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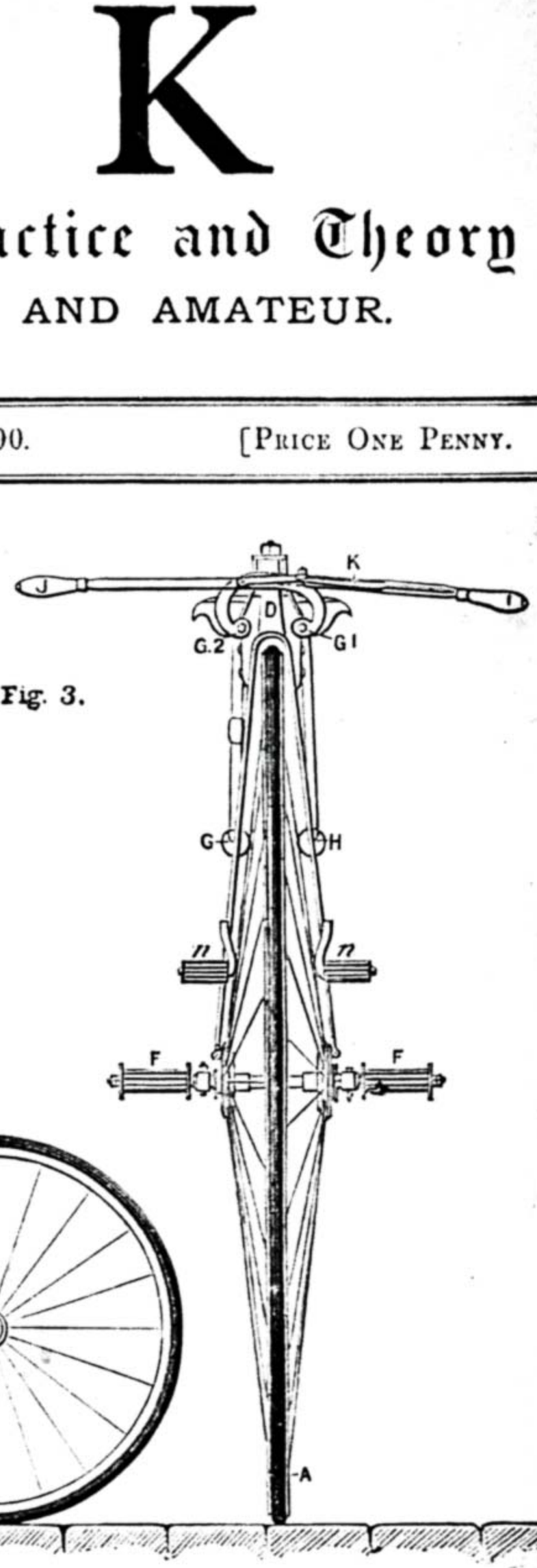
Fig. 2.

Fig. 3.



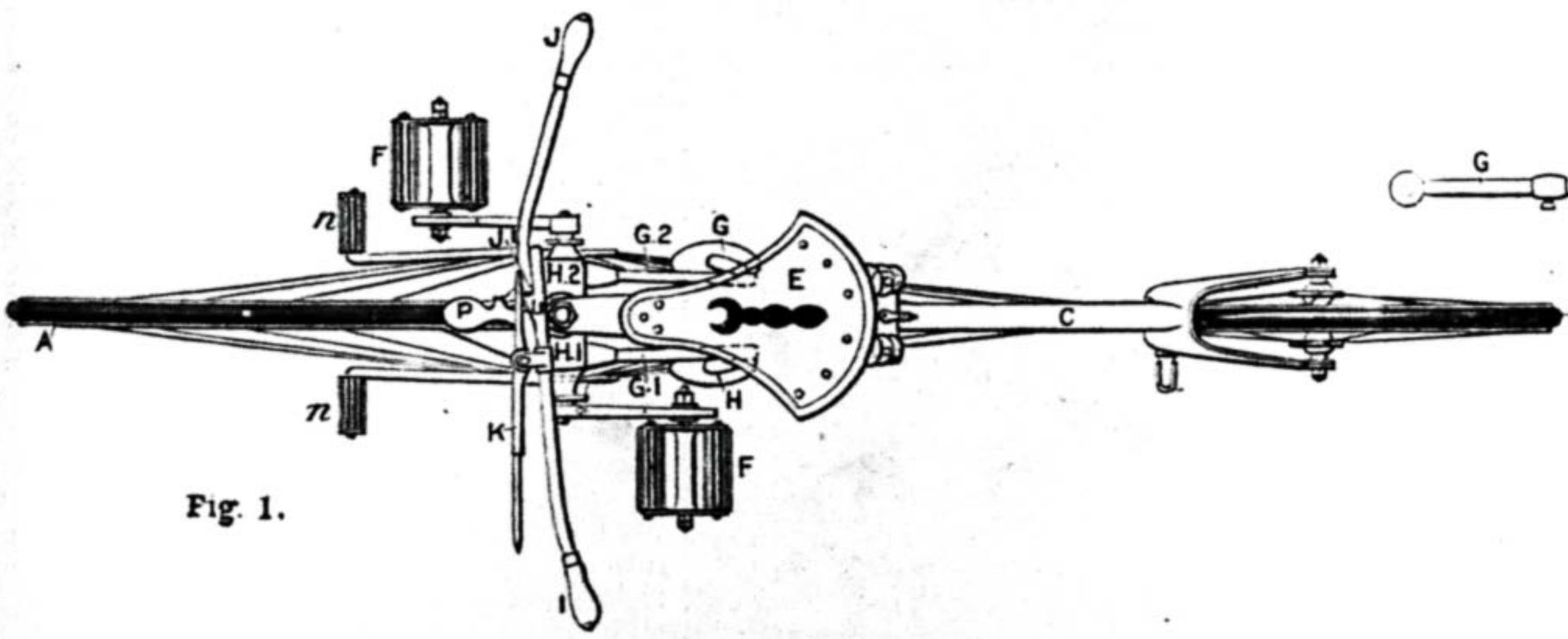


Fig. 1.

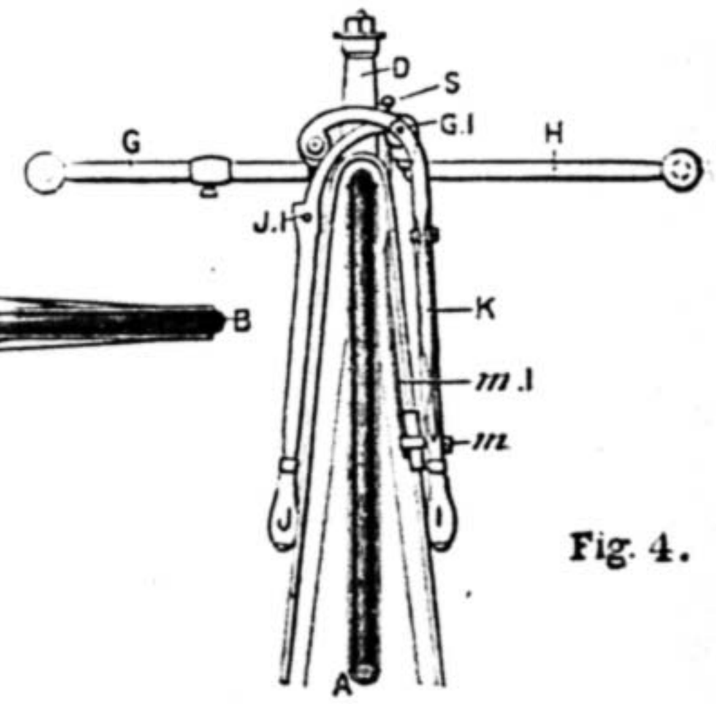


Fig. 4.

BROXUP'S PATENT INTERCHANGEABLE FORE AND REAR HANDLE-BARS FOR BICYCLES.

Fig. 1.—Bird's-eye View or Plan, showing Fore and Rear Handle-bars in same Positions as in Figs. 2 and 3. Fig. 2.—Left-hand Side Elevation, showing Fore Handle-bars locked in Position for mounting and steering, with Rear Handles depressed or hanging down so as to be of no hindrance to Rider when mounting his Machine. Fig. 3.—Fore End Elevation, showing Fore and Rear Handle-bars in same Positions as in Figs. 1 and 2, when the Machine is required to be reared against a Wall. By depressing Fore Handle-bar (J) in the same way as Rear Handle-bar (G) is shown, it is manifest that Machine will occupy less space. Fig. 4.—Shows Fore Handle-bars locked fast and hanging downwards, and the Rear Handle-bars up in a Horizontal Position in readiness for steering with, and leaving all clear and open in front of the Rider.

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BROXUP'S PATENT INTERCHANGEABLE FORE AND REAR HANDLE-BARS.

BY T. W.

BEFORE proceeding to describe the construction, object, and application of Broxup's Patent Interchangeable Fore and Rear Handle-bars to bicycles called "ordinaries," it will be necessary briefly to refer to the "ordinary" as at present constructed, and to point out its inherent good qualities, as also its most salient features.

The "ordinary," "old ordinary," or, as some of its admirers delight to call it, the "good old ordinary"—this last term seeming to indicate a desire to soliloquise and say, "With all thy faults and dangers, I love thee still," which, taking its good points into account, is not so much to be wondered at—is acknowledged to be the most graceful in appearance, and the simplest in construction, with the fewest parts liable to wear and tear of any other bicycle extant. It possesses also the important qualities of requiring little power for its propulsion, and of elevating its rider above the dust, etc., on the roads, and enabling him to have a better view of the surrounding scenery when touring through the country.

On the other hand, and notwithstanding the above enumerated advantages, it certainly possesses some very objectionable features as at present constructed, with the handle-bars rigidly fixed in an immovable horizontal position, which is the sole root and cause of the disastrous effects to the rider's limbs and to his machine, proceeding from what is termed "coming a cropper," or an involuntary performance of an acrobatic feat, brought about in the first instance by the fore wheel of the machine coming in contact with some small obstacle on the road, such as a stone, brick, or stick, etc., and by the sudden concussion that immediately follows the impact, which causes the rider to be jerked from his seat in a forward direction (and here is where the danger begins) over the handle-bars, which act as rigid barriers retarding the motion of the lower part of the rider's body and legs, and thereby compelling him to alight on his head.

Another objectionable feature is the absence of proper "foot-rests," which cannot be applied on account of the immovable handle-bars; therefore, when pedalling is not required, the rider is induced, as an alternative, to throw his legs over the handle-bars, and thus to exhibit himself in a very ungraceful and dangerous attitude (should an accident occur meanwhile): a contorted position that would supply an artist with a model for an apt illustration to the well-known nursery rhyme of "Froggy would a-wooing go."

Another inconvenient feature that is found in the immovable horizontal position of the handle-bars, is that they prevent any machine so constructed ("safeties" included) from passing through any aperture, doorway, or along any walled passage, etc., whose transverse width is less than the extreme length of the handle-bars.

Having thus pointed out and explained the good qualities of the "good old ordinary," as at present constructed, as well as its defects and the evil effects arising therefrom, it is therefore now convenient, with the aid of the accompanying drawings, to proceed with a description of the construction, object, and application of Broxup's Patent Interchangeable Fore and Rear Handle-bars, and the advantages to be

Fig. 5.—Perspective View of Bicycle, showing Fore Handle-bars depressed or hanging down, and the Rear Handle-bar up in Position for steering with.

obtained by dispensing with the immovable handle-bars now in use.

Mr. Broxup's invention and improvements consist essentially in the employment of steering handles G and H, one on each side of the machine, and occupying positions to the rear of the rider. These handle-bars are attached to short horizontal side-shafts, G^1 and G^2 (or rather they form a continuation of said side-shafts, but are bent at right angles thereto), and are made to oscillate from a vertical to a horizontal position, and *vice versâ*, in socket bearings H^1 and H^2, the sockets being cast to the head-piece at the top end of guide-fork D.

To each side-shaft at its fore end is attached the fore handle-bars I and J, which are horizontally disposed when the rear handle-bars are depressed, and *vice versâ*, to allow the rider to mount his machine; and after he is firmly seated thereon, by releasing the catch lever K, which pins the two fore handle-bars together, they immediately drop down into vertical positions, one on each side of the fore wheel, slightly in advance of the guide-fork D, to which they are locked by the lever catch *m*, at the bottom end of the vertical rod m^1, by the act of pressing downwards on the button or knob S, at the top end of vertical rod m^1. The catch lever K is released again by the act of pulling up at the button or knob S, simultaneously bringing the rear handle-bars into a horizontal position, one on each side of the fore wheel, in readiness to be grasped by the rider as a means of steering his machine, and by these means giving him a clear open space in his front, free from any obstruction should an accident occur, and with nothing to prevent him from dismounting over the wheel and alighting on his feet, still retaining his

Fig. 6.—Perspective View of Bicycle, showing Fore Handle-bars up and in Position, and Rear Handle-bars depressed or hanging down.

grasp on the handles, and maintaining both himself and machine in upright positions.

The two fore handle-bars, when in position for steering with, are made to abut against each other, or rather against stoppers I^1 and J^1, forged on to the said handle-bars, thereby retaining them in a more rigid position; and in addition thereto there is a spring lever K fixed to one of the fore handle-bars, with a round hole formed at one end of said lever, which, by the action of lifting the fore handle-bars up into position, causes them to butt against the stoppers and the round hole at one end of lever K, to slip on to a projecting pin or stud which is fixed to the other fore handle-bar, and thereby to join and secure the pair of fore handle-bars firmly together horizontally, and at the same time holding the rear handles down until released in the manner previously described.

The side shafts G^1 and G^2 are free to move laterally along with the fore wheel under the back bone C, for steering purposes, and they also serve the purpose of mud guards.

The brake lever O (see Fig. 2) is fixed to one of the rear handle-bars and connected by the wire rod R to the brake P, this arrangement adapting itself without interfering with the brake when raising or lowering the rear handles.

In dismounting from the machine whilst steering with the rear handle-bars, the easiest and safest method is to apply the brake P so that the rider may be carried over the fore wheel A, instead of dismounting at the side of ditto, as is usually practised with the immovable fore handle-bars.

Amongst a number of advantages to be gained by steering with the rear handle-bars is the application of proper foot-rests, etc., to the "ordinary," for use when pedalling is not required, equal in every respect to those attached to safety machines; also the "rake" in the "guide-fork" D and saddle E is dispensed with, thereby improving the steering qualities of the machine, and enabling the rider to sit in the best possible position so as to avoid the effects of vibration, also to "back-pedal" with greater force, and by firmly pulling upwards at the said handle-bars, at the same time pressing down with his feet on the pedals F, he can so pin himself to his seat that it is almost impossible for any obstacle coming in contact with the fore wheel to unseat the rider or overturn his machine. Another advantage is that the arms and hands of the rider are in the most easy and natural position whilst grasping the handles of the rear handle-bars, as the extreme ends of these bars are only about $2\frac{1}{2}$ in. back from the centre of the fork D, which places the rider's hands at the most convenient distance in advance of his shoulders for ease whilst steering, and does away with tendency to become round-shouldered.

The chief aim and object of the inventor in designing and perfecting the improvements herein described and shown in the drawings has been to dispense entirely with the objectionable features inherent to the "old ordinary," and at the same time to retain all its acknowledged good qualities and to add thereto a number of other advantages, all of which have been fully described; and his endeavour has been to accomplish the task without in any way detracting from the symmetry of the machine, but to increase it rather than otherwise, and by these means to transform the "old ordinary" (dangerous) into a real *bonâ fide* "safety ordinary," and to make it the safest, the

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most reliable, and the most rational bicycle in existence up to the present time.

How nearly the inventor has succeeded in accomplishing his aim and object must now be left to the impartial and unprejudiced judgment of all readers of WORK who are at all interested in matters relating to bicycles, and more especially to those of them who are practical users of the "wheel."

After perusing the description, etc., herein contained of the fore and rear handle-bars, if any of the readers of WORK are impressed with the idea that there is some difficulty in the manipulation of the said handle-bars, the writer may now tell them that the inventor has two sons, fifteen and twelve years of age respectively, both of whom he has supplied with "ordinaries," fitted with the interchangeable handle-bars, and to witness with what ease, and with no apparent effort, they perform the operation (when out with their machines), as I have often done, would instantly dispel any doubts they might entertain on that score. The elder of the brothers has often dropped off the side walk on to the road channel—a distance of seven inches—seated on his machine, and steering with the rear handle-bars. Another instance I will relate, to prove that there is no difficulty of the kind named, is that the writer saw Mr. W. G. Hurst (well known in the bicycle world under the pseudonym of "King of the Wheel") mount for the first time the machine belonging to Mr. Broxup's eldest son, which he had never seen before, nor any machine like it. He mounted with the fore handles in position, and did not go more than twenty yards on the road before he changed the handles and came back steering with the rear handles, and dismounted with them with the greatest ease imaginable.

Prices of machines fitted with Broxup's patent fore and rear interchangeable handle-bars, and the cost of fitting existing machines with them, may be ascertained on application to Mr. Broxup, 7, Plumbe Street, Burnley.

THE TRIUNIAL OPTICAL LANTERN: HOW TO MAKE IT.

BY CHARLES A. PARKER.

PREPARATION OF THE SLIDE-STAGES — NATURE OF THE WORK — PRICES OF TUBING, AND WHERE OBTAINABLE — MARKING STAGE-PLATE — CUTTING CIRCULAR APERTURE AND BRAZING TUBE TO PLATE—CONDENSERS—SPRING-PLATE OF SLIDE-STAGE—MAKING AND FITTING OUTER PLATE OF SLIDE-STAGE WITH DRAW TUBES—PREPARATION OF SUPPORTING PILLARS OF SLIDE-STAGE — FITTING STAGE TOGETHER — FITTING SUPPORTING PILLARS TO SPRING-PLATE—MAKING SPIRAL SPRINGS—HINGEING STAGE-PLATES TOGETHER.

HAVING in the previous papers completed the description of the carcase of the lantern, it behoves us to turn our attention to the preparation of the movable stage-plates and fittings for the front of the instrument. Before commencing the constructive details, it may not be out of place to briefly explain the necessity for some movable arrangement of the slide-stages. Supposing, for instance, that the lens system and slide-stages were to be a fixture to the front of each lantern, it would be found that the disc projected from the upper lantern would not coincide or register with that of the lower one when the two were thrown upon the screen. It therefore becomes requisite to secure their coincidence by either tilting the top lantern downwards, or by attaching the condenser, slide-holder, telescope front, and objective of each system to a brass plate or stage, which is hinged at one end to the lantern body, and provided with a spring at the other end to press it outwards, and two milled nuts to screw it back. By means of this arrangement it will be found an easy matter to secure the accurate adjustment of two, or even three, discs on the screen at the same time. The condensers are fitted into a short tube or collar, which projects from the back of each stage-plate into the interior of the lantern—the front of the plate being occupied by the slide-holder and the tubular front to which the objective is attached; the latter being formed of two tubes sliding one within the other, in order to enable the operator to lengthen the front when it becomes necessary to use long focus lenses.

The stage-plate and fronts should be made entirely of brass, with the exception of the wooden frame for the rolling curtain. The sheet brass required for this purpose will vary in cost from about 8d. to 10d. per pound, according to thickness; and the price charged for ordinary brass tubing will be about 10d. per pound, or 2s. 6d. per pound for drawn tubing. Brass tubing and sheet brass of every thickness can be obtained from either of the following London metal warehouses, cut to any size required, and charged for by weight: Messrs. Smith and Sons, 29—33, St. John's Square, Clerkenwell, and Messrs. Stanton, 21, Shoe Lane, Fleet Street, E.C.

For each of the stage-plates a piece of brass plate, measuring 7¾ in. by 6 in., and ⅛ in. thick, will be required. As this will in all probability be uneven when first obtained from the metal warehouse, it will require to be flattened previous to being worked upon, and as this is a job which requires a considerable amount of care and skill, it will be found advisable to get it performed by a professional brass-worker; otherwise, a novice may make matters worse by filling the plate with a lot of hammer marks, which will cause a considerable amount of trouble before they can be removed. Having got a perfectly flat plate of sufficient size, the first proceeding will be to mark out a rectangle of the above size by the aid of a square and a sharp steel point, after which the plate should be put in a vice having leaden clams for the edges, to be carefully trued up by means of a second-cut flat file, not forgetting to occasionally test them with a straightedge. When this has been done, one side of the plate must be rough-polished by means of a lump of pumice-stone or blue-stone and plenty of water, care being taken to always rub the stone in one uniform direction until all the scratches or imperfections have been entirely removed, and the plate has been brought up to a smooth and even surface. It will only be requisite to polish one side of the plate, as the other side from which the tube projects goes inside the lantern, and is consequently not seen. After the blue-stone, the metal may be further improved by using a piece of water of Ayr stone in the same way, by which time the plate will have been brought up to a sufficient degree of finish for all present purposes.

