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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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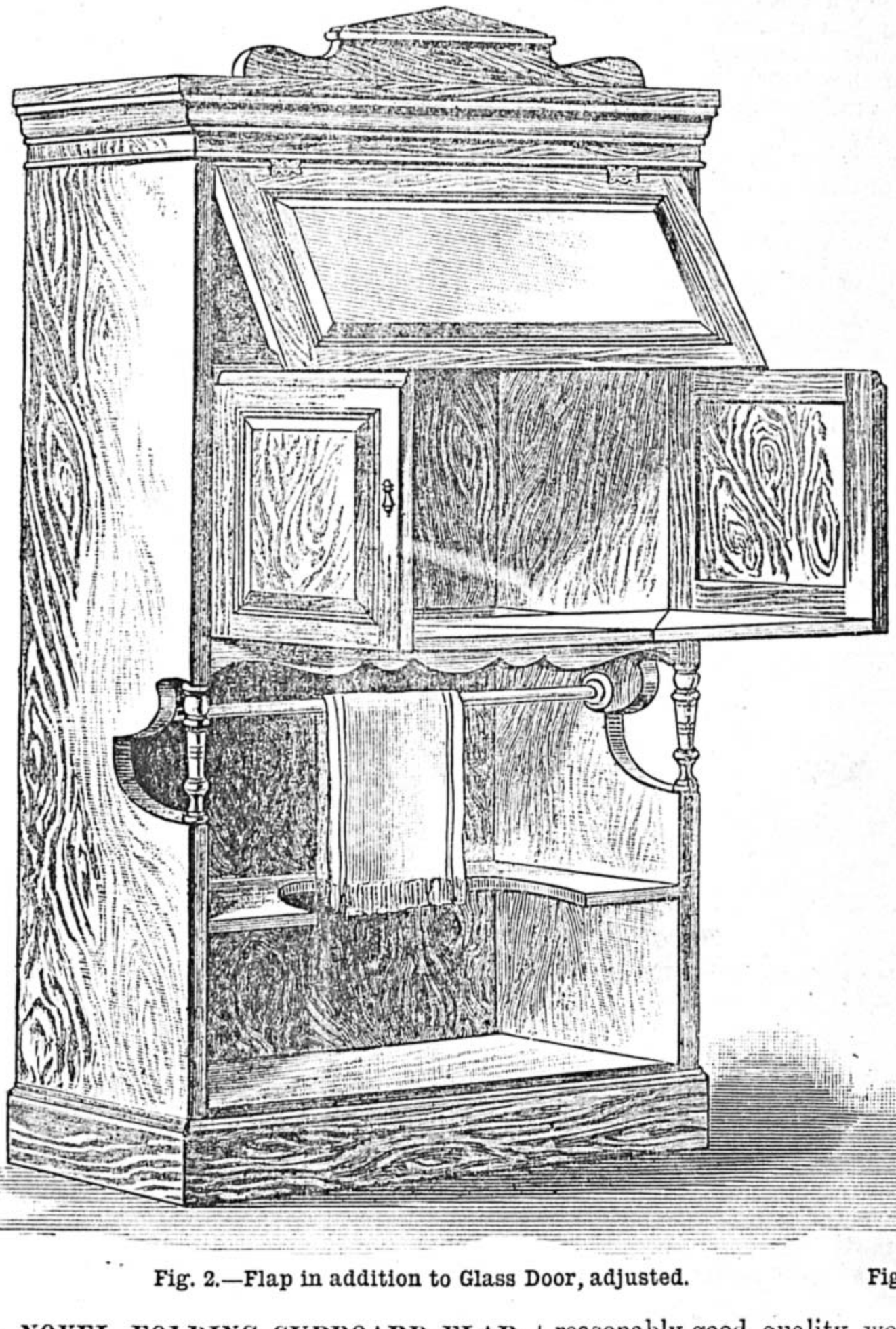


Fig. 2.—Flap in addition to Glass Door, adjusted.

