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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

SKYTOGEN is a paper substitute for calico and leather in bookbinding and fancy goods. It is soft and leather-like to the touch, does not scratch so easily as leather, and is not readily soiled as is calico.

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Cycle sections have fallen off considerably. The great variety of sections for tires has caused Sheffield makers of cycle material some expense and anxiety, but the demand for the coming season will be met.

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An electric snow-sweeper, with steel brush at either end, has been used in several towns in the United States with complete effect. It is an electric motor car that drives the steel brush, from enclosed gears, at a normal speed of 1,200 revolutions per minute.

* *

Digging for petroleum or "earth oil" engages two hundred families in Upper Burmah. The future, however, does not present bright prospects if native methods only are retained, as they only enable a depth of 310 feet to be reached, and many of the wells have reached this depth already.

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There is to be a line up the volcano of Popocatepetl. Sulphur and natural ice are wanted for the City of Mexico. Thus a railway is proposed to be worked by electric motors. The quality of the Popocatepetl sulphur is excellent, and, if mined in large quantities, will find a ready market in the United States.

* *

An anomalous condition of things prevails in the hematite market. While the West coast makers consider the lowest price has been reached at which they can make a profit, and decline to quote lower than 57s. delivered in Sheffield, North-Eastern makers, on the other hand, offer hematites at about 53s. per ton.

* *

A new manufacture is glass sheet, with wire netting embedded in it, for use in roofs and other situations in which the fall of broken glass is a source of danger. It is also to be used for footlights and windows, thick glass, with heavy steel wire netting, being made for burglar and missile-proof purposes where light is required.

Wood concrete of a novel character is now being made in Germany. It consists of chips, shavings, and clean mill waste of plain or fancy woods, which can be stained to requirements before use. These are mixed with casein, calcined limestone, glycerine, sodium silicate, and linseed oil. The dry composition is hard and solid, and can be sawn, planed, and polished.

* *

In yet another method of extracting aluminium which has been elaborated, the aluminium oxide is extracted from pure clay and dissolved. The solution is treated with an electric current, which deposits the metal —almost pure—on brass plates, from which it is removed in the form of a silvery impalpable powder, which is subsequently melted into ingots.

* *

The number of men and boys employed on the Manchester Ship Canal, from November, 1887, to November 18, 1892, has been 10,500 per annum. The list of killed or dying from injuries received on the works has reached 130—an average of 26 a year; the array of permanently disabled is 165, and those partially injured, 997. The total number of accidents of all kinds has been 1,292.

* *

For experiments in electrical communication, a shore wire, a mile long, has been erected on the Welsh coast, a little to the south of Cardiff, and a receiving wire on the island of Flat Holme in the Bristol Channel. The shore line was furnished with a powerful generator, and the island line with a sounder, and words despatched on to the mainland wire were distinctly heard on the island, the wires acting by induction. The wires are parallel, and the distance between them is about three miles.

* *

A new method of measuring, at a distance, the rate of rising of a river after a fall of rain has been devised. An organ pipe of square section is inverted with its open end in the water, which then acts as a stopper to it. It is sounded by a bellows driven by a very small water-wheel. The note varies with the water level, and is conveyed by a micro-telephone to a town station, where a duplicate organ pipe is placed in a tank; this is raised or lowered to give the same note as that coming through the telephone, and thus the rises and falls of the river level can be measured at the tank.

In the new small arms factory at Herstal, the mechanical transmission of power from the engine to the machine tools by belts or ropes is abandoned in favour of electrical transmission. A 500 horse-power dynamo is fitted on the shaft of the engine, which is 460 horse-power. The current generated by this dynamo is used for driving small motors varying in size from 3 to 37 horse-power. The main dynamo had to be specially designed to run at the lower speed of sixty revolutions per minute. The armature is about 16 ft. in diameter, and acts also as a fly-wheel to the engine. The machine develops 2,400 ampères at 125 volts.

* *

The longest telephone line ever constructed, exceeding by at least 450 miles that in operation between Paris and Marseilles, extends between New York and Chicago. The line is constructed of No. 8 hard-drawn copper wire, weighing 435 lb. to the mile, the total length being 950 miles. It is strung upon poles, the utmost care, of course, being paid to insulation, and the use of cables has been avoided wherever possible. The two wires forming the circuit are run on what is called the balance principle—that is, the wire from New York passes on the north side for a short distance, then crosses to the south side, then back to the north side again, this arrangement being adopted in order to avoid induction.

* *

A gas of very high illuminating power is secured by injecting oil into red-hot retorts by means of steam, the oil used being a heavy hydro-carbon. Results obtained by this process compare with coal as follows:—

	Cb. Ft. Gas per Ton.	*Candle-power.*
West Lowthian oil ·840 sp. gr.	24,922	60·15
,, ,, ·890 ,,	23,573	55·29
,, ,, ·870 ,,	24,383	56·26
,, ,, ·870 ,,	24,396	57·65
Westfield oil (crude)	16,755	49·03
Walkinshaw oil ·653 sp. gr.	19,464	46·23
Boghead coal	14,900	42·19
Cairntable coal (1872)	11,294	35·75
Haywood coal (1884)	11,360	32·12
Lesmahagow, Auchenheath coal (1882)	13,201	34·52

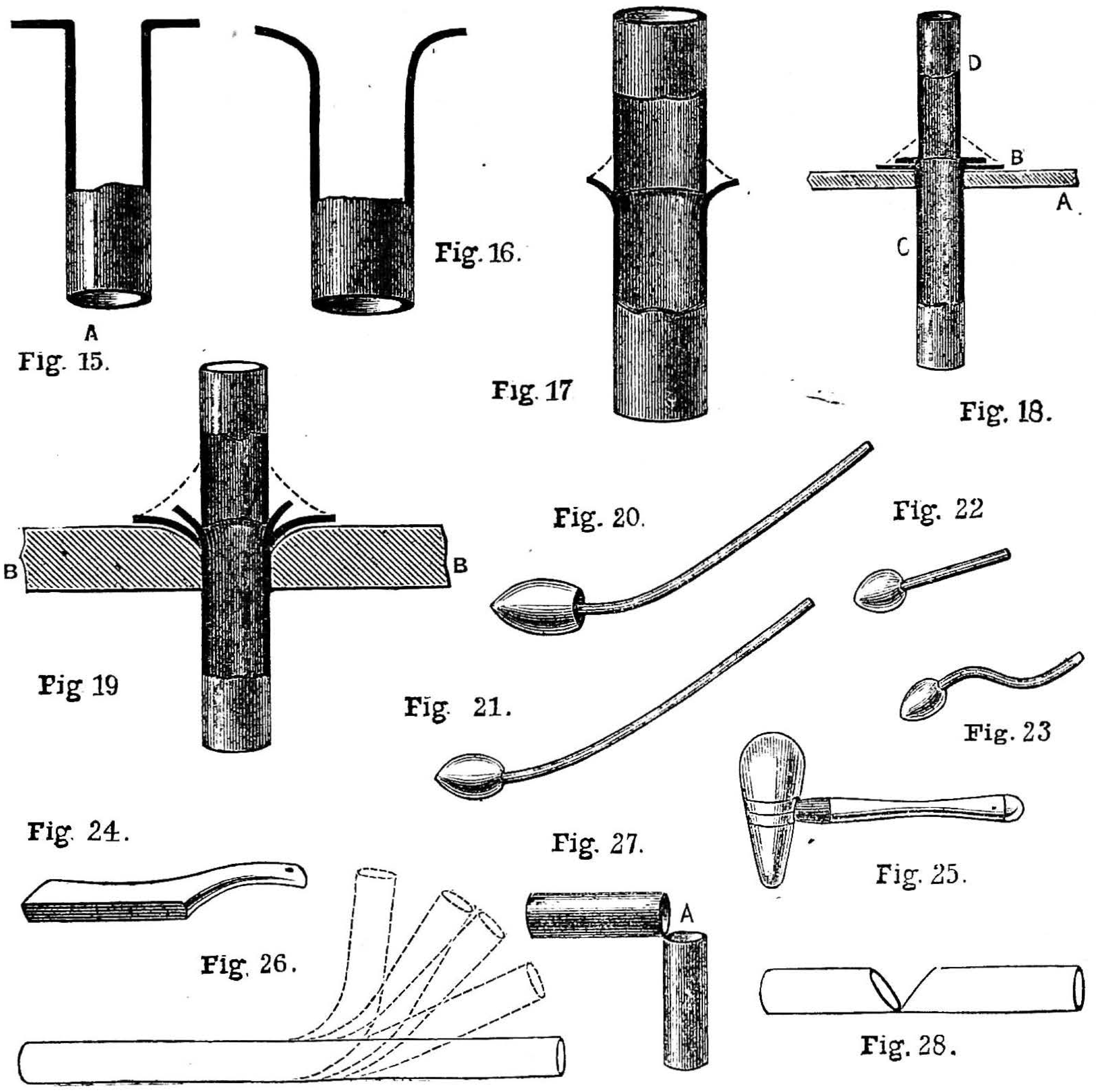
Each result shows how vastly superior some heavy oils are than coal for the production of illuminating gas, not only for quantity of gas yielded, but also in the candle-power of the gas.

PRACTICAL PAPERS ON PLUMBING.

BY R. A.

JOINT MAKING (*concluded*) — THE TAFT JOINT, BLOCK JOINT, FLANGE JOINT — GENERAL REMARKS ON JOINTS — PIPE BENDING EXPLAINED AND DESCRIBED.

Taft Joints.—These are not much in favour with skilled plumbers, but are often made nevertheless by others not so well up in the trade. They are very much decried by some, but if properly constructed they are a strong, useful joint. The method of operation is to taft back the edge of the lower pipe from 1 in. to $1\frac{1}{4}$ in., according to the size of the pipe, and here is where many spoil the joint. Figs. 15A and 16 show bad and good tafting; in Fig. 15A you will notice that the pipe is flanged back quite sharp and square. It is thus rendered very weak at the angle, and liable to break off there if there should be any weight or expansion and contraction of the pipe; but if made with an easy curve, as shown at Fig. 16, the joint when completed (see Fig. 17) is a very good one. It is probably the easiest of all wiped joints to make. After tafting back the pipe, shave the inside, soil the top pipe 4 or 5 in., and shave the end $1\frac{1}{4}$ in.; place in position, "touch" round, and either pour or splash on the solder, and when sufficiently plastic wipe as before described.



Practical Plumbing. Figs. 15 A and 16.—Sectional Views of bad and good Tafting. Fig. 17.—Section of Taft Joint. Fig. 18.—Section of Flange Joint. Fig. 19.—Section of Block Joint. Figs. 20 to 23.—Dummies. Fig. 24.—Dresser. Fig. 25.—Bossing Mallet. Fig. 26. —Diagram showing Stages of Bending. Figs. 27 and 28.—Diagrams illustrating Theory of Bending.

Flange Joint.—This is mostly made where a pipe comes through a floor (see Fig. 18). To make this joint, first cut a lead collar or flange 3 in. or 4 in. larger in diameter than the pipe that is to pass through it; cut a hole the exact size of the pipe, and slip it over it, then cut the pipe off so that it stands up $\frac{3}{4}$ in. or 1 in. above the flange. This is best done with a tenon saw and piece of board the requisite thickness of the stand-up that you want. Next drive the turnpin in to swell the pipe out a little, and then work the pipe down on the collar; prepare and make the joint as described in taft joint. In Fig. 18, A represents the floor, B the lead collar or flange, C the lower pipe, D the upper pipe, and the dotted lines the wiped soldering. This form of joint is mostly used for small pipes.

Block Joint (Fig. 19). — Although this appears similar to the flange joint, yet it is differently fitted, and is much stronger. B B is a section of the wood block through which the pipe passes, which is fixed in the wall to support the pipe. This block is dished out as shown, and the lead flange, with a hole cut in it, that will just admit the pipe, is dressed down into it; the pipe is then passed up through the block and flange, and the turnpin driven in as previously mentioned to open out the pipe. Now, instead of dressing it sharply back on the flange, it is left as shown in the sketch, so that the solder will run underneath as well as above the tâfting, thus forming a very strong substantial joint. Of course it will be noted that the outside of the pipe that is tafted back will require to be shaved and "touched" as well as the inner part. It is also advisable to "tin" the lead flange before putting in place, to ensure more perfect cohesion between the parts. This class of joint is mostly used when soil or vent pipes are fixed in the interior of dwellings, in a chase or cutting left in the wall for that purpose. These are the principal joints used in plumbing practice, and when proficiency in making these various joints has been attained, the groundwork of plumbing may be said to have been learned. Much argument is sometimes heard as to which is the strongest, a blown or copper bit joint, or a wiped joint. Well, though the former joints are very good and useful joints when in their proper place, yet no sensible man would contend that a wiped joint was not superior in strength; if not, how is it that so many water companies will have no others made on their service pipes? The fact is that no other soldered joint will stand an equal amount of pressure or rough usage, or will stand the expansion and contraction of the pipes like wiped joints will. This is due to the well-known fact that plumbers' solder approaches very much nearer to the composition of the pipe to be jointed than does the solder used with copper bits or blowpipes; it is also tougher and more tenacious. These are a few of the reasons why wiped soldered joints are preferable for good plumbing work; others could be adduced, but these I think will suffice.

Pipe Bending.—The art of bending lead pipes, especially those of large diameter, was not very extensively practised till within the last thirty or forty years, and there are many plumbers at the present day who cannot bend a piece of 4 in. or 5 in. soil pipe successfully. And at the same time it is a fact that pipes of this kind and size can be bent successfully to any required degree of angle, and that without diminishing their size or thickness in any part; some practice, of course, is requisite before this degree of skill can be attained. I will now describe the process, and by care and strict attention to details a successful job may be made by anyone conversant with the use of tools. The only tools required for bending large size light pipe, say from $3\frac{1}{2}$ in. to 6 in. in diameter, are a plumbers' mallet, dresser, and some dummies. These dummies are simply long pieces of pipe or iron rod with a lump of lead run on the end. They are illustrated at Figs. 20 and 21; short ones, Figs. 22 and 23, are also required when the bend is near the end of the pipe. The dresser and mallet are shown in Figs. 24 and 25. To bend a piece of 4 in. pipe (which we will take as our example) is a two-handed job. The pipe should be first heated in the place where the bend is to be; this may be done in various ways. Some plumbers put some lighted shavings down the pipe and pull them out when it is sufficiently hot; but I prefer to use a blowlamp, as the heat can then be directed more definitely to the place where it is wanted. The pipe should be just hot enough to make a fizzing noise when a splash or two of water is dropped upon it. Next place the pipe on the floor on a bag of shavings or something similar; take a couple of pieces of stout carpet in your hands, and let your mate pull up the pipe a little bit, you holding it firmly in the bend, and shape it as well as you can. Do not let it be pulled up too much at once; just sufficient to dent it across the throat of the bend. Fig. 26 shows a straight piece of pipe, and the dotted lines the various stages of bending to get it to a right angle, or square bend, which is the farthest that pipe of this description is required to be bent. After pulling up, and whilst the pipe is still hot, take one of the long dummies and lightly dummy up the part that is dented in, taking care not to strike the back of the pipe, or it will make it thin at that part. Give the sides a rap with the dresser where they are pressed out. When you have got the pipe fairly into a round shape, it must be warmed again, and the pulling-up process repeated. This time let your mate hold up the dummy inside and dress the sides into shape, giving the blows a direction towards the back of the bend, so as to thicken the lead at that part, as it is thinner there the more it is bent, unless this is done. I will explain this presently. Repeat these processes till the bend is brought to the desired shape, then with the joint use of mallet, dresser, and dummy remove all marks as far as possible, and the bend is completed. Should the bend be near the end of the pipe, a piece of wood called a mandrel must be inserted at the end to afford a leverage to pull up by. It should enter the pipe about 6 in., and should just fit it. The diagrams Figs. 27 and 28 will explain what I meant by saying that the lead would be thin at the back of the bend, unless it was assisted by bringing lead from the throat, or inside part of the bend. Fig. 27 shows a piece of pipe cut nearly through and then bent at a right angle. It will be seen that there is a vacant space at A. Fig. 28 shows a piece of pipe with a V-shaped piece cut out; this, if pulled up together, will form an angle similar to Fig. 27, but with no vacant space, and the piece cut out would, as near as possible, fit in at A (Fig. 27). It will thus be seen that in making a bend there is much superfluous metal in the throat that must be worked round to the back to supply the deficiency there, caused by the stretching of the metal at that part. This can be done by careful and well-directed blows, making the bend an equal thickness throughout. A badly made bend is thin at the back; a bend that is thin can easily be detected by giving a blow in different places, and with equal force (light blows of course), and noting the part that dents the easiest.

Bending Small Pipes. — The method just described of bending soil or funnel pipes will not be suitable for small bore pipe such as is used for water service, overflows, etc. Strong lead service pipe, up to 1 in., can be easily bent by pulling round, if the bend is not made too sharp, and the plumber should always make his bends as easy as possible. When a sharp bend has to be made in a long piece of pipe, it is best to cut the pipe near to where the bend is to be made, then when pulling round, if the throat contracts, it can be worked out to its proper size by means of what is called a bolt or tommy (see Fig. 11, p. 578). These are made of iron or steel, with the ends well rounded and quite smooth.