Now drill a couple of ⅜ in. holes at each of the top corners of the plate, as shown in Fig. 21, and then make a centre-punch mark in the middle, and strike out a 4½ in. circle by means of a pair of compasses, after which the brass should be mounted on the face-plate of a lathe of sufficient size to accommodate a plate of these dimensions, with the head-centre pushed forwards until it touches the centre punch-mark in the plate, when the latter may be clamped securely in position, and the central portion afterwards cut through, where marked. It will be necessary to be particular to cut this circular aperture straight through the metal, in order to ensure the inner edge of the opening being quite square with the face of the plate. When the aperture has been cut, a 1½ in. ring of moderately stout brass tubing, 4½ in. in diameter, will require to be fitted into the opening in the plate, in order to form a cell or collar to receive the condensers. Each edge of this ring should first be carefully trued up in a lathe, after which it is accurately fitted into the opening in the plate, with the edge of the ring flush with the outer or polished side of the plate. Of course in actual practice it will be found advisable to get this ring before the aperture is cut in the plate, as it will then be an easy matter to fit the two together accurately; after which they must be brazed together in the manner about to be described.

Having first ascertained that the two surfaces to be joined are perfectly clean—that is to say, the edge of the tube and the circular aperture in the plate—carefully fit them together, and then paint the joint with a feather which has been dipped in a paste composed of borax ground up with water upon a piece of glass or slate until it is as thick as cream, after which a sufficient quantity of spelter should be dusted along the join. Now blow up a good fire, and then gradually apply the heat to the underneath of the plate and inside of the tube, continuing to gently puff until the borax runs, when the work should be tilted in various directions, in order that the solder, which melts about the time that the metal attains a dull red heat, may run in the required direction, using a wire, if necessary, for the purpose of guiding the solder round the joint until the latter is complete, adding a little more borax if the solder exhibits any disinclination to run.

As soon as the join appears to be well covered with the solder, the work should be removed from the fire and allowed to become gradually cool, care being taken not to shift the seams in so doing, otherwise the joint would be spoiled. It will be necessary to remove the superfluous borax whilst hot, as it becomes intensely hard when cold. For brazing large work, a small forge will of course furnish the most suitable source of heat, but for the work in hand a blowpipe worked by a foot-blower will be found quite sufficient. If a fire is employed, coke will be the most suitable fuel to employ, and this should be blown up until quite clear and entirely free from smoke, as the latter would tarnish the work and effectually prevent the spelter from adhering. It will be necessary to be particular and use soft spelter, and apply the heat gradually, otherwise the work might happen to melt at the same moment as the spelter. An inexperienced hand will do well to employ either common silver solder or an alloy composed of thirteen parts of copper and eleven parts of fine silver, using borax as a flux. As this solder melts at a much lower temperature than spelter, there will be less likelihood of the work being spoiled. Experience alone will teach the exact quantity of spelter required to make a strong joint; but it may be stated that the best and strongest joints usually have but little solder, and as this simply represents a needless waste of metal,

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it is a fault which should be guarded against, as it affords no additional strength to the joint.

As the size of the brass ring just fitted to the plate has to be governed by the size of the cell in which the condensers are mounted, it will be necessary to procure these previous to cutting the apertures in the stage-plate. In a future paper hints will be given regarding the selection of suitable condensers; in the meantime, it may be stated that they should be procured from some firm of repute, and on no account should second-hand condensers be purchased, unless the reader is an expert judge of their qualities. Condensers are not very expensive when procured from a reliable firm, as a capital pair of 4 in. condensers mounted in brass cells are now supplied by Messrs. David Noakes & Sons, of Billingsgate Street, Greenwich, for 10s. 6d., and a still cheaper pair by Messrs. Theobald & Co., of Bath Place, Kensington, who charge 8s. 6d. for a serviceable pair mounted in brass cells, with ventilation apertures.

Having so far completed the stage-plate, the next proceeding will be to make the inner spring-plate of the slide-stage, which is shown in plan and section in Fig. 23. For this we shall require a piece of $\frac{1}{16}$ in. sheet brass, measuring 5 in. by $6\frac{1}{2}$ in., which must be made perfectly flat, and then brought up to an even state of semi-polish in a similar manner to that previously described for the stage-plate, after which the four corners should be carefully marked out in curves, each having a radius of $\frac{3}{4}$ in. from the corner of the plate. When this has been done, the plate must be screwed in a vice between leaden clams for the edges to be filed up quite square and true, after which the curves are roughly shaped to the form of the outline by means of a cold chisel, and then smoothed to the exact form by the aid of a half-round file. At this stage of the proceedings make a centre-punch mark in the centre of the plate, and strike out a $3\frac{1}{4}$ in. circle by means of a pair of compasses, afterwards mounting the plate on the face-plate of a lathe for an opening of the above size to be cut to the form of the outline. When this has been done, a $1\frac{1}{2}$ in. ring of brass tubing $3\frac{3}{4}$ in. in diameter should be carefully trued up at each end in a lathe, and then fitted and brazed into the circular aperture in the plate just prepared, after which the spring-plate may be placed aside for a short time for the outer plate of the slide-stage to be prepared. This plate, which should be $\frac{1}{8}$ in. thick, is shown in plan and section in Fig. 24. It measures 6 in. square, and is constructed in much the same manner as the last, with the exception of the corners, which will not require to be shaped. Previous to working on the plate it will be necessary to flatten it, and then roughly polish both sides in the manner previously described, after which the edges should be filed up until quite square and true with the face. When this has been done, strike out a 4 in. circle in the usual manner, and afterwards mount the plate on a lathe for an opening of this size to be cut in the metal. A 5 in. length of tolerably stout drawn tubing 4 in. in diameter will now be required, likewise another piece of just sufficient size is slid over the first in telescopic fashion; the latter, which forms the draw-tube of the stage front, will not be required at present, and may therefore be placed aside, but the other tube should be trued up at each end in a lathe, and then fitted into the circular aperture in the brass plate just prepared, with the edge of the tube brought through the opening in the plate until it is flush with the surface on the other side, after which the two are brazed together in the usual manner.

Before proceeding further, it will be necessary to prepare the four supporting pillars of the slide-stage, one of which is shown in Fig. 25. These may be formed by cutting an $8\frac{1}{2}$ in. length of brass rod of about $\frac{3}{8}$ in. diameter into four 2 in. lengths, and afterwards drilling and tapping each piece longitudinally at either end just sufficient to take the stem of a cheese-headed brass screw, as shown in the cut, using a milled screw to one end if preferred. Should any difficulty be experienced in obtaining screws of this size, it will be found advisable to send to Mr. Morris Cohen, 132, Kirkgate, Leeds, who will supply them at 6d. per dozen, postage $1\frac{1}{2}$d. In ordering, it should be stated that brass cheese-head screws No. B are required. A skilful hand at hard soldering may form these pillars in a slightly different manner. An $8\frac{1}{2}$ in. length of stout brass, bent $\frac{3}{8}$ in. diameter, may be cut into four 2 in. lengths, to each end of which the bush of a small milled screw similar to Fig. 27 is hard soldered, as shown in the section of the tube in Fig. 26. By this means the

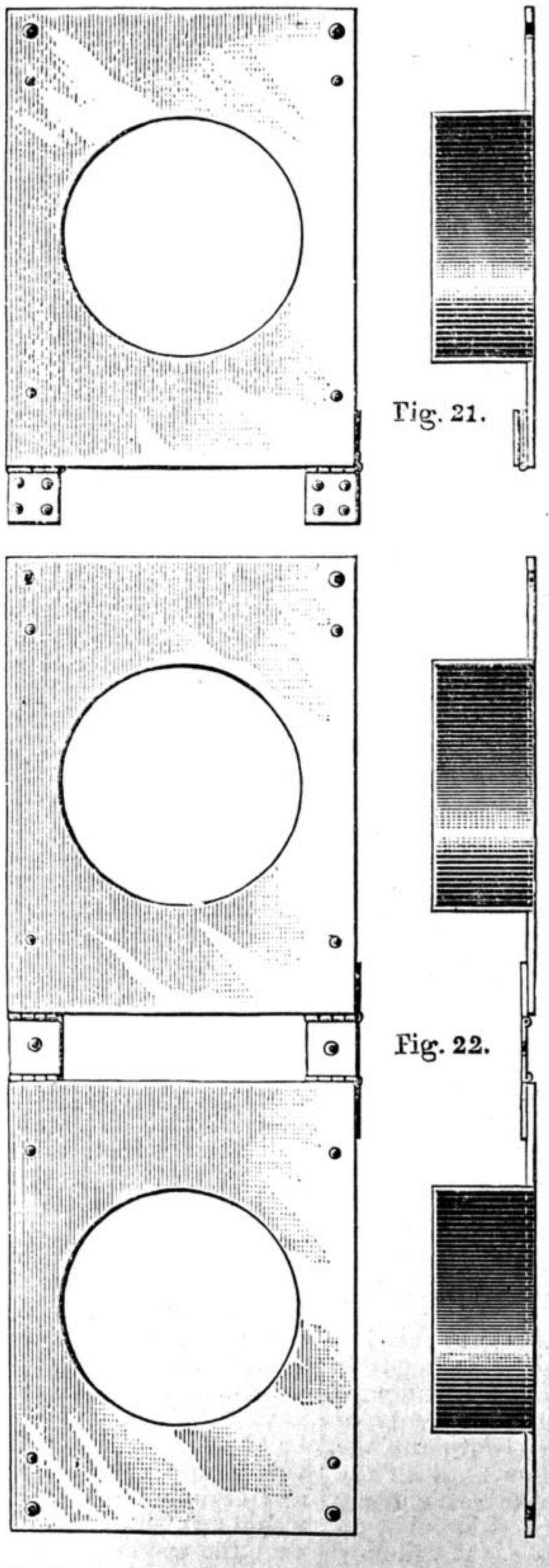


Fig. 21.

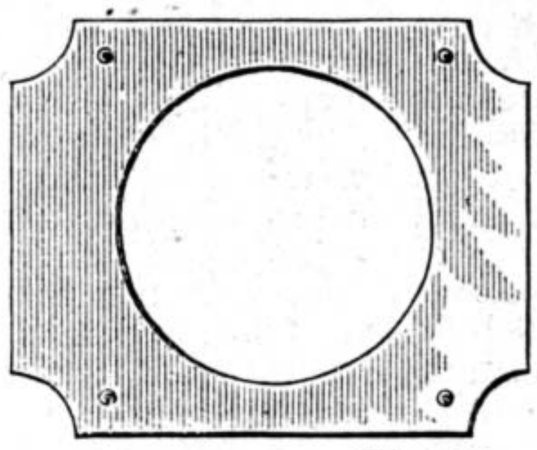


Fig. 23.

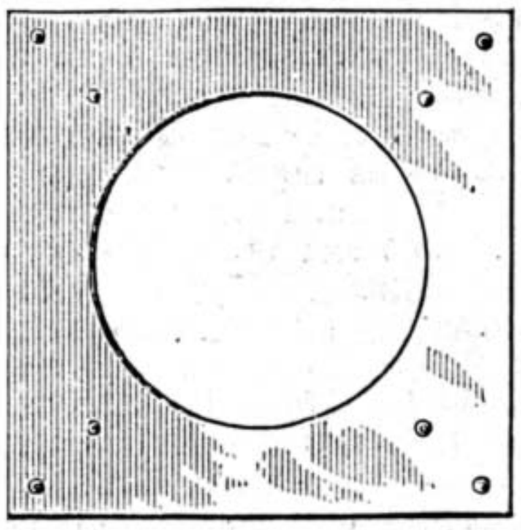
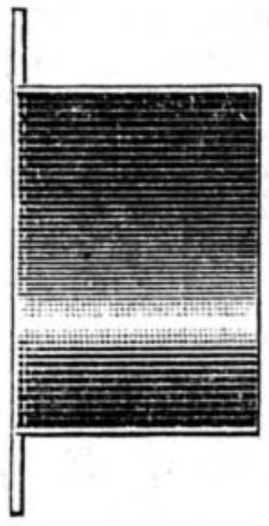


Fig. 24.



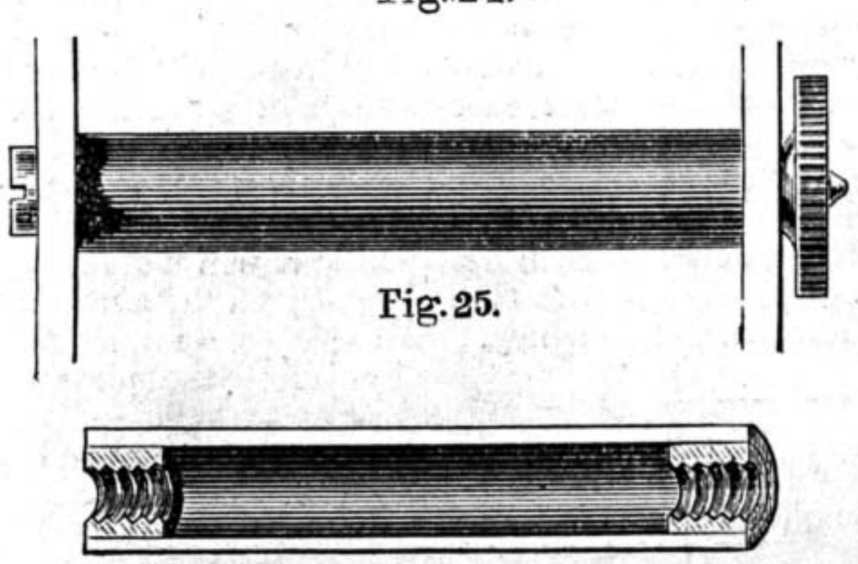


Fig. 25.

Fig. 26.

Fig. 27.

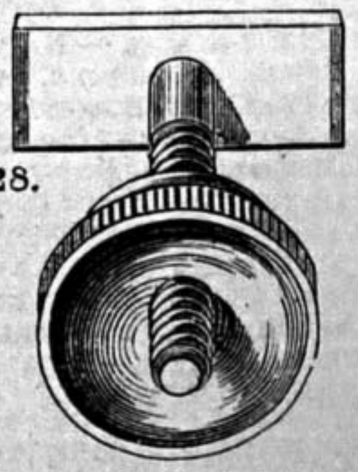


Fig. 28.

Fig. 22.

Fig. 21.—Plan and Section of Stage-plate of Top Lantern. Fig. 22.—Plan and Section of Stage-plates hinged together. Fig. 23.—Plan and Section of Spring-plate. Fig. 24.—Plan and Section of Outer Stage-plate. Fig. 25.—Section of Stage joined together by Brass Pillar. Fig. 26.—Section of Tubular Pillar. Fig. 27.—Milled Screw and Nut. Fig. 28.—Bolt and Milled Nut.

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trouble of drilling and tapping the ends of each pillar will be avoided. Screws suitable for the purpose may be obtained from Mr. Platt, Birkbeck Works, Birkbeck Road, Ridley Road, Kingsland, E. Order No. 60 in list, price 4d. each. These milled screws will only be required for the outside of the stage-plate, as the ordinary cheese-head screws are quite sufficient for the back of the stage-plate.

When these pillars are ready, a hole must be marked and drilled at each corner of the outer plate of the slide-stage in the position indicated in Fig. 24, after which this plate should be laid flat on the stage-plate (Fig. 21) for duplicate holes to be marked and drilled in the latter. Thus prepared, the stages may be screwed together with one of the pillars just made placed at each corner. When fixing these pillars, it will, of course, be necessary to frequently test the stages accurately by means of a square, in order to ensure their being put together properly, as it is of first importance to have them quite true and perfectly rigid.

The stages being fitted together, it is now time to return to the spring-plate, and fit this between them. For this purpose we want four brass bolts and milled screws, No. 69 in Mr. Platt's list, price 4d. each (Fig. 28). The small bottom plate of each of these must now be removed, and a slight shoulder filed at this end of each screw stem, in order that they may be readily fitted and riveted into holes drilled for their reception at the four corners of the spring-plate, as shown in Fig. 23, care being taken to see that they are planted quite firm and at right angles to the plate. Thus prepared, four holes about $\frac{3}{8}$ in. in diameter should be drilled in the outer plate of the slide-stage, in a suitable position to receive the stems of these screws. Previous to putting the spring-plate in position between the stages, it will be necessary to slip a short spiral coil of springy brass wire on to each screw stem, after which the plate may be inserted in position between the stage, with the stems of the screws projecting through the holes in the front stage-plate. The milled nuts may now be replaced upon the screw stems, and screwed up until the spring-plate occupies just half the space between the stages, the unused portion of the stem projecting beyond the milled nut, being removed by being grooved with a file and then broken off. Make these springs, and wind the wire round a piece of rod of the size required to produce a spring of sufficient diameter to readily pass over the stems of the screws; and as the spring is intended to act by compression, two or three wires may be wound on it at the same time, so as to form two or three distinct springs. Steel or iron wire will answer very well if it is hardened and tempered first, but hard brass wire is preferable, as it is not liable to rust and spoil if exposed to damp. Each spring should be allowed to double its length—that is to say, a $\frac{1}{2}$ in. closed spring will extend to 1 in. when released. The stage-plates should now be provided with hinges, as shown in Figs. 21 and 22. For the stage-plate of the top lantern we shall require a pair of blank back flap hinges, No. 18 in Mr. Platt's list, price $2\frac{1}{2}$d. per pair, and for the other two stage-plates which have to be joined together we shall want a pair of double blank hinges, No. 3 in the above list, price 8d. per pair. A $\frac{1}{4}$ in. hole should be drilled through each of the central leaves of the double hinges, but the other pair will require no further treatment, and may be soft soldered to the stage-plates without delay. The outer or plain leaves of each hinge, also the under corners of the stage-plates, must first be scraped until quite clean, and afterwards tinned by moistening them with a little chloride of zinc soldering fluid and sprinkling a few scraps of soft solder on the metal, which is then held over the flame from a Bunsen burner or spirit-lamp until the solder has melted and covered the allotted space, when the fluid may be washed away by means of an old tooth-brush and some water. Some fresh fluid is now applied to the tinned surfaces, which are then held in close contact over the flame until the union is complete, when they are again rinsed in water, and the join afterwards trimmed up by means of a file.

HOW TO MAKE A T-SQUARE.

BY G. LE BRUN.

A T or drawing-square is an appliance that is in continual requisition by all classes of the *genus* mechanic, whether professional or amateur, and as it is of the utmost importance that it should be correctly made and of good material—two features that are often lacking in those purchased at shops—I have thought that a few hints as to its construction would be of service to those readers of WORK who do not as yet possess one, or who do not care to pay the high price that is often demanded for a really good square.

As to the material to be used, any non-warping wood is suitable, and in using the expression "non-warping," I am aware that I am not strictly correct in my term, as all woods are liable to warp under certain conditions, but there are several that will warp in spite of all precautions, and these are to be avoided. In this category I would place birch, beech, elm, ash, and woods of a similar texture, and, avoiding them, choose a wood of a clean straight grain, preferably mahogany, cedar, or American walnut; personally, I prefer teak, but, unless you are in a shipbuilding district, it is sometimes difficult to procure. Whatever wood you may fix on, choose a piece free from knots or fancy markings, for, however beautiful in themselves, they will only prove a source of trouble after your square is made, and keep you continually stripping and correcting it.

I will deal first with the simplest form of square—that shown in Fig. 1. It consists of a stock and blade only, and presents not the slightest difficulty to the merest tyro. The size of the square required will, of course, to a certain extent, govern the thickness of the stock and blade, and I will suppose that the one in hand is to have a 28 in. blade, a very useful size, and not too large. The stock for this square, then, will be 10 in. long, and $2\frac{1}{4}$ in. wide, the thickness being $\frac{5}{16}$ in. The inner edge is rebated next the blade, as in Fig. 2. The blade is 28 in. long, $2\frac{1}{4}$ in. wide, and slightly under $\frac{1}{8}$ in. thick; it is

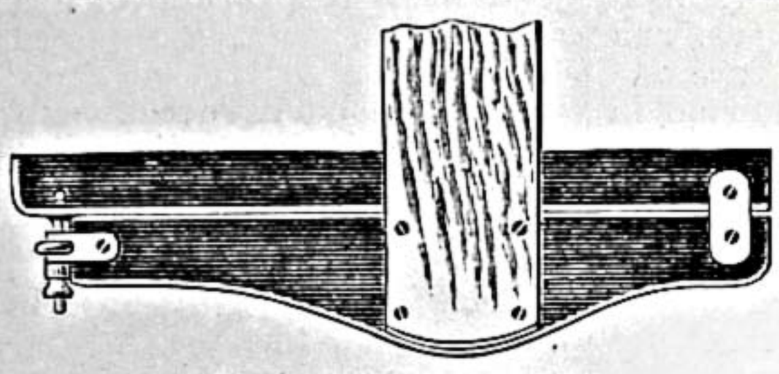

Fig. 8.—Adjustable Stock.

