—D. A.

Inlaying.—H. L. M. (*Birmingham*).—Gum is not suitable for fastening the pieces of inlay together or to the ground. Good ordinary glue is the best thing you can use. Unless the pieces are very thin they will not be injured in colour, though of course if the inlay is very light you will choose a colourless glue. With Lepage's carriage glue you can lay any inlay without fear of discoloration. Fix the inlay up first on a sheet of paper. When dry clean up with a toothed plane, the veneer and inlay being in one sheet supported by the paper. Lay the whole paper side upwards, with a cant on the panel; after the glue has set clean off in the usual manner. You must remember that though it is of comparatively small consequence what kind of glue you use to fasten the pieces of inlay to the paper, if there is much light wood, colourless glue is necessary to attach the veneer to the ground, as the heat of the cant may cause a dark coloured glue to leave a stain. The pattern for fine work should be pounced, as sufficient accuracy cannot be got by tracing. Use powdered asphalte in a piece of muslin or a roll of flannel well dusted with asphalte. After pouncing the design down, hold the pounced pattern to the fire. This melts the asphalte, and the outline is then indelible. You may use coloured chalks instead of asphalte, but the outlines require careful handling, as they are easily erased. By a little adaptation you may use almost any of the ordinary fretwork designs for inlaying purposes; but if you mean designs for marquetry inlays, such as are seen on so much modern furniture, you will find a considerable difficulty in obtaining them, as none are published in this country. Tiersot, of Paris, publishes designs for inlays, but they are not in the style now fashionable here; so they may not suit you. The only thing you can do, or, at least, that I can suggest, is that you apply to any furniture designer whom you may know. He may be willing to supply you; but, as the designs will have to be specially drawn, you must be prepared to pay fairly for them. Possibly Mr. David Adamson, whose name will be familiar to you in these pages, may be willing to supply you. The whole subject of marquetry inlaying will be treated of in these pages in due course.—D. D.

Linseed Oil.—CUMRO (*Rhyl*).—Raw linseed oil may be made thicker by boiling, but by doing this it is rendered unsuitable for French polishing purposes. It will not injure the polish, but if thickened it clogs the work; and it is just because raw oil is thin that it is preferred. I do not know whether I am right in supposing that you wish to render the oil serviceable both for oiling and filling at one operation; but if so, let me attempt to dissuade you from doing this. Your question is put rather obscurely, so I may be wrong in supposing that such is your intention.—D. A.

Reproduction of Fretwork Designs.—I. C. G. (*Reading*).—Yes, fretwork designs can be multiplied by the blue printing process, the reproduction, of course, showing the dark lines of the original white on a blue ground. The original must be interposed between a sheet of glass and the blue paper either in a frame or otherwise. Both papers must be kept in close contact during the printing, or the print will be indistinct. Patterns printed in blue ink, such as those of some of the Italian designs, cannot be copied by this means. The printing may be much expedited by oiling the original, so as to make it semi-transparent. A colourless oil should be used for the purpose.—L. I. P.

Lettering in Gilt.—F. W. H. (*Sheffield*).—In lettering in gilt on leather proceed thus:—Wash the leather with paste-water, *i.e.*, water with a little flour paste mixed in it. When it has become thoroughly dry, coat it over evenly with glaire (prepared from fresh hen eggs); use the whites only, and beat up until a dry-looking, white froth has been formed of the whole mass. After heating allow it to settle. The froth will disappear and leave a clear amber-coloured liquid as thin as water. When the first coat is dry, give it a second, and allow it to dry also. Rub it over with a little hog's lard or olive oil, and lay on the gold leaf. The letters used are made of brass with wooden handles; they are heated over a gas stove, and, when the proper degree of heat is obtained, they are pressed one by one on the top of the gold leaf; the heat causes the gold to adhere to the leather. When the lettering is completed, the surplus gold is rubbed off with an oily rag kept for the purpose. The procedure for cloth is much the same. Omit the paste washing, and give only one coat of glaire. (See reply to ANXIOUS ONE in No. 14, page 221.) In doing the lettering for your sister, you should get a hand palette made with the name and address engraved in relief upon it. Any engraver could make it for you, but it would be best to apply to Messrs. Royle and Son, Lovell's Court, Paternoster Row, as they will know exactly what you want. However, the sketch given above will show the shape of the palette; the lettering is cut on the face.—G. C.