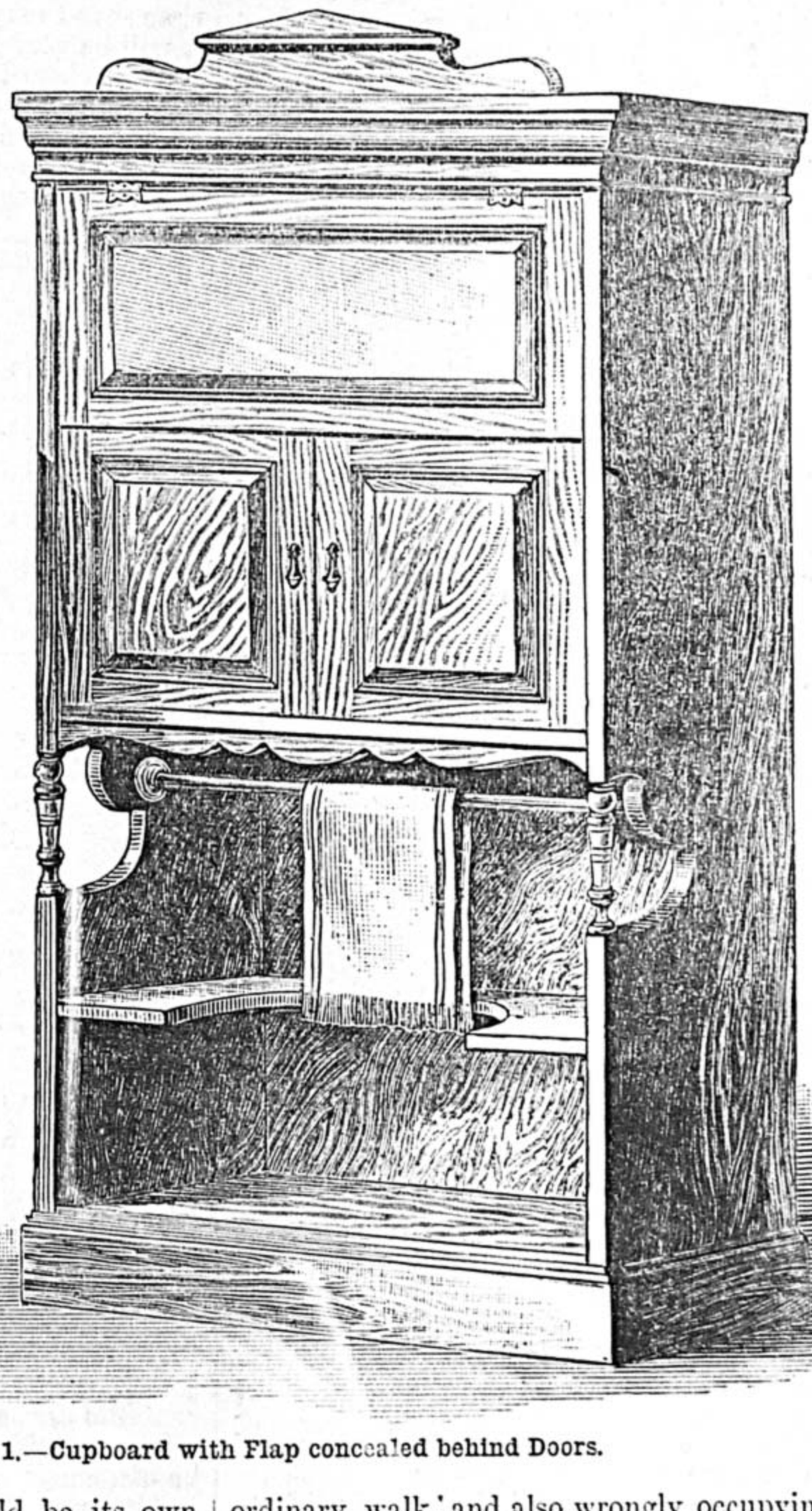


Fig. 1.—Cupboard with Flap concealed behind Doors.

A NOVEL FOLDING CUPBOARD-FLAP.

BY JAMES SCOTT.

"TIME is money." If these words contain any truth—and no one can doubt that they do—one would think that that truth would be applicable in any degree and in any case: that is to say, if time is economised to the extent of but a few moments, money would be saved to a proportionate value.

However, it would not do, nor indeed is it considered an essential matter, to be always endeavouring to regulate all our actions in such a manner that each and every moment of time is occupied profitably. If time-saving were uppermost in our thoughts, I am inclined to think that this reasonably good quality would be its own executioner; inasmuch that, in order to *save* time, the thoughts dwelling so much upon the subject would have the influence of diminishing the amount of attention requisite for the proper performance of any particular action or actions. This is exemplified in the case of a man about to travel a certain distance by foot. In order to save time, he may run briskly for half the way; but, then, for the remainder of the journey it would in many instances be found that, in addition to his slower progress by reason of physical exhaustion, he would be casting up in his mind how much time he had saved, thus making his later movements even slower still than they might have been had he travelled the whole distance at an ordinary walk, and also wrongly occupying his thoughts, which should have been dwelling upon the business to be transacted at the journey's end, which business would then probably require more time to transact than had been saved by the half-journey run.