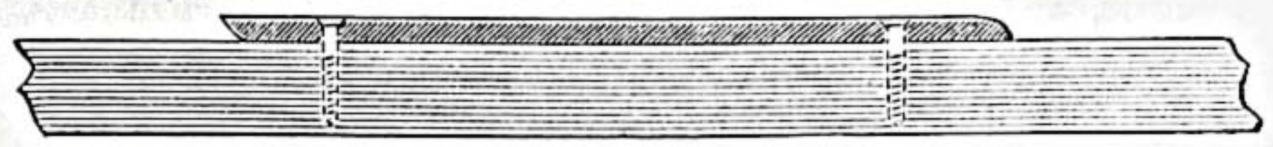

Fig. 3.—Section of Blade, showing Rounded Edge

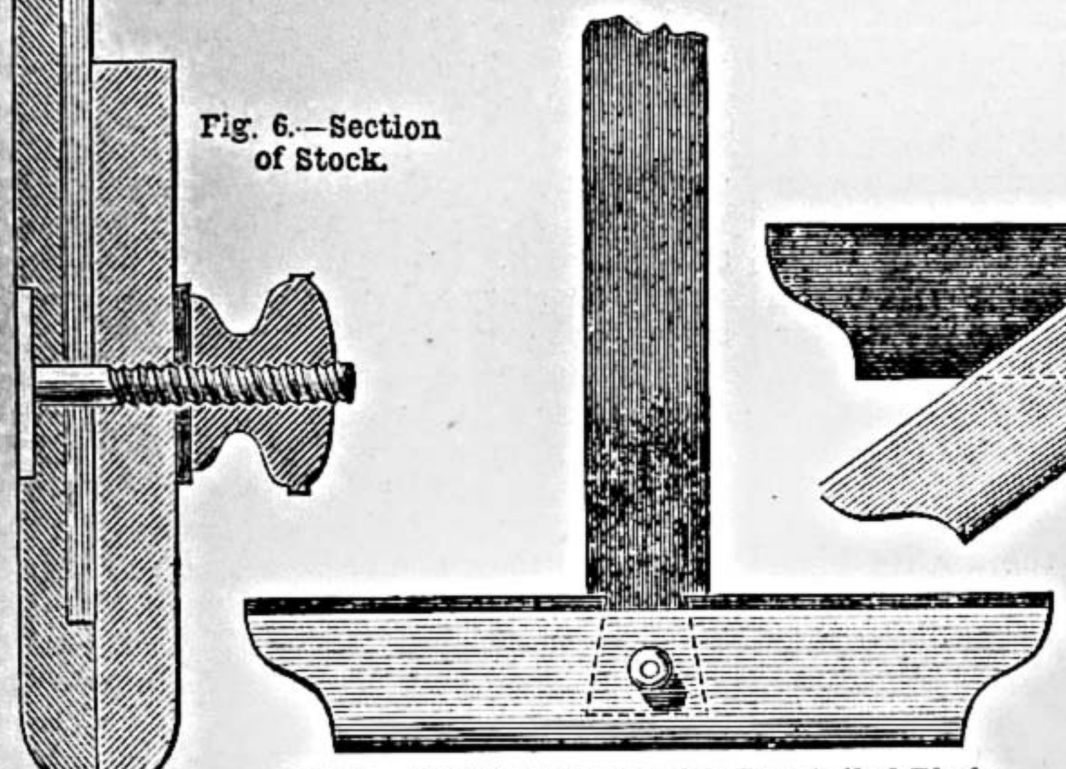

Fig. 6.—Section of Stock.

Fig. 4.—Shifting Stock with Dovetailed Blade.

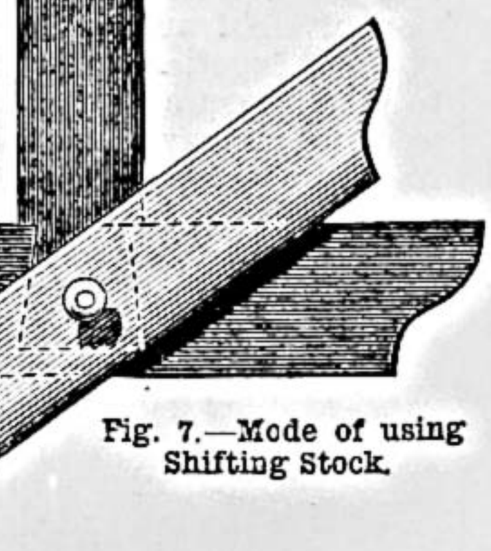

Fig. 7.—Mode of using Shifting Stock.

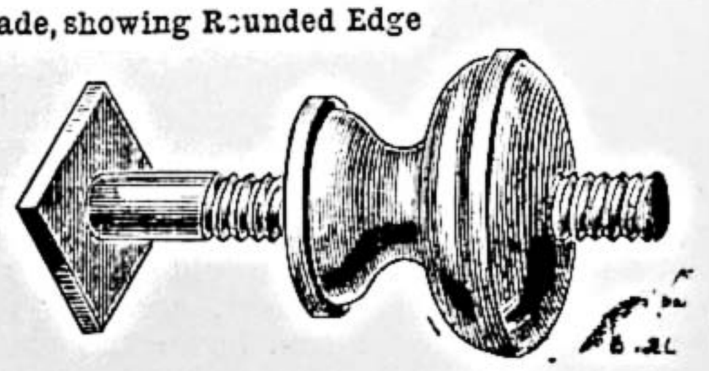

Fig. 5.—Brass Screw for Shifting Stock.

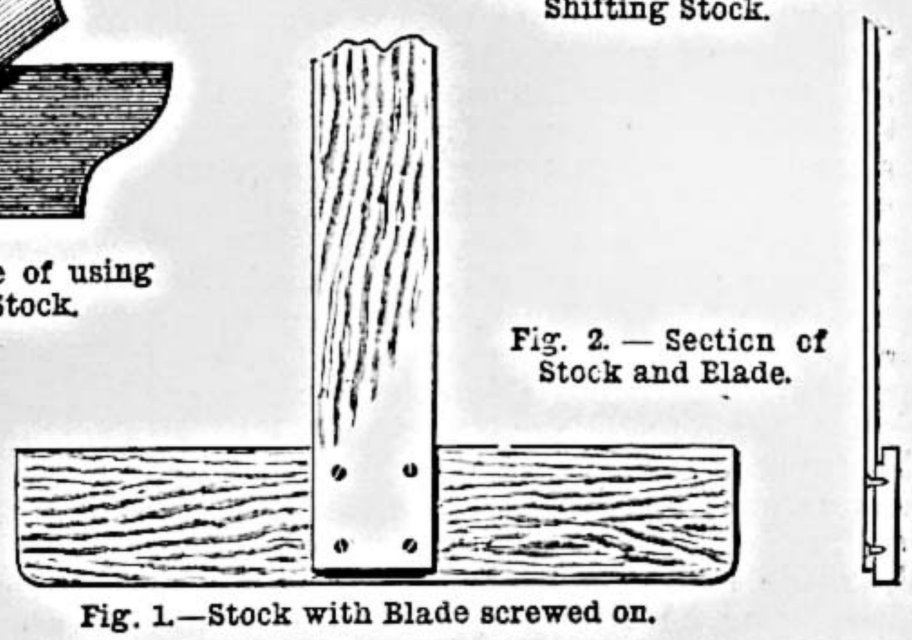

Fig. 2.—Section of Stock and Blade.

Fig. 1.—Stock with Blade screwed on.

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rounded on the edges, in the way shown in Fig. 3, and is simply fixed on the stock by means of four ⅜ in. fine screws (Fig. 1).

Fig. 4 shows a more useful form of square, in which the stock is in two pieces, thus enabling it to be used for drawing angle lines, as one piece is loose, and adjustable by means of a turnscrew. The sizes of the wood used are similar to that of the previously described square, and, in finishing, the ends are cut to an O.G. shape, to improve the appearance. The blade is sunk flush, by means of dovetailing, in the inner side of the fixed piece of the stock. The movable piece of the stock is ¼ in. narrower than the fixed piece, and is held in position by means of a brass screw (Fig. 5), the diamond-shaped head of which is let in flush with the stock on the fixed side. This is shown in section, full size, at Fig. 6.

In using this square for drawing angles, the movable stock is shifted to the required position and the screw tightened (Fig. 7); it can then be used with the same facility as a set square, and will be found to be an appliance of much service in drawing bevelled work.

Of course, it is understood by all who know the use of a square, that, to be of any service, it must be perfectly just—near enough will not do; the greatest care, therefore, must be used when finally fixing the blade to the stock. There are many ways of assuring the truth of the blade; but one of the simplest is to take a drawing-board (a smooth table top would do), with a perfectly straight edge, and, applying the square to it, draw a line down the blade with a very fine-pointed pencil; then, turning the square over and keeping the stock exactly parallel with the edge of the board (when turned you cannot apply it to the edge, as the blade interposes), see if the blade and the line coincide: if they do, your square is just; if not, you must keep on correcting and trying till they do, and then firmly fix the blade to the stock.

There is an adjustable T-square made by a firm in Holyoke, Mass., and patented in the United States. I am not sure if it has been introduced into this country; at any rate I have never seen one here, but it deserves notice on account of the ingenious arrangement for adjusting the blade. The stock is made in two pieces, to one of which the blade is attached, the other, and inner piece, being adjustable by means of a set screw and lock nut. A drawing of this square is given in Fig. 8, a study of which will show its construction and advantages, and perhaps lead some budding genius to still further improve upon the idea. Certainly the maker seems to have overcome the difficulty of adjusting the square after the blade is finally fixed—a job which those who have tried it know to be very troublesome.

When the square is finished, of whatever form it is made, you can either French-polish it or oil it. Polish, after constant use, gets scratched and looks bad. Oiling fills the pores of the wood to the exclusion of damp, and tends to prevent any tendency to warp, therefore I would say—oil your square. Raw linseed oil is the kind to use; it must be well rubbed in with a soft rag, and allowed to dry thoroughly before each fresh application.

By continuing this treatment you will, in time, bring up a fine and lasting polish, and have the satisfaction of being the possessor of a tool that defies the changes of weather, and that can always be depended on to act on the square.

DESIGNING FOR WORK: HOW TO GO ABOUT IT.

BY J. WHITFIELD HARLAND.

I HAVE previously referred to the fact that a certain amount of beauty results from strength of construction, and that strength is capable of being combined with beauty in design. Weakness and poverty of design so mar the effect, that beauty in other respects is lost sight of, even if it exists, in the aggregate finished result. It will be as well therefore to point out how to avoid this weakness, which is of two distinct kinds. Firstly, in construction, if evidences are visible that the design has been carried out in material too slender for commensurate strength for its purpose, and that consequently it looks weak and fragile, the impression on the mind is of discomfort, unrest, and dissatisfaction; whilst, secondly, if the design itself, however graceful it may be, is carried out in execution in stuff of superfluous strength, the mind perceives it at once, and the result is a feeling that clumsiness, heaviness, and awkwardness are destroying all grace and beauty. The "happy medium" is found in well-considered work, carried out in its construction so as to combine lightness and gracefulness without exhibiting weakness or the semblance of it, and without showing that too much material is employed to gain strength, or that unnecessary strength for the purpose in view has been attempted.

The mind, when guided by good taste, and supplemented by an instinctive perception of right and wrong construction (the result of experience and knowledge), ceases to take pleasure in any design of a piece of work which may exhibit such incongruities. As an instance, suppose a dining-table with fine mouldings, beautifully finished, of clean and sharply cut section, with the rails well-proportioned to support the top, carried at the four corners by billiard-table legs—no matter how shapely or well carved, or moulded and panelled they might be—no one could admire it, further than to like separate parts, taken singly, apart from the whole.

Imagine the tall and elegant giraffe lifting its graceful neck high in the air, its high shoulders and sloping horse-like body mounted on the legs of an elephant! Nature knew better than to create a "giraffe-phant," to coin a name for our imaginary monstrosity. The converse, an elephant's body on a giraffe's legs, could not stand. These absurd instances are merely inserted here to enforce my contention that harmony of construction, and the true relation and combination of strength and beauty, must be fully borne in mind in all designing. They cannot be borne in mind unless previous training and thought has first put them there. Ideas that are of any use or beauty do not come of themselves—they are the offspring of cultivation and thought, and spring from the seeds we sow in the mind, just as plants grow from seeds scattered by birds, and are fertilised by the rain and the sunshine and the pollen of other flowers. As well might one expect a raw youth, fresh from the plough, to successfully undertake command of an army, as to imagine even the embryo artist being able, however much genius he may be endowed with, to design anything that involves construction without previously graduating by *some* study of the subject. It is with this thought on my mind that these papers have been delayed till those on "Constructive Strength" shall have been read in between, as it were, in the sequence in which they have appeared in WORK; and I trust that any WORK reader, who may have been interested at all in my former papers on "Design," will carefully re-read them once again, consecutively, together with those above named, which have a closer connection than at first sight appears with this series.

I have often thought that a most useful book might be written on the subject of "Diseased Design—deformities, anomalies, structural weakness, congestion, indigestion, paralysis, aberration of mind, incoherency, colour blindness, lameness, etc., etc."—if an author could only be found to deal with the subject who would and could express the diagnoses and exhibit the proper remedies—a sort of M.D. in Art.

Design is far too much, nowadays, a matter of fashion, who cannot rule herself, instead of nature, who rules the universe, man, or perhaps woman, or both excepted; hence the stupid pseudo-admiration for Japanese or Japanesque design, and the pretended æstheticism in house decoration. Thus the lines upon which Japanese designs are based, as might be expected, partake of the character of the scarecrow, a series of angles, with but little relation to one another, being the basis of their "composition," like the poses of Sarah Bernhardt in her photographs—"all legs and wings," giving the idea to the mind that there was no gradual process of growth, as in nature, but a sudden snap like the flash of a detective camera, in their origin. Where is dignity, grace, or any other of the noble sentiments to be found? Weak and puerile, semi-barbaric designs, whether original or founded upon this style, as it is called, are ephemeral and—fashionable, that is all. In nature, one can delight in the curves that nature exhibits, and even the angles when they occur naturally, as they always do wherever they are met with. Traces that tell the wonderful glory and story of their origin and growth are always evident. In Japanese art (?) one sees, for instance, the head and hands and the clothes of the woman doing duty for the figure. In nature, and in art, if it is true art—that is, true to nature—one sees the woman in the effulgence of her beauty; but more than that, one sees or feels the beauty of the child-state of the woman. Transitions are marked and origin traced, former states of being and "have-beens" are forced home to one, and the mind is filled, as it were. Japanese art is, if an art at all, an art that touches no deeper than the eye. Nature controls, and natural art awakens, the heart and mind, through the eye.

Further, design fails in its purpose, unless it awakens sympathy. If it does not "fetch" you, and induce the mind to elevated thought and reflection, what function does it fulfil?

Take the highest possible instance—the interior of a church. What ought to be the aim of its designer? Japanese fans, storks, butterflies, and trees? No! and why? Because they mean nothing! No! his aim should be to awaken and soften the heart and conscience, and render the mind of him who enters amenable to religious feeling, awe, reverence, and love. Mere grandeur, as in St. Paul's, and St. Peter's at Rome, does not completely subdue one's feelings like Notre Dame at Paris, or Westminster Abbey, where grandeur has only arisen out of fulness and size, not as the chief attribute, but as a side issue half unsought. There is no "pointing upward" in the classical architecture of heathen temples, such as there is in Gothic columns, with halfway bands holding them together, the crown or corona of their blended shafts

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marking the point of the final spring of the arch, as it rises upwards to meet its fellow, till they become *one* at its highest point; typical of our life on earth and our hereafter.

Descending, our homes come next to our churches. The designer of a home should aim at awakening the refined and affectionate sentiments of family relations, the restful and peaceful feeling that here, at least, outer cares and troubles cease; that, herein, repose from the labour of the day, and the comfort that labour ought to bring, are known, felt, and emphasised. Will Japanese insects and fans and "folderols" inspire these feelings? Not much! Well, it may be asked, what will? I answer that any object of art and pure tendencies that recalls to the husband or the wife, or both, the days of their own childhood, the stories they read, the songs they heard their mother sing before manhood or womanhood was reached, the times they lived in then, and the poems and pictures they then loved. These are the associations conducive to the arousing of a home feeling that designers of homes should think out and act upon. If this programme is pronounced fanciful or far-fetched, let anyone who may be sceptical go abroad, not for a few weeks, but for a year or two, until in some moment, quite unforeseen, called up by such simple things as the moonrise or the evening calm, the sunrise or sunset over the sea, in the tropics or any other of nature's reminders, you know the full meaning of "home-sickness." This is only one of the many lessons that foreign travel impresses on the mind—which never, however, so far as my own personal experience, gave the least significance to Japanese, Chinese, or æsthetic design. My remarks do not apply to other so-called barbaric styles—such as Indian, Egyptian, and ancient South American architectural design—which possess something of suggestiveness of the association of ideas formed when the heart was young, a quality I entirely miss in pretentious Japanese or Japanesque design and ornament.

The lesson I wish to bring home to WORK readers is, in short, this: that design which has no thought in it is like an empty barrel, musty and useless, no matter whether silly fashion stamps a trade mark on it or not, for fashion assuredly is unfit to be the judge.

Seriously, designing, for no matter what, ought to be undertaken and approached with something of the spirit that should inspire those who teach the young, that should fill the mind of the author of fiction and the writer of history; a real and true conscientiousness, even in the most trivial details. Such designing, even if not distinguished by much originality of conception, if not remarkable for new combinations of form and colour, possesses at any rate the sterling impress of truth, and speaks to the heart in all its efforts, doing good instead of evil to countless thousands, posthumous perhaps; whilst design for the mere purpose of mercenary ends has no intrinsic value, and carries with it none of that power—the highest given to mortals who pass over to the majority—of handing down to "this side the grave" the records of one's life-labour on earth.

[Japanese or Japanesque design and ornament seems to have much the same effect on our friend and contributor, Mr. Harland, as the proverbial red rag on an easily excited bull. What a terrible sinner Mr. Gleeson-White must be in Mr. Harland's eyes, and how sad the fact that WORK will continue to sin in upholding Japanese ornament!—ED.]

MATCHBOARDING.

HINTS ON ITS APPLICATION TO WALLS AND CEILINGS.

BY ALEXANDER MARTIN.

VARIOUS reasons may cause it to be desirable to cover the walls inside our houses, shops, or halls, in whole or in part, with wood in place of the more common material for that purpose—plaster. In days gone by, good honest oak wainscot was erected in thorough workmanlike fashion; but in these days of cheapness, less expenditure is the rule everywhere, and oak wall-panelling is not often met with in new work. Pine wood takes the place of oak, and even panelling is discarded for matchboarding (or V-jointed lining, as it is sometimes called) when cost is the factor which is weightiest of all. The result is usually a dead, plain wall-surface, with innumerable vertical lines unrelieved in their immense monotony until the decorator comes upon the scene and leaves his mark, in the shape of sundry horizontal bands or stencilled ornaments. Why should not this matchboarding be so placed as to be decorative in itself? Why is there so little thought expended in utilising the necessary lines of the joints, so as to form a pattern or design of a suitable kind? The extra cost entailed is, no doubt, at the root of the matter; but where an agreeable effect is desired, a little extra time spent in erecting the wood will not be in the least out of place.

As matchboarding is most commonly used in lining a wall from 3 ft. to 4 ft. up from the floor, we shall, first of all, consider it in this position and to this extent, and see in what way it may be arranged to produce a more agreeable and satisfactory result than is obtained by the usual multitude of upright lines surmounted by a bead. And the first thing that seems unsatisfactory is the fact that these lines run right down to the floor; they stop naturally enough against the bead at the top, but they ought to have some other finish at the foot, and not seem as if the boards extended downwards to the room below. A skirting-board might be placed against them, running right along the floor, and thus form a base to the structure above. In such a case the matchboarding need not extend to the floor, an inch below the top edge of the skirting-board being sufficient. In Fig. 1 is shown a section of this arrangement of base.

If, however, it be advanced as a drawback to this plan that the base projects beyond the face of the boarding, the same effect may be obtained in another way. The skirting-board, still running along the surface of the floor, may be set in flush with the face of the boarding, as shown in section in Fig. 2, when the vertical lines will then stop against the bead there shown in the same way that they do against the bead on top. The result wished for is attained—viz., a suitable finish to the lines of the matchboarding before they reach the floor.

The top bead may with advantage be made more imposing than it usually is. In Fig. 3 is shown the section of the ordinary bead; if it be brought out a little further, another moulding could be set in underneath it, as shown in Fig. 4. Another arrangement is given in Fig. 5, bolder in appearance than the former one. One consideration which will help to lessen the extra cost of the mouldings in Figs. 4 and 5 is the fact that the top ends of the boards may be left rough, and do not need to be closely fitted to the top bead, as the moulding planted on the face will cover up all the deficiencies. If the same objection be taken to these projecting mouldings as was mentioned in connection with the projecting base, the difficulty may be overcome and our ends attained by using either of the plans shown in Figs. 6, 7, and 8. They all show the horizontal lines carried along the top of the vertical lines of the boarding, broader than usual, Figs. 6 and 7 being about 2 in. broad, and Fig. 8 about 3 in.