Bending with Water or Sand.—Some plumbers adopt these methods for bending small pipes. In the former method the water should be poured in *hot*, and the ends plugged tightly or flattened close, and the soldering-iron run over the ends to keep the water from bursting out when the pressure of bending comes on it. In bending with sand, the sand may either be put in hot, or the pipe can be heated in the place where the bend is required. After filling, one end should be plugged, then the sand rammed in as tightly as possible till the pipe is nearly full, and then plug or close the other end. In bending pipes they should not be bent over anything sharp, but they should be "humoured" as much as possible. The great point to be aimed at is to keep the pipe full size at the bend, otherwise its effectiveness is reduced.

BAMBOO FURNITURE: A WRITING-DESK AND TEA-TABLE.

BY C. S. V.

Introduction.—In placing before the readers of WORK these designs for bamboo working, I do not think any apology will be needed for what I might call introducing the subject—one which all can turn to. Bamboo furniture is in itself very artistic, and is much seen in lately furnished houses, more especially in drawing-rooms where there is an appearance of Eastern art, by the many coloured silks and highly-tinted fans, and other ornamentations that abound; and if strongly and carefully made, will be found very durable indeed, as well as handsome, and, I am sure, will repay anyone the trouble expended thereon. The two designs given are very simple, and to the ordinary amateur should not be difficult, as anyone with a knowledge of carpentry and the use of tools should be able easily to construct them.

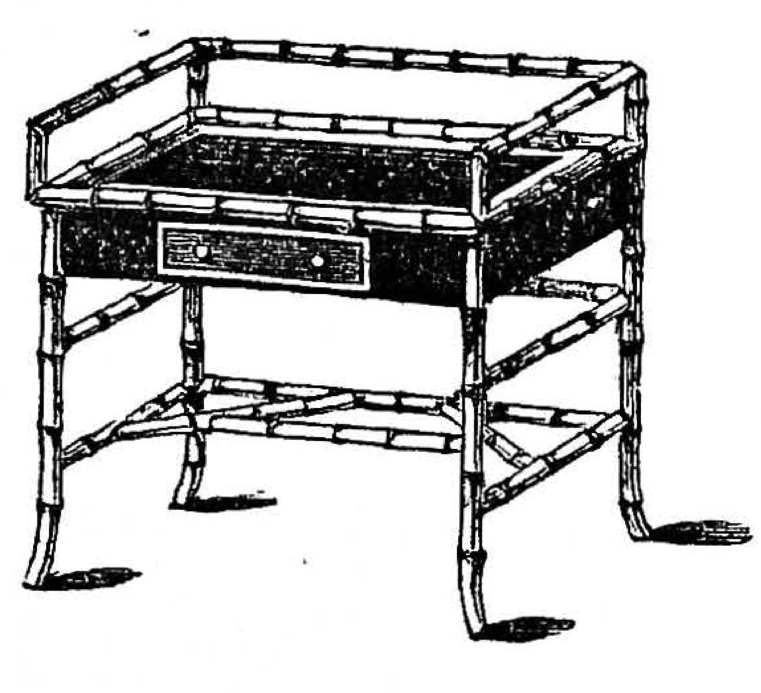


Fig. 1

Fig. 2.

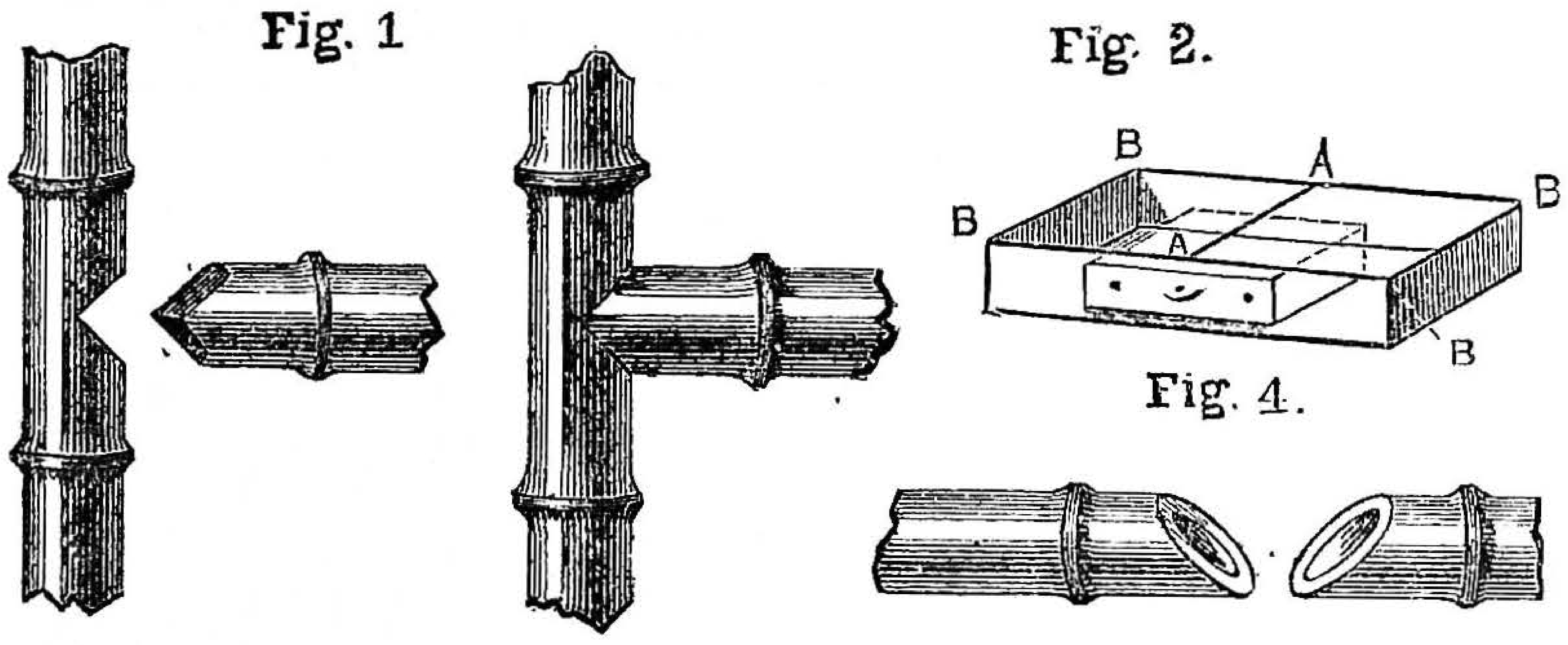


Fig. 4.

Fig. 3.

Bamboo Furniture. Fig. 1.—Bamboo Writing-table. Fig. 2.—Bamboo Card-table. Fig. 3.—Plans, showing Joints in Bamboo and Mode of fixing same. Fig. 4.—Plan of Drawer in Fig. 1.

I will now give a few hints enabling anyone to make either one or the other of these designs.

Heights.—The most convenient measurements for the writing-desk will be as follows:—Height (exclusive of outside railing) 2 ft. 6 in., the depth 2 ft., and the length 3 ft. 2 in.; and for the tea-table: height 2 ft. 7 in., length 3 ft., and depth 2 ft.

Construction.—Fig. 1 shows a view of the desk complete and finished; but we had better first commence by making Fig. 4, which is the skeleton of the top part, and which consists of a simple tray cut for a drawer to be inserted. I may add that two drawers would look as well as one, and would be equally easy to make. A small bit of wood dividing the tray, and running from A to A, will be required so that they keep their position. We shall then require a nice bit of wood—say, walnut—well stained and polished, to go over the top, and to run from B B. The edges had better be rounded and polished and well finished-off, so as to add to its beauty. Next we shall get our bamboos and arrange them as Fig. 1, fastening the legs by small screws on to Fig. 4, at the top of each corner; and by running bars across, and fastening them by screws and joints as Fig. 3, we shall make the whole very secure. The bamboos round the sides of the desk will be required to be neatly fastened, as also the rail; and this can be done by running small screws and nails under the sides of the canes. With regard to the table, the top can be fitted with tiles or plain or carved wood; and the construction is similar to that of the desk.

In conclusion, if the desk or table is stained and varnished a dark colour, and carefully done, I have no doubt it will be a success. Information as to bending bamboos, and where they may be bought, can be turned up in the back numbers of WORK. And the number of firms who sell bamboos who advertise, or should do so, in WORK, disposes of the question, Where to buy the bamboo?

HINTS TO USERS OF MILLING CUTTERS.

BY N. MACLEAN.

BEFORE setting the cutter to work on any material, first ascertain the number of revolutions the milling-machine spindle is making per minute, then multiply number of revolutions by circumference of cutter in feet, which will give cutting speed in feet per minute. This should be approximately as follows:—On cast iron, 60 feet per minute; on wrought iron, 48 feet per minute; on steel, 36 feet per minute; on brass, 120 feet per minute. The above rule relates to cutters of 6 in. diameter and upwards.

If there is not any great depth of material to be cut away, the feed per minute should be about:—On cast iron, $1\frac{5}{8}$ in. per minute; on wrought iron, 1 in. per minute; on steel, $\frac{1}{2}$ in. per minute; on brass, $2\frac{5}{8}$ in. per minute. When working on cast iron, a very easy way to ascertain how many revolutions the spindle should make with cutters 6 in. in diameter and upwards is to divide 240 by the diameter of cutter, which gives the proper number of revolutions the spindle should make; thus:—A cutter 8 in. diameter $\frac{240}{8} = 30$ revolutions per minute. Do not use blunt cutters; have them re-ground as soon as the teeth become dull.

ENAMELLING PRINTS WITHOUT GELATINE OR COLLODION.

MIX oxgall and alcohol in equal parts without frequent agitation, and allow to stand two days; finally filter the resulting solution. Place the albumenised print in close contact with a glass plate coated with the above mixture. Drying will be complete in about one hour. The print can then be removed by peeling, and will be found to be highly enamelled. To mount the print without loss of gloss, affix a sheet of paper to the back of the print while it is on the plate. The outside of the paper is then coated with gum or dextrine. When detached and pressed down upon a mount with a thoroughly damp surface, the print will be permanently mounted, and yet possess all its high finish. It should be thoroughly rubbed down and passed through a cold burnisher, with the print in contact with a zinc plate without flaw of any kind.

HOW TO VENTILATE A ROOM.

BY E. DICKER.

Introduction. — Hardly any other subject has occupied the attention of scientific men to a greater extent than ventilation. It is a well-known fact that every room should be supplied with a steady flow of fresh air in order to secure the health of its occupants, and to do this without draught is often a very difficult matter, as so much depends upon size, situation, and construction. The object of this article is to give a method by which the ventilation of nearly all ordinary rooms can be greatly improved. It is a very simple matter to admit fresh air to a room by opening a window, but what is the result? — a draught, especially in cold weather. So we will first consider the various methods of admitting fresh air without a draught, and afterwards the means of getting rid of the heated or otherwise vitiated air, bearing in mind that one of the principal considerations of these articles is economy, and following that, the wish of most of the readers of these pages for a *modus operandi* that they can carry out themselves.

Fresh Air Inlets. — Figs. 1 and 2 show what is known as a "Sanitary Rail." It consists of a piece of wood about 6 in. wide, fitting in tightly between the side sash beads and on top of the bead of the inside of window-sill, secured by dowels at bottom and two ordinary blind bolts on the top, that bolt into the beads on either side. This enables it to be readily removed for the purpose of cleaning the windows, etc. Now, by raising the sash about 5 in. a current of fresh air is admitted between the meeting bars of the upper and lower sashes in the direction shown by arrows. The meeting bars of an ordinary sash being above 6 ft. from the floor, and the space between the two sashes forming a short shaft, the air is directed upwards, so that nobody in the room feels any inconvenience. Fig. 2 shows the sectional end of the rail, with a piece of indiarubber piping inserted and glued in a hollow groove, against which the face of the bottom sash slides, and thus prevents a draught at this point. I generally put a similar piece along the bottom of the rail, to make a good joint down on to the bead.

The above is the simplest and cheapest form of fresh air inlet, but it is open to the objections that it does not sufficiently direct the current upwards; also, that it lets in smuts and blacks, etc., as well as fresh air.

Figs. 3, 4, 5, and 6 are elevations, and sections of what are known as "inlet air tubes," and can be made either of zinc or wood. This consists of a tube from 2 ft. to 6 ft. long, with a valve, as shown at B, to regulate the quantity of air, and a filter, A, made of coarse canvas or muslin stretched on a wire frame and dropped into the tube from the top, and made removable, so as to enable it to be dusted about once a week. This entirely prevents any dust, etc., getting into the room, and tends to break up the current and diffuse the air more generally. The back part of the tube is carried up a little higher, and bent slightly forward to throw the air away from the wall and prevent its being marked; an opening is formed at the bottom of the back of the tube, as high up as the skirting is deep, with a flange as shown at C, to make a good joint to the opening.

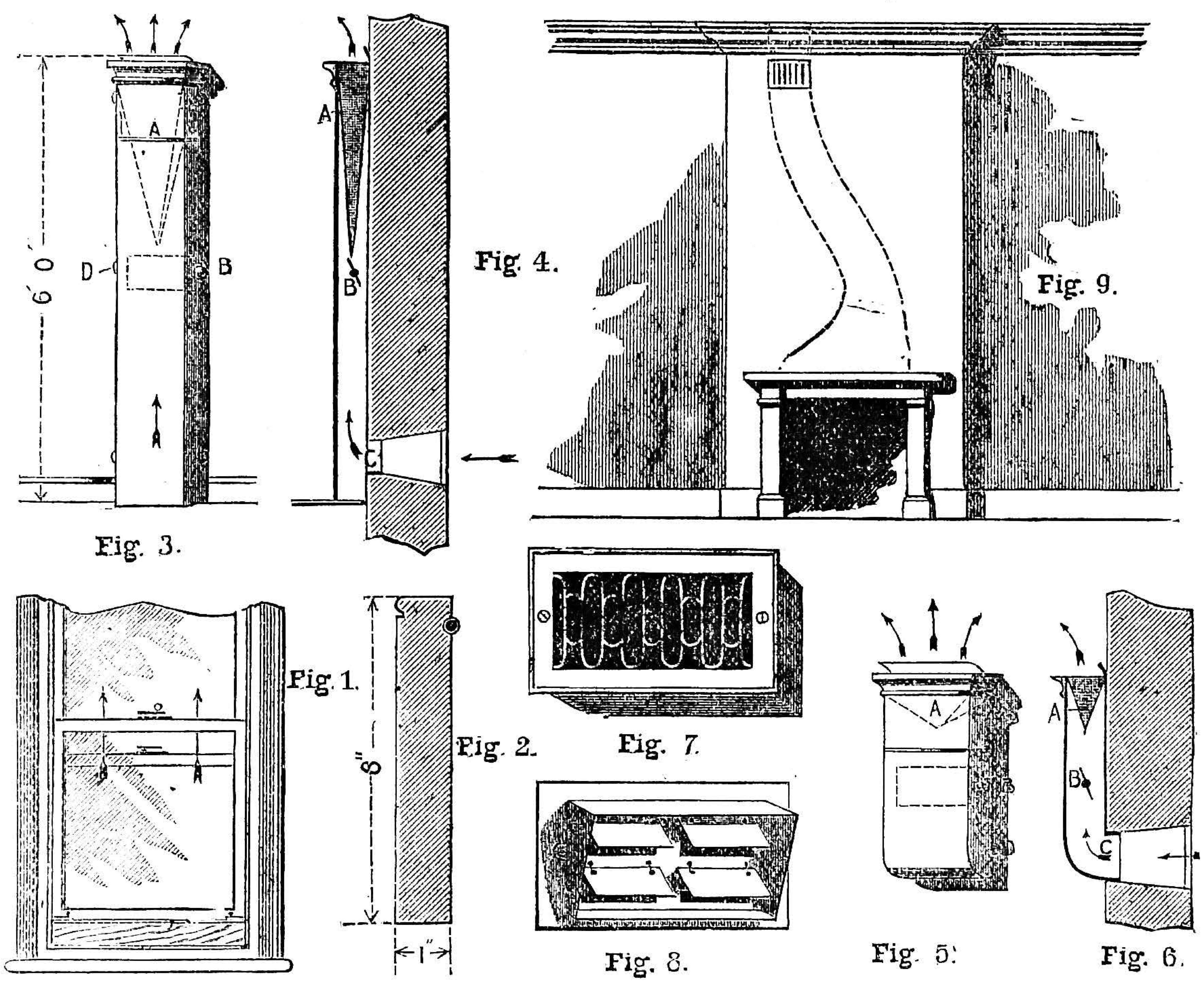
To fix these tubes, it is necessary to cut a hole through the wall, communicating with the open air. This hole should be at least about 3 in. by 9 in., and be made a little larger outside than inside. To cut this hole, first determine by examining both inside and outside the wall the most convenient spot for cutting, taking into consideration the appearance, etc., it will present when finished. The best place is just above the wood skirting, if this is practicable, and the farthest point away from the fireplace. Commence by cutting a small hole right through the wall about the centre of the hole when finished, taking great care not to burst the plaster away when cutting from the outside, or the brickwork when cutting from the inside, and from this small hole work all round carefully until it is the size required. A terra-cotta or iron air brick should be fixed on the outside of hole, and the inside roughly rendered with cement or mortar, so as to present no obstruction to the current of air. To fix the tube inside, small ears are formed on the sides, as shown at D, Figs. 3 and 5, if the tube is made in zinc, but if it is made in wood, looking-glass plates should be used. The flange, C, is then passed into the hole, and the tube simply screwed to the wall; the inside tube should be fixed before the air bricks outside, so as to enable you to make good round the flange, and thus prevent draught. Sometimes a water-trough is inserted at the bottom of the hole through the wall, to catch the blacks and other impurities, but in our case it is hardly necessary. The action of the "inlet tube" is as follows:—The fresh air enters through the opening in the wall near the floor level, and by means of the vertical tube is caused to take an upward direction, owing to its natural pressure, and the extra velocity it attains in passing through a long narrow channel. It continues upward as a direct column of air, equal to the area of the tube, for several feet above it, spreading over the upper part of the room, and then getting warmed, passes away through the outlet in the chimney, which we shall speak of later on.