Of course, in travelling by conveyance of any description time *is* most undoubtedly saved, because then the thoughts *can* dwell upon the future transaction; but I am speaking of individual actions, and the purport of my words is intended to illustrate the fact that if certain actions, assisted by certain methods, take less time to perform than they do by other methods, time or money is not thereby necessarily saved.

Space requires almost as much considera-

tion as time, and it is needless to say that anything which economises it to an appreciable extent is welcomed by those who have not much of it at their disposal. Of course, there are people to whom anything of the kind is utterly useless. But then, because this is the case, they should not pronounce them so in every instance, for I am sure there are many homes and offices where such articles find favour and good use. If people would recollect this, we should not be told by cynical men, who, doubtless, can invent nothing more than a poor and feeble joke, that "if 'Necessity is the mother of Invention,' there must be a lot of inventions that are orphans." Such remarks seem to spread a tint of uselessness over a number of inventions, but if the writers of them would remember that all orphans *have had* mothers, they will see the foolishness of their words; for if an invention were found of necessity at one time, is it in any way the fault of that invention that it becomes motherless?

conjunction with the other necessary parts, could be appropriately utilised, for although, as I hinted previously, the consideration of the time saved by opening and adjusting the doors, flap, and glass by one action instead of, perhaps, four or five (for it must be remembered that in most cases the doors would first have to be opened to get at anything within the cupboard, then the basin-flap would have to be brought down, up, or out from somewhere—certainly, this flap could be made to answer the purpose of the doors, thus making only one action necessary in this direction—then one or two brackets, or something similar, brought out to support it, and, finally, the glass flap fixed at a suitable angle)—although the consideration of time saved may not be of much importance, it will be very handy and convenient indeed. As a cupboard of this description, I should advise the use of a rail across, as I show, to be utilised as a towel-airer. A lower shelf also would prove serviceable.

An advantage of this flap is that it in no

them. The length of this board should be just twice its width, so that if the doors are each 18 in. square and $\frac{1}{2}$ in. thick, the board will be 35 in. long and $17\frac{1}{2}$ in. wide. Mark a line down the middle of it, as represented by the dotted line A′ A″ in Fig. 4, and after drawing lines from A′ to, B′ B′, cut off each corner separated by those lines. The board will then be divided into three parts, A, B, C.

The hingeing of the three pieces should be plainly understood from Figs. 5 and 6, the letters in both diagrams representing the same parts. The method of hingeing B and C to the doors is shown in Fig. 8. The back part of A need not be hinged at all, for sufficient strength will be obtained with the hingeing I have mentioned, as, if the hinges are properly screwed on, the flap will be equally as firm as a solid board. A back view of the flap and doors when the doors are closed is shown in Fig. 9.

If it is intended to have the glass flap as well, it must be borne in mind that it will hang away from instead of laying flat

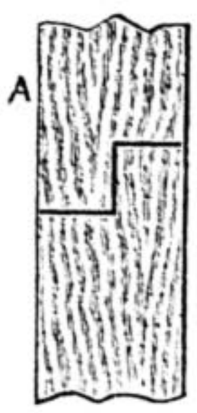


Fig. 7.

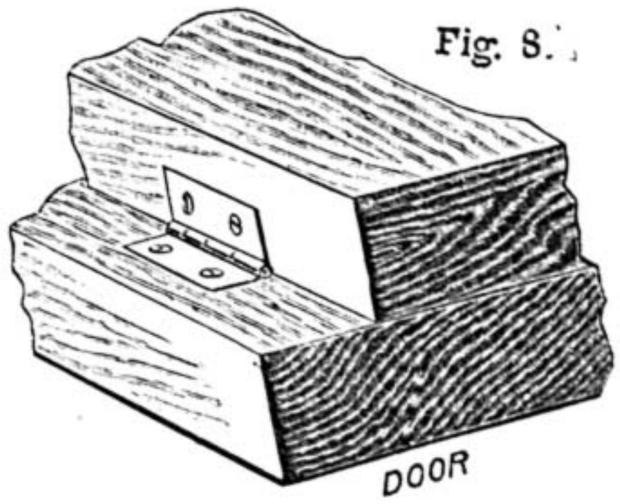


Fig. 8.