The next thing is to vary the constant perpendicular lines of the matchboarding, and this may be done in many ways. Perhaps the simplest way of all would be to form a square of upright boards, next a square of horizontal boards, and so on alternately, as indicated in Fig. 9. The grounds for fixing the boards to must, of course, be arranged to suit (see Fig. 9A, where upright straps or grounds are shown placed so as to catch the ends of the horizontal boards). This arrangement of partly vertical and partly horizontal boards necessitates some care in laying off the distances to be covered, so that a certain uniformity may be secured at the corners and where doors and windows interfere with the continuation of the work. At the corners, if the squares come in, they may naturally range themselves round the room. Sometimes, however, this may be difficult, and it may be better to adopt another method. A square may be halved on both walls in the corner, the boards running in both halves the same way, either vertically or horizontally. If, in the spacing, half of a panel does not come in exactly at the corner, repeat on both walls the same amount of pattern, either less or more than half a square, as indicated in Fig. 10. In the window recesses—if there be such in the room—the boarding may be arranged as shown in Fig. 11, where the elbows have the wood running opposite both to the window-breast and the wall outside the window-opening. Though the window-breast be lower than is shown, that does not affect the principle we are talking of—viz., the arrangement of the vertical and horizontal grooves in the matchboarding. And it is this necessary arranging of the different parts which constitutes the greatest difficulty whenever we deviate from the usual method of placing board against board all the way round a room till it is finished. The other variations to be mentioned require this same care to be taken with them, but how well worth all the extra trouble is the result at completion!

Another simple variation is given in Fig. 12, where four boards are mitred at their tops and bottoms. In spacing these groups of mitred boards it is not necessary to have absolutely the same space between them in all the walls of the room—in fact, it will often be found to be impossible to have them all exactly spaced alike. In that case, they should be placed as nearly as possible at equal distances from each other. This same remark applies to all these designs. In Fig. 12A is shown the arrangement of grounds for the design in Fig. 12. A solid piece of wood of the same thickness as the grounds is placed behind the ends of the mitred boards. The design in Fig. 13 entails more mitring than the preceding one, and the necessary grounds are perhaps best obtained by having a solid surface of rough boards behind the mitred square, as shown in Fig. 13A. The diamond pattern shown in Fig. 14 is very effective; it also requires a solid grounding, as shown in Fig. 14A.

In the next figures (15 and 15A) is shown an arrangement of upright and horizontal boards differing from Figs. 9 and 9A only in

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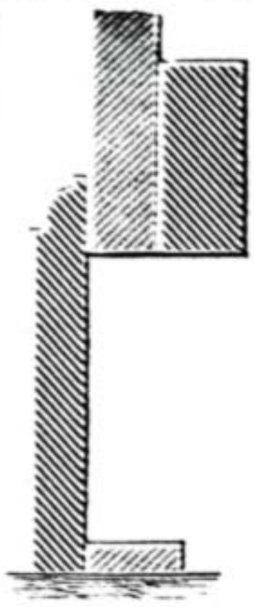

Fig. 1.

Fig. 2.

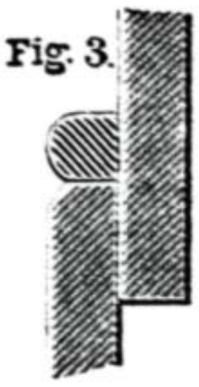

Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

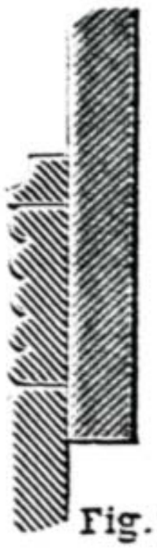

Fig. 8.

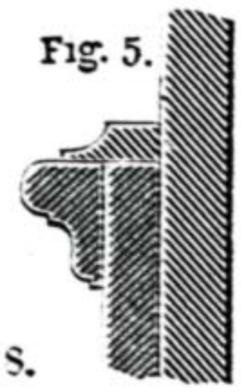

Fig. 5.

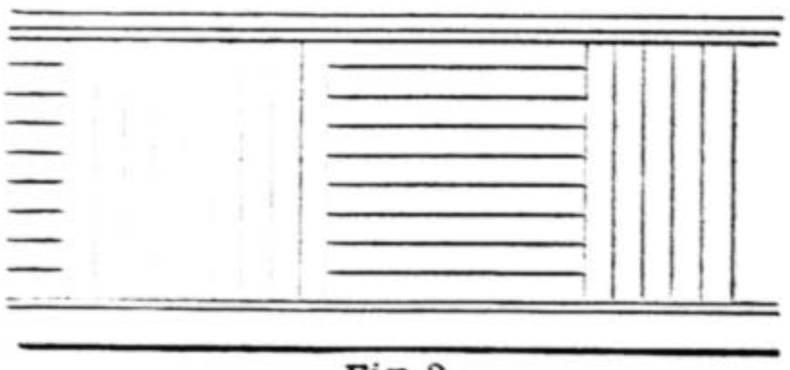

Fig. 9.

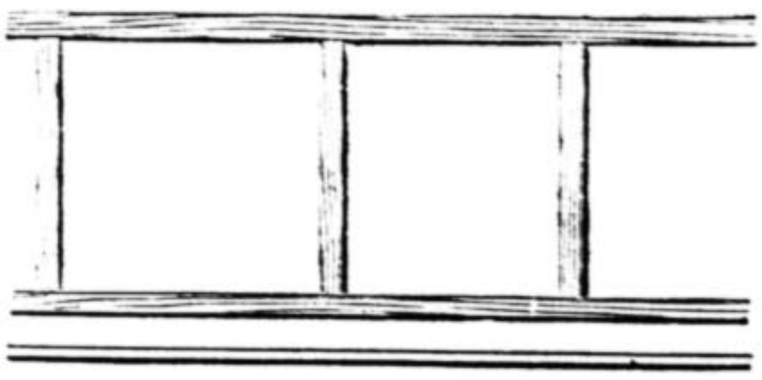

Fig. 9 A.

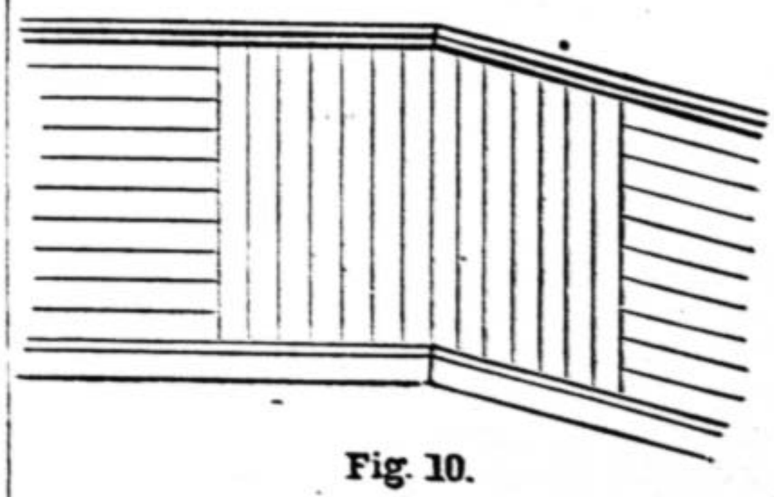

Fig. 10.

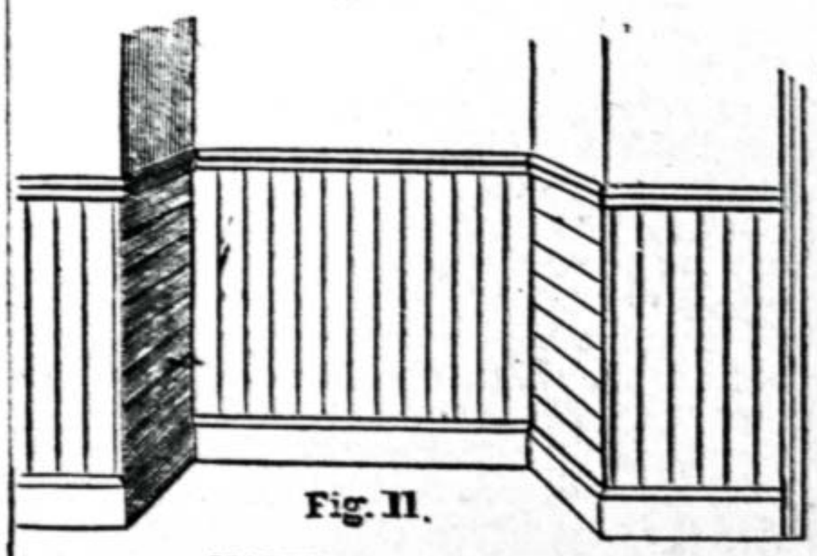

Fig. 11.

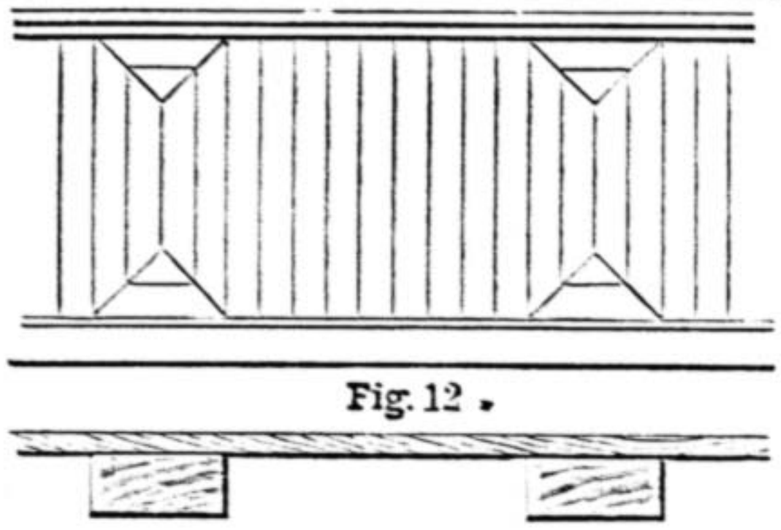

Fig. 12.

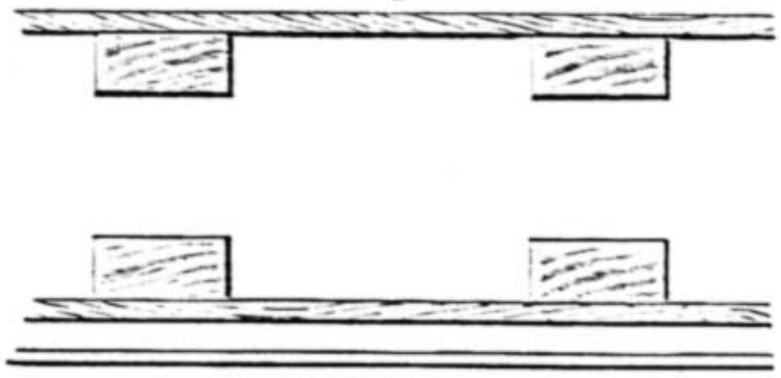

Fig. 12A.

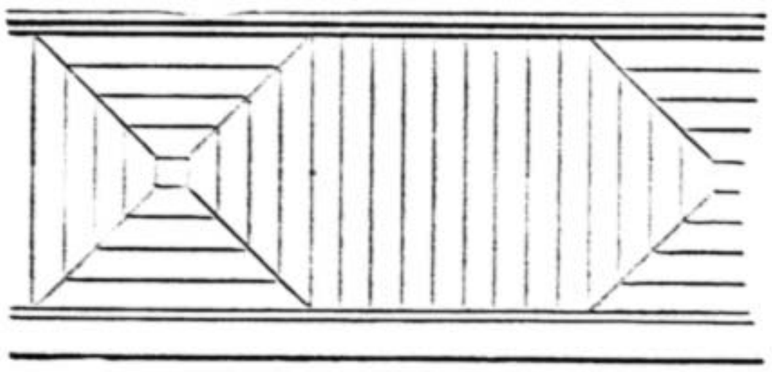

Fig. 13.

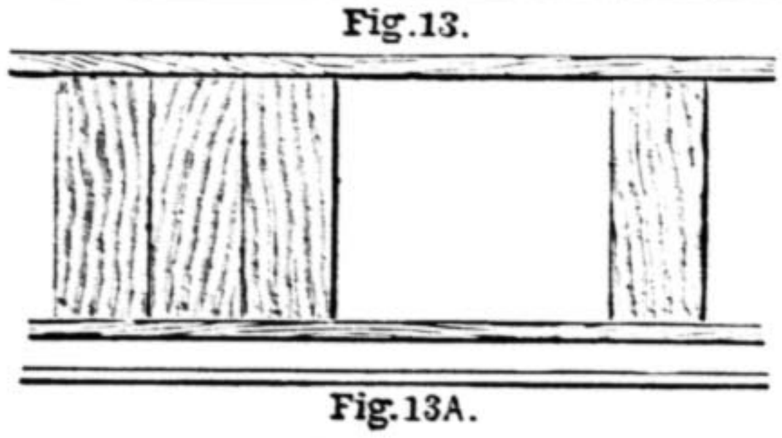

Fig. 13A.

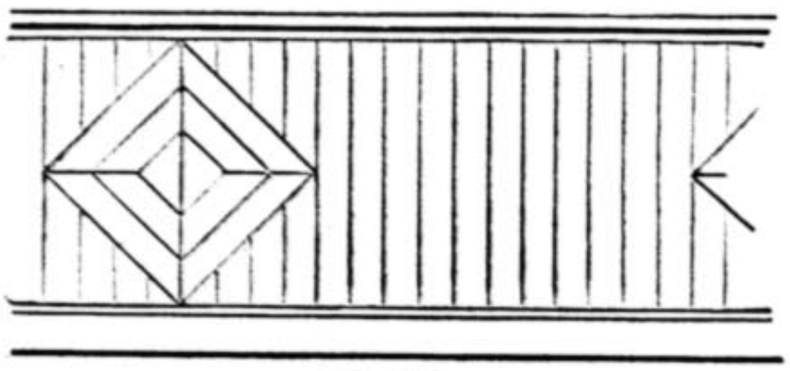

Fig. 14.

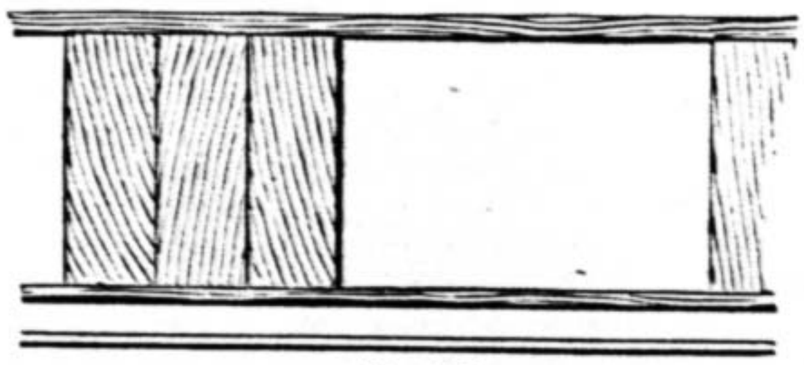

Fig. 14A.

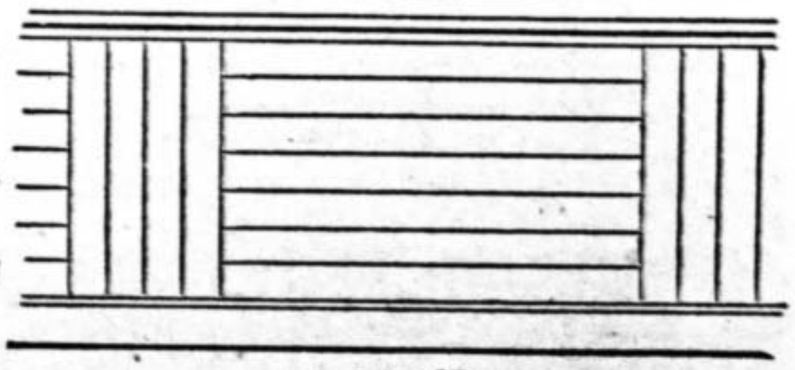

Fig. 15.

Fig. 15A.

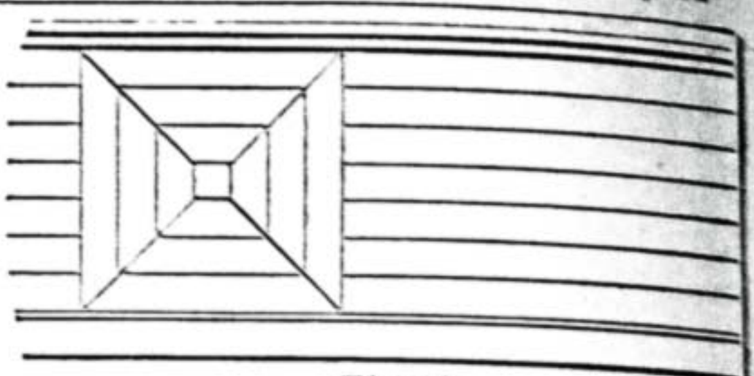

Fig. 16.

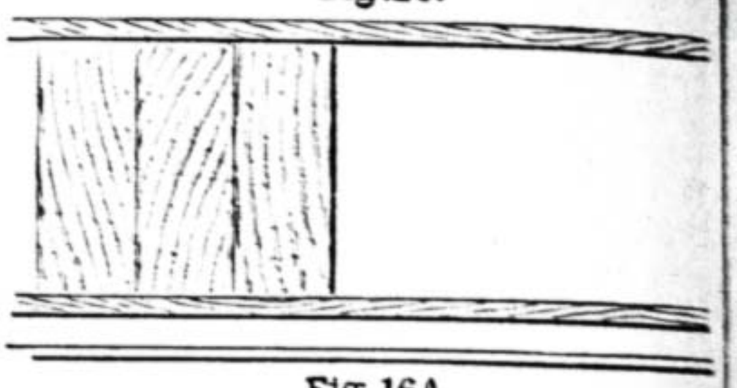

Fig. 16A.

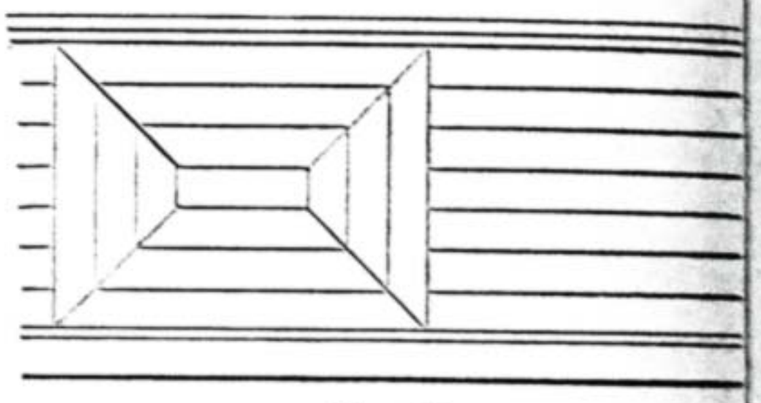

Fig. 17.

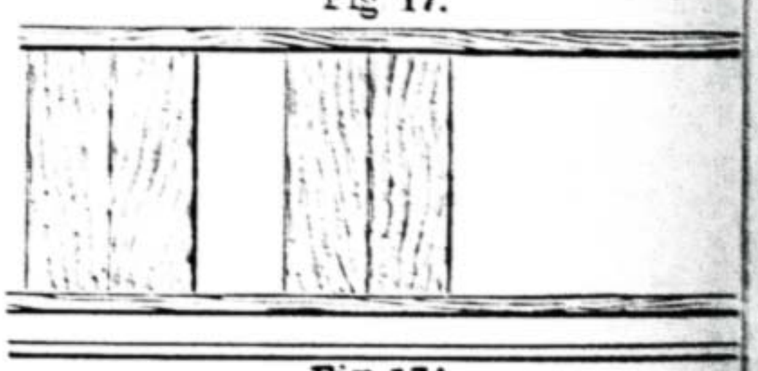

Fig. 17A.

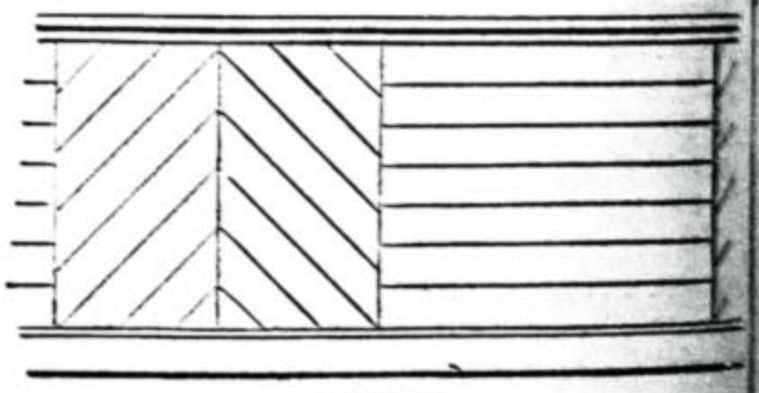

Fig. 18.