Figs. 5 and 6 are elevation and section of a shorter tube, but being shorter, the air does not gain such a velocity as it does with a longer one; these shorter tubes are generally used when it is found impossible to make the hole through the wall at the skirting level.

We now come to the outlet ventilator (see Figs. 7 and 8); and although the one I am about to explain is open to some objections, it is almost the only form that is suitable for an ordinary room, where no thought has been given to the ventilation of the various rooms in the building of the house.

It consists of an iron frame, hung in which there are four or more mica flaps or valves. These flaps are light, rigid, and incorrodible, and are so sensitive that they open with the slightest appreciable outward current into the chimney flue (to which they communicate), and immediately close against down draughts, and effectually prevent the smoke entering the room. There is an ornamental iron front that screws on to the body of the ventilator, this front being also very useful in covering up any damage done to the plastering round the hole in cutting into the flue. Sometimes these iron fronts consist of an ornamental "hit and miss" ventilator, and are worked with cords and pulleys, so as to close the outlet when necessary, and prevent the noise of the flaps flapping against the iron frame.

These "mica flap" (outlet) ventilators, as they are called, are sometimes made with the mica flaps hanging perpendicularly down and always open, unless there is a downward current, which downward or



How to Ventilate a Room. Figs. 1 and 2.—Sanitary Rail. Figs. 3, 4, 5, and 6.—Inlet Ventilators—A. Air Filter; B, Valve; C, Flange; D, Ears for fixing. Figs. 7 and 8.—Mica Flap Outlet Ventilators. Fig. 9.—Sketch showing supposed direction of Flue and position of Outlet Ventilator.

backward current at once closes them for the time the down current lasts. Some are made with the flaps resting on the iron frame continually, until there is an outward current to open them. This latter method is not to be recommended, as I and many others have found in practice that the fact of them resting on the iron frame when there is not a good current of air, or the room is not in use, they get stuck, as it were, to the frame, and refuse to work when required.

These outlet ventilators should be fixed as near to the ceiling of the room as the cornice or other obstacle will allow, and the only difficulty is to find the exact position of the flue near the ceiling. This does not present much difficulty to the practical man, but with an amateur it is very different; but I will endeavour to explain how it can be done with a little care and disregard of soot.

First look carefully up the chimney, and see if you can see the direction the flue takes; be very careful in this, as the flue, if properly built, sometimes takes just the opposite direction it appears to directly after leaving the fireplace opening. (See Fig. 9.) In some flues you can see the sky on looking up; and although this is exactly what you should not see in a properly constructed flue, it makes the finding of the position of the flue on the face of the chimney crest a very simple matter.

If you cannot exactly determine the direction of the flue even with a light, pass a stiff cane so far up the flue as just to reach the ceiling level, and get someone to wriggle it about whilst you listen, with your ear to the wall or the chimney breast near the ceiling, and in nine cases out of ten you can easily locate the spot where the flue is.

Having determined the position of the flue, make a small hole through the brickwork, about 6 in. below the cornice, into the centre of the flue as near as you can guess. Now that you have made sure you *are* in the right spot, take the ornamental front off the ventilator, and mark out on the wall the exact outside size of the body with the flaps attached, and working from the centre, gradually make the hole the size required, being very careful not to damage the plaster and paper round the opening. When the hole is cut, put the body of the ventilator into its place, wedging it in position with small pieces of slate, and make good round it with plaster, and screw on the front with a little painters' putty between the two frames, to prevent the smoke coming through any joint there may be. If this operation has been performed properly there is no occasion for any appearance of dirt or damage round the ventilator.

I should have cautioned you to close the register of the stove before commencing to cut through the wall; the pieces of brick, etc., can be readily removed afterwards by carefully opening the register and inserting your arm into the flue and taking the rubbish out.

The size of ventilator for an ordinary room in a ten-roomed house should not be less than 9 in. by 7 in., and the inlet about 9 in. by 4 in. The cost of a 9 in. by 7 in. outlet mica flap ventilator is about 8s., and a zinc inlet ventilator 9 in. by 4 in., 6 ft. high, about 15s.

Iron castings that are to receive a coat of paint should be first well rubbed with a piece of common coke, and then painted, when they will present a much better appearance.

AN ELECTRIC HAMMER.

BY G. E. BONNEY.

Introduction — Electro-Magnets — Magnetic Shell—Hollow Electro-Magnets, or Solenoids—The Action of a Solenoid applied in the Construction of an Electric Hammer—Parts of the Electric Hammer—The Legs, or Frame of the Hammer — The Cylinder, or Bobbin.

Introduction.—The little toy described and illustrated herewith is made and sold for 12s. 6d. by Mr. G. Bowron. It is intended to practically illustrate the magnetic action of an electric current in a solenoid. It may not be generally known that a solenoid is a hollow electro-magnet. If we take a piece of iron, and wind around it some insulated wire, then send a current of electricity through the wire, the current will induce in the iron a magnetic effect, and convert it into a magnet whilst electricity is passing through the wire. Such an arrangement is named an electro-magnet, because the magnetism of the iron core is dependent upon the electric current passing through the wire wound over the iron, and ceases when the current is stopped. This magnetic influence is always present in and near a conductor of electricity, whether wound around iron or any other metal, or not wound on any metal at all. The presence of iron merely demonstrates the existence of magnetism, because iron is easily magnetised. If we pass an electric conductor through a piece of cardboard placed in a horizontal position, and sprinkle a few iron filings on the upper surface of the card, near the conducting wire, the filings will arrange themselves in lines radiating from the wire, as the spokes of a wheel radiate from its centre. These become more distinct when the card is gently tapped or shaken. This shows that a conductor of electricity is always surrounded with a shell or halo of magnetism, and this has been named the magnetic shell of the conductor. Now, if we wind the wire around a bobbin of wood, and place this over the iron core, as in making a magnet for an electric bell, we get the same magnetic effects in the core as when we wound the wire direct on the iron. Remove the iron core from the bobbin of wire, and the coil still remains an electro-magnet, but is now named a solenoid, because it is a hollow electro-magnet without an iron core. It has now a core of air, capable of being magnetised, and this core will attract to itself a piece of iron brought within the sphere of its magnetic influence. If, therefore, we connect the wire of the coil to a source of electricity, and place the tip of the abstracted iron core to the opening of the bobbin, the magnetised core of air will attract to itself the iron core, and suck this into the bobbin. If a strong current of electricity is sent through the wire, the core will be strongly magnetised, and the iron will be drawn into the bobbin with some amount of force. This sucking action of the current is shown in the toy under consideration, where the piston of the hammer is drawn into the cylinder when a sufficiently strong electric current is sent through the wire.

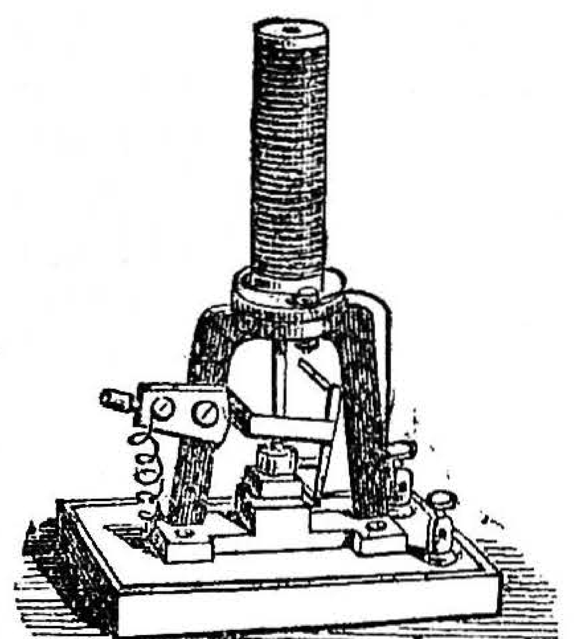


Fig. 1.—Bowron's Electric Hammer.

Parts of the Electric Hammer. — This little hammer may be regarded as a model of a Nasmyth steam hammer, and is therefore made up of the following parts:—(1) The legs or frame. (2) The cylinder. (3) The piston of the hammer. (4) The hammer head. (5) The block or anvil, and its base. (6) The regulating gear, or, in this case, the make and break arrangement. I shall first describe Mr. Bowron's toy as illustrated at Fig. 1, and then suggest, under each head, how the various parts may be modified to suit the requirements, skill, and pockets of amateur makers. In this way I hope to meet the wants and wishes of all my readers.

The Legs, or Frame of the Hammer.—This, together with the base and block of anvil, and also the cylinder, is formed of one piece of cast brass (obtainable for 1s. 9d. by post) in Mr. Bowron's novelty. The dimensions of this are as follows:—Height of frame, $2\frac{1}{4}$ in.; legs, $2\frac{1}{8}$ in. by $\frac{5}{16}$ in. by $\frac{1}{8}$ in.; feet, 1 in. by $\frac{1}{2}$ in. by $\frac{3}{16}$ in.; base, including feet of legs, $2\frac{5}{8}$ in. by $\frac{1}{2}$ in. by $\frac{3}{16}$ in.; anvil block, $\frac{5}{8}$ in. by $\frac{1}{2}$ in. by $\frac{1}{2}$ in. Cylinder—length, $2\frac{7}{8}$ in.; diameter of bottom flange, 1 in., thickness, $\frac{1}{8}$ in.; diameter of top flange, $\frac{11}{16}$ in., thickness, $\frac{1}{16}$ in.; diameter of body, $\frac{3}{8}$ in. A lug $\frac{5}{8}$ in. by $\frac{1}{2}$ in. is cast on the right leg of the frame, halfway up, to form a support for the regulating gear.

The legs and frame may be made of sheet brass, cut to the form of Fig. 2, and bent on the dotted lines to the required shape, or may be of very stout sheet zinc or iron. The centre disc of this will form a support for the flange of the cylinder, or bobbin, and a guide for the piston. The hole for the piston should be square or rectangular, to prevent the piston from turning round. The feet can be bent outwards after they have been cut, and screw-holes drilled in them. The base and anvil may be made separately.

The Cylinder, or Bobbin.—This may be made separately of brass, or of zinc, or of boxwood, ebony, ebonite, or ivory, or of papier-mâché. The length should be about 3 in., the diameter of lower flange 1 in., thickness of flange $\frac{1}{8}$ in., diameter of body $\frac{5}{8}$ in., bore for piston $\frac{1}{2}$ in. The cylinder must be bored true and smooth. If this is not done, the piston will stick in it sometimes. Holes must be drilled in the lower flange to correspond with the holes in the disc of the supporting frame, and be bolted to this with two small bolts. The cylinder should be wound with No. 22 silk-covered wire in two layers if the hammer is to be

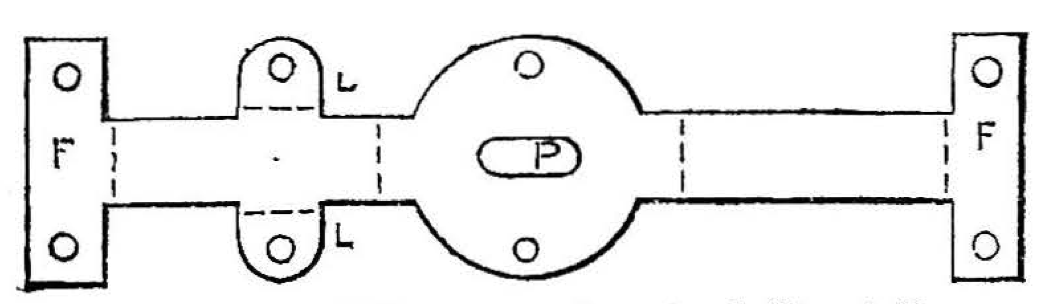


Fig. 2.—Shape of Frame cut out of Sheet Brass—F, F, Feet; L, L, Lugs to support Regulating Gear; P, Piston Guide.

worked with two bichromate cells, or with four layers if it is intended to be worked with four Leclanché cells. The commencing end of the wire should pass through a hole in the lower flange, and the bared clean end be secured under the head of one of the bolts in contact with the metal disc beneath. The finish end will pass down by one of the legs under the wooden support of the hammer and be secured to a binding screw in front.

To desulphurate indiarubber or gutta-percha, treat these substances with iron shavings and sulphuric acid, diluted, before boiling them in the alkaline lye.

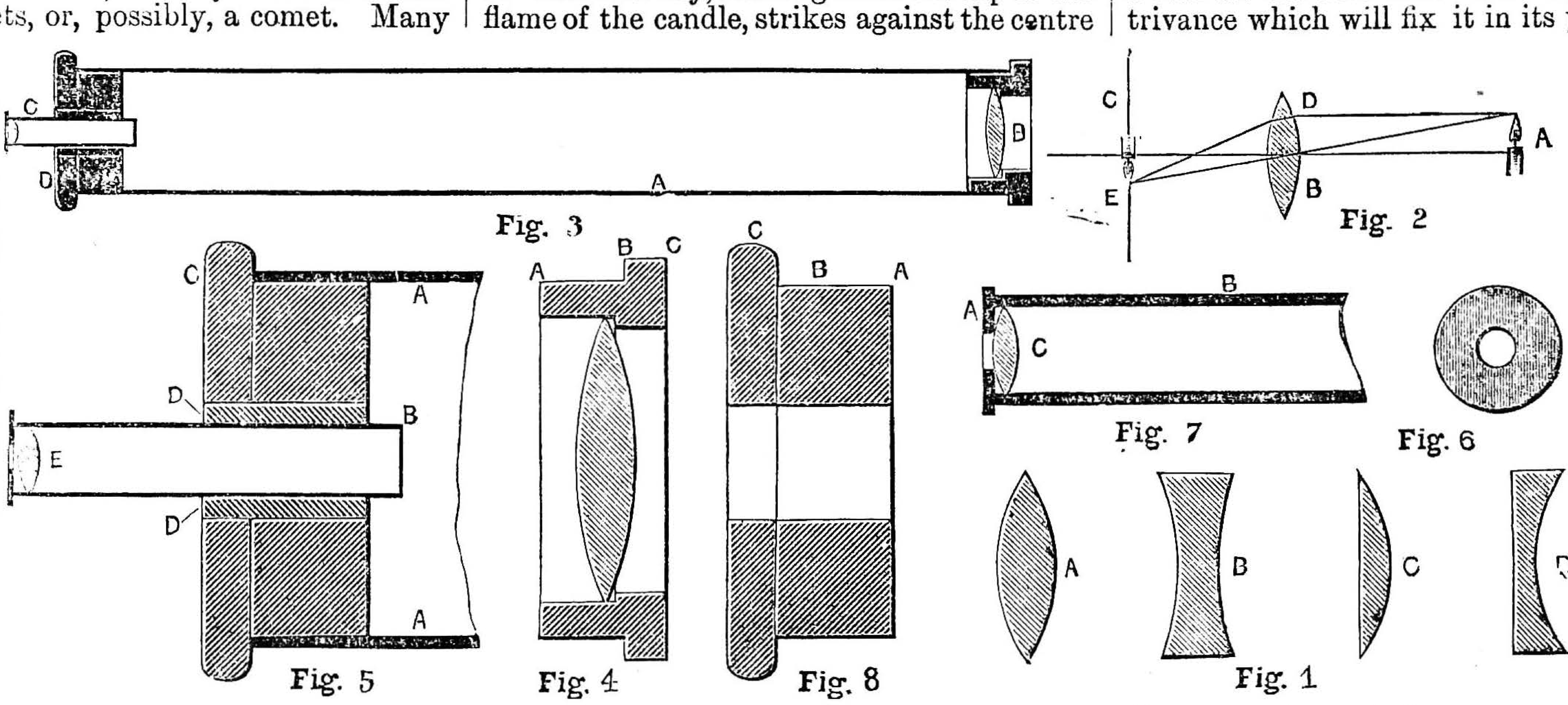
THE ASTRONOMICAL TELESCOPE, AND HOW TO MAKE IT.

BY ROBERT W. COLE.

Introduction—Kinds of Lenses—Production of Image by Lens—Parts of Telescope—Making Tube—Seat for Field-lens—Fitting Lens into Seat—Eye-lens—Fitting Eye-lens into Tube—Magnifying Power of Telescope—Using Telescope.