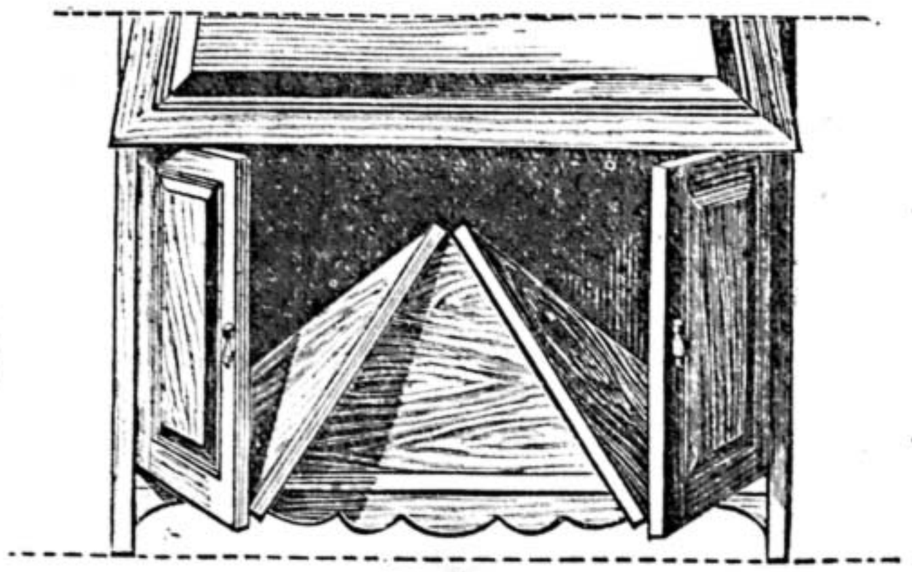


Fig. 3.

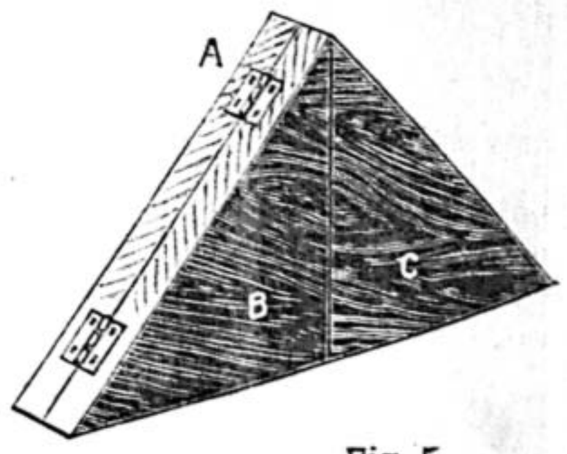


Fig. 5.

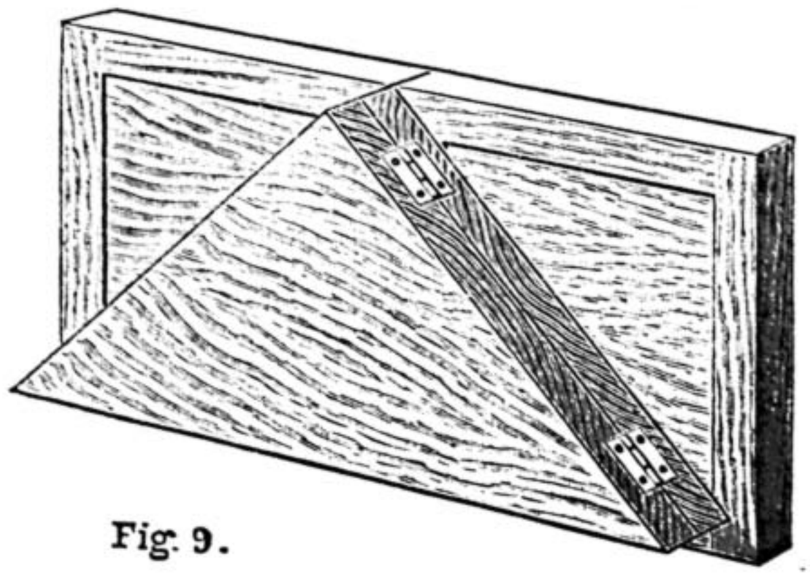


Fig. 9.