Hand Palette.

Fretwork Designs.—W. V. T. sends a modification of design for cabinet in fretwork, by Mr. Gleeson-White, in No. 1 of WORK, and writes:—"I should be also much obliged if you could tell me of a firm who would be likely to buy designs, and of the usual means of transacting that sort of business."—Your modification of Mr. White's design is very nicely rendered; but I must ask readers of "ours" to take my word for this, as it is not possible to find space to publish it. J. H. Skinner and Co., East Dereham; Harger Bros., Settle, Yorkshire; Booth Brothers, Dublin, all buy designs; but purchase will depend entirely on suitability of

designs for their purpose. The usual mode of transacting business of this kind is to submit designs, and name terms at which you would part with them.

Griffin's Fret Saws.—J. A. J. (*Stratford, E.*)—In reply to your intimation that you "would esteem it a favour if I could give you the address of the makers of Griffin's patent fret saws," I regret to say that I am unable to do so. Possibly Messrs. Churchill & Co., 21, Cross Street, Finsbury, E.C., may give you the information you require, or what would do very nearly as well. If you want to sell them retail they would supply you on the most favourable terms.

Enlarging Camera.—CUPID (*Castlejohn*).—If you have made the enlarging camera as described, you will find the process of making enlargements very simple indeed. The *modus operandi* is as follows:—Put your negative in the carrier with the film side inwards; focus sharply upon the ground glass to the size you desire, in which you are guided by the lines on the glass. Then, in the dark room, put the paper in the slide, fastening it in position with fine drawing tacks, and keeping it to the lines corresponding with those on the glass to which you focussed your picture; put the slide in the camera, draw the shutter, and expose. Return to the dark room and develop the picture. The developer is made up as follows:—No. 1. Neutral oxalate of potash, 8 oz.; boiling water, 16 oz. No. 2. Sulphate of iron, 12 oz.; boiling water, 16 oz. No. 3. Bromide of potassium, 60 grs.; water, 1 oz. For use, mix the developer in the following order:—No. 1, 5 oz.; No. 2, 1 oz.; No. 3, 12 drops. Put the paper in the dish and flow the solution over it; gently rock till the image appears and develops to the required tone. Pour off the developer, and, without washing, flood the print with a clearing solution of sulphuric acid, 1 oz., water, 80 oz. Allow it to remain one minute, pour off and repeat. Then wash well and immerse in fixing bath (hyposulphite of soda, 4 oz., water, 20 oz.) for ten minutes. Wash in running water for two hours; then hang up to dry. Do not dry between blotting paper as in the silver print process. There are various brands of paper in the market, all of which are fairly good and give pleasing results. I should, however, recommend you to use Eastman's C paper; it has a rough surface, and is easy to work, giving pure blacks and whites similar to good pencil drawings. The most difficult thing is to gauge the right exposure—everything depending upon the quality of the light, which in this country is a varying quantity. The best way to find the proper time of exposure is to put a strip of the bromide paper in the slide, giving it different exposures by drawing out the shutter one-fourth of its length, then half, then three-fourths, and then full out, with a pause of, say, half a minute between each pull. Develop the strip and see which part is rightly exposed; then expose your picture accordingly. Keep the camera close to a window, with a northern exposure, if possible, but in no case facing the sun, and raise the carrier end of it as much skywards as you can. Avoid walking about or shaking the floor during the time you are making the exposure, or you will get a blurred image. The foregoing is as concise a description of enlarging as can be given in "Shop;" but if you already know something about photography you will easily grasp the details, and after a few trials succeed in making good pictures; but I must remind you that underexposed negatives will not do for enlarging from. Use negatives that are rather over-exposed, thin, but full of detail, and the results will be pleasing.—G. LE B.

Brass Finishing.—C. H. C. (*Margate*).—This subject will be touched on in due time; but, as I have said before, it is impossible to handle at once everything that it is desirable to handle.