Many of us have often been told by books and other sources of information of the many wonders with which the deep vault of the sky teems. On looking towards the sky on a fine night, we see it studded with countless hosts of stars—some large, some small, and others so minute that they can hardly be seen at all. On some nights we see the moon wending her way through the midst of the stars, gradually increasing from the crescent to the full moon and then diminishing back again to a crescent; or, if we happen to be very lucky in selecting the time of observation, we may see one of the larger planets, or, possibly, a comet. Many of those objects — especially the moon— if viewed through a telescope, reveal their hidden beauties to the enchanted observer, and show the vast foundations on which our universe is constructed. The moon, if viewed through a telescope, will show its mountains and valleys, its seas and plains, and even the shadows cast upon the plains by the mountains; and, if the telescope is very powerful, it will also show the minute details of its surface. The planets will reveal their spherical shape and their attendant moons. Saturn will show his magnificent system of rings, his belted surface, and his moons; Mars will show his surface divided into oceans and continents, and his snow-capped poles; Jupiter will show his four moons, his belted surface, and his orange-shaped form; and Venus will only appear as a crescent. A telescope directed to the Milky Way, or to any of the star groups, will reveal a multitude of stars invisible to the unaided eye, and will make known the fact that certain stars which appear to the naked eye to be single really consist of two, which revolve round one another.

In order to understand the principle upon which the astronomical telescope gives an enlarged view of an object viewed through it, we must, first of all, examine the optical properties of those round pieces of glass which are known as lenses. Four of the most generally used kinds of these are represented in section by Fig. 1, where A is a double-convex, B a double-concave, C a plano-convex, and D a plano-concave lens. A straight line passing through the centre of a lens is called its axis, and a ray of light, on passing through a lens, has the property of being refracted or bent back. If a bundle of rays of light pass through a double-convex or a plano-convex lens, they are bent inwards, but if they pass through a double-concave or a plano-concave lens, they are bent outwards. Both of the two convex lenses have also the property of throwing on to a screen an inverted image of a luminous object placed in front of them: for instance, if a lighted candle is placed at a short distance from one side of a double-convex lens, an image of the candle will be thrown on to a screen placed on the other side of the lens. The manner in which this takes place is represented by Fig. 2, where A is the candle, B the double-convex lens, and C the screen. A ray, starting from the top of the flame of the candle, travels straight on to the top of the lens at D, is refracted on passing through it, and falls on to the screen at E. Another ray, starting from the top of the flame of the candle, strikes against the centre of the surface of the lens, and, by a law of optics, passes straight through it without being refracted at all, and falls on the screen at E, where it forms, together with the former ray, an image of the top of the flame. In the same manner, images of all the other points of the candle and its flame are made on the screen, and thus the whole image is formed. These properties, and the additional property that an object when viewed through a plano-convex or double-convex lens is magnified, are made use of in the construction of the telescope.



Astronomical Telescope. Fig. 1.—Four kinds of Lenses—A, Double-convex Lens; B, Double-concave Lens; C, Plano-convex Lens; D, Plano-concave Lens. Fig. 2.—Showing manner in which Image of Candle is thrown on Screen by Double-convex Lens—A, Candle; B, Lens; C, Screen. Fig. 3.—A, Tube; B, Field-lens; C, Draw-tube; D, Circular Piece of Wood which fits Draw-tube into End of Telescope. Fig. 4.—Seat of Field-lens. Fig. 5.—Sectional View of Arrangement for fitting Tube containing Eye-lens into the Telescope Tube—A, Portion of Tube; B, Small Tube containing Eye-lens; C, Circular Piece of Wood; D, Cork; E, Eye-lens. Fig. 6.—Disc of Brass placed at one End of Tube containing Eye-lens. Fig. 7.—Section of Tube containing Eye-lens—A, Disc of Brass; B, Brass Tube; C, Lens. Fig. 8.—Sectional View of Circular Piece of Wood (C, Fig. 5).

Having gone through this preliminary explanation, we will now turn our attention to the construction of the telescope. An astronomical telescope, in its simplest form, consists of two lenses, a large one and a small one, fixed at a considerable distance apart from one another in a tube, the large lens—which is nearest to the object to be viewed—being called the field-lens, and the other one the eye-lens. The field-lens is fixed permanently in its place, but the eye-lens is fastened into a short brass tube which is made to slide up and down in the large tube. Fig. 3 is a section of the telescope, showing the two lenses and draw-tube fitted in their places; A is the tube, B the field-lens, and D is a piece of wood which fills up the other end of the tube, and which contains the draw-tube, C, at one end of which the eye-lens is fixed. The first things to be obtained are the lenses. Go to an optician, and buy a double-convex lens of 36 in. focal length and $3\frac{1}{2}$ in. in diameter; also a small double-convex lens $\frac{1}{2}$ in. in diameter and of 1 in. focal length. These will cost about three shillings the two; and, since it is rather difficult to get a lens the focal length of which is exactly 36 in., one whose focal length is nearly this amount will do equally well. Now get a tube 4 in. in diameter and 36 in. long. This may be made of brass, iron, or paper, and must be painted inside with dead-black varnish. If made of iron, you can easily get it made by a blacksmith, and if made of paper, you can make it by wrapping sheets of paper round a smooth wooden cylinder and pasting them together. The tube having been either bought or successfully made, you must make a seat for the field-lens—that is, some contrivance which will fix it in its proper place at one end of the tube. A sectional view of the seat, and the lens fitted into it, is shown in Fig. 4. From A to B its diameter is equal to the internal diameter of the tube, and from B to C its diameter is slightly greater than the external diameter of the tube. The distance from A to B is about 1 in., and that from B to C is $\frac{1}{2}$ in. It must be turned on a lathe out of boxwood or some other wood, and, as is shown in the illustration, must have a projecting collar turned inside it, and its greatest internal diameter must be just large enough for the field-lens to fit easily inside it. If you do not possess a lathe, you can easily get a professional wood-turner to make the seat for you. Now lay the seat on a table with the end, A (see Fig. 4), upwards. Then take the field-lens, carefully polish it with a piece of soft rag, and place it inside the seat so that it rests on the projecting collar. Go to a watch-maker, and get a piece of pliant clock-spring about $\frac{1}{2}$ in. wide, cut off a piece of it long enough to go round the seat about $1\frac{1}{4}$ times, bend it into the form of a circle, and place it inside the seat so that it presses against its sides and holds the lens firmly against the collar, which projects inside. This is all that we need do for the present to the field-lens, so we will now set it on one side, and proceed to make the contrivance for fitting the eye-lens into its tube and making it slide up and down. These are represented in section by Fig. 5, where A is a portion of the tube, C is a piece of wood turned upon a lathe, and having a hole about 1 in. in diameter bored through its centre, and a flange ½ in. wide projecting round its circumference, and D is a large cork fitted into this hole, through which a hole is bored in which a small tube, B, about 3 in. long, slides. We will begin with making the small tube, B. Procure a piece of brass tube about 3 in. long and ½ in. in diameter, and solder at one end of it a piece of circular sheet-brass, having a small hole about ⅛ in. in diameter bored through its centre. This piece of circular sheet-brass is shown in Fig. 6, and is also shown, fitted on the brass tube, in Fig. 7, where it is represented by A, the brass tube by B, and the lens by C. Care must be taken in soldering the piece of sheet-brass on to the tube that the hole in its centre is exactly over the centre of the tube. The lens can then be dropped into the tube, and can be secured in its place by a piece of clock-spring in exactly the same manner in which the field-lens was treated, care being taken during the operation that the lens is not at all chipped or cracked, or otherwise its utility will be impaired.

We may now see about making the turned piece of wood, C (see Fig. 5). As in the case of the seat of the field-lens, you must get a professional wood-turner to make this for you, if you do not happen to possess a lathe. From A to B (see Fig. 8) it is 1 in. wide, and is sufficiently large in diameter to fit tightly inside the tube. From B to C it is about ½ in. larger in diameter and ¼ in. wide. Through its centre a hole 1 in. in diameter is drilled, care being taken that this hole is of the same diameter throughout. A good cork is fitted into the hole, and a hole bored through its centre, large enough for the tube to fit tightly into it. The hole must be bored through the cork by means of certain instruments called cork-borers. These—which are used in chemical operations, and which consist of a piece of brass tube having one end made very sharp and a knob at the other—can be obtained in sets at any chemist's shop, and usually cost about a shilling the set. Select a cork-borer of the right size, hold the cork between the forefinger and thumb of your left hand, and press the sharpened end of the cork-borer against its centre with your right hand, and gradually press it forward, at the same time turning it round, when you will find that it will easily cut into the cork. When you have cut about halfway through the cork, take the cork-borer out, and treat the other side of the cork in the same manner, making the two holes meet, when you will have cut a small cylinder of cork out of the hole of the same diameter as the cork-borer. When you have made the hole, see if the tube will fit into it. If it fits in too tightly, file the hole slightly all round, then glue the cork inside the hole in the circular piece of wood; fit the small piece of tube into the hole in the cork; place the circular piece of wood in its position at the end of the tube so that the flange presses against the edge of the tube all round, and secure it by a small screw passed through it and the large tube. Then, in a similar manner, fix the seat, which contains the other lens, at the other end of the tube by passing a small screw through it and the tube. The tube must now be coated with some kind of paint; if constructed of paper, black varnish will do very well, but if of sheet-iron or brass, black or dark-blue enamel paint would be more suitable. When the tube is being painted, the lenses and their seats had better be taken out, in case they get damaged. The construction of the telescope will now be complete; and, in conclusion, I will say a few words with regard to the method of using it, and its magnifying power.

The magnifying power of this kind of telescope—for there are other kinds besides the one which I have already described—is equal to the focal length of the field-lens divided by the focal length of the eye-lens. As the reader will undoubtedly remember, the focal length of the field-lens was 36 in., and that of the eye-lens was 1 in.; therefore, the magnifying power of the telescope is 36 in. It will be obvious from this that the magnifying power of the telescope may be increased by diminishing the focal length of the eye-lens and increasing that of the field-lens. This is what is usually done, and it may be done to a slight extent in the present case. Another small brass tube may be made of the same size as that which has already been fitted into the hole in the cork, but containing a lens having a focal length of ½ in., and thus, by using this tube instead of the other one, the magnifying power of the telescope will be doubled. The magnifying power can be diminished by making another small tube containing a lens of 2 in. focus. As inexpensive lenses are usually not of very good quality, they will not stand a very high magnifying power, and the image, consequently, becomes blurred: for instance, the image seen in the present telescope, when its magnifying power is 72 in., is much more indistinct than the one which is seen when its magnifying power is only 36 in. It is only when achromatic lenses, which are very expensive, are employed in telescopes that the image which is obtained by employing high magnifying power is perfectly distinct. A better method of increasing the magnifying power is to employ a field-lens of greater focal length; but, since field-lens and eye-lens must be placed at a distance apart equal to their focal lengths added together, this method requires a very long and, consequently, inconvenient tube to contain the lenses. But if the reader requires a telescope of higher magnifying power, I should recommend him to employ a field-lens of 72 in. focal length rather than an eye-lens of ½ in. focal length.

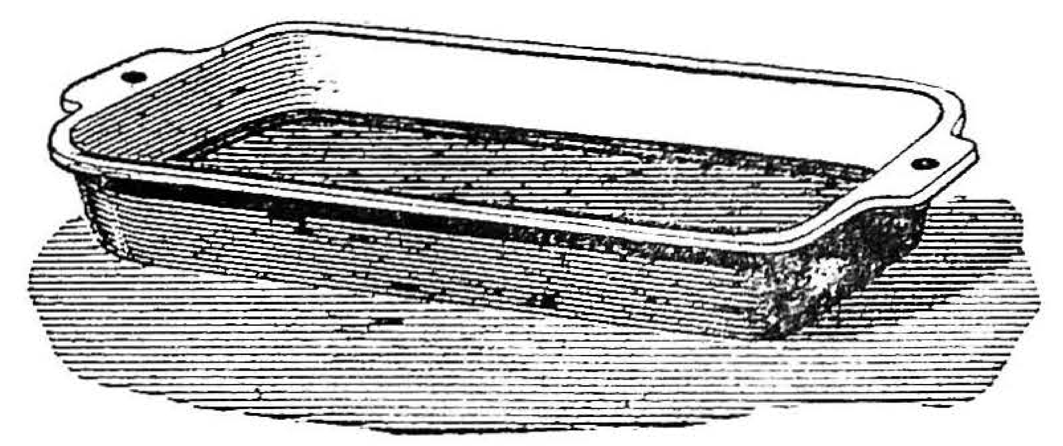
As the field of view of a telescope decreases with the increase of magnifying power, it is best to enlarge the diameter of the field-lens when the magnifying power is increased.

To use the telescope, direct it at some very distant object, and draw out or push in the small tube until the object is quite clear and distinct. The telescope will now be focussed, and will not need refocussing, except in the case of people who are short-sighted, to observe the heavenly bodies. When you wish to observe the stars, moon, etc., rub the outside of the field-lens with a soft handkerchief, to remove any specks of dust which may have settled on it, incline it against a post, fence, or some other convenient object to steady it, and point it towards the body which you wish to see through it. The moon is one of the most interesting of astronomical objects, and shows its craters best if observed when it is in quadrature—that is to say, when only half of it is visible.

FINE-GROUND flint glass may be turned to good account for grinding in safety valves, feed-check valves, and the like, when they become warm and commence to leak. Many prefer it to using flour emery.

DRIP PAN.

THIS pan—an American novelty—is made of a single piece, with no wire handles nor with wire beaded into the edge to stiffen it. The material is drawn into shape by means of dies, and is finished with a flanged edge and projecting handles at the ends. The flanged edge enables the housewife or cook to lift the pan easily and safely



Drip Pan.

from the oven. Pans of this form of construction possess great advantages over the old style pan made of common stove-pipe iron, such as the absence of lapped corners, seams, and wire beading, which collect and retain grease and filth of all kinds; also the superior quality of the metal prevents pans made of it from warping and twisting.

NEW INSULATOR.

IVORY is an excellent insulator, but very expensive. A substance has been manufactured in America, with the elements of ivory, as a substitute:—Lime, 100 parts; water, 300 parts; solution of phosphoric acid (density, 1·05), 75 parts; chalk, 16 parts; alum, 5 parts; magnesia, 1·5 part; gelatine, 15 parts.

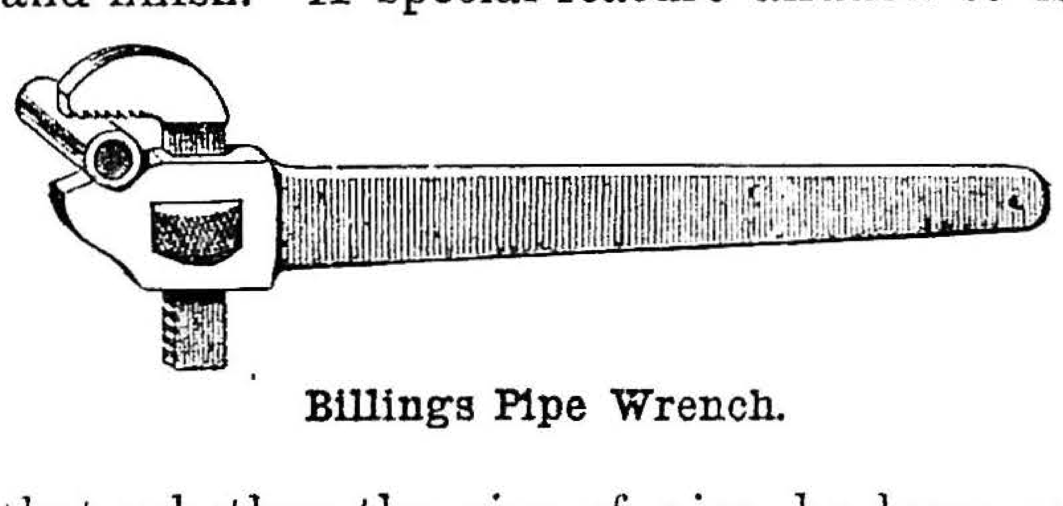
Thus tribasic phosphate of lime is obtained, carbonate of lime, magnesia, alum, gelatine, and albumen.

This is the method followed:—Quicklime is partially hydrated, then treated with a solution of phosphoric acid. While making this mixture, small additions are made of chalk, magnesia, alum, and, finally, gelatine and albumen, dissolved in water. The mass should be as homogeneous as possible. It is allowed to repose for twenty-four hours, so that the phosphoric acid may have full effect on the lime. Then, being very plastic, it can be shaped as required, and dried in a stove with ventilator at 150° C. during a short time.

After a month the objects are quite dry, and present the appearance of ivory, with its hardness and insulating power.

PIPE WRENCH.

THE illustration herewith shows the Billings Pipe Wrench. The advantages claimed for this wrench over similar tools are simplicity of design, few parts, excellent workmanship and finish. A special feature alluded to is



Billings Pipe Wrench.

that, whether the size of pipe be large or small for which it is adjusted, the angle of the jaws remains the same. Total length, 14 in. The wrench is made to take pipe from ¼ in. to 1½ in.

NOTICE TO READERS.

NEXT week's WORK (No. 196) will contain, among other illustrated papers, the following:—

SWEDISH WEAVING.
NEW DEPARTURE IN PHOTOGRAPHIC LENSES.
CHEMICAL APPARATUS, AND HOW TO MAKE IT.
HUNG SASH LIGHTS ALTERED TO PIVOT LIGHTS.
PRESERVATION OF MINERALOGICAL SPECIMENS.
BLACK DYE FOR PEAR WOOD.
A BRACKET IN EGYPTIAN TRELLIS WORK.

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

WORK

is published at La Belle Sauvage, Ludgate Hill, London, at 9 o'clock every Wednesday morning, and should be obtainable everywhere throughout the United Kingdom on Friday at the latest.