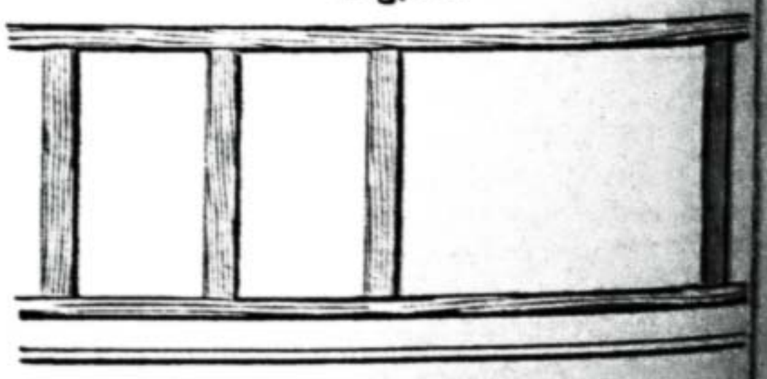

Fig. 18A.

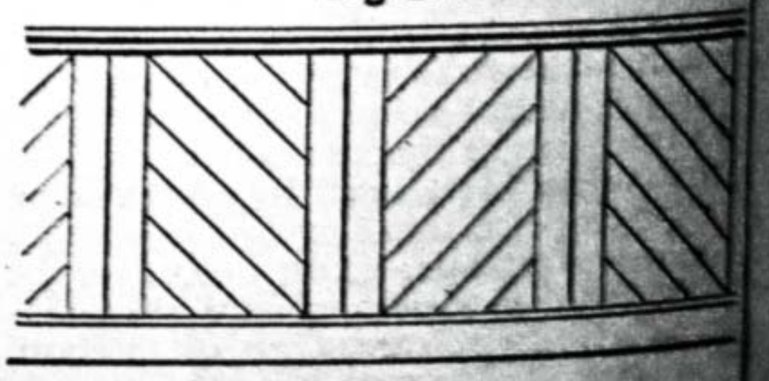

Fig. 19

Fig. 19A.

MATCHBOARDING: ITS APPLICATION TO WALLS. Figs. 1 to 19 A.—For Explanations of Diagrams, see Accompanying Text.

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the proportions of each of the directions of the boards; while in Figs. 16 and 17—with diagrams of their respective grounds in Figs. 16A and 17A—simple changes of some of the previous figures will be observed. The length of the horizontal boards in each

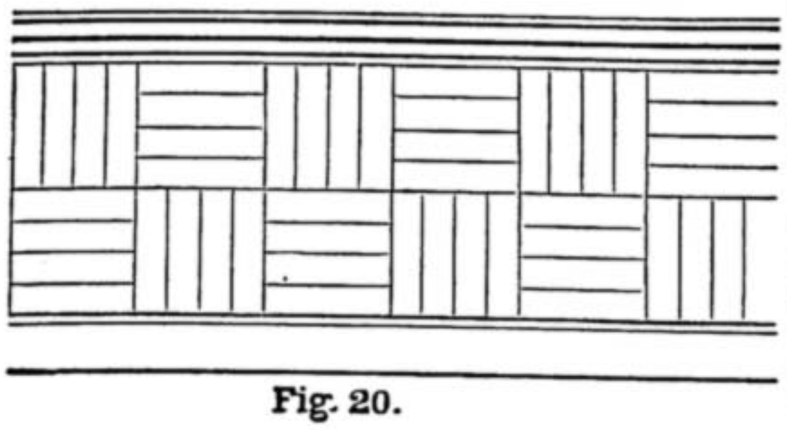

Fig. 20.

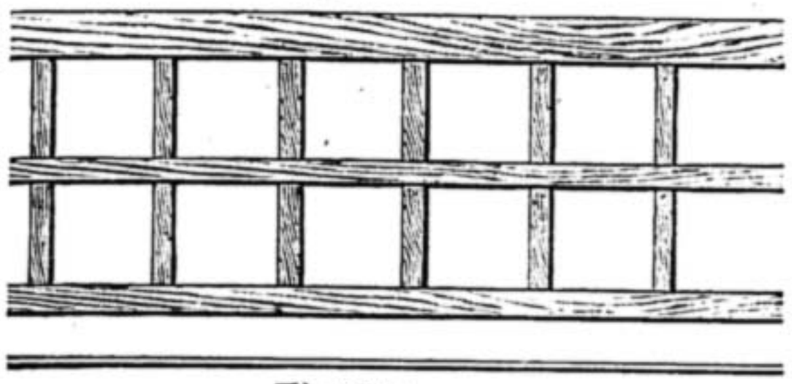

Fig. 20A.

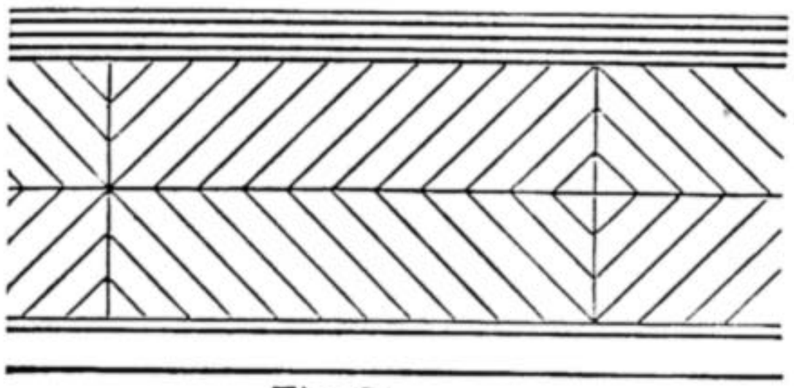

Fig. 21.

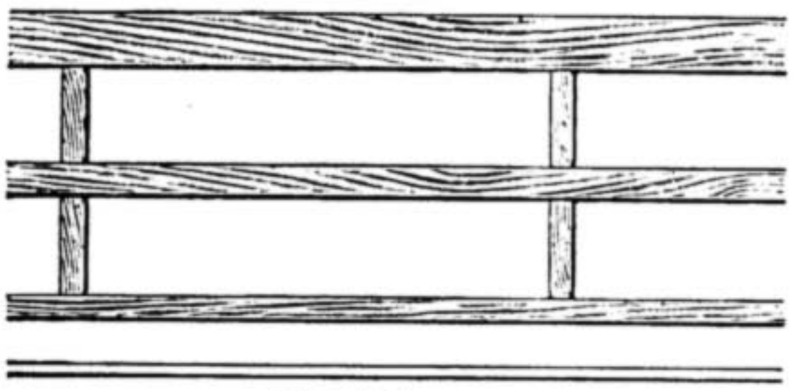

Fig. 21A.

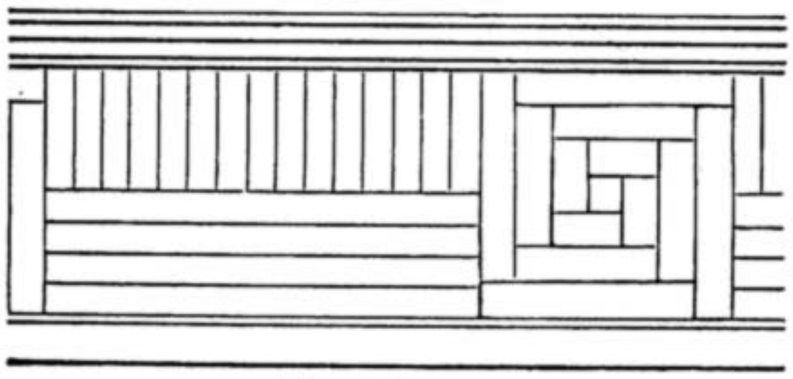

Fig. 22.

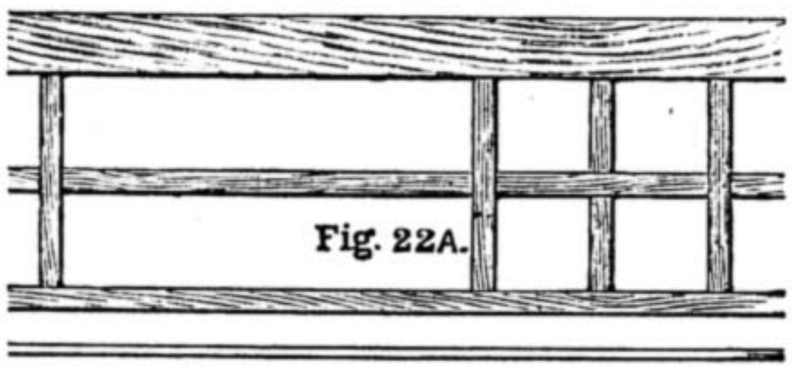

Fig. 22A.

Figs. 20—22 A.—Matchboarding on Walls.

of these may be from one and a half to twice the length of the mitred part. Our two next sketches—Figs. 18 and 19—introduce diagonal boarding alternating with straight. The diagonal boards are cut to the angle of 45°, or, in other words, to the usual mitre of any square panel moulding. They may be repeated without any square work intervening, the different directions of the boards being of sufficient contrast in themselves; but the straight bands between give a greater variety to the whole. The grounds for Figs. 18 and 19 are shown in Figs. 18A and 19A respectively.

The pattern divides itself midway between the top bead and the base in our next sketch (Fig. 20); otherwise it is a repetition of what has gone before, and a diagram of the necessary grounds is given in Fig. 20A. In Fig. 21 is shown a very effective pattern when carried out in a length; the alternate radiating lines contrasting so frequently with each other make a very pleasing result. Of the grounds or straps required a sketch is given in Fig. 21A. Of a more uncommon and quaint character is the design shown in Fig. 22. The square is formed all of square corners; no mitres are used here at all. This mode of forming a square is borrowed from the Japanese, who are particularly fond of this arrangement. The horizontal and vertical lines between the squares are in keeping with them, and the grounds or straps are shown in Fig. 22A. The boards forming the square should have their ends grooved or tongued, as required, to fit the board they butt against, so that all may be firmly bound together. If this be not attended to, the ground behind this square had better be all solid, as in Figs. 13A, 14A, and 16A.

MEANS, MODES, AND METHODS.

An Automatic Gate-fastener.

In this last summer, while wandering in the New Forest, I saw a useful contrivance for keeping gates shut. It was new to me, and as it may be of use to others I will describe it. The gate on which I saw it fixed was an ordinary garden wicket-gate, opening outwards from the garden on to the road.

About ten inches from the fastening, which was the ordinary latch, a staple was driven in, and to this staple was attached a strong iron chain, probably an old trace, or agricultural chain of some kind, about 5 ft. long, with a heavy lump of lead piping hammered on about halfway from either end of the chain. The other end of the chain was nailed on to the wall of the cottage: the chain in reality forming the hypotenuse of a right-angled triangle, the sides containing the right angle being respectively the gate and the cottage wall.

The contrivance seemed to me to be particularly well designed for its purpose. The gate, by opening outwards, could not be opened by any of the many vagrant porkers of the neighbourhood who were wallowing about close to the trimly kept cottage garden, and it could not be opened by any of the smaller children who were in the garden, the latch being outside.

The weight, which may be made of anything, from a broken flat-iron to a flint or brick with a hole in it, was well suited to shut the gate; in fact, to hold the gate open for long would require a certain amount of effort.

The idea may be as old as the hills, perhaps older than many, but I chronicle it for what it is worth. It is useful, I think, to jot down all such notions when one comes across them and get them into WORK, for to many they will not fail to be like some of the odds and ends, under the impression that they are sure to be useful once in seven years, if not in less time than that.

H. J. L. J. M.

Improved Operating Table for Animals.

Veterinary surgeons, farmers, and those who keep horses generally, cannot fail to be interested in the following account of a novelty in veterinary surgery in an operation recently performed upon a horse by Dr. L. A. Anderson in his hospital—presumably at Cincinnati, as the description is borrowed from the *Cincinnati Enquirer*:—

"The remarkable feature of the operation was the table and its appliances, by which a sixteen-hand draught horse, weighing 1,200 pounds, was so secured that during the operation, which lasted only eight minutes, the animal moved not a hair's breadth.

"The table is of solid oak, and rests on a stout platform about two feet high. By means of a crank operating on cogs, the table on which the animal lies is made to move slowly upward and downward; the horse, led alongside of the table in an upright position, is securely fastened to it, and then the horse and the table lowered until

Fig. 1.

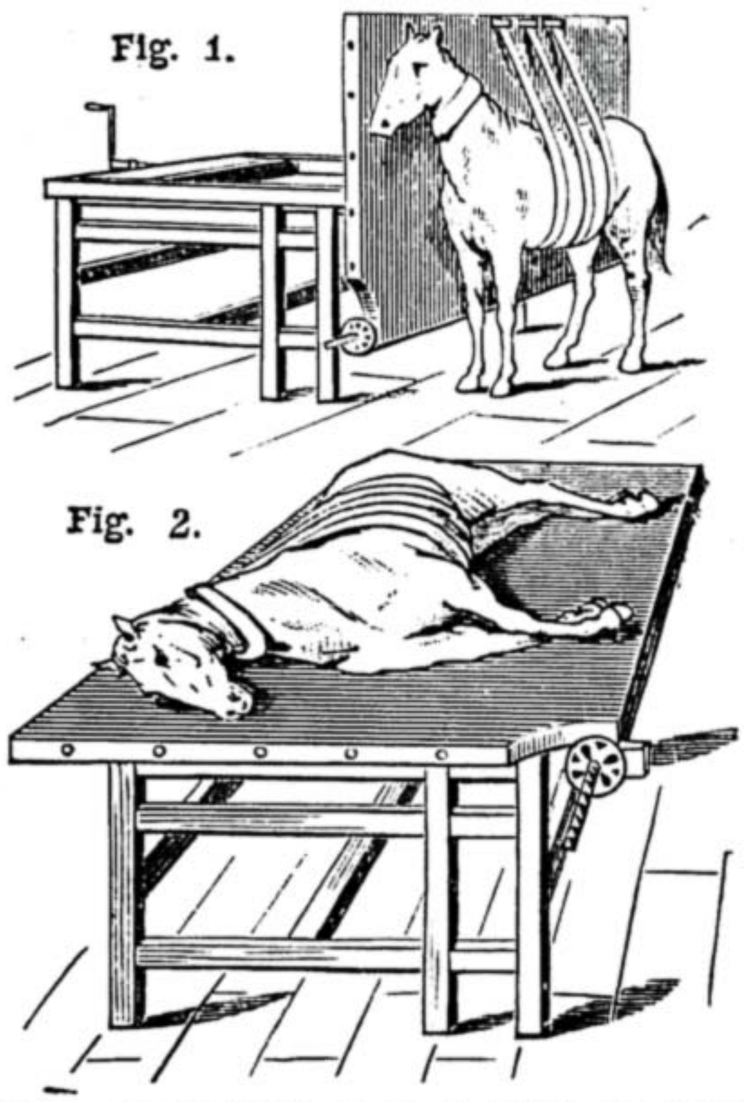

Fig. 2.

Fig. 1.—Table with Top tilted to secure Horse.
Fig. 2.—Table in Position with Horse secured.

the animal is lying so as to be operated on with ease.

"The horse could barely walk, the spavin on the off hind foot causing such agony. The animal was led alongside of the table, and a stout inch rope fastened to the front of the table was held round the animal's legs by an attendant. The three four-inch wide surcingles were then strapped securely, tying the animal alongside of the table. The head was then fastened to the table, and it was slowly lowered to a horizontal position. The animal at first struggled, but once on the table lay as meek as a lamb. The feet were securely fastened by stout straps to the table, the additional precaution being used of tying the left hind foot with an inch rope.

"The operation is known as cuneon tenotomy, and was first proposed by Professor Lafosse to abolish lameness arising from bone spavin. It requires the division of the internal or cuneon branch of the tendon of the flexor metatarsi. The tendon that gave the trouble is a stout one, a branch of another tendon. It starts from the anterior portion of the hock and runs across

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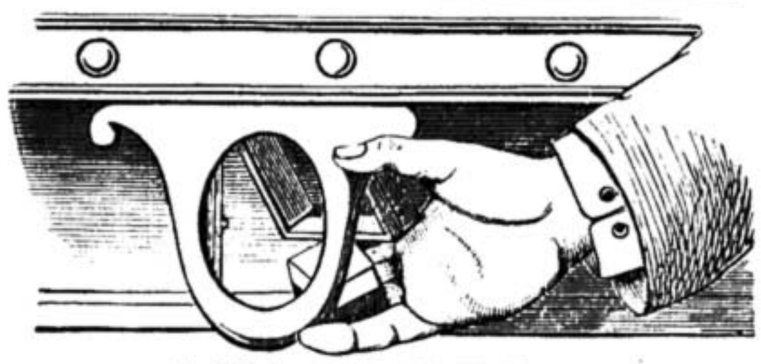
diagonally downward to where the curb generally occurs. The doctor first made an incision an inch long, and a probe-pointed instrument was inserted and the tendon raised and cut, which gave instant relief. The tendon lay in a groove and was readily found. A bony tumour was growing under the tendon, making the tension on the tendon so great that the animal could not put its foot to the ground. Five minutes after the operation the horse was eating hay, and an hour afterwards was walking, with many signs of improvement."

A Billiard Chalk Holder.

This is one of those useful trifles that add to the comfort of billiard-players where they are applied to tables. The common plan is a pocket from which the chalk is not so readily got at as with one patented by Messrs. Hennig Brothers, High Street, Bloomsbury, which is automatic in its



A Billiard Chalk Holder.

operation of dropping the chalk into the hand on touching a small box containing the chalk. The sketch will show its action. It is ornamental in its position underneath the cushion frames, with an open front, allowing the player to see if there is any chalk there, and to replace it easily.

J. C. K.

The Care of Pocket-knives.

What follows may seem to some—or to many—very trivial advice, and scarcely worthy of admission under the heading of "Means, Modes, and Methods," but being a description of a means of lengthening the existence of one of the most useful pocket tools, it may perhaps pass muster.

We all know the charm attaching to the possession of a new knife—we like to hear the business-like click it gives when opened and shut. As time goes on it requires a little force in opening, and help in shutting, and we are apt to say: "What a wretched spring—my knife used to shut in grand style at first, now it won't shut without help. What is the maker's name? Ah! I see; my last knife was just the same, and it was one of theirs too: what poor stuff they must turn out! Next time I buy a knife I'll try one of So-and-so's warranted Sheffield cutlery," and so on.

Now the thing to be remembered about a pocket or penknife is this: that it spends its life in either a waistcoat or a trousers' pocket, in the latter case in the company of a bunch of keys, possibly too a box of wax matches and a few coppers. The pocket by itself is, as we all know, a famous receptacle for dust, and the keys and the other miscellaneous articles mentioned above are bad company for a knife, as they all, and particularly the keys, harbour dirt of a more or less greasy nature. Of all the dirt that is collected in the pocket, a large portion finds its way into the knife, and much of it stays there, especially in the ends, where the spring is free. This dirt collects daily on the spring and the hasp end of the blade, and causes the knife to close with difficulty; and, in ignorance, the owner of the knife blames the maker.

A knife, like any other machine or tool, is all the better for being periodically cleaned and oiled, and it is more easily cleaned than most machines. A pin is sufficient to clean out the dirt in the knife, and will serve admirably to oil the knife afterwards. With frequent cleaning and oiling, a knife will give more satisfaction and last much longer, certainly as far as the spring is concerned.

H. J. L. J. M.

OUR GUIDE TO GOOD THINGS.

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

105.—Imrie's Wood-turner's Cutting Dividers.