Wooden Beehives.—G. G. (*Hammersmith*).—In reply to your inquiry for papers on the construction of wooden beehives, I will endeavour to give you something to do in this direction in the winter months.

Designs for Wood Carving.—J. P. (*Dundee*).—Mr. George Alfred Rogers, wood carver, 29, Maddox Street, London, W., not only supplies designs for wood carving, but he also lends specimens for learners to copy, carved by himself. It is some time since I have seen or heard from him, but I furnish you with his address, trusting that he is still in the land of the living.

The Tenant's Greenhouse.—G. J. (*Peckham, S.E.*) and J. W. C. J. (*East Dulwich*).—In reply to your letters let me say that Mr. Le Brun's mode of construction referred only to a mode of barring the *landlord's right* to claim a greenhouse erected by the tenant for his own convenience. As to the points mooted in your letters, it would be better for you to place the matter before your respective lawyers, who will advise you according to their conception of the bearing that the Metropolitan Building Act (1855) has upon the subject.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Machine for Current of Air.—CENTREBIT (*Tullow*) writes in reply to BELLOWS (see page 190), who asks in No. 12 of WORK for a machine to give a constant current of air:—"I enclose a few rough drawings of a fan much used in various parts of this country, especially in those districts where the anthracite, or native hard coal, is abundant. It is made entirely of iron, of which Fig. 1 gives the general shape; in height it is about 2½ ft. by 6 in. broad. The large wheel is turned by the hand, and imparts the motion by means of a belt to the small wheel, C (Fig. 2); this is on the fan axle, and the fan, B, inside moves in conjunction with it, drawing in the air at A (Fig. 1), and expelling it through the pipe, B (same figure). It is shown in position in Fig. 3, of which A is the machine, B the hearth, C the fire,

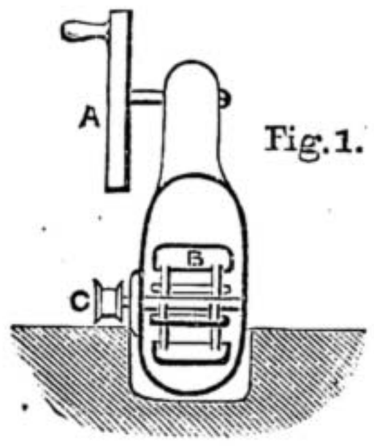


Fig. 1.

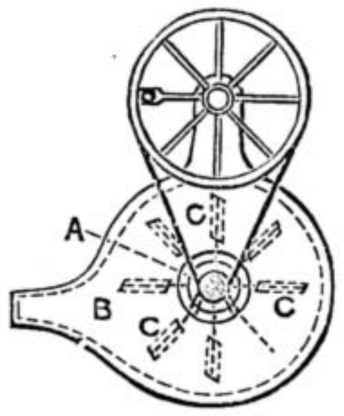


Fig. 2.

Side View: Section.

A, Wheel, Belt off. B, Fan. C, Small Wheel.

Front View.

A, Hole to Supply the Fan with Air. C, C, C, Shows Position of Fan.

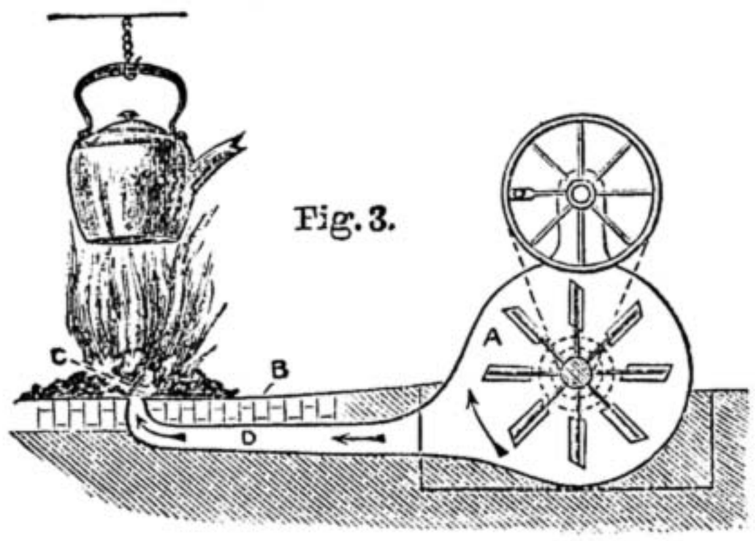


Fig. 3.