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Quarter Page	3	12	6
Eighth of a Page	1	17	6
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Prominent Positions, or a series of insertions, by special arrangement.

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

WORK correspondents are wanted in every Town.

TEMPERING SPRINGS.—Many amateurs find considerable difficulty in tempering springs, and this frequently arises from not beginning at the beginning—that is, with the forging itself. The forging should be done with low heats and light blows, and the steel should not be hammered when cold. Care should be taken not to make hammer marks while forging, for although such marks may be worked out, they interfere with the homogeneity of the metal. Many failures of apparently good springs could be doubtless traced to this cause. After the spring has been hammered to size, it is advisable to lightly hammer it for a short time when it is nearly cold, but do not strike hard. This light hammering toughens the steel and improves the quality of the spring. The outside skin seems better adapted to spring work, when the surface is hammered up, than when it is ground or filed. After hammering, the spring may be polished with fine emery. The spring should not be put on an emery wheel, however, as this would remove the "hammer" skin. If it is necessary to partly shape the spring by grinding, this should be done at an early stage of the work, so that the skin may subsequently be restored as much as possible. When ready for hardening, the work may be heated, either by holding the spring over a clear fire with a small pair of tongs, keeping the spring high up so that it will heat slowly; or by heating a large piece of iron and laying the spring upon that until it acquires the requisite temperature. A modification of the latter method consists in heating some lead red-hot in a ladle, and placing the spring in that; but the spring should first be heated black hot. When the spring is uniformly heated to a light red, plunge it into cool—but not ice-cold—water. The spring should be put endwise or straight into the water, for if the flat side first touches the water distortion will ensue. After hardening, polish the steel with emery cloth; then put a few drops of oil on a piece of paper, light it, and hold it under the spring until every part is covered with a coating of smoke. Then hold the spring above the forge fire until the smoke is uniformly burnt off, taking care that the burning off proceeds equally over the surface of the spring, which may then be placed in the ashes to cool, after which it will be ready for work.

CRAFT OR PROFESSION?—Some of our well-informed daily papers have been calling attention lately to the overcrowded condition of the labour market generally and of some professions in particular. The matter is undoubtedly one of importance—especially to the world of family men who have before them the solution of that difficult problem contained in the not altogether disposed of question, "What shall we do with our boys?" We are told that the professions are going from bad to worse—one particularised being distinguished by wig and gown. To train for the profession of barrister is, it appears, scarcely worth the proverbial candle—since it is difficult to get back in brief-money even the sums paid for such preliminary necessaries as "articles," so crowded has this particular branch of legal occupation become. Added to this, the prizes to be gained are getting fewer and less worth having—which, if it means that people are growing less litigious, or that competition is producing a healthy effect upon the extravagant fees of fashionable counsel, affords ground for a modicum of satisfaction to those who may not be contemplating a legal career. Doubtless a great wave of change is passing over not the trades merely—as many restrict it to—but the professions of this country. With improved methods of living, ever-advancing education, and higher and higher culture, there must be changes even in professions which may tend perhaps to almost obliterate what may be at the present time most remunerative sources of income. Whether the first to feel the new condition will be that profession the members of which are recognised as gentlemen whose occupation consists in practising at the "bar," is difficult to predict. Most likely not. We are tending more and more to arbitration in all matters, and national disputes and the piques of emperors may some day be settled without the annihilating processes adopted by modern armies and navies. Wordy warfare will take the place of *mitrailleuse* and steel ordnance, when—on the principle of the survival of the fittest—the lawyers will be more than ever needed. We cannot all be lawyers, however, and the same newspapers have pointed to crafts for our boys. One selected is the art of plumbing—a very good and profitable business when thoroughly acquired, as a correspondent in *The Daily Telegraph* has recently asserted. This, with many other trades which could be enumerated, would unquestionably far oftener present a profitable occupation for even superior boys, could parents but be induced to overcome the silly prejudice about a "profession" for their sons. Of course, there would be something incongruous in the sight of the Eton boy "devilling," as it were, for a journeyman plumber. We are not, however, thinking of this element, but rather of the wide range of middle-class boys who, without money or interest, are almost hopelessly handicapped when facing the world from a middle-class school. If they are all to be clerks, the prospect is a decidedly gloomy one for them. After all, parents might do worse than return to the good old idea and give their sons a trade. Thus equipped, well-educated, and with a little money, they will have no difficulty in making their way in America or the Colonies.

THE ART OF STAIRCASING.

BY GEORGE F. CHILD.

Open-String Staircase.

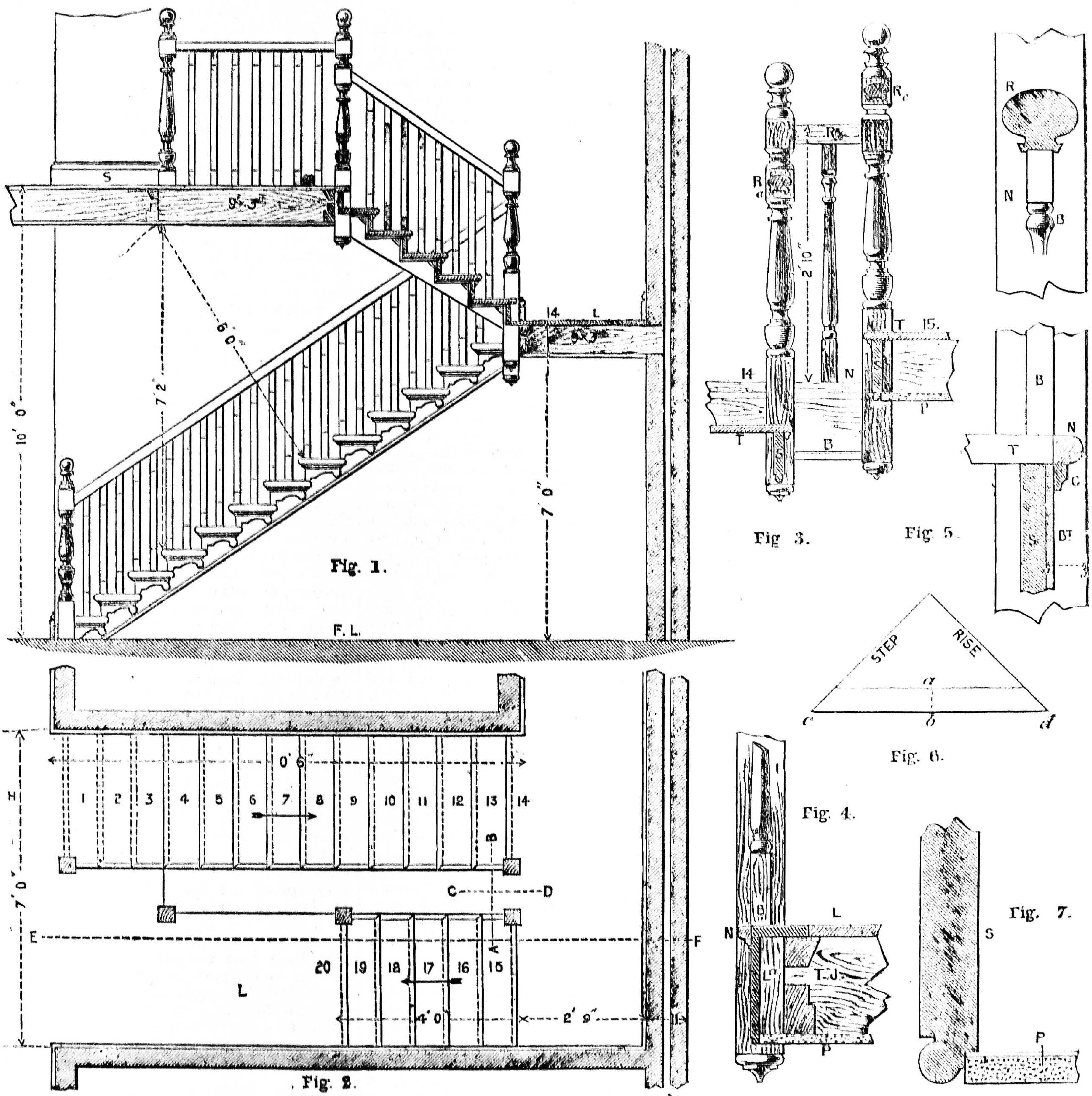
Introduction—Setting out the Plan—Setting out the Elevation—Two Newels on Landing—Section on Landing—Position of Strings on Newels—Setting out the Cut-strings—Pitch-board—Head Room.

Introduction.—In all staircases previously examined the *outer string* has been the same as the *wall string*—that is to say, that the board has merely been *housed* out to a depth of ⅜ in., into which the "treads and risers" are inserted. Now, however, we propose describing a staircase of a superior class, the outer string being "cut" or notched out to receive each step, the *nosing* being returned across the face of the string, which gives the stairs a handsome appearance. It will be noticed that the width of the space into which the stairs are to be fixed is 7 ft. Now, by allowing 3 ft. each for both top and bottom flights, we can employ two newels on the landing in place of one, which greatly adds to the general effect.

Setting out the Plan.—We find from the plan (Fig. 2) that the hall, H, passes the foot of our staircase at right angles, with a passage exactly above it on the first floor. Also on the first landing we have a doorway passing into adjoining rooms (as seen). This will, of course, limit our "going" to the distance between the two walls. As we want an easy stairs, we find on dividing out the "going" that the number of steps it is proposed to employ will allow no space for an easement on the strings; we therefore have to work a special moulding, which will be described hereafter.

Setting out the Elevation.—At Fig. 1 we have the sectional elevation, which is taken on E F (Fig. 2). This elevation can be set out as all preceding examples, the difference being in the two newels on the first landing and the open string.

Two Newels on Landing.—To set out the newels for the "turner" will require some



Staircasing. Fig. 1.—Sectional Elevation—F L, Floor Level; L, Landing; S, Skirting. Fig. 2.—Plan, 1 to 14 inclusive, Steps of Bottom Flight; 15 to 20, Steps of Top Flight; L, Landing; H, Hall; A B, C D, and E F, Section Lines. Fig. 3.—Section on A B (Fig. 2)—14, Landing; 15, Step; S, S, Strings; T, T, Treads; N, Nosing; P, Plaster; B, Bead; R, R, R, Rails; *a* and *c*, Rails on one Pitch; *b*, Rail on one Landing. Fig. 4.—Section on C D (Fig. 2)—L, Landing; T J, Trimmer-joist; P, Plaster; B, Baluster; N, Nosing; L[a], Lining. Fig. 5.—Details for setting out Position of String on Newels—S, String; N, Newel; R, Rail; B, B, Baluster; B, Bracket; T, Tread; N, Nosing; C, Cove; *a b*, Distance from Edge of Newel to String. Fig. 6.—Pitch-board—*a b*, Distance equal to Width of Carriage-pieces; *c d*, Edge for Guide. Fig. 7.—S, Section of String; P, Plaster.

little attention, as upon this depends the appearance of the newels when in position.

The bottom newel requires no special explanation, it being set out as all others previously described. The next upwards—that is, on the top of the long string—will require a little more care, it having, in addition to the bottom "handrail," to take one on the landing also.

Before setting this out, it will be necessary to mortise it for the string, also marking the height (2 ft. 7 in.) of the long rail. Now mortise newel No. 3—that is, the one at the bottom of the "top or return flight"—at the same time drawing the lines to denote the height of the *top* rail.

Having proceeded thus far, we have to attend to the rail on the landing. This will be more readily understood by an examination of Fig. 3. The newel on the *left-hand* side represents the one on the top of the long or bottom flight; S shows the string-board, T the tread immediately under the landing, and 14 the landing itself.

The newel on the *right-hand* side, of course, being the bottom one of the top flight, S is the string, and 15 the first step upwards. This will be seen by reference to Fig. 2.

The rail R*a* is the bottom one, and R*c* the top. Having obtained this, we have to decide upon the height for the rail R*b* on the landing.

It has been before explained that rails on the *level* should be higher than those on the *pitch*; but the distance between the newels being so small, no regard should be paid to this rule in this instance, as to place the rail at a height of 3 ft. 2 in. from the landing would oblige us to make the square an unsightly size. By making R*b* 2 ft. 10 in. from landing, we are able to obtain several turned members between the rail, which all will allow is an improvement.

It may be remarked that the square *under* the landing is much greater on one newel than the other. We are bound to have a long square on the bottom newel to take the string, S, but this necessity does not exist upon the top newel. It is therefore kept about 1 in. below the bead, B—that is to say, the square portion—the turned drop being about $2\frac{1}{2}$ in. long. I have omitted to state that Fig. 3 is a section taken across A B (Fig. 2).

Section on Landing.—Fig. 4 shows a section of the landing taken on C D (Fig. 2); T J is the trimmer-joist; L the landing; L*a* the lining, which is blocked out from the joist; B the baluster, which is let into the floor-board; N is the nosing, which is worked to the same section as the nosings on the steps, and nailed on the edge of the flooring, as seen.

Position of Strings on Newels.—Before mortising the newels for the strings, it will be necessary to decide upon the size of the balusters to be used. For stairs of this class they should never be less than $1\frac{3}{4}$ in. square, although they are made in sizes ranging from $1\frac{1}{4}$ in. to $2\frac{1}{4}$ in. square.

We will suppose that $1\frac{3}{4}$ in. balusters are to be used, this being the average size. This being the case, we draw a portion of the newel *full size* (see Fig. 5). Now draw the baluster, B, in the *centre* of the newel. In a line with the *outer* edge of baluster draw the line B*t*, and from this line the thickness of the bracket, which is $\frac{3}{8}$ in. Now, this bracket (as will be explained later on) being nailed upon the face of the string, it follows that the string itself (S) should be set off on the *inside* of the bracket. Having done this, the distance from *a* to *b* will give us the position of the tenon, which should always be cut with a *bare face*.

Setting out the Cut-strings.—In setting out the "cut" or "notched" strings, we have to bear in mind the fact that the treads are fixed on the *top* of the portion cut out to receive them. Now, as we have always before set out the strings for the *top* of the tread, we must allow the thickness ($1\frac{1}{4}$ in.) *below* this line and to which it is cut. There is also a portion of the riser equal to the thickness of bracket in *front* of the *notch*, which also must be taken into account. Details of this and all other important parts will be given in the next paper.

Pitch-board.—This cut-string should be set out from the bottom edge. The pitch-board (Fig. 6) having been set out, the distance from *a* to *b* should be made equal to the depth of carriage-piece and plaster, and the guide screwed on the edge, *c d*. This being done, proceed to set out as before. Fig. 7 shows part section of string, rebated to receive the plaster, P, the carriage-piece being above.

Head Room.—In Fig. 1 the curve struck with a radius of 6 ft. gives the position of the trimmer on landing. This has been described before, and is only mentioned to recall it to mind.

SWEDISH WEAVING.

BY COUNTESS HAMILTON AND MISS CLIVE BAYLEY.

INTRODUCTION.

In the present rage for technical handiworks, there are very few which are specially adapted to women. There are two, however, which were in high repute among our ancestors, and which might, with much advantage, be revived amongst us, both on account of the utility of the employment, and also because of their attraction as picturesque and pleasant occupations. Poets have sung of the spinning-wheel and of the loom, and artists have also chosen, on more than one occasion, to depict women employed in these handicrafts.

Spinning is already well known in England, and there are homes in which the wheel is not a mere adornment, kept in sacred uselessness, but the whirr may be heard in many a lady's boudoir, and flax and wool are alike in request for its use. But it would, doubtless, be still more in fashion were there any means of working up the hanks of material spun into useful stuff. It would be well if the ancient art of hand-weaving could be restored in this country, so that the two industries might follow each other in their natural sequence.

Sweden is the country which, perhaps, stands highest in Europe as regards home industry, and the Handarbetets Vänner, or the Society for the Promotion of Manual Work, has, during the last twenty years, laboured with much success for the revival of these arts. It takes the same position in that country as does the somewhat more recently founded Society of Home Arts and Industries, or perhaps, more correctly speaking, the South Kensington Royal School of Art Needlework in our own country. The Swedish Society upholds a very high standard of excellence, both in execution and in design. It allows no designs to be used by its weavers or in its schools but those which are really Swedish, in order to maintain the national characteristic of the art, and a pure and not a mixed style, which would ruin the distinctive nature of the work. The old art of weaving, as practised among the peasantry, was very nearly superseded by the more mechanical forms introduced by machine-weaving. The Handarbetets Vänner stepped in, and saved the national work from oblivion and neglect, and now loyally maintains, as we have said, the ancient and national style in all its integrity.