Fig. 4.

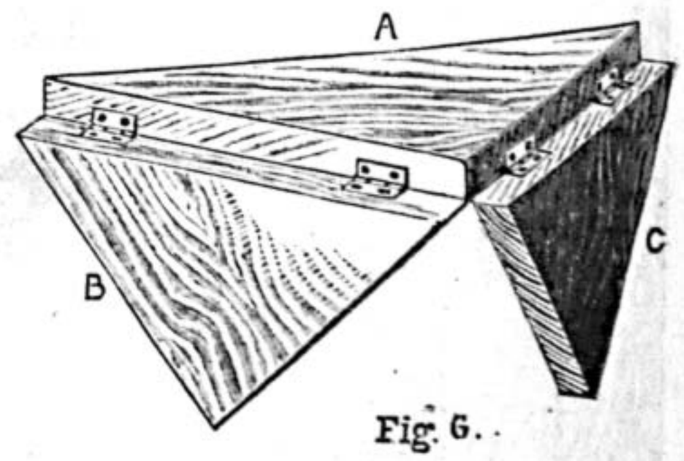


Fig. 6.

Fig. 3.—Diagram showing how Flap folds. Fig. 4.—How to cut Boards to obtain Flap. Figs. 5, 6.—Diagrams showing Flap folded, and folding, and how the Hinges are fixed. Fig. 7.—Section of Glass Flap and Doors. Fig. 8.—Diagram showing how to hinge Parts B and C of Flap to Doors. Fig. 9.—Flap folded behind Doors.

Even supposing that many of the great number of inventions are of such a character as these writers would intend to convey by their illogical witticisms, my belief is that no invention creates waste of anything, for if it is comparatively useless for its named purpose, it will generally be found that suggestions are taken from it whereby useful articles are made.

I have said this much because I wish to imply that the design I give this week is offered principally as a suggestion. Hence my reason for not giving any particular title to the article as a whole. Neither shall I burden the reader with measurements. I will only explain what it is and how it acts, and name some of the uses to which it may be put.

In Fig. 1 is shown a cupboard—an ordinary looking article. In the front is represented two doors and a looking-glass flap. When either or both doors are opened, a flap is adjusted as in Fig. 2, and the glass flap is also placed at an angle, represented also in the same diagram. In Fig. 3 the movement can be better understood.

As a toilette cupboard, the idea, in way interferes with anything within the cupboard—it folds up quite flat behind the doors.

It would also be extremely useful attached to a medicine or other cupboard, where search might have to be made among the contents for a particular bottle or article. Of course, the glass flap in such cases would be dispensed with.

Although the folding of the flap appears simple, care must be taken before the proper result can be attained.

It can be attached to any existing cupboard, providing the latter has two doors, each square; the main thing being to recollect that the pieces necessary to form it must, when placed together, fit close up against each other and the doors to which they are hinged.

The flap consists of three pieces, A, B, C, Fig. 4, hinged together so that they may fold as in Figs. 5 and 6. A must be just the size of B and C put together. Supposing it is desirable to attach a flap to an existing cupboard, the way to proceed will be to open the doors at right angles to the cupboard, and cut a board to fit exactly in between

against the cupboard, unless it is treated in a similar manner to that which I advise. Along the bottom edge, nearer to the *front* of the flap than to the back, cut a groove, and place some lead or other heavy substance in it. The front of the flap is supported by the hinge, but the back, although supported in a literal sense, falls away from the cupboard, therefore it is that something is needed to counterbalance it.

The bottom edge of the flap is rabbeted: as are also the top edges of the doors, in order that they may fit together as in Fig. 7. Thus it will be seen how the doors adjust the glass flap. The deeper the latter hangs over the former, the greater will be the angle at which the latter may be adjusted.

I have no doubt that several readers who will note the above particulars will find the suggestions conveyed in them very serviceable, if they carry them out and construct a cupboard with a flap attached to the doors in the manner described. For the encouragement of those who may hesitate to begin the work, I may add that the construction is by no means as difficult as it looks.

XYLONITE: ITS NATURE AND USES.

BY D. DENNING.