I have received from Mr. John Melrose Imrie, 19, Caledonian Crescent, Edinburgh, a tool for wood-turners which has been designed and made by himself, and to which he has given the name of "The Wood-turner's Cutting Dividers." It is a tool that cannot fail to be welcomed by all turners who are engaged in what I may term wholesale turning, as it cannot fail to facilitate their operations and to save them a great deal of trouble in preliminary measurements and divisions before commencing the reduction of the intervening parts with chisel and gouge according to pattern. I do not know the price of the appliance, nor if it be yet in the market, but this can be learnt from Mr. Imrie. The chief purpose of the tool is to ensure equal divisional measurements in all pieces of turned work of the same pattern, whether there be only two bits alike and of the same pattern, or any number of bits proceeding upwards from two as a starting point. Thus, in turning a couple of standards or uprights for any piece of ornamental cabinet work, or in turning the four legs of a table, or dozens of spindles, perfect equality of what I am obliged to call divisional measurements or divisions into spaces by incised rings of greater or less depth is obtained, and a symmetry of parts at the outset, as far as this work of division is concerned, is obtained without any trouble or chance of mistake through any slip in reading the measurements on the rule. Let me now endeavour, by aid of the illustrations, to describe the tool itself, and, in giving a description of it, to show its purpose. First of all there is a handle A, about 6¼ in. long, into which is placed an iron holder B, which can be inserted or removed from the handle at pleasure. The top of the holder is slotted, or made in the form of a fork, to receive an iron rod, screw cut at one end, and placed at right angles to the holder. On this central rod are placed arms D, D, divided or separated from each other to the distance required by brass rings and washers W, W, of various thicknesses, as shown in Fig. 1. The shape of the arms will be best understood from Fig. 2, in which the arm E on the right-hand end of the rod is shown, slotted like the holders to fit on to the rod C. This, in Fig. 1, is shown separated from the fixed nut on the right-hand side by three brass rings, W, W, W, and all the arms (five in number, shown in Fig. 1) are placed on the rod and held apart in the same manner. When the last washer on the left-hand end of the rod has been put on, the whole of the arms and washers are tightened and locked up by the movable nut at the left-hand end, and perfect rigidity is thus obtained, and absolute immobility of the arms, and, therefore, of the cutters as well. The manner in which the cutters E, E are placed and secured in the arms is shown in Fig. 2, from which it will be seen that they are placed in a groove cut in one side of the arm and held therein by a nut F. Now, it is manifest that the end arms, or stops, as they may be, and, I believe, are, called by Mr. Imrie, which, it will be noted, are longer than the rest, indicate the extreme points of the length over which these and the intermediate cutters will act, and the utmost extent to which the stops can be placed apart is governed by the length of the

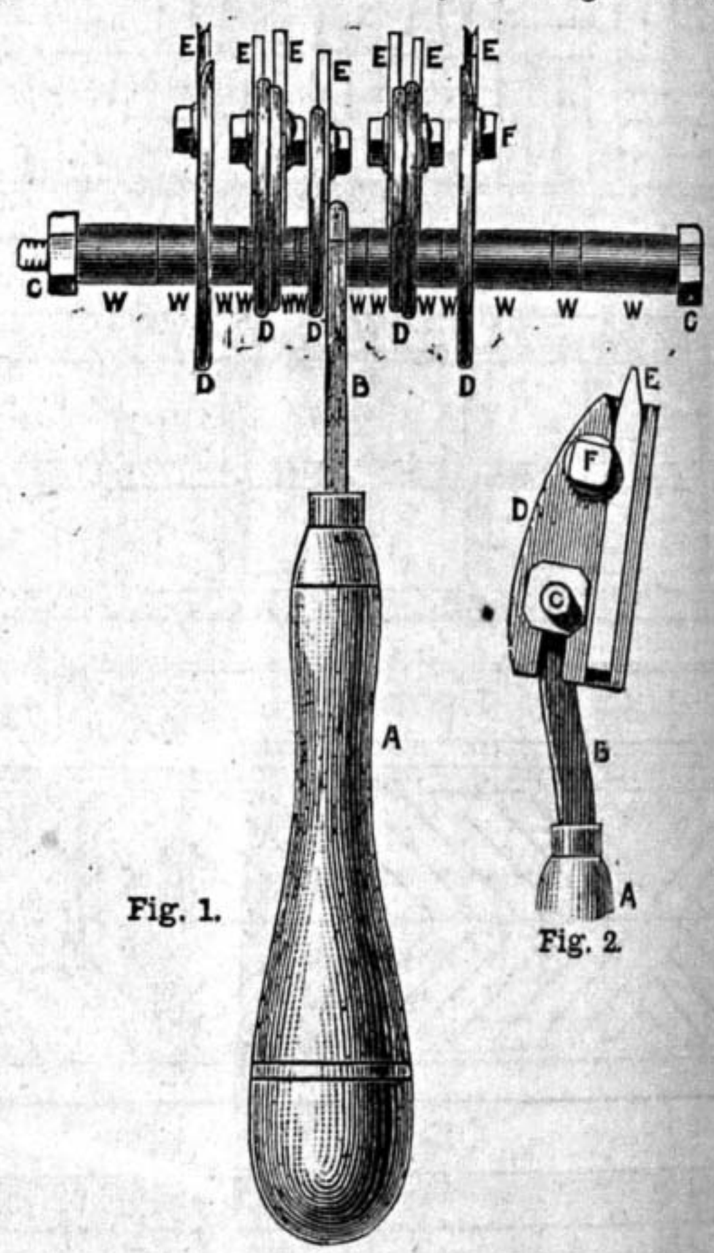


Fig. 1. Fig. 2.

Fig. 1.—Imrie's New Composite Cutting Tool for ensuring Equal Measurements in all Turned Work of two or more Pieces of the same Pattern: Front View of Tool as seen from above. Fig. 2.—Side View of Right-hand End of Tool, showing Mode of securing Arms on Rod and Cutters on Arms.

rod C C. If anyone is inclined to say, "Oh, but this tool is not long enough to cover the whole length of a baluster," I can only reply "No; but by the aid of two or three, or even more, dividers, if necessary, you can set out the different parts of a baluster with a minimum of trouble." Now, see how this tool affects turned work of the same pattern done in large quantities. Possibly some dozens of spindles are wanted, and, in the ordinary way, when the first spindle has been turned, it must be copied, or replicas of it, so to speak, must be formed, involving much care and accurate measurement. But, with Mr. Imrie's invention, as soon as the arms have been set to the necessary distances one from the other, and the cutters regulated for the necessary depth of the incisions, no more measurement from spindle to spindle is necessary, but as soon as one is completed, another piece of wood is placed in the lathe and the preliminary incisions are at once made without any measurement at all. The regulation of the arms is effected on a rule board supplied with the tool for this purpose. End arms, or stops, of different patterns are supplied with the tool; thus for balusters that have a square at each end, pulleys or rollers of hard wood are attached, to protect the sharp corners and prevent them from breaking, as the pulley revolves when it touches the baluster. Mr. Imrie has sent for inspection several beautifully turned spindles in wood and ivory, showing in all cases the wood with the divisional rings incised before the turning is commenced, and the finished spindle. It is equally well suited for elliptic work, as an oval spindle is included among those sent.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

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

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

I.—Letters from Correspondents.

Stanley's Portable Saw.—E. R. (*Crouch End*) writes, in reference to Stanley's Portable Saw, noticed in page 502 of this volume:—"Being a subscriber to Work, which in many cases I find of great utility as an amateur worker, I hope you will not think it out of place if I point out to you what appears to me an erratic statement in No. 83 of your valuable Magazine. It is in connection with Stanley's Patent Portable Saw. The idea is by no means novel, for during the American war I was employed in a Paris shipping firm, and we used to ship to America hundreds of dozens of the very same saws, which were intended for amputating legs and arms in the battle-field. Those saws were supplied by M. Charrierè, the most prominent surgical tool maker in Paris."—[It seemed to me from a humane, as well as from an editorial, point of view, that it would be very hard on wounded men who were compelled to submit to the amputation of a limb to have the bone sawn through by a flexible saw instead of the rigid straight saw that is ordinarily used for such a purpose, and I wrote to my correspondent to ask him how the saws did their work, and if they were much used and in any way commended by the profession; and when I was writing I pointed out that the idea of the surgical instrument maker was to enable one man, or at the most two, to do the work of four or five, as in ordinary operations, but that his notions of the manner in which amputations are performed must have been hazy in the extreme, as no man in his sober senses would think either of recommending or resorting to such a plan. The following was his reply:—"Yours of the 17th inst. to hand. I cannot tell you much more about the 'chain saw.' It was about 9 in. long, blued, and the two handles were exactly similar to those shown in the drawing in Work. Of the size of the tenons I have but a dim recollection; they were very flat and the saw extremely sharp, so much so that our office chairs found themselves amputated in the twinkling of an eye: to our great satisfaction, if not to that of the governors. My opinion is that a chain saw for amputating purposes is a clumsy tool, answering its purpose on an emergency, but certainly not to be compared with the regular surgical saw. I may add that a quantity of them were returned to us at the close of the war in a very rusty state, and that Charrierè took them back at a very low figure compared with the original invoice price."—[This was very much the sort of answer that I expected to receive. The saws were in no way suited for the purpose for which they were intended, and although they might have been very effective when used for the dismemberment of office chairs, they were found altogether wanting for parting asunder the bones of men. Whether or not M. Charrierè had a French patent for them I do not know. Possibly not; and I do not think Mr. Stanley need fear vitiation of his own patent through prior claims. Had my correspondent and his friends been in my employ, and tried their pleasing little game of saws *versus* seats, they would have got what is popularly known as "the sack." But I daresay the "governors" were quite as equal to the occasion as I should have been.—Ed.

Fountain.—A. H. (*Brighton*) writes:—"Allow me to thank Mr. C. Maynard Walker for his article and design of Hero's fountain in No. 69 of Work, page 265. I had heard of the fountain, but never could see it or a design of it. When it was published I was spending my spare time in making one to work with a pump driven by an electromotor, but I set to work and tested the plan there and then with three small canisters and some compo pipe, and found it worked first-rate, so I intend to make a large one attached to an aquarium for gold-fish. I should not have written now, but I see F. H. (*Streatham, S.W.*), in No. 69, page 445, thinks he has an improvement, but which, as far as I can see, is just the reverse. When he is filling the chamber A with water, he must wait until the air that is contained in the funnel F is forced out of the jet at the top, which will take a considerable time, according to the size of it, as the fountain won't play until the air is out; and then, again, when the air from B, through D, has forced the water in A down to the bottom edge of F, there will be a spluttering set-out, caused by the air in A and the water in F changing places, which the plan of Mr. C. Maynard Walker does away with."

Electric Light and Electrical Engineers' Sundries.—G. E. B. (*London, S.E.*) writes:—"I have received from the secretary of the Electrical Engineering Corporation, Limited, a copy of their illustrated catalogue, from which I learn that the firm of J. G. Statter & Co. has amalgamated with the United Electrical Engineering Co., Limited, under the above name. The new firm have their engineering works at West Drayton, and their electrical supply works at 36, Albert Embankment, London. They are manufacturers of the Statter-Brunton Patent Dynamos and Electro-motors, and are prepared to undertake the complete installation of electric lighting plants and the erection of electric tramways. I am also in receipt from the same firm of the following samples of electrical engineers' sundries. Tinned steel staples for electric bell and telephone work: these sharp-pointed staples need no bradawl to make holes for them, and they are sold under the name of 'Yankee Jacks,' at the low price of 1s. 3d. per lb. Brass saddles for securing main electric leads to beams and other woodwork: these neat little saddles are secured by brass screws, and are sold at from 3s. 6d. to 4s. 2d. per lb. 'Chatterton's compound,' an insulating substance resembling shoemakers' 'heel-ball,' which is warmed, and then moulded around a wire joint to ensure its insulation. This compound is sold at 8s. per lb. Fine and thin strips of easily running solder for soldering wire joints, sold at 1s. per lb. Copper binding wire, tinned and annealed soft, at 5d. per ½ lb. bobbin. Various widths of prepared tape for binding around joints to complete their insulation, price 1s. 4d. per lb.; and pure rubber strip for making the insulation more secure, price 10s. 8d. per lb. Any other electric light and electrical engineering sundries of good quality can also be obtained from the above-named firm."

Fretting Banjos.—J. G. W. (*London, N.W.*) writes to B. A. B. (see page 546):—"I was very pleased to see your able criticism of my method of fretting banjos, mandolines, etc. You have made rather a curious mistake in giving Mr. Gleeson-White the credit (if there is any credit attached to it) of writing the directions for making a mandoline, also how to fret banjos, etc.; it should have been yours truly, John Geldart Winder, banjo specialist. I do not agree with you about dividing with the compasses being a formidable undertaking; I think nothing of setting out a scale by the method I give. I do not think that it requires more patience than anything else that has to be done well. Suppose it takes one hour to set out a scale (I can do it in something less than that), what is it? once it is done, it is there for a lifetime for that particular size of instrument. The method you give with the pieces of iron is not new to me, but was suggested to me by a pupil of mine, who is in the piano trade, and who had been experimenting in setting out a scale from my instructions. I should never have given the instructions in 'Shop' if I had not been sure the method I gave was for all practical purposes (playing in tune) correct. When I first commenced the manufacture of banjos, etc., one of the most essential things I wanted was a method for correctly setting out a fretting scale, and our capital paper Work not being published at that time, I had no one to whom I could inquire for instructions how to do it, but had to find out the best way I could. I tried the compasses, and found they worked out the result all right, so have stuck to them ever since. Many other makers may use the same method, and may have used it long before I thought about it; whether any of them do so or not I cannot say. I may tell you that I am pretty well known as a player and teacher, as well as a maker of banjos, therefore I think that I may be considered fairly competent to test an instrument. When I gave the method in 'Shop' I expected someone would attack it; but knowing that the result attained by the method was for all practical purposes correct, I did not care much about that. If you live in London, I should be pleased to let you test a small piccolo banjo with *raised* frets. The shorter the string the more likely it is to expose any defects to the ear."

Riddles.—C. T. C. (*Brockley*) writes:—"Your correspondent J. S. (see page 553, Vol. II.) evidently doesn't know that there is an imperial standard wire gauge, which became a legal measure on March 1, 1884, by order in Council, August 23, 1883. This is gradually being used by many firms, but still more sensible firms work on the decimal part of an inch."

Oval Drawing.—J. W. H. writes, in reply to F. C. (*Leytonstone*). (see No. 84, page 519):—"I am too busy just now to answer you fully, nor do I wish to treat you with disrespective silence; in the meantime, may I just ask you to think out and reply to this? I turn, on a lathe, a brass ellipse, as true as the chuck will do it. Cutting out the middle of the plate—say ¼ in. thick, on a bevel or angle of 45°—I turn the edge of the plate elliptical also, and this on a bevel also of 45°; the top face of the plate then forms a frame (without the middle piece, which has been cut out), with two bevelled edges or soffits. Now, which of these four curves is the true ellipse? and which of them is parallel thereto? and whether any other than the true ellipse *is* a true ellipse? and if so, which, and why?"

Exhibition Memorial Number of Work.—Subscriber writes:—"I have several friends in our colonies who take a great interest in Work, and, doubtless, will in the approaching Exhibition. As it strikes me the 'Memorial' number will soon run out of print, I intend ordering at least six copies from my bookseller at once, in order to send them abroad. Perhaps some of my fellow 'chips' may like to be put up to this precautionary wrinkle, as there is sure to be a speedy run on this Memorial number."

II.—Questions Answered by Editor and Staff.

Flatting Plates for Fenders.—Fender-maker.—The main thing is to be able to see where the plate requires hammering, as sometimes a plate that seems far from flat will only require a few blows judiciously placed to put it right. If your plates are thin, it is more difficult to flatten them than if they are fairly stout. If the plates seem fairly straight along the edges, but seem to rise in the centre, the main force of the blows should be towards the edges—that is, commence with light blows in the centre, and work outwards with heavier ones, noting carefully the result of each few blows, so as not to overdo it in any one place; if the plate seems twisted and sprung, it will probably require more hammering in the centre parts. I should advise you to practise on odd pieces and carefully note results; use a flat anvil stake, and a hammer also perfectly flat, but with a rounding edge, to avoid marking the plate.—R. A.

Solder.—T. E. D. (*Northampton*).—Solder for metal pots. Take ½ lb. of lead, 1 lb. of tin, and 2 oz. of bismuth; for a flux, use resin or resin and oil.—R. A.

Circumferences of Circles.—A. U. G. (*Chippenham Road*).—For all practical purposes the ratio of the circumference to its diameter is taken as 3·1416 to 1, or in the nearest vulgar fraction, 3½ to 1, or, in whole numbers, 22 to 7. Thus to find the circumference of a circle, multiply the diameter by 22 and divide by 7. The circumference of a circle 5¼ in. diameter is $\frac{5\frac{1}{4} \times 22}{7} = 16\frac{1}{2}$ in. The *exact ratio* of the circumference to the diameter has never been determined, but some enthusiastic mathematicians have worked it out to some hundreds of places of decimals. You can buy tables of circumferences and areas of circles at any technical bookseller's, such as Batsford's, in High Holborn.—F. C.

Condensation of Steam.—Aqua (*Sheffield*).—From Regnault's "Tables of Density and Temperature of Steam at Various Pressures," we find that at a temperature of 385° F. it has a total heat (including latent heat) of 1231·5° F., and therefore, to reduce it to 208° F., the heat abstracted must be 1231·5 less 208°, which leaves 1023·5° F. To raise the condensation water from 56° F. to 208° F. we must add 152° F.; hence, for equal weights the ratio of condensation water to steam will be that of 1023·5 to 152, and, dividing the former by the latter, we get 6·73 lbs. of water per lb. of steam. One quarter of a cubic foot of steam at 385° F. weighs 0·1035 lb., therefore the condensation water required will weigh 0·1035 multiplied by 6·73, equals 0·696—say, 0·7 lb. Taking water as weighing 62·5 lbs. per cubic foot, this will be equal to about 19½ cubic inches.—F. C.

Marine Glue.—Busy Bee.—Dissolve by heat one part of pure indiarubber in twelve parts of mineral naphtha or coal-tar; when melted, add twenty parts of powdered shellac. Pour out on slab to cool; when used, to be heated to about 250°, or slightly above boiling water; the application of too much heat would set the mixture on fire.—P. B. H.

Oval Chuck.—A. W. D. (*Colingus*).—The answer to your query only awaits its turn in "Shop," which is still overcrowded.—Ed.

Tricycle Hut.—Busy Bee.—In Work, No. 64, there appeared an article, with sketches, entitled, "How to build a Tricycle House." If this article will not answer the purpose, Busy Bee must say what the *difficulties* are in the roof, and state also if he wants the pieces to pack exactly square with each other, as in this case. The sides in the above mentioned hut are not square, but slope towards the back, so that the water may run from the roof: which is very necessary. The parts can be packed on the roof, and it can be taken to pieces, without help, in about half an hour, and put together with the help of a single person in about the same time. Probably the dimensions might be reduced and the house made lighter if the machine were of small dimensions.—P. B. H.

Replies in "Shop."—J. McA. (*Barrow*).—If your query has, as you say, been briefly acknowledged in "Shop," there can be nothing very "disrespectful" in the treatment you have received. Hundreds of letters come every week for "Shop," and each one has to be sent into a different direction to be replied to by a specialist; thirty per cent. of the questions need an illustrated answer, which means time for the artist to draw and the engraver to cut; there is about one-third of what there should be in the way of space available each week in Work for "Shop"—hence the arrears, among which, doubtless, is yours. To meet these arrears the publishers are, at periodical intervals, presenting, without charge, four-page supplements of "Shop." What more can be done? Be a little more patient.—Ed.

Simple Circular Saw Machine.—Sawyer.—You find the labour of sawing wood "laborious," and wish for assistance to make a simple machine for the purpose. Now there is a good deal of power required to saw wood, even under the best conditions, and you cannot avoid that by using a circular saw instead of a hand saw. All that you can do is to see that you have a suitable saw with the proper number of teeth, properly set and sharpened, and then apply it well. If the work you have to do is short, and most work is so, then a saw on the principle of the Britannia Co.'s (see page 29 of Vol. I.) will help you. Here you have simply a powerful fly-wheel running at a good speed; you have to work away at the treadle till you get

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up a good speed, and then you have enough power stored up to rip a plank 3 ft. long. Of course, it can't give out any power but what you have yourself put into it, but it is easier to apply the force gradually and allow the machine to store it up and give it out when wanted. Sawing is *intermittent*, that is the secret of the power of that saw. Perhaps you could fit up a circular saw on a long spindle having a 50 lb. fly-wheel on the end of it, sufficiently far off the saw (say 2 ft.) to be out of the way in most work. Or could you not manage to buy your wood from a saw mill, where they would rip the planks by steam to the widths you require? Or, again, are you using a suitable saw in your work? It would be very hard and tiresome work to rip up deal planks with a panel saw of nine points to the inch. If you have much sawing to do, I advise you to get a rip saw and keep it sharp: let it have four points to the inch, and you will be surprised to see how it will walk through an inch plank.—F. A. M.

Unmounted Lenses.—MILL will doubtless obtain what he requires from Messrs. A. Coiffier, of 13, Hatton Garden, London, E.C.; or Messrs. Joseph Levi & Co., 2, Dyer's Buildings, Holborn, and 10, Hatton Garden, London, E.C.; both of these firms are importers of foreign goods. Mr. E. S. Platt, Birkbeck Works, Birkbeck Road, Ridley Road, Kingsland, London, N.E., can supply the material called "Imperial cloth," used for camera bellows making. It is perfectly waterproof and unaffected by the extreme changes of climate, and may be washed with soap and hot and cold water if required. This material is the nearest approach to leather at present made, and can be had in morocco or cross-grain at 3s. per yard of 45 in. wide. A special quotation will be given if you require a considerable quantity.—C. A. P.

Blueing Gun Barrels.—URGENT.—I am not able to say how the trade blue their barrels, but you might try the following:—Dissolve ½ oz. hyposulphite of soda in 1 lb. of water, and to it add ½ oz. acetate of lead, previously dissolved in ½ lb. of water; place the articles to be blued in this solution and heat it to nearly boiling, but it should not quite boil. A sulphide of lead is formed and deposited on the articles; if of iron, a steel blue colour is the result.—R. A.

Varnish.—A. P. (*Halifax*).—I cannot help you in your difficulty, as your varnish (or rather polish) seems to be made all right, though for pure polish you might as well leave the resin out. Possibly the ingredients may not be good, but it is more probable that the dulness arises from some defect in working. Are you sure the dulness is not caused by the varnish or polish sinking into the wood, and that the work was done in a warm, dry place?—D. D.

Hutch, etc.—WHOG HTIMSDLOG.—(1) I cannot recommend you to use cane instead of wire netting for any hutch. For one thing, it will be more troublesome to use cane; and for another, cane is not as durable. (2) For a mouse-cage, have an oblong box with part of the front enclosed by a wire door, and a smaller part enclosed by a wooden door and separated from the other by a partition with a hole in it. Size is not of much consequence, and must depend on your own wishes. Keep the cage clean, and, if you prefer it, have a sliding tray or false bottom. (3) Quite impossible to give designs for all sorts of stencils in "Shop."—D. D.