When the matter was first mooted it was in the southern provinces of Sweden that the Society found the richest store of woven work. In this part of the country the population was thicker, and the resources too, in the way of materials necessary for the art, were plentiful in these, the most fertile, districts of Sweden. Here the peasants wove not merely the ordinary stuffs for clothing, but also ornamental cloths and draperies for their rooms. Bed-covers, chair-covers, carpets, are all woven and used for great occasions, such as weddings, funerals, christenings, and for festivals such as Christmas. At other times they are locked away in dower chests, carefully preserved, and are handed down from generation to generation as heirlooms. Thus, antique patterns are still retained among the peasantry, and from them have been adopted by the patriotic Society, which numbers, amid its supporters, the members of the most aristocratic families of the country. Such relics of ancient days are now highly prized and bought by the aristocracy, and treasured as artistic hangings and draperies. They are, in fact, admirably suited for use in libraries, smoking-rooms, and large halls arranged as sitting-rooms. It was also the custom in olden times for the tenants to bring part of their rents in materials which they had woven, and on rent day long settles were placed round the walls of the castle hall, and the ells of material woven were measured off as they were spread upon these settles; hence it is that many of the old-fashioned pieces of weaving, now so much valued, are in long narrow strips. It was also the fashion to weave into these, and other pieces of drapery, records of events, insignia, initials, and other mementoes which related to family or national events. It was, it appears, the custom in every land to make "woven pictures, as did the daughters of the Huns." In Finland, which was subjugated in former days by Sweden, and which was only made over to Russia a century ago, the long narrow strips, when made in coarse weaving, are used as mats, the boards of the floor showing between each strip. The practice of weaving has, in consequence of the energetic action of this Society, become so universal in Sweden that the loom is now to be found in almost every house, from the cottage to the castle. We are therefore encouraged to hope that these articles may spread the knowledge of the art in England, and enable those who are familiar with plain hand-weaving to learn the high art work which it illustrates. We may also hope that the art is not so wholly foreign to England as might at first sight appear, for we have come across an old Swedish folk-song in which reference is made to some "sisters from England," one of whom "sat to the treadles with heed" while the other "threaded her needle and reed."

The following articles will show, *first*, what apparatus is required; *secondly*, how to prepare it; *thirdly*, how to use it in the different styles of plain and art weaving.

LABOUR AND CAPITAL MEN.

THOMAS BURT, M.P.

Mr. Thomas Burt, the Northumberland miners' representative, is, perhaps, the plainest man in the House of Commons—plain and unassuming in appearance, plain and unassuming, also, in speech and manner. He still clings to his Northumbrian dialect, though he has now been a member of Parliament for eighteen years, and will tell you that a better day is in store for labour "for sartin," but that "I doan't know" whether it will be through a legislative eight-hour day.

Though Mr. Burt be thus plain, and though he have little of the brilliance that surrounds newer figures in the field of labour politics, he is yet surpassed by no man in the highest attribute that can invest the human mind. That attribute is honesty. Honesty of purpose pervades plain Thomas Burt's whole being. So much is this the case, that even his opponents cannot raise the slightest whisper of suspicion against him.

He is a poor man—so poor, indeed, that while Parliament is sitting he leaves his wife and family at home in the north, and is content with the accommodation of a single bedroom in London. The Reform Club supplies him with a rendezvous for meeting friends and callers. To such a man it cannot be said that money is no object. Yet when bad times came on the miners he was the first to propose a reduction of £100 a year on his salary as the General Secretary of the Northumberland Miners' Union.

Again, only lately, after he had been chosen by Mr. Gladstone to fill the office of Parliamentary Secretary to the Board of Trade, an office with the comparatively small salary of £1,200 a year attached to it, he offered to relinquish the salary he receives from the miners now that he was in receipt of Government pay. "The offer of office made to him," he further said, "was a compliment to labour, but no honour and no emolument which could be held out to him would persuade him to leave the labour movement on which he had set his heart, and which he would continue to work for. His ideal was that competition would be succeeded by co-operation, and that was what he looked to for the solution of the labour problem." The Northumberland miners will be well advised if they reject Mr. Burt's generous offer and retain the services of so true a friend to the cause of labour in general, and of mining labour in particular.

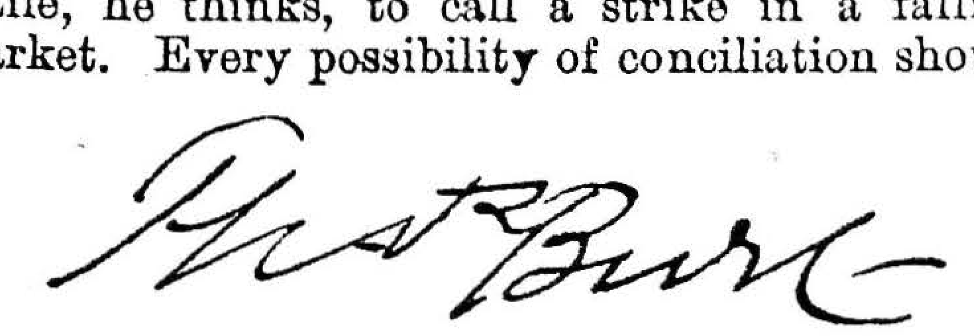
Mr. Burt's career has no doubt been a most remarkable one. He began with every worldly possibility of ending in the obscurity of a coal-mine. He descended the shaft at the early age of ten, and he continued to go up and down the shaft daily for eighteen years. These eighteen years were marked by hard physical toil, the monotony being broken with a few short hours—far too short for the indomitable youth—over books. The present Secretary to the Board of Trade in the greatest commercial country in the world is an entirely self-educated man, and curiously enough, as he has never been slow to acknowledge, the book of all others that lent him the greatest aid in his self-imposed task was "Cassell's Popular Educator."

After eighteen years, however, Thomas began "to see of the travail of his soul," and when he was twenty-eight he was appointed General Secretary of the Miners' National Union, with a salary of £1 7s. 6d., increased to £2 per week. This union comprises the miners of Northumberland, Durham, and Cleveland, and co-operates with the Miners' National Federation in all that concerns the mining industry in general. His election as secretary was in 1865, and nine years later, in 1874, he was returned to Parliament for Morpeth, a constituency which he has not ceased to represent since. During the twenty-seven years of Mr. Burt's secretaryship two general strikes occurred, both being against reductions in wages proposed by the employers. The first was in 1876. The men proposed arbitration, when the employers rejected it, and the men were ultimately obliged to accept the reduction. The next was the seventeen weeks' strike of 1886. Again the miners were defeated and had to accept a reduction of 12½ per cent. Thus Mr. Burt's experience of strikes has led him to be rather wary. He is, with such experience and

Mr. Thomas Burt, M.P.

(From a Photograph by A. & G. Taylor, Newcastle-on-Tyne.)

knowing the untold suffering they entail, opposed to them. At the same time he is inclined to think that if workmen never resisted the encroachments of the employers, their position would be worse than it is now. It is positively futile, he thinks, to call a strike in a falling market. Every possibility of conciliation should



be exhausted before recourse be had to striking; and he is of opinion that as the unions become better organised, and the men become aware of the resistless power perfect organisation will give them, strikes will become less frequent than now. The unions will then be burdened with a keen sense of responsibility which will prevent the arbitrary use of their power.

Such is a skeleton outline of Mr. Burt's career, and such is his opinion on strikes. As regards his views upon the labour question in its entirety, he is well known to look upon a legislative eight-hour day as an impossible solution. He opposed the Eight Hours (Mines) Bill that was introduced into the last Parliament, because, firstly, his constituents were opposed to it; secondly, where eight-hour Acts have been passed, as in some American States and in Australia, they are a dead letter; and thirdly, he cannot see how the carrying out of such an Act is practicable. Show him a policy that will ameliorate the hard lot of the workman, which he knows too well, and he will support that policy. Meanwhile he believes that grown-up men, by combination, can themselves far more effectively control and adjust the conditions under which they labour than can the most drastic Parliamentary measures. We have, at the beginning of our sketch, quoted from Mr. Burt's own lips words which show the direction he looks to for redemption. That direction is towards co-operation. Such is the opinion of a man who has climbed from the bottom of a mine up to a seat in the Government of this great Empire. That opinion is worth tons of rhetoric, and weighs far more with the sober-minded worker than the fiery oratory that the masses are too often fed with.

TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

Building Trade.—There are good signs of work for all in the future, but at present all branches are dull.

Surgical Instrument Trade.—Surgical instrument makers are having a good time, every Sheffield firm being full of orders.

Cotton Trade.—Our Rochdale and district correspondent writes:—The cotton crisis, as it is now familiarly called, is in about the same condition as in the last report. The notices of short time have been posted in the mills.

Engineering Trade.—In the Lancashire engineering trade boiler makers have rather more work on hand than recently, but prices are cut very low. Locomotive builders are not securing any new orders of any weight, and several stationary engine builders have not been so slack for many years. Our Aberdeen correspondent writes: — Marine engineering is in a very unsatisfactory condition.

Iron Trade.—Low prices and small transactions continue the rule in the Lancashire market. For local and district brands of pig iron 44s. is being quoted for forge, and 45s. 6d. for foundry, purposes. In the finished iron trade prices have fallen slightly, but only very few inquiries are coming forward.

Metal Market.—A moderate amount of business is being done in the Lancashire metal market, and quotations are as follows: Solid-drawn brass boiler tubes, 6d.; ditto surface-condensed tubes, 7d.; solid-drawn copper tubes, 7d.; brazed copper gas and steam tubes, 7¼d.; brazed gas tubes, 7d.; brass wire, 5¾d.; copper wire, 7d.; rolled brass, 5½d.; sheet brass, 6½d.; and sheet copper, £3 per ton.

Shipbuilding Trade.—This is almost at a standstill in Aberdeen, and one of the largest yards is working a short day of six and a half hours.

Granite Trade.—In Aberdeen the building and granite trades flourish.

Ironplate Trade.—The ironplate trade has for years past been declining in Birmingham, Wolverhampton, and Bilston, and has slowly, but surely, drifted into the Lye and Cradley district, where large factories have been built up and apparently cheaper labour — mostly female — is obtainable. Some masters declare it is from 50 to 100 per cent. cheaper, thus enabling them to compete unfairly with the Midland town manufacturers; who have, consequently, given notice to their *employés* that the 10 per cent. bonus given some years ago will, after the 3rd of December, be withdrawn. This the men will strenuously resist.

Railway Carriage Trade.—An order of the value of £10,000 has been placed with the Oldbury Railway Carriage Company for carriages for Indian railways.

Cable and Chain Trade.—Government contracts for five years for the supply of mooring-chains, mooring-gear, and ordinary cables have been placed with Messrs. H. P. Parkes & Co., of Tipton and the Round Oak Ironworks. This means that thousands of tons of steady work will be turned out, the value of the orders being about £80,000.

Sheffield Trade.—In the staple trades of Sheffield there is little change to note. The silver trade is below the average; files dull; rolling mills, tilts, and forges are not busy, and cutlery is slack.

SHOP:

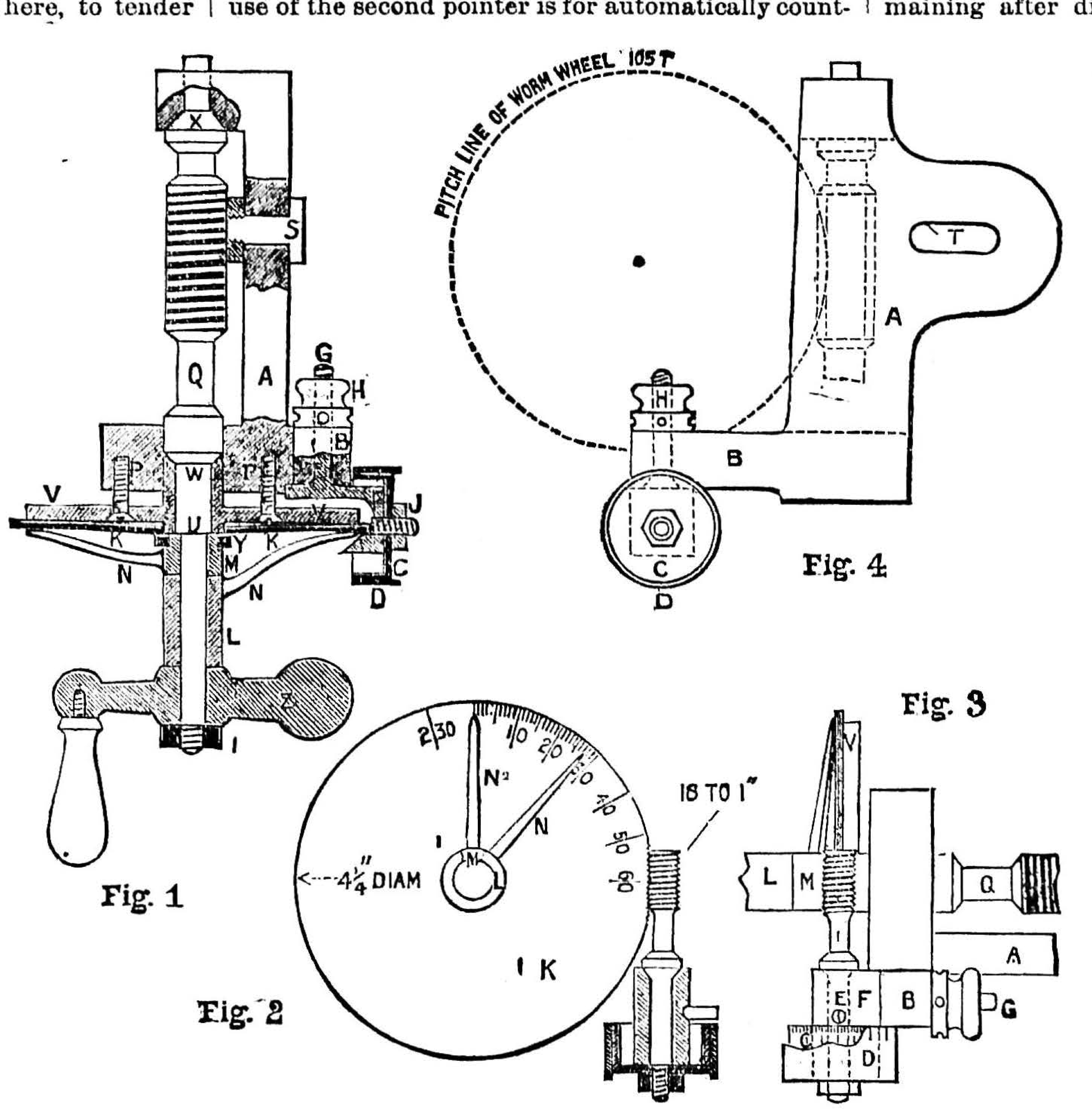
A Corner for Those who Want to Talk It.

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

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

I.—Letter from a Correspondent.