THERE is manufactured, under the name of Xylonite, a material which can be used with advantage in many crafts and trades. As WORK is cosmopolitan in its character, and does not refuse to notice anything which can be utilised by its readers, either in pursuit of their various hobbies or of their means of livelihood, no excuse is necessary for devoting some space to xylonite and a few suggestions about its employment. Although not exactly a new material, it is not yet so widely known as it deserves to be, and it is more than probable that many of our readers have never even heard of it. Probably, however, some of them may be acquainted with "ivorine;" if so, it may interest them to know that this is merely xylonite of a particular finish. What the material is actually composed of, I am not able to state exactly; but it is a preparation the base of which is paper. How it is made, and of what, is not, however, of much consequence just now, as it is not one of the things which are suitable for amateur manufacture. The user must buy it ready made, as he can easily do from the makers—the British Xylonite Company, Limited, 124, High Street, Homerton, E.

The appearance of the preparation is by no means easy to describe, for it is to be had transparent as glass or opaque, snow-white or jet-black, or, in fact, apparently any colour or mixture of colours that may be wanted. It is not surprising to find that this facility of lending itself to assume such a variety of appearances has been taken full advantage of by the manufacturers in giving to the public the "counterfeit presentment" of various animal and mineral substances. The imitations of the real thing are, in many instances, simply wonderful in their close approach to Nature. The "grained ivory," for instance, has the peculiar grain and creamy look which are seldom seen in substitutes for ivory. Tortoise-shell, both red and dark, clear and cloudy amber, the costly lapis lazuli and malachite, are all imitated with great faithfulness to Nature. In addition to these and other imitations, plain xylonite can be had in all colours.

It is made in any thickness up to about 1 in., in sheets or slabs which generally run about 35 in. by 20 in.; and is sold by weight. The price is 4s. per lb., except for the grained ivory, which is 1s. more. Of course, it may be assumed that in small retail quantities higher prices will have to be paid, so that the amateur must not be disappointed if he has to pay more. In texture xylonite is close and compact, without any grain like that of wood. It is, to a small extent, flexible, and can be rendered more so by heat—which, however, should be carefully applied, as the material is very inflammable when brought into actual contact with fire. It is only of moderate hardness, so that it can be cut with the greatest ease. It cuts freely and cleanly, without the slightest tendency to tear, or roughness of surface. On this account it is admirable as a material for carving, especially for small articles which require carefully and minutely working out. Indeed, it may be said that anything which the high price of ivory, or other costly materials, renders inadvisable for employment, may, so far as appearance is concerned, be successfully rendered in xylonite. In case the suggestion of ivory may lead some to think that carving tools as used by the ivory worker are wanted, let it be said that ordinary carving tools are best. The only point in which it may be at a disadvantage is in durability; but as small ornamental articles are seldom exposed to much wear and tear, this is of little consequence. Of course, there are some people who on principle object to all imitations; and if the mention of xylonite offends their sensitive æsthetic feelings, because they regard it as an outcome of perverted ingenuity, let them treat it as xylonite simply, and as a manufactured production of which many beautiful articles can be made, without reference to its being an imitation of anything. The most enthusiastic Ruskinite could hardly object to this, unless he is prepared to ignore all new productions which may perchance happen to resemble something that has been previously familiar to him.

In thin sheets (*i.e.*, those of the thickness of veneer), xylonite, under the name of ivorine, has long been well and favourably known to the inlayer, or—to give him his trade name—the marquetry cutter, who in most cases is precluded from the use of ivory on account of its costliness. Now that the once fashionable Boule furniture seems as though it would again enjoy a run of popular favour, it may be useful to suggest that the tortoise-shell-finished xylonite is well adapted for use, and is much superior to the common French imitations which are so frequently seen.

Those who take up fret-cutting as a means of recreation or profit, might greatly enhance the beauty and intrinsic value of their productions by the judicious use of the material under notice. Small things only would be made entirely of it; but the capabilities of original execution in working from fretwork designs as published, are much greater than most amateurs imagine, if one may judge from their slavish following of the printed suggestions which are so often given with the designs. What, for instance, is to prevent a design being cut in xylonite some $\frac{1}{16}$ in. thick, and used as an overlaid fret on solid wood? Everyone knows the fragile nature of most fretwork articles when the wood is, as is generally the case, cut through. What is to prevent the article being made of wood of appropriate thickness, and then overlaid with xylonite? If this be done, an article infinitely more durable, and not a whit less beautiful than if it had been made of ordinary fretwork, can be produced. To give an instance from an article before me. It is a "postcard-holder," or receptacle for note-paper—just such a thing as would be useful and ornamental in any room—from a design which came under my notice in one of the periodicals. If the working directions had been adhered to, $\frac{1}{4}$ in. stuff would have been used, with the result of an elegant but fragile article. Instead of that, fret-cut xylonite glued on solid $\frac{1}{4}$ in. mahogany gives a really serviceable thing. Another consideration is that the time and labour were less than if it had been made in plain fret, unless, indeed, duplicate parts had been cut together—which is not always convenient—instead of separately. There is, however, little appreciable difference in the amount of labour when several thin sheets of xylonite are cut at the same time, so that with one operation several parts of the same outline can be made at once. At first the fret cutter, especially if he uses a machine, may find xylonite rather awkward, as it is so much softer than the materials commonly used. A very small amount of practice will enable him to overcome this difficulty.