Lantern Slide Painting.—SUBSCRIBER asks what varnish is used in painting slides in water-colours. There is a special varnish prepared by Messrs. Rowney & Co., London, which is all that can be needed. Any dealer in artist's material can supply it. In purchasing, it should be stated that it is to use with water-colours.—O. B.

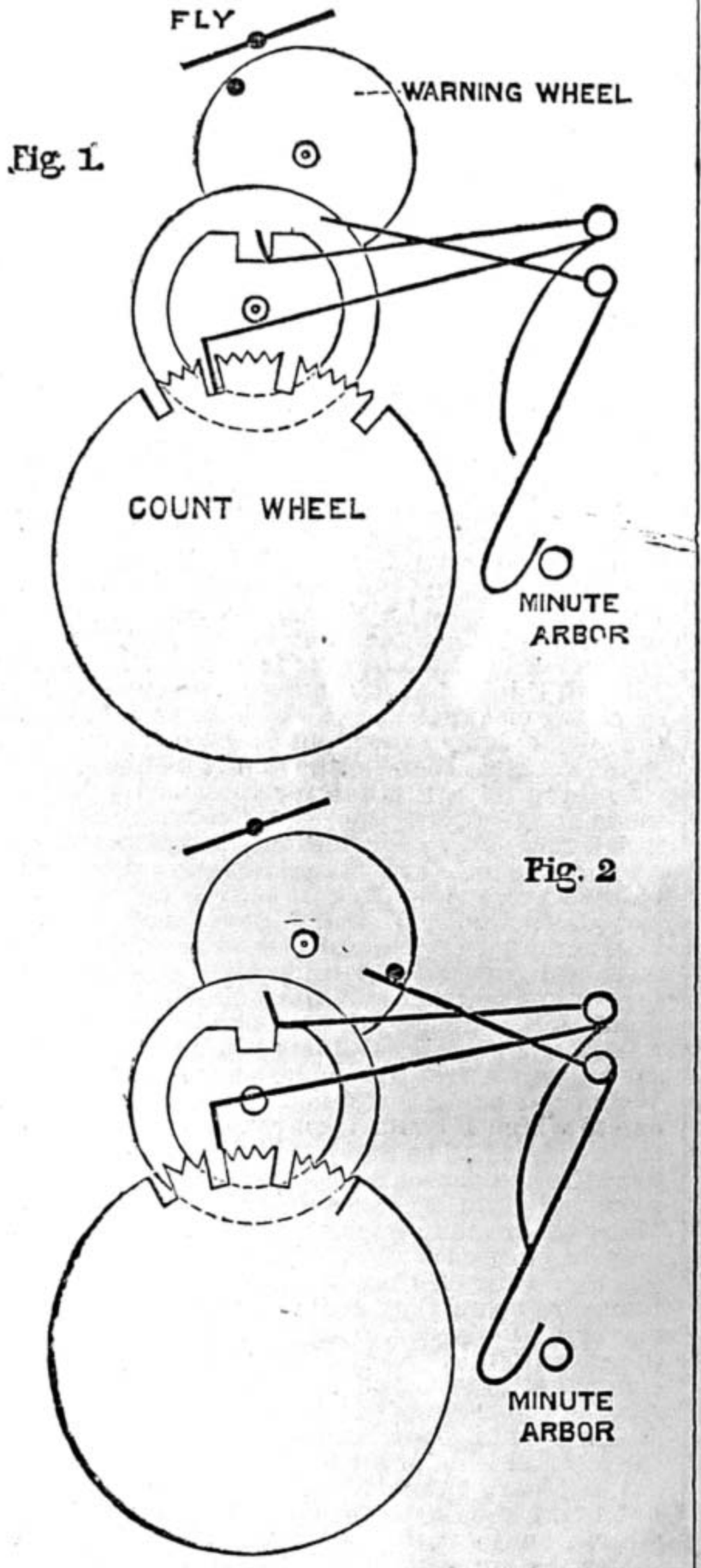
Taking Out a Patent.—INQUISITAS.—No one is obliged to employ a patent agent, and when the inventor has the skill to make his own drawings, and the intelligence to write his own specifications, there is no occasion for employing one. The regulations with regard to drawings are strict—too long to be given here. Our correspondent will find them in the official "Circular of Information," which he will get, post free, by writing to the Patent Office, 25, Southampton Buildings, Chancery Lane, E.C. By all means, get and study this circular; also read the article on "Taking Out a Patent," in WORK, No. 35, Vol. I., page 545.—C. C. C.

Model Locomotive.—R. F. (*Newton Heath*).—To deal sufficiently with this subject would require a series of many papers for which I have no available space at present.—ED.

Wiring Tinware.—E. J. B. (*Chesterfield*).—The general run of pieced tinware made by ordinary tinmen is usually wired in the flat; if it were wired after being formed it would be more difficult. I should think you have not used the machine very long. Perhaps you do not take up fold enough for the wire. Try again, and if you cannot succeed, give full particulars as to your mode of working.—R. A.

Staining.—W. B. (*Inchinnan*).—Try and make your joints so good that they do not necessitate stopping. If you want to make some, melt resin and beeswax together. This may be either run into the cracks while hot, or kept in sticks similar to sealing-wax, and melted with a hot piece of iron into the joints. Colour the mixture to suit the wood it is being used with. As you are evidently a novice at painting and graining, do not make your first attempt at the latter on such a conspicuous piece of furniture as you name. Paint it nicely in one uniform colour, relieved, if you can manage, with lines of another shade or colour, after the manner in which so much art furniture is finished nowadays.—D. D.

American Striking Clock.—AMBITIOUS HEIGHT.—The pin on the minute arbor is quite right, and should begin to lift the other wire at about ten minutes to the hour; the wire that it lifts has, or should have, another piece on it, beside the one that touches the wire on the minute arbor; and that piece should come up high enough to catch the pin in the wheel next to the fly, and should hold it until the wire drops off the hook piece on the minute arbor. The piece that is lifted by the minute arbor, after rising a short distance—say, ⅛ in.—comes against an arm of the piece that drops in the count plate, and also in the notch of the disc on the second wheel from the fly; now when the arm has fallen in a long notch in the count wheel,



American Striking Clock. Fig. 1.—Striking Part when at Rest. Fig. 2.—Striking Part whilst on the Warn, and waiting for the Arm to drop off Minute Arbor Pin or Hook.

the arm in the disc should fall down to the bottom of the notch nearly; but when the arm is in a shallow notch of the count wheel, the arm on the disc should be just free of the top of the notch; it will then strike till it falls in a long step or notch. You have, very likely, bent the wire that catches in the warning pin (that is, the pin in the wheel that drives the fly) up too high; or, it may be, too low. That is evidently where the fault is. When the striking is at rest, arrange the wires as in Fig. 1; then put the hand up to the Figure XI. on the dial, and see that they are as in Fig. 2.—A. B. C.

Triunial Optical Lantern.—N. (*Kilburn*).—Fig. 1 is not drawn to scale, and merely gives the appearance of the lantern when completed. Figs. 2, 3, 4, 5 and 8, are ¼ in. of the real size, therefore, every ¼ in. in these cuts will represent 1 in. in the full-size plans. Fig. 9 is full size, but the remaining diagrams are not to scale.—C. A. P.

Drawings and Specifications.—A. C. (*Peterborough*).—You should advertise your name and address, and willingness to undertake such work, in "Sale and Exchange" columns of WORK.

Lathe Matters.—R. N. (*Grays*).—There is no periodical devoted solely to this work.

Wiring House for Electric Light.—AMATEUR (*Putney*).—Your two diagrams of wiring for electric lights are both wrong. If you run a wire from the dynamo and return the other end to the machine, so as to form a loop, as shown in your sketch, the current will traverse this wire, but will not pass through the lamps which form bridges across the loop. The outgoing lead must terminate entirely at the end of the run, and the incoming lead must start independent of the other, not be connected to it, as shown in your diagrams. The circuit is completed through the lamps. If you have one or two, or more, leads from the dynamo to various parts of the house, one of which feeds lamps in an electrolier, these must either be connected in parallel—that is, so as to form bridges between the leads as on the other circuits—or, if connected in series, as shown in your sketch, their combined resistances must be balanced by a resistance placed in the other circuit. If this is not done, the lamps in the electroliers will not get sufficient current to light them. For instance, in your first diagram you have four 15-volt lamps on one circuit in parallel. These will offer a resistance of about 4 ohms. In the other circuit you have two electroliers of three lamps each, the lamps connected in series. These will offer a resistance of 23 ohms, and you would not get sufficient current through them unless you interposed a resistance of 19 ohms in the first circuit so as to balance the resistance of the second. In your second diagram the arrangement is worse still, with an additional electrolier bearing five lamps in series on the same circuit with one of three lamps. In planning the wiring of a house for electric lights, you must first take into consideration the output of the dynamo, and arrange the lamps to suit its ability. If it gives a current of high voltage, the lamps must be arranged in series. If the volume of the current is large, but of low voltage, arrange the lamps in parallel. You will find full instructions in the series of articles on "Model Electric Lights."—G. E. B.

Small Dynamo.—ARMATURE (*Walsall*).—To light up two 10 c.p. incandescent lights, you will want a machine of the Siemens type, of the following dimensions:—Field magnet cores, 5 in. by 4 in. by ⅝ in., wound with 4½ lbs. No. 22 cotton-covered copper wire; laminated H girder armature, 4 in. by 1¾ in., wound with 10 oz. No. 20 double cotton-covered copper wire connected in shunt with the field magnet coils. Drive at 2,500 revolutions per minute. See the articles on "Model Electric Lights" for more detailed information.—G. E. B.

Small Storage Battery.—M. NSD (*Wigan*).—You are wrong in your "list of things wanted to make a small storage battery." I suppose you have read about a battery made up with "half-round porous cups," but I have no idea where they can be obtained, unless you have them made for you at a pottery. Sulphate of soda and sulphuric acid can be had of any druggist at a low price. What do you want with sulphate of copper cells? These are simply the cells of a Daniell battery. You do not need these to make a small storage battery. I advise you to read all that has appeared in "Shop" respecting accumulators, and to also read carefully the articles now being published on "Model Electric Lights." You will then have a clearer idea of the things required to make a "storage battery," which is only another name for an accumulator.—G. E. B.

Lineff Tramway.—R. R. Y. (*Cananoque, Canada*).—In the Lineff Patent Electric Tramway, a magnetic conductor is employed, buried in a channel running along under the central rail, which is laid flush with the surface of the roadway. An electro-magnet on the car attracts the magnetic conductor, and completes the circuit through an iron wheel which runs on the central rail. As the flexible iron ribbon, which forms one conductor, is only drawn into contact with the central rail when the car with its powerful electro-magnet passes along over it, there cannot be any danger from an accidental shock either to horses or human beings. A full illustrated description of the Lineff Electric Tramway is given in the *Electrical Engineer* for October 10th, 1890. The address is, the Lineff Electric Traction and Lighting Syndicate, 11, Queen Victoria Street, London, E.C.—G. E. B.

Address Wanted.—Will DEAN FOREST (see page 519, Vol. II.) kindly send his full name and address to the editor of WORK, as a letter awaits him at the office of WORK?

Fret Saw.—AMATEUR.—There is nothing to prevent a circular saw being fitted to the Britannia Company's No. 8 fret machine. You might have ascertained what you wanted to know by writing direct to the makers. The thumbscrew must be used every time when fixing a saw in a fresh hole in wood. In this respect the machine in question does not differ from any. You cannot get a better fret machine than the No. 8 of the Britannia Company.—D. A.

Frames.—W. J. W. (*Whitehouse*).—The frames can be purchased from any of the factors or manufacturers who supply the trade. There are many of these in London. Without being acquainted with the class of goods you supply, it is impossible to recommend any particular firm as likely to suit you. Those who are in any particular trade have no difficulty, even if travellers do not call on them, of ascertaining, through ordinary trade channels, the sources of supply.—D. D.

Weights of Metals Book.—J. B. (*Louth*).—You should get Penn and Ryberg's "Tables, showing the Weights, etc., of Iron, etc." 2s.; J. Blackwood, 8, Lovell's Court, Paternoster Row, London.—K.

Carpenters' Brace.—F. F. (*Leytonstone*).—I have used a brace made on what is called the American pattern for some years, and I find they will hold almost any bits firmly and fairly true, the

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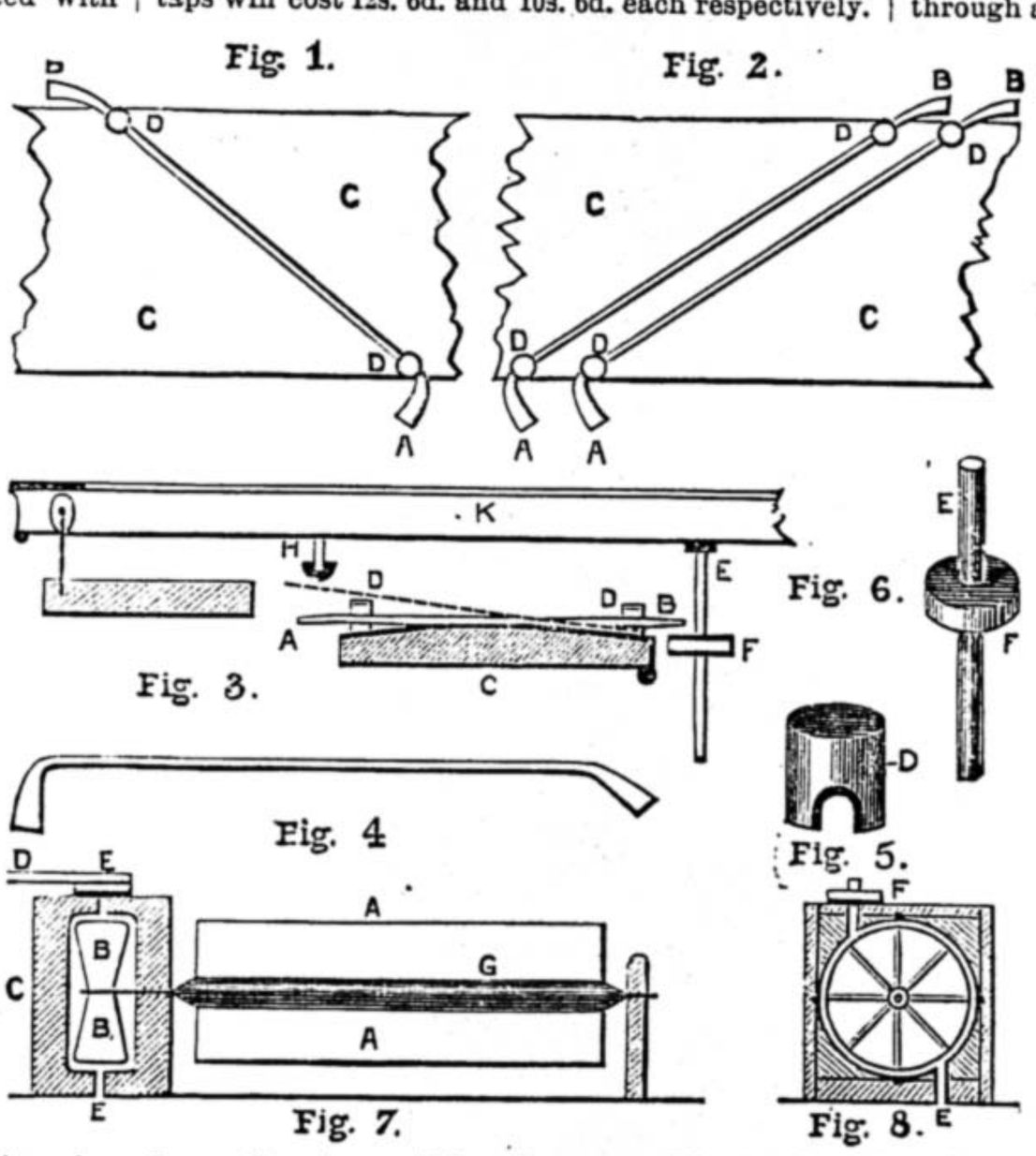
only exception to firmness of grip being in the case of stout stems, such as large centre-bits have, but, for the great majority of bits, the brace leaves nothing to be desired; as to truth of centring, that depends on the bit; but the stock or brace made on the American pattern by Sorby, of Sheffield, with ratchet, which is very useful in corners, beats, both for quality and price, any American article of the kind. The cost is but 4s. 6d. with ratchet.—B. A. B.

American Organ Coupler and Vox Humana.—COUPLER.—I am not much acquainted with the practical work of American organ construction, but I give you such information as I can, which will, I think, enable you to add couplers and vox humana to your instrument. But I must first caution you that if your organ is without stops the bellows may not be sufficiently large to supply couplers. As regards the coupler, it merely consists of pieces of wire about ⅛ in. thick bent and flattened at the ends, as shown in Figs. 1, 2, and 4, fixed loosely at each end on a platform, marked C, by means of two round pieces of wood, marked D, and of which a view is given in Fig. 5. Figs. 1 and 2 show a plan of the platform and wires, the first coupling downwards, the other coupling upwards. Fig. 3 gives a section showing how the coupler is placed with regard to the keys—A B is the coupler wire; C, the platform; D, the pinch-pin; E is the plunger which the key presses down to cause the note to sound. On this is fixed a wooden collar F, covered with soft leather on the top. On the underside of the key K is a little peg of wood H, with a button on the lower end covered with leather on the underside. When the coupler is in action, and the key pressed down, the peg H presses on the A end of the coupler wire, causing the wire to partly revolve, the B end of the wire presses on the button on the plunger of the key an octave higher or lower, as the case may be, and causes that note to sound also. The sketch shows the coupler out of action. When the draw-knob is pulled out it causes the front end of the platform to be drawn up as shown by the dotted line, so that the A end of the wire is close under the peg, and the B end close down on the collar of the plunger. The platform should be slightly rounded on top, so as to lessen friction on the wires, and the underside of the grooves in the pinch pins should be lined with leather or cloth, so that there may be no noise in working. The platform may be either hinged or centred at the back. Any stop action (such as a square or a lever) that will raise the platform will answer the purpose. Fig. 6 gives an enlarged view of the button on the plunger. The platform will only be about 2 in. wide, ½ in. thick, and long enough to carry all the wires required to be actuated by one draw-knob. This coupler action can be placed in a small space, as it requires but little room for working. As regards the vox humana, or fan tremulant, Fig. 7 gives a general view of the fan and a section of the box in which the motor wheel is enclosed to be actuated by the wind. The construction is very simple. The spindle G is a round rod of wood 12 in. or 15 in. long, and ¾ in. thick, grooved by a thin tenon-saw cut on two opposite sides to receive the fans A, which are simply two pieces of thin cardboard about 2 in. wide and nearly as long as the spindle, into the grooves of which they are glued. The axes on which the spindle turns are pieces of steel wire (pieces of a knitting-needle will do well), great care being taken to insert them truly in the centre of the spindle. The left-hand axis is sufficiently long to pass through the wind-box C and to receive the motor wheel B. The axle hole in the wind-box must be bushed with cloth, to prevent inrush of wind. The motor wheel, of which a front view is given in Fig. 8, is made with six or eight leaves of thin wood or tin, and the box in which it is enclosed may be made of thin veneer bent round, built up square, or turned out of a solid piece of wood with a circular hollow sunk in it to receive the wheel. Probably an amateur would succeed best by the second method, building up a square box 4½ in. high and the same width, and 1½ in. or 2 in. deep in the clear. As the space in which the wheel works must only be large enough to allow the wheel to clear, corner pieces must be added, as shown in Fig. 1, so as to form the circular hollow for the wheel. The wind comes in from the top through a small hole F, so that it strikes on the wheel in the position shown in Fig. 8, and is drawn out through the hole at the bottom marked E, which communicates with the bellows. Of course you know that in the American organ the bellows acts by suction and not by pressure, so that the wind is drawn through the hole into the bellows, and is not blown from the bellows and through the top of the wind-box. The hole F is about ¼ in. diameter, countersunk on the top, and covered with a valve of wood or leather which may be connected to a rod D as shown, which will be lifted when the draw stop is pulled out. Any other stop action that will lift the valve clear of the opening when the stop is drawn will answer equally as well. It must be understood that the wheel is entirely enclosed in the wind-box C, the left-hand end being screwed on, and the fan and wheel must be made as light and true as possible, or it will not work. Place the whole affair at the back of the treble tube board, over the bellows, boring a hole through to connect the hole in the bottom of the wind-box with a similar hole in the bellows. You will notice that the holes in the wind-box come in the centre of the wheel, as seen edgeways in Fig. 7, and in opposite corners, as seen sideways in Fig. 8.—M. W.



American Organ Coupler and Vox Humana. Fig. 1.—Coupling down. Fig. 2.—Coupling up. Fig. 3.—View of Coupler, showing its Position under the Keys. Fig. 4.—Coupler Wire. Fig. 5.—Pinch-pin (full size.) Fig. 6.—Plunger with Collar. Fig. 7.—Front View of Vox Humana. Fig. 8.—End Section of Wind-box and Motor-wheel.