Lathe.—W. H. C. (*Orillia, Ont.*) writes:—"I have been a subscriber (through a London friend) to the English journal, Work, from the commencement, and have been much instructed by the articles you, dear Mr. F. A. M., have contributed to that paper on lathe matters, and wish, from here, to tender you my thanks for same. I am a lathe 'crank,' as they say in this country, and have a No. 5 Barnes lathe to operate with, and run it, with other shop tools, with a 5 horse-power steam engine; and although I am only an amateur machinist, still I take a great deal of pleasure out of my little workshop, especially in the winter season, when architecture is at a standstill. This place is only a small town, and there is no other person beside myself that has anything like the shop rigging I am possessed of, so I am shut off from the privilege of coming in contact with others of like tastes in a mechanical way, so that any help got through the trade papers is very acceptable to me in my mechanical exile. My main reason in writing to you at this time is for some information in regard to a 'front slide' lathe after the style of the 'Price' type. I want to build a lathe after that pattern as far as the principle of the front sliding carriage is concerned. What I would like to have you do for me is to furnish some rough sketches of the method of constructing the front slide and the elevating slide-rest; and if you can help me to an understanding of what is required to make the figure effective, after the style of the Price lathe or after any improvement that may have occurred to your practical mind, I shall be very thankful for the service, and would be willing to pay any charge in connection with the matter. As to the rest of the lathe, my plans are matured, and I am aiming at something 'extra' fine in the lathe line. May I count on your good nature to help me? Among the many things you gave in Work was a tangent screw-dividing apparatus, which interested me very much. As an outcome of a study of your scheme, I have constructed what I consider a very fine dividing rig for my own lathe on somewhat independent lines, and find it all that can be desired for the purpose. I have made a drawing of the rig, and enclose it for perusal. The variations from your scheme were adopted in order to avoid making so many dividing collars and to try to obtain an apparatus that would practically divide any number of divisions in the circle without having to change anything in the device, and for cheapness. Referring to the drawings, Fig. 1 is a horizontal section, in which A is the casting, with lugs for the bearings of the worm, Q. The worm is passed through front bearing, and centres against side shake by cone-part, X; a similar cone-part, W, acts to prevent side and end shake at the front bearing. V is a disc-and-thimble-piece for a bearing for worm-shaft, and is confined to casting, A, by screws, P, P; K is a brass swaged dial mounted loosely on hub of shaft at U. M is a collar with pointer, N, attached thereto, and L is a similar but longer collar with its pointer; Y is a washer shouldered about M. The ball handle, Z, and nut, I, act to tighten up on the collars, M, L, and washer, Y, to hold them rigid to the position that may be arranged for the pointers. The use of the pointers is to count by for whole and part turns, the pointers being set to suit any required division, and move with the shaft. The dial, K, is graduated into two hundred and forty parts, and its edge is cut with the same number of teeth, as shown in part. B is an arm of the casting, A, carrying a small micrometer screw-shaft bearing, F, held to arm, B, by screw, G, and capstan-nut, H, so that F may swivel on B to allow worm, J, to readily mesh with K. Rigid with J is a reading-flanged collar, C, divided into one thousand parts, to read in connection with the station point, E; D is a slip-collar, to be used when absolute correctness of division in certain cases is desired. The worm-wheel that goes on the mandrel of the lathe has one hundred and five teeth, and was cut by myself with great care, the same being in halves and corrected, as you have advised. The casting, A, is secured to the arm that carries the change-gears by a bolt, S, in connection with a slot, T, as in Fig. 4, which allows the worm to mesh with the worm-wheel. The working of the apparatus is effected as follows: Suppose the awkward division 13 is wanted; then, as the product of 105 × 240 gives 25,200, we find we shall have to make eight whole turns of the worm and eighteen parts of the dial divisions as well; and then there is a remainder of 6 to divide into thirteen parts. This we dispose of by the secondary or micrometer worm, J, and treat the fraction decimally and obtain a movement of forty-six parts, graduated on C. This is done for each division, and the resulting error is only two parts short on the micrometer, or one-fifth part of one of the divisions on the dial, K. It is to be understood that the movement of the dial by the micrometer is independent of the pointers, M, L, and the operator imperceptibly follows up the extra movement of the dial as he uses the pointers. The use of the second pointer is for automatically counting the odd number of parts on the dial. In our case of thirteen we set the pointers eighteen divisions of the dial apart, and then, if we call N^2 the zero pointer, we turn eight turns, see where the second pointer, N, is, and make the extra or odd part movement by bringing the zero pointer over the position occupied by the second one, after which we turn the micrometer collar, C, forty-six parts, which completes one step, or a division of the required number. The worm-wheel number of teeth and the dial number of division combine to give a very large number of straight working divisions. If we want to be very 'pernickity,' we could divide a collar, D, into thirteen parts by the process just explained, and move six parts thereof on the micrometer in place of the forty-six parts of the hundred, as in the other way, and be as near mathematically right as possible; and so on for any case of division. I trust the foregoing will be of interest to you. Degrees are got by si... ly turning seventy parts of the dial, K. I have done some nice graduating for verniers for reading to one minute without any trouble, and I am somewhat proud of my dividing rig. As a proof that I am not merely playing with my lathe, etc., I may say that I invented and made the typewriter with which this letter is written. Some of the letters are not clear for want of cleaning, which kindly allow for."—[F. A. M. writes on the above:—"My notions on the lathe with front and vertical slide can be had for 4d. by anyone who will obtain Nos. 1122 and 1124 of *The English Mechanic*; I need not, therefore, send you any sketches. I congratulate you on your ingenious modification of the dividing apparatus given in No. 14 of Work. The details are nicely worked out, but I am bound to say I do not think it quite satisfactory, and the example given of thirteen divisions very well illustrates the weak point. You pursue that unlucky one-thirteenth through two worm-wheels, and still, to get the exact division, you must divide a collar into thirteen parts. In a case of this kind it will not do to have the divisions *nearly* right, especially as, in wheel cutting, you may have to go round two or three times. I do not think it the best plan to have *two* worms and wheels; the second one makes the motion too slow. I would rather prefer to have on K a series of division plates, as on the dividing head of the milling machine; or to have the first worm-shaft turned by a set of change-gears with a click, as in the ordinary dividing engines. By these methods there would, probably, be less chance of a miscount. However, if you have invented and made a typewriter, you must be a better mechanic than I am, who have never attempted such a thing."—[W. H. C. writes:—"I fear you have not grasped the true 'inwardness' of my dividing apparatus, for I can assure you the difficulties you think exist while using the rig are purely imaginary. Several machinists have seen the rig and think it is a first-class device for originating any desired division of the circle. I daresay you have failed to observe that the wheel, or dial, K, is loose on its bearing, and is used to deal with the fraction remaining after dividing as near as allowable by primary dividend (25,200), and in place of an undesirable number of turns of the secondary worm, J. The fact is said worm is never turned a whole revolution, for the reason that one of the divisions on K is equal to a revolution of worm J. The error in dividing for 13 is only 1 in 1,260,000, which is as close as workmanship will permit with theoretical exactness, I should presume. I send along a sample of the unlucky number dividing, and, although it was not done with a jig for guiding the drill, I think you will have some difficulty finding the first and the last hole drilled. I have never needed to divide by an extra collar to suit the division in hand, and this sample was divided by the fixed decimal collar, C, as is my usual custom for eliminating the fraction when the dividend of primary worm-wheel and dial is prime to the number to be divided."]



Tangent Screw and Micrometer Dividing Apparatus for Lathes. Fig. 1.—Horizontal Section. Fig. 2.—Graduated Dial. Fig. 3.—Showing Slip on Collar for exact Division. Fig. 4.—Fixing and Meshing of Worm-wheel.

II.—Questions Answered by Editor and Staff.

Sale for Painted China Plaques and Tiles.—Neptune.—The market for such things is, at the present day, flooded with the work of lady painters, who are contented with small gains, and this would be against you, unless your skill is exceptional. Perhaps your most promising plan would be to bring specimens of your work to London, to look out in the Directory such firms as seem likely, and to go round and show them what you can do. Possibly Howell & James, Regent Street, might be worth trying, or the great furnishing and decorating houses, such as Oetzmann's, Hampstead Road, or Maple's, Tottenham Court Road.—M. M.

Private Installation of Electric Light.—P. E. C. (*Bromsgrove*).—The cost of a private installation of electric light, equalling from 16 to 20 lamps of 16 c.-p., will be from £200 to £300. If you have a dynamo, gas-engine, and ordinary fittings to your lamps, and work the lamps direct from the dynamo, the plant will cost about £200. Some skill will be required to work this plant. If you add a set of accumulators, and have better fittings, in the form of a few handsome electroliers, shades, globes, ornamental brackets, etc., the cost will run up from £250 to £300, which may or may not include engine shed, and shed for accumulators, but will include cost of fixing and starting. The cost of maintenance afterwards will depend upon the source of power. With gas it will be considerably higher than the cost of gaslight. With steam it will be less. With water or with spare steam, the cost will be very much less than gas at 4s. 3d. per thousand. An installation with accumulators is very easily managed. A similar installation in a gentleman's house at Croydon is run by an intelligent page boy. Messrs. Cathcart, Peto & Radford, Hatton Garden, can lay down for you such an installation.—G. E. B.

Pantograph.—A. G. (*St. Albans*).—See Work, No. 187.

Incubator.—J. M. (*Edenfield*).—The copper flue is 6 in. long and 1¾ in. in diameter. The tray is 4½ in. at top, 3½ in. at bottom, and 1¼ in. deep. It is fixed to flue with the top of tray ½ in. below top of flue. The space between top of flue and radiator is ¾ in., and the radiator is 2½ in. in diameter.—Leghorn.

Lady's Workbox.—W. E. (*Notting Hill*).—It seems that, after all, the initials J. E. (*Notting Hill*) were correct, and not intended for yours, although the coincidence is curious. You will find, too, that F. J. has replied, giving a drawing, to your former query, in issue for October 22nd (No. 188). All, then, which I need say is in relation to your query as to where to obtain the satin or silk for the interior of the box. Most drapers would supply you, and you will be wise to obtain the assistance of a lady relative or friend thereunto. Wadding or cotton-wool (sold by chemists, etc.) is generally allowed to intervene between the wood lids and the silk covering, the ends of the latter being glued out of sight by means of an extra covering in the shape of cardboard, or paper, or silk.—J. S.

Bamboo Working.—W. E. R. (*No Address*).—An article upon this, which clears away many of the beginner's difficulties, is in Vol. I., p. 518 (No. 33), and numberless "wrinkles" upon it have since been in "Shop;" so that, with the article given in the present issue, the amateur bamboo worker will find much to help him in this publication. W. E. R. is thanked for his suggestions.—M. M.

Bamboo Working.—W. J. (*South Wales*) is referred to the above answer to W. E. R. As to the places where bamboo may be procured, he is referred to Vol. I., p. 221 (No. 14), and elsewhere in "Shop."—M. M.

Fret-saw on Sewing Machine.—Amateur.—You have made a very nice drawing of the sewing-machine stand, but your wheel is too small and light to give you satisfaction if you used it for fret-sawing, and it is too small for anything but a watchmaker's lathe. I have made a fret-sawing machine on a sewing machine, but my wheel is 12 in. in diameter; yet, even here, you do not get power enough: your legs and ankles get cramped, and you feel you cannot use the strength you have. I think you should have a 15 in. wheel at least, weighing not less than 25 lb.—F. A. M.

Electric Bell.—W. C. (*No Address*).—You can procure the castings, etc., from Mr. N. Collins, 59, Church Street, Newcastle-on-Tyne. You can purchase ordinary bell parts from Messrs. King, Mendham & Co., Western Electrical Works, Bristol.—J. T.

Old Oak Dresser.—Constant Reader of "Work."—I doubt whether a drawing of your dresser would be of sufficient general interest for publication in Work. It appears, by the sketch you sent, to be Late Seventeenth Century style.—F. J.

Kitchen Range.—Anxious.—If you have not set a range, you had better get a bricklayer to set one for you, and get him to explain the method to you, as, if improperly set, you will soon hear of it afterwards. Speaking generally, a chamber lined with fire-brick is formed under the oven, with an opening from the fire. A flue is carried up the side, and returned across the metal hollow top, on which a damper is fixed, and a small vertical flue carried up and sloped into chimney flue. The boiler is set in a similar manner. If it is a kitchener or close range, the ironmonger will supply a plan of the flues. The brickwork should be set with fine joints, and neatly cut and fitted together.—M.

Framed Door Jambs.—Newel.—Framed door jambs are made in the same way as doors—that is, as far as the framing together or mortising and tenoning is concerned. The rails generally carry round the same lines as the rails of the door. Of course, there are no mullions, as the total width of the jambs is generally the thickness of the wall, including the plastering on either side; and, taking 1 ft. 5 in. as the average thickness of walls in a building that requires "framed jamb linings," it will be seen that, after deducting the width of the stiles, it only leaves just room for panels. The ordinary jamb linings go right through the depth of the brick opening, and on one side of the wall have their edges rebated to receive the door, the edges on the other side of the wall being similarly rebated to correspond; so that you must allow your stiles to be the thickness of the door wider than you wish to show when the door is closed. The head or soffit is framed in the same manner. The length of soffit is generally divided into two panels by a mullion following the line of the mullion of the door (if there is one). The soffit is grooved to receive the tongues formed on the top of the jambs (as in ordinary window or door linings). The soffit is then nailed down on to the jambs, and a shutting piece is temporarily nailed in the door rebates to keep the jambs parallel, and a brace fixed across the top angles to keep it square whilst being fixed. In fixing the linings, scribe the bottoms down on to the floor, so that the soffit is level and the right height in the rebate for the door, taking particular care that the uprights are upright. Now offer the frame in its place, and measure the thickness of cradling or backing required to make up between the wood bricks, joints, or other fixing material and the wood frame. Put the frame on one side, and fix the cradling perfectly straight, square, etc. etc., and then put the jambs in their places, and secure them to the cradling. Some joiners cut long folding wedges between the back of the jambs and the fixing bricks, and gently drive them or slacken them until they are just right. This makes a very good job, especially if you fix the top and bottom of the frame first and the centre afterwards.—E. D.

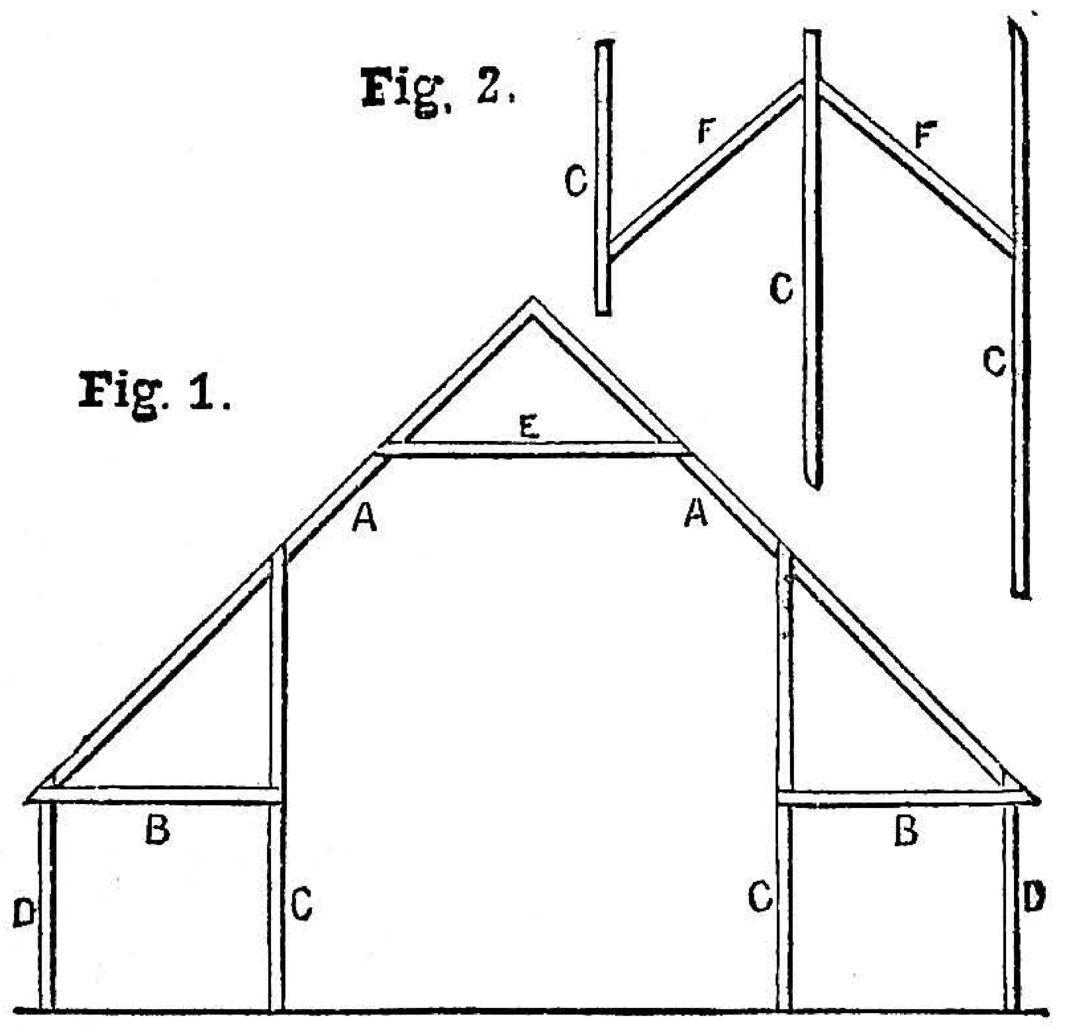
Tire Cement.—Splice.—Having never made indiarubber cement, I am not in a position to reply to this query from personal knowledge. The best I can do is to give a recipe from "Spon" to make rubber cement, as follows:—"Cut pure rubber into the thinnest possible slices, then cut these with scissors into the finest possible shreds. Get a wide-mouthed bottle, and fill about one-tenth full of the cut rubber; add benzine—pure, and free from oil—about three-fourths full; shake frequently, and in a few days it will assume the consistence of honey. If rubber remains undissolved, add more benzine. If solution is too thin, add more rubber. In using, smear the surfaces to be united with the solution, and let them stand for an hour or so; then unite, and press firmly together."—A. S. P.

Tooth-cutting Machine.—A Young Clock-maker.—Write to Grimshaw & Baxter, 33, Goswell Road, London, for catalogue, in which you will find a drawing of a machine for cutting wheels. It is far too elaborate an affair for any but a very skilful mechanic to attempt.—J.

Cow House.—Needy One.—Your cow house, as you have sketched it, is a very large building, and I cannot, by any means, understand why you require a space of 26 ft. by 40 ft. in which to store 16 tons of hay. There is plenty of room for nearly 100 tons! But it is not my duty to find fault with your needs, but to give advice; so I tender it. I will reply to your questions in the same order as you asked them. (1) As you say you do not wish to use any intermediate rafters, it is useless for me to give any size for them. The principal should be about 16 in. by 4 in., and they will require to be 30 ft. long, as the pitch should be about as I have shown it in Fig. 1; otherwise, you will not keep the wet out. (2) Battens should be about 3½ in. by 2 in., placed edge up on the principal rafters, not cutting the rafters or battens in any way. (3) The ties should be whole trees not less than 6 in. in diameter, mortised through the inner posts, and the outside posts mortised up through them and also through principal rafters. (4) For the inner posts you should use whole trees from 7 in. to 9 in. in diameter, either bolting the principal rafters to the top of each, or cutting a tenon on top of post to fit in a corresponding mortise in rafter. The outside posts will do a

Fig. 2.

Fig. 1.



Cow House. Fig. 1.—Pitch. Fig. 2.—Bracing of Posts. A, Principal Rafters; B, Tie-beams; C, Inner Posts; D, Outer Posts; E, Collar; F, Braces.

trifle less—say, 6 in. in diameter—and must be tenoned up through tie-beam and rafters, as stated above. (5) I do not know of any books likely to be of use to you in buildings like this, but I will have a search, and if I find any which I think are suitable, I will let you know where to obtain them, and also the prices. You must brace the inner posts lengthways, as shown in Fig. 2, bracing each way alternately; otherwise, you will find yourself and cows buried in the ruins some day. It is also necessary that a small collar be put on as in Fig. 1. I should not think that would be in the way if placed as high up as I have drawn it. I am afraid you will think it a rather gigantic task to use the size timber which I have given; but, as I take it, timber is cheap with you, and the sizes are not overdone in the least. I should be very pleased to have a few weeks' work at the wages you mention in your letter, and should not mind roughing it a little.—Chopstick.