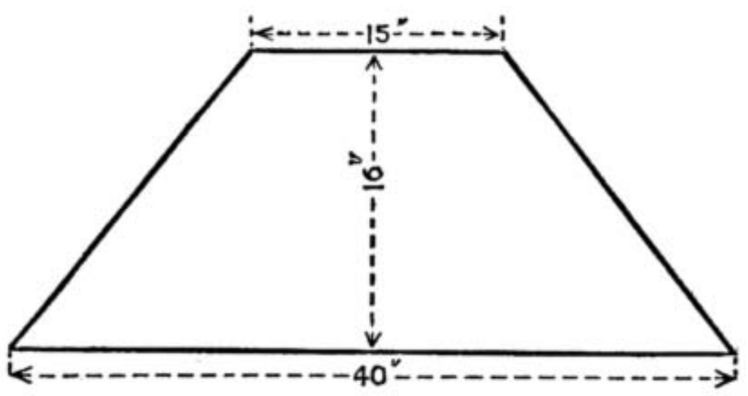
Section in Position.

A, Machine. B, Hearth. C, Fire.

and D the supply pipe. As you see by Fig. 3, it is used with the flat hearth and large open chimney; but I have no doubt that it could be fitted to a fireplace. It is made by Peirce & Co., Wexford, and costs 9s. 6d. I do not black on different parts of it. On the top I drew the flying stork; on the left top corner and right side, the stork standing, and several others on different parts. It made a great difference in the frame, and made it look very pretty."

Drilling Square Holes.—T. M. B. (*Colchester*) writes in reply to A READER (see page 270):—"This appliance was introduced into England many years ago, and Britannia Company advertised it. But not one was sold. It is so much quicker to bore a round hole and drift it out with a square drift with cutting edges. This applies to either metals or wood. The drifts can be driven through with a hammer, or drawn through by a screw and proper appliance."

Dulcimer.—MUSIC (*Govan*) writes:—"In reference to question by T. C. B. in 'Shop,' July 13th, page 268, about sound board of dulcimer, will you allow me to send enclosed sketch with singer marked, as I know it to be the angle to please any one who tries? I am only an amateur, but like T. C. B. have made three dulcimers, and have one at present to dimensions given, which is capable of



Sounding Board of Dulcimer.

playing on platform, or with other instruments if desired, or for that matter anywhere—the corner of the street if you like. Hope you will excuse the amateur sketch, but I like a tip myself, and therefore like to give one when that is possible. Should it be convenient I shall be pleased to let T. C. B., or any others who have a taste that way, examine mine, the shape I mean, not the workmanship, which is only amateur. I trust this may be of some use to those who want to know."

Child's Wooden Toys.—B. A. B. (*Hampstead*) writes in reply to W. A. (*Hanley*) (see page 270):—"He can obtain toys wholesale at several houses in and close to Houndsditch. There is a good little book on making toys, published by Gill, 170, Strand, W.C. It is by J. Lukin, B.A., price 1s."

Trade Note.

"SCRIPP'S League of Newspapers," composed of six newspapers published in the leading cities of the Central States, and circulating largely among working-men, have sent, at their own expense, a deputation of representatives of trades and industries to the Paris Exhibition. These representatives are forty in number, four of whom are women, and include the engineers, foundrymen, sewing-machine makers, blacksmiths, car builders, safe and lock makers, shipbuilders, stove makers, and others; each individual of the forty representing a distinct occupation. Most of the men occupy positions of trust and responsibility in their respective vocations, and the names of several are familiar to us upon this side of the water, as Mr. Robert E. Masters, Joseph Thorpe, Edmund G. Vail, and William J. Keep. It is a pity that our shrewd, practical workmen have not more opportunities for indulging in travel; it would counteract that narrowness of mind which, through no fault of their own, is too generally a feature in their characters. Their observations would certainly be as fruitful as those of their employers.

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