Triple Optical Lantern.—OPTICUS AND OTHERS.—*Re* lowest cost of the condensers, objectives, jets, etc., required for a triple lantern, as described in WORK, No. 83. The cheapest house from whom to obtain these requisites is Messrs. J. Theobald and Co., 4, Bath Place, Kensington. This firm will supply 4-in. compound condensers, mounted in brass cells, at 9s. each; rack and pinion double combination portrait objectives, 12s. 6d., or the same with flashers and extra large-faced lenses, 14s. 6d. Well-finished blow-through jets, 9s. 6d. each, or with cog-wheel lime-turners, 12s. 6d. each. A dissolver will also be required, and, as a triple dissolver is an expensive affair, it would be cheapest to fit a six-way dissolving tap on to the twin lantern, and a four-way tap to the third or top lantern. These taps will cost 12s. 6d. and 10s. 6d. each respectively. Second-hand dissolvers and jets can very frequently be purchased cheaply. A short time since Mr. Tyler, of 48, Waterloo Road, London, S.E., offered some jets in good condition at prices ranging from 4s. 6d. to 12s., likewise some dissolving taps at 6s. 6d. to 10s. 6d. each, and ready taped 9-ft. screens for 7s. 9d. As the above will constitute the chief items of expenditure, it will be an easy matter for you to calculate the cost of the materials required in the construction of the lantern. In a manufacturing town like Sheffield you should experience no difficulty in obtaining the sheet-iron required for the lining of the lantern, or the brass tubing and brass plates for the stages; and as for the wood, it is always possible to pick up a couple of dining-table leaves cheaply at any second-hand dealer's. You could lessen the cost of the instrument considerably by making a biunial or twin lantern, as this would answer all ordinary purposes for dissolving views, and for a certain class of effect slides. You would then require a pair each of condensers, objectives, and jets, together with one six-way dissolver.—C. A. P.

Drawing-board and Materials.—APPRENTICE MECHANIC.—You can purchase all drawing materials of any artist's colourman, and most stationers and booksellers will procure them on your order.—ED.

Boiler and Bridge-making.—ANXIOUS INQUIRER (*Wednesbury*).—"A Treatise on Steam Boilers," by R. Wilson, C.E., 6s, and "Materials and Construction," by F. Campin, C.E., 3s.; both published by Crosby Lockwood & Son, London.—F.C.

Hard Rubber Tyre.—T. H. N. (*Cockermouth*).—You cannot soften hard rubber tyre. If it was good rubber it would be soft. Hard tyres are made of a composition having a certain percentage of rubber—how much or how little depends on the price it is sold at, or on the honesty of the seller. I paid a good price for a tyre not long ago; I hung it on a nail in the wall, it broke at the nail by its own weight. It seemed to be composed mostly of red clay.—A. S. P.

Transmitter.—M. A. C. (*Glasgow*).—I cannot trace your former query. If you want to set up two or more telephone stations you cannot make an instrument that will work satisfactorily as transmitter and receiver.—W. D.

Charcoal Iron.—J. S. R. (*Burton Latimer*).—The ordinary ferro-type plate would suit your purpose well enough. There are not many firms who deal in this class of stuff. "Tinfoil of about 15 square feet to the pound." Any chemist will supply this.—W. D.

Spiral Chuck, etc.—OVERHEAD.—As to *mechanical movements*, there is a series of articles on the subject, with illustrations, in Vol. XI. of the *English Mechanic*, continued from the *Mechanic*, which the *English Mechanic* absorbed; these articles are taken from a useful little work on "Mechanical Movements," by Mr. Henry J. Brown, Editor of the *American Artizan*. You might get this book through an American publisher in this country. I have just found a cover containing ten sheets of "Diagrams of Natural Philosophy" in quarto, and a pamphlet explaining them in a popular manner, published by James Reynolds, 174, Strand; no price is marked: these are pretty good, though about thirty years old. You wish to know whether a notice of the spiral chuck will appear in WORK: I hope that nothing of real use on the lathe will escape notice; but we are yet at an early stage. You can very easily dispense with a spiral chuck by marking the change wheels, and then, between each strand of your spiral, lowering the wheel-plate and passing the correct number of teeth. For instance, say you wish to cut a spiral of ten threads or strands; then have on the mandrel a wheel with, say, 100 teeth (any multiple of 10 will do); you cut one strand, then, since you wish to turn the work one-tenth before you cut again, mark with chalk the 100 wheel, and the one it gears with at the point of juncture; then loosen the wheel-plate, and, turning the 100 wheel, pass ten teeth and lock in again; continue so till you get round. Another plan is simply to use the click wheel of the eccentric chuck for dividing the strands. A spiral chuck *should* fit on the tail end of the mandrel, not in front where it is often put. Get Nos. 863 and 901 of the *English Mechanic*, you will find full descriptions of both plans.—F. A. M.

Voltmeter.—CYMRO DEWI.—At some future time I hope to describe a voltmeter. The following will do as a makeshift, and give tolerably accurate results. Get a pocket compass, and fix to a disc of wood a little larger so as to form a stand for the compass. On each side of the compass, and close to it, fix a small telegraph pattern binding screw or small brass pillar. Stretch a piece of fine brass or German silver wire exactly across the centre of the compass, close down to its face, and connect the two ends to the two pillars. Turn the stand around until the compass needle lies in a line with the wire. If, now, a current of electricity is sent through the wire, the compass needle will deviate from the line of the wire in proportion to the strength of the current passing through the wire. By connecting up one cell of a Daniell battery to the wire, and noting the deviation of the needle, we may put this down as representing one volt, and any number of volts may thus be determined by coupling up Daniell cells in series, and sending their current through the wire.—G. E. B.

Advertisements.—BATHONIAN.—I can only repeat to you what I have told many other subscribers: that while you regard the advertisements in WORK as a blemish and eyesore, other readers look upon and consider them as useful for reference, and always ready at hand if occasion requires.

Soldering and Staining.—D. T. (*Chatham*).—If you and any other new subscribers will buy the Index to Vol. I. of WORK, you will find therein a host of references to both soldering and wood staining. Then purchase the requisite back numbers of WORK.

Cold Brazing.—A READER.—Cold brazing is a delusion and a snare as regards any practical work; it is not suited for the job you want it for, nor for anything else where strength is required; nothing beats the old-fashioned fire and spelter, or blowpipe and ditto. The receipts you speak about are simply catchpennies; they have been published in various journals. If, however, you should care to try the process, here is a receipt and directions for cold hard soldering:—Melt 10 dwts. of tin in a crucible, and add in the following order as soon as the tin melts, bismuth, 1 dwt.; fine silver, 8 dwts.; platinum foil, 1 dwt. When melted and mixed together pour into a mould. Reduce this to filings, and reserve till wanted. To use this solder, prepare the article for soldering by scraping and cleaning

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as for ordinary soldering. "Tin" the surfaces to be united with a little of the following flux:—One part metallic sodium to fifty parts mercury; let this flux be prepared by a chemist, and kept in a closely stoppered bottle. Mix three parts of the solder filings with one part of mercury in a mortar till reduced to a paste, smear it on the surfaces to be united, and press firmly together: it will set hard in a very short time. Suitable only for articles that cannot be exposed to the heat necessary for brazing in the ordinary way, and that are not likely to get strained or knocked about.—R. A.

Hydrostatic Bellows.—HYDRO.—HYDRO has made a hydrostatic bellows; the sides or connection between top and bottom are of American cloth, with the inside coated with boiled linseed-oil, which arrangement answered until the water began to ooze through small cracks. If I purposed making such an instrument I should use stout waterproof cloth from a rubber manufacturer: this would be much better. Another difficulty is that the present cloth is fastened with copper nails ½ in. long, driven close together, and he asks, how can they be removed? This ought to be no serious difficulty. Supposing the circular top and bottom were turned in a lathe, re-mount them, and cut off, say, ¼ in. each side down to the nails, and then when the head and part of the shank are exposed they can be easily withdrawn. Or if they were simply sawn out, then cut away the wood with a chisel down to the nails. —O. B.

Chamber Organ Drawings.—POOLE.—Too long an answer would be needed to deal with this in "Shop." Wait until the Organ Building articles appear in WORK.

Spelter.—BRAZING.—You have not gone wrong. You had not the right kind of spelter. Spelter is certainly not "brass borings," and if he said it was, he either does not understand his business, or he deliberately sold a lot of rubbish. In future, if you want to braze anything very particular, and are not sure of your spelter, try a piece first on some of the same kind of metal that you wish to braze. If you want good, easy running spelter, apply to Messrs. Warner & Sons, Crescent Foundry, Cripplegate, or to Berham & Froud, Chandos Street, W.C.; you should state what you want it for, and you will get a good article.—R. A.

Shocking Coil.—C. A. B. (*London, N.W.*).—We have not yet published any articles on shocking coils, or on motors for revolving vacuum tubes, but a series of articles on these subjects is in course of preparation for WORK.—G. E. B.

Gilding Jewellery.—T. G. P.—A short series of articles on this subject is now being prepared. You will learn better how to gild your few "odments" of jewellery from reading an article on the subject, than from a few brief directions in "Shop".—G. E. B.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Cardboard Models.—J. F. (*Mullingar*) writes:—"I shall be glad if any reader will let me know of any work published instructing how to prepare models in cardboard. I should like to have address of publisher and price."

Wire Gauge.—J. G. (*Glasgow*) writes:—"Could anyone give me some information anent the new legal standard wire gauge—if it was instituted by Act of Parliament, or otherwise; also if the Birmingham wire gauge is now abrogated? My warm thanks to HERR SPRING for his simple, yet clear, demonstration of how watch hands can be turned back without affecting the movement. The gauge, also, I now understand, and will be of use."

Blacksmithing.—G. A. T. (*Ilfracombe*) asks for addresses where he could obtain designs for wrought iron gates, suitable for a gentleman's villa.

Carvers' Tools.—J. D. (*Tiverton*) writes:—"Will any reader furnish me with the addresses of good carving tool makers?"

Fire-proof Safes.—J. D. (*Tiverton*) writes:—"Having discovered that some silver plate, which had been deposited in a fire-proof safe, had taken rust, I asked a silversmith about it, and he told me that it was owing to damp, which was often, if not always, the case with articles placed in above-named chests. Might I ask if other readers of WORK have had similar cause to complain, and if there is any remedy? Would lime absorb the damp and keep the air dry and sweet?"

Punt.—W. P. (*Cardiff*) writes:—"Would any reader kindly instruct me as to making a small 'punt?' I have a great liking for a punt."

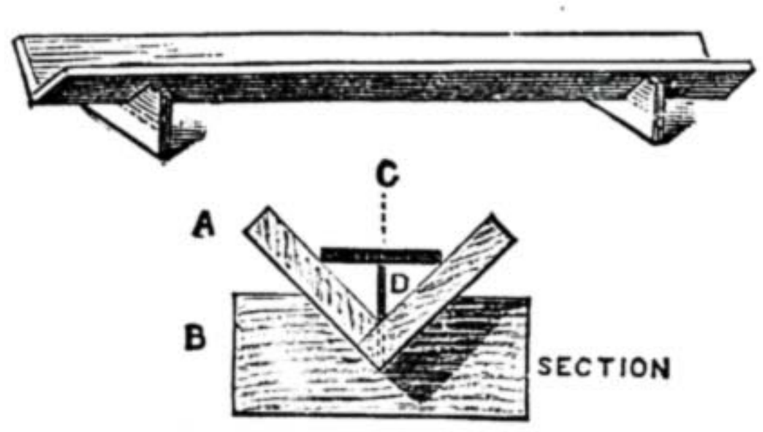
Rabbit Skins.—IDEM SONANTIA writes:—"Will some kind reader give me instructions how to cure rabbit skins for domestic use?"

Appointment.—A. T. (*Eastbourne*) writes:—"Would it be possible for me to obtain a situation under the British East African Company as smith; and if so, where could I apply?"

Window-cleaning Chemical.—C. T. (*Ashton-under-Lyne*) writes:—"About twelve months ago I saw a man in Leeds washing windows with some kind of liquid preparation which he kept in a gutta-percha or indiarubber bottle; he put some of it in a bucket of water, brushed it on the glass, and washed it off with clean water, and it cleaned all the dirt from the glass without doing any harm to the paint or putty. Can any reader oblige me with particulars of this preparation? Would it be a chemical acid?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Venetian Blind Painting.—E. C. (*Norwood*) writes:—"In reply to your appeal for co-operation from correspondents, I beg to forward subjoined sketch of trough for the rapid painting of Venetian blinds. I have painted many of them, and for the benefit of ASPIRANT, who writes under the heading of 'Venetian Blinds,' page 522, Vol. II., I give the following details:—The trough is made out of any kind of wood, ¾ in. by 5 in. floor-board answering the purpose first-class, about 4 ft. 6 in. being most convenient for length, and the two pieces nailed together at an angle of 45°, and resting on two bearers, each fixed about 6 in. from each end; a nail is then driven perpendicularly into the bottom of the inside of the trough, as at D, about 3 in. from one end, which acts as a stop for the lath while under the brush, without which the lath would slide out of the trough. The nail should not be above the level of the lath, or it will cut the brush in the centre—only just sufficient to answer the



Trough and Parts.—A, Trough; B, Bearer; C, Lath in Trough; D, Nail Stop.

purpose. The first finger of the left hand is placed against the other end, and performs the same office against the brush in its opposite course, and is also ready to assist in the turn-over to paint the other side, which I should add is done with the two first fingers of each hand, without laying down the brush. I don't know if it would be trespassing for me to say that to paint a Venetian blind, say of thirty laths, in a trough of this description, would take me about twenty-five minutes; but to paint the same blind as I paint them now—that is, with one end resting on a box of a convenient height and size, with the end of the lath resting against a tack for a stop, and the first finger of the left hand in the hole nearest the other end, and turning it with that finger and thumb—would take me about thirteen minutes; it is well to practise that way: it is easy to get into it, and you save time in not having to walk to and fro to set down the laths."—[Thank you for your able reply. There must be every week many points which suggest themselves to you and others, and for the expression of which the "Shop" columns of WORK are specially designed. Let me hear from you, and others too, often.—ED.]

Magic Lantern.—W. B. (*Maidstone*).—You will find a paper on "How to Make a Triunial Optical Lantern" in No. 83 of WORK. There is no paper in hand at present on the construction of so cheap a lantern as you suggest.

Water-pipes.—W. B. (*Maidstone*) writes to GLASGOW (see No. 86, page 551, Vol. II.), who is a sufferer from water-pipes bursting, and who would like to know of a regulator to prevent same:—"I might say that GLASGOW is not the only sufferer, for we are subject to the same complaint. The only safe, and cheapest in the end, and effectual regulator that we advise is to fix, or have fixed, a 'stop-cock' on the service in the cellar or other convenient place to be easily got at. I think GLASGOW will find that he can regulate the pressure to what he likes, or he can shut it off altogether. No doubt there are other regulators in the market GLASGOW could use, but as I have found that the 'stop cocks' do their work effectually, I have not troubled myself about any others. I hope the above is plain enough for GLASGOW to understand."

Blueing Swords and Guns.—W. B. (*Maidstone*) writes:—"I should like to ask a question through 'Shop.' If there are other methods to blue swords and gun barrels (to come within the scope of the amateur) besides the elaborate process of the heating apparatus?"

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. F. S. (*Hammersmith*); J. M.; H. E. (*London, N.W.*); LEGHORN; W. H. H. (*S.E.*); A. B.; H. E. (*Kensington*); L. A. C. (*Wigan*); H. E. (*West Bromwich*); CLERK; ECONOMY; H. J. (*Upper Holloway*); £ S. D.; CORNICE; VAPORIFER; JOINER; W. H. T. (*Hanley*); M. L. (*Rochdale*); F. F. (*Cardiff*); J. W. (*Sheffield*); J. S. (*Ramsbottom*); B. C. (*Poplar*); G. H. M. (*Camberwell*); CHARITY; J. H. E. (*London, W.*); J. T. G. (*Edinburgh*); JABEZ; W. W. (*Brixton*); W. S. (*London*); G. H. (*London, E.C.*); H. B. T.; F. W. H. C.; J. S. (*Barnet*); BOSWORTH; K. W. (*London, W.*); W. H. R. (*Liverpool*); E. A. S. (*South Norwood*); H. A. C. (*Plaistow*); A YOUNG BEGINNER; SECRETARY; J. W. (*Homerton*); A. S. (*Newport*); DANS EMBARAS; W. W. (*London, N.W.*); H. A. (*Leeds*); APPRENTICE; A PLAYER; C. W. (*London, N.*); AMATEUR; W. AND L. (*Leeds*); F. R. H. (*Manchester*); W. F. (*Lindhurst*); UNCLE; H. D. (*Suffolk*); G. A. (*Liverpool*); IMMOT; CAPUT NIGER; R. S. (*Bow, E.*); F. C. (*Swanley Junction*); C. H. S. (*Nottingham*); J. H. F. & CO., (*Birmingham*); R. J. D. (*Edinburgh*); A. W. (*Wakefield*); M. R. (*Kerry*); A. B. (*Suffolk*); G. P. (*Elgin*); SHEET METAL WORK; LANCASHIRE LAD; RAINFORD; A. H. (*Southport*); E. D. (*Royston*); YOUNG SIGN WRITER; J. F. P. and others; W. M.; T. C. (*Sunderland*); TOM.

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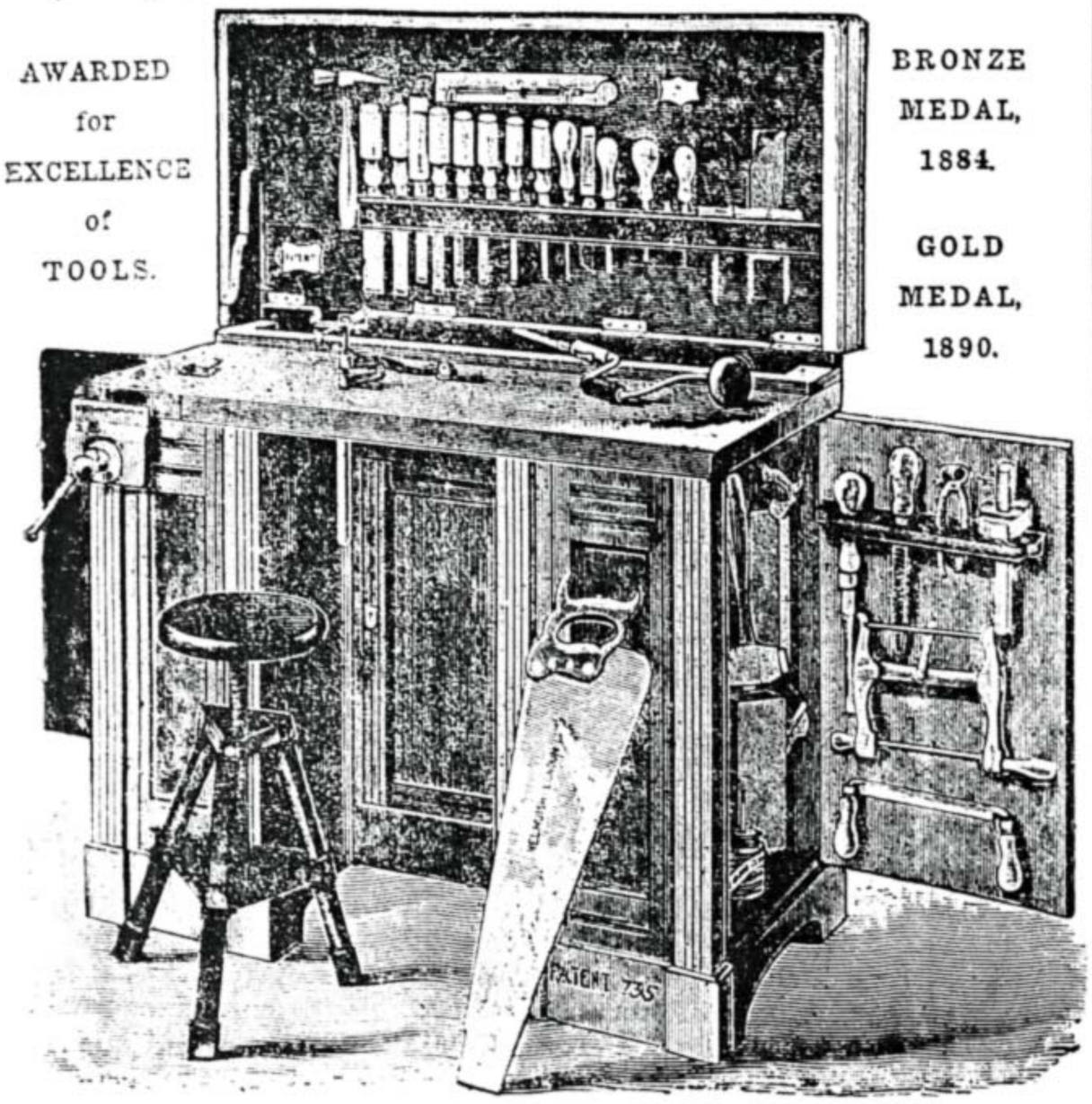

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