Rust in Boiler.—Opifex.—The only way is, I think, to keep the boiler filled with water when not in use. This is the practice in steam boilers for engines: an analogous case.—J.

Organ Blower.—No Name.—W. H. Bailey & Co., Albion Works, Salford, Manchester, make a small organ blower, suitable for a chamber organ, at £6 6s. It is illustrated in their price list. Some day I will describe one in Work, but at present am too fully occupied with pre-arranged subjects.—J.

Protecting Iron-work from Rust.—A. H. (*Bradford*).—By means of Barff's process, which forms a film of magnetic oxide on the bright surface. It is effected by heating the iron to redness, and passing superheated steam over it.—J.

Steam-engine.—H. H. (*Stony Stratford*).—The idea is a very useful and practical one, and one which I shall be pleased to take up in due course.—J.

Mangle Springs.—A. N. (*London, N.E.*).—Rubber will do very well, but not better than steel. Its range of elasticity is not so great as that of steel. I do not think I should alter present arrangements. If the steel springs do not act quite as you wish, you can have them re-tempered to a different grade of elasticity.—J.

Model Steamboat.—*No Name* (*Crown Hotel*).—I hope to reply at length to your query at a future time, in an article or two.—J.

Bent Iron.—J. B. (*Newcastle-on-Tyne*).—You can get the strips of W. Whiteley, Bayswater, W., and of Gawthorp, 16, Long Acre, W.C.—J.

Bent Iron.—H. L. D. (*Leicester*).—You can get flat-headed rivets of any of the model makers, but will have to make the cup-headed ones yourself.—J.

Re-waxing Brass Name-plate.—Novice.—I fear there is nothing left for you but to entirely re-wax your plate. You should have worked with the graver only, then the wax would have remained in the cuts. You must patiently pick out all the old wax, and roughen the bottom of the cuts. Next pound up your sealing-wax into a fine powder, and lay in the cuts sufficient powder to fill them, pressing well down with a flat piece of iron or steel. Now gently warm the plate; if you have an oven large enough for the plate, that will do as well as anything. Failing that, stand the plate upon two bricks, and burn waste paper under it until the wax begins to melt, and press the wax into the cuts with the piece of iron alluded to before. Be careful not to allow the wax to boil, as that will cause small air-holes to develop in the wax. Afterwards clean off in the usual manner.—N. M.

Papier-mâché Work.—Linseed should write to Thornby & Son, oil and colour merchants, Snow Hill, Birmingham, who will supply him with a proper oil and a proper black japan. For the purposes of the latter Brunswick black is useless, as it never hardens properly; and it may be that in the oil used (which certainly ought not to conduct itself in the manner mentioned in Linseed's letter) a proportion of driers is mixed.—S. W.

Painting Screen.—H. E. S. (*Chatham*).—I see no reason why sateen should not be a very good ground for your purpose. To prevent the colours running, you must before painting "satisfy" the material, so far as the painting will extend, with size of some sort. Those who paint on sateen use, I believe, simply white of egg. When the ground is sized no especial medium is required. Whether you can gild on this I am in no position to say. If you think of using much gold, perhaps you will do better to have linen or calico, and size with isinglass, or if the work is on such a scale as to make cost of material an object, size with dissolved Russian glue. On these sizes you can gild with confidence.—S. W.

Varnish for Painted Sign.—E. R. (*Limavady*).—Ordinary carriage varnish is generally used by sign-painters, and would be all that would be needed if the situation is *inland*. But if the action of *sea air* has to be guarded against, a varnish prepared by dissolving gum in oil would be desirable. In this latter case, apply to a firm which supplies ship painters for the transparent varnish used by them over the paintings on white wood in saloon fittings.—S. W.

Reeds on Organs in lieu of Pipes.—F. D. (*Dunstable*).—Your suggestion of using harmonium reeds instead of Bourdon pipes is not practicable, as reeds will not keep in tune with pipes. Papers on Organ Building are already commenced in Work.—W. M.

Wire Egg Holder.—J. G. (*Crosshouse*).—Do not trouble with your idea. Many better things are on the market.

Invention for Producing Ovals, etc.—W. H. (*Arbroath*).—It would be impossible to advise you as to your invention for producing ovals, etc., without seeing the machine, and knowing more fully its capabilities and scope. The prints you have sent as specimens are very nicely and cleanly done, as far as they go. But all these have been produced by other means, chiefly by the aid of the rose-engine and the various chucks. The work itself is too simple for banknote engraving and kindred work, and I cannot designate any other occupation which would be likely to afford employment for such an invention. Having proved your competency in making such a machine, might you not go further in the same direction, taking in certain modern ideas, and consolidating them with your own invention? The main thing to be first considered is to make the machine strong enough to cut soft steel, and to provide for a more irregular outline—not circular only, but elliptical and general geometrical outlines. Next, you would have to consider how you could make the patterns less simple and more difficult to imitate. To bring this about, a multiplicity of movements are brought into use—viz., longitudinal, transverse, elliptical, excentrical, and cycloidal, all of which can be accommodated in one machine. I take it that your machine is built in the vertical position with horizontal movements, which is certainly the most approved fashion for constructing such modern lathes; and should you require further information on this subject, I shall be pleased to reply in "Shop."—N. M.

Enamelling Photos.—W. M. (*Bray, Co. Wicklow*).—The enamelling of photos is so different from the enamelling of jewellery that I do not feel at all sure of the details. I therefore suggest that you write to Oeffelein & Co., 54, Berners Street, London, W., and make inquiry as to the cost, etc., of what you require. If W. M. is really bent on trying his hand, I think some of the photographic manuals give details—Capt. Abney's, for example. The enamelling I am speaking of is that in which the photo is to be burnt into a vitreous base. I am not referring to the so-called enamelling of photos on cards, which is produced by some kind of glaze or varnish. There will be a short article in WORK soon on the furnaces, etc., used in enamelling, that may help you to understand the great need of practice and skill to obtain a successful result.—H. S. G.

Coloured Lights for Tableau.—NOVICE.—Whether limelight or oil lamp should be used will depend partly on the size of the room and also on cost. If the room or groups are large, and cost of no consequence, I should certainly recommend a biunial limelight; if, however, the other conditions exist, then a pair of good four- or five-wick lanterns will serve the purpose. When the coloured glass slides are in position, dissolve with a slow effect, not instantaneous, so that one tint shall blend and slowly fade into the other. Do not dissolve with violent contrasts.—O. B.

Model Lighthouse.—CORNISHMAN proposes making a model of the Eddystone Lighthouse in wood, with the lantern 2 in. in diameter and 2¾ in. high, and inquires where he can procure a glass globe for the purpose. Now, I cannot see exactly how or where he can get a *globe* of this size and form, and if he could, it would be of no service to him; but he can get a small glass shade with a dome-shaped or circular top, such as are used for covering delicate objects. Knowing Penzance well, I venture to say he can get any size he requires. CORNISHMAN, however, proposes to do what is far more difficult—the "globe" is to be ventilated by four or five ¼ in. holes. How does he propose to do it? That ventilation will be necessary is a fact, if CORNISHMAN does what he further proposes: "What sort of a lamp can I use to burn in it, as I wish to light it up from the inside of the lantern? Where can I get the lamp?" I am sorry, in a general way, to dishearten any budding genius, but I am afraid my countryman is attempting to do the impossible. The only thing that I can suggest is that he should procure a tiny electric lamp, such as is used in scarf-pins. This can be fixed in the lantern, with two wires leading from it through the woodwork, the electricity being supplied by two or three cells of the Bunsen type. A lamp of this size will be quite large enough to be in proportion to the lantern, and will not require ventilating. With reference to the question of using knotting for the knots in elm, I would say knotting is only used on wood which contains resinous knots, such as pine; consequently, it is not needed in elm.—O. B.

Phonograph.—ANXIOUS.—I am sorry that I cannot help ANXIOUS with his instrument. If he had been more explicit in his letter—if he had stated where he thought the fault lay—I might have helped him. I can only refer him to the details already given in WORK. If he has made the instrument to the instructions, the next point will be to carefully adjust the needle, and work away until he gets it right. He must not think that I am unwilling to help him, but he must try and give me something to work upon. His letter is too meagre for anything.—W. D.

Phonograph.—A. B. (*Herts*).—See above reply to ANXIOUS. I cannot make anything of your letter. Try and locate the fault, and write again. The tin-foil can be purchased at a chemist's.—W. D.

Varnish for White Wood.—G. W. R. (*Cheam*).—Ordinary white hard spirit varnish, such as can be bought at any respectable oil or drysaltery stores, at not less than 1s. per pint, should be suitable for this. Should you prefer to make a varnish yourself, take 6 oz. white shellac, 2 oz. pale resin, 1 oz. benzoin, and 1 pint methylated spirits. The gums to be finely crushed and spread out on paper for a few hours in a warm room or sunshine. To dry the shellac—a necessary proceeding, owing to its being kept under water—carefully strain before using, and apply with a camel-hair brush in a warm room free from dust.—LIFEBOAT.

Pinna.—W. P. (*Ballynafid*).—I cannot tell you where you can purchase pinna, and, in fact, I do not think it is in the market. There are about thirty species to be found on the British coasts, but they are not all silk spinners. You might write to one of the firms in Dublin who supply fishing material on this point.—F. C.

Steam-engine Cylinders.—R. C. (*Skipton*).—There is no necessity for any steam-engine cylinder to be made of brass, whether oscillating or otherwise. The reason why brass is used for models is that it is more easily worked than cast iron. For the size you mention, brass would be preferable. You should write to "The Model Dockyard," Fleet Street, London, E.C., for price; all kinds of models—complete and in parts—are to be purchased there, either rough or bored and turned.—F. C.

White Clay.—E. F. F. and B. E. E.—You can procure the clay from Messrs. Doulton & Co., Lambeth Pottery. You may also be able to get the colours and glaze at the same place, but I am not sure. If not, you can procure them from a wholesale chemist, or through a local chemist. If you want colours for painting, you can procure them from Messrs. Hancock & Son, Worcester, but as you are comparatively near the potteries, by making inquiries you might procure what you want from there.—M.

Boat Making.—J. W. W. (*Heckmondwike*).—Articles on Model Boat Making for Boys appeared in WORK, Nos. 160, 166, and 171.

Drawing Office Work.—COMPASSES.—Articles on Drawing Office Work appeared in WORK, Nos. 158, 162, 166, and 171.

III.—QUESTIONS SUBMITTED TO READERS.

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

Speaking Tube.—H. L. P. (*Montrose*) will be glad of the address of the Homacoustic Speaking Tube Company.

Monogram.—T. L. E. (*Cardiff*) writes:—"I should esteem it a great favour if any reader would kindly submit a monogram for the three letters T. L. E."

Tinware Japan.—GULIELMUS writes:—"Can any reader inform me how to japan tinware—carriage lamps, for example—so that it will not finger-mark nor chip off?"

Plaques.—J. B. (*Lincoln*) is in possession of a pair of terra-cotta plaques which he is desirous of painting, and which he finds absorbs the paint as soon as it is placed upon them, and thus interferes with the shading. Will any reader inform him how to prevent them from doing so?

Monogram.—BECK writes:—"Would some kind reader give me monograms for 'H. Y.' and 'J. B.'?"

Weaving.—A READER OF "WORK" writes:—"Will any kind reader tell me where I can get full particulars of the Jacquard Weaving Machine?"

Mat Machine.—CONSTANT READER writes:—"Being a regular reader of WORK, I would be much obliged for any information as to a machine for the working of mats or hearthrugs out of strips of old cloth, using a piece of light canvas as a foundation. Any information from your many readers will be thankfully received."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Saw Belt.—HEBBLETHWAITE BROS. (*Huddersfield*) write to SUBSCRIBER (see No. 181, p. 446), that "they can probably supply a belt that will drive a circular saw without difficulty."

Water Wheel.—W. A. H. (*Redhill*) writes to DYNAMO (see No. 179, p. 366):—"The best thing you can do is to send one stamp for price-list of dynamos and motors, etc., to Mr. W. Wells, Toovicsworth, Crawley, Sussex, who is the best maker of them. As to water power, send two stamps for list to Mr. P. Pitman, Withington, Manchester, who is the maker of the 'Demon' water motor."

White Wood Articles.—F. C. (*No Address*) writes:—"A. M. R. (*Golden Square*) (see No. 186, p. 478) can get white wood articles from F. Bennett, 20, Norman's Buildings, St. Luke's, E.C."

Fret Saw.—M. A. T. (*Farnham*) writes that he has a Rogers' Fret Saw which he can sell to H. W. (*Halifax*) (see WORK, No. 183), or would take tools or books in part exchange.

Catching House Flies.—EDDEFRA writes to W. W. (*Wembley*) (see No. 183, p. 430):—"I read of a trap which was seen at work in a chemist's shop window. I do not know if it was a patent. It consisted of two rollers, over which was stretched an endless piece of tough paper or linen; the distance between centres of rollers, about 12 in. Over one roller was a glass case. An electric motor was connected to one of the rollers, so that the paper was carried slowly under the glass case. Some sweet mixture was spread on the paper to attract the flies. They were carried under the case, when a rod across the paper caused them to leave the mixture and fly up the case. I think one could be easily made. For motive power, if there were one of those advertising fans fixed above shop door, it could be made to run the traps. The fan would require a new shaft—one long enough to pass through the wall into the shop—with small pulley on it. You will find you would get enough power to make it also work a fan ventilator for cooling the shop."

Kitchen Range Castings.—EDDEFRA writes to J. W. (*Askham-in-Furness*) (see No. 183, p. 430):—"The patterns for kitchen ranges are mostly made of a mixture of tin, lead, and zinc, on account of the castings being so thin, and having such a quantity of mouldings, carvings, etc., which would occupy so much time to make in wood. The boilers are made in wood. The tin-plate pattern-makers' tools consist of solder-iron, chisels, and files. They first make a long frame, if they want a long moulding, into which they run a quantity of plaster-of-Paris. The top is strickled over with a piece of wood cut to suit required moulding, with its edge protected with zinc. When the plaster has set, the mixture—tin, lead, and zinc—is run in. It is then taken out when cold, and cut up and soldered together as required. It is a practice about here to knock the metal castings out of the sand as soon as they will bear it. They then keep their colour and do not rust, which is the case if they are left till morning."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—A REGULAR READER; T. S. (*Eastbourne*); W. H. K. (*Failsworth*); F. S. (*Ealing*); T. E. T. (*Forest Gate*); F. W. T. (*Ipswich*); E. N. R. (*Pickering*); ANXIOUS ENQUIRER; W. J. B. (*Cradley Heath*); H. M. (*Hampstead*); W. J. F. (*Cork*); G. V. (*London*); F. B. (*Hastings*); READER OF "WORK"; A. B. (*Keighley*); W. F. H. (*Limerick*); L. (*London*); JOINER; C. D. (*Exeter*); T. K. (*Liverpool*); H. T. B. (*Norwich*); STEEL CHAIN HARROWS; R. McC. (*Glasgow*); BICHROMATIC; F. J. (*Kingston-on-Thames*); T. R. (*Birmingham*); BUFFALO BILL; G. H. C. (*St. Georges, E.*); BAROMETER; C. L.; AN OLD HAND; PRO BONO PUBLICO; G. S. W. (*Dewsbury*); J. A. H. (*Cardiff*); A CONSTANT READER; PASTE; P. F. S. (*Leigh*); CONSTANT READER (*Lewes*); G. A. J. (*St. Georges, E.*); ZINC; W. S. S. (*Leeds*); J. R. L. (*Aberdeen*); A NEW READER; J. J. (*Ottawa, Canada*); KILKENNY CAT; J. McN. (*Glasgow*); H. L. (*Newport, Mon.*); DERWENT; E. L. (*Earl's Court*); OLRAC; H. D. L. (*Worley*); G. B. (*Wolverhampton*); E. F. J. (*Market Harborough*); NEW READER; R. P. (*Stoke-on-Trent*); T. W. L. (*Hexham*); AXLE UPHOLSTERER; C. A. (*Sunderland*); W. S. (*Alford*); B. G. (*Wandsworth*); T. W. H. P. (*Bolton*); M. C. J. (*No Address*); W. A. (*Birmingham*); H. S. N. (*Sheffield*); W. M. (*Dublin*); BOSKINS; C. H. S. (*Midsomer Norton*); G. N. R. (*Dundalk*); P. S. (*Hull*); A. B. (*Waltham Cross*); M. R. (*Beckenham*); J. B. (*Poole*); NEW READER; PATENT; N. B. (*London, N.*); J. D. (*Port Talbot*); W. H. (*Halifax*); CONSTANT READER; WOULD-BE ENGINEER; J. C. (*Motherwell*); M. E. L. (*Lower Clapton*); J. W. H. (*Higher Broughton*); G. P. (*Hulme*); J. S. (*Burslem*); E. G. (*Bradford*); R. G. D. (*Burnley*); CORNISHMAN; C. O. (*Preston*); G. E. L. (*New Brompton*); C. I. C. (*Brixton*); G. E. (*Ipswich*); HORIZONTAL; W. H. T. (*Mexborough*); H. & SONS (*Windsor*); A. F. (*Dalston*); S. G. C. (*Belfast*).

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