One more use may be suggested for xylonite—it has been found very useful as a substitute for ivory for piano keys.

In the lathe it works beautifully, and being susceptible of a very high polish, the uses to which it may be put are almost endless.

To give some idea of its weight in proportion to its size, I may say that a piece I am now working on, and measuring 6 in. by 3 in. by 1 in., weighs as nearly as possible 1 lb. From this the approximate cost of a piece of any size or thickness may be easily calculated. No doubt the Xylonite Company will answer any inquiries that may be addressed to them on points and uses which, on account of space, must necessarily be omitted here. I may suggest that inquirers should have the courtesy to enclose a stamp for reply; and that if they only want to purchase an infinitesimal quantity, it will be better to get it from some retail dealer than to trouble the manufacturers, who, however obliging, can hardly be expected to lay themselves out to supply small cuttings at wholesale prices.

WHIBLEY'S REVOLVING-TABLE BAND-SAW MACHINE.

BY THE INVENTOR.

THE USE OF THE MACHINE AND THE VARIOUS PURPOSES TO WHICH IT IS APPLIED.

IT will perhaps be advisable, as conducing to a clear perception and a correct understanding of the distinctive principles of the table and guide fences of this machine, as also the why and wherefore of their adoption, if we first investigate the conditions met with in the twisted form of a handrail wreath, whose plan must of necessity be partly or wholly curved, and its axis partly or wholly inclined. This is taken as a representative case, as it involves principles and operations associated with the production of many other forms of work. In Figs. 4 and 5 (page 789) we have the plan and elevation of such a rail. This, it will be seen, starts from a straight and level shank, from which it rises by an "easing" to its greatest pitch or inclination, and thence, without further alteration of pitch, extends upwards and onwards over a circular plan, thus forming at its upper part a solid helix or square thread-screw. The inner and outer edges of that portion of the rail standing over the circular plan, though not strictly cylindrical, may for all practical purposes be considered and dealt with as such, and as generated by two straight lines parallel to, and revolving around the axis of, "well" or cylinder at determinate distances therefrom; and the top and bottom surfaces as generated by two parallel lines, *a b*, and *c d*, moving horizontally along two "falling" or directing lines on either the inner or outer cylindric surfaces, and tangent to opposite sides of a smaller cylinder (A). For obvious reasons, the whole of such a rail would not be formed of one piece of wood, but of several pieces joined endwise, one of which is shown separately, Fig. 6 being plan and Fig. 7 elevation. It will also be evident that this piece of rail can be contained by or cut out of a plank whose thickness is equal to *e f*. If now the plan of wreath-piece be marked on a board (any thickness), as *a b d c*, Fig. 6, and this is made a level base whereon to "horse" or fix in any required position or inclination a piece of plank of sufficient size to contain the wreath-piece; then working upon the level table of an ordinary form of band-saw or fret-saw

machine, and using the plan of wreath marked upon the baseboard as directing lines to cut by, the cylindric surfaces of rail may be cut, as Fig. 8—if the capacity of machine will allow of the top end of plank passing under the upper saw guides and the machine arm. The conditions when this would be practically possible are few, and in them the liability to saw breakage considerable, in consequence of the large amount of unsupported saw between the guide blocks. The work would also be one of considerable danger, consequent upon the stability of the whole being destroyed by the act of cutting. We might, instead of "horsing" the plank, erect an auxiliary inclined table upon the machine table, a hole being formed in it for the saw to pass through, and the whole so arranged that though it could be freely turned around the saw—the cutting edge of the saw being preferably the axis of rotation—it would be restrained from movement in any other direction. Upon this auxiliary table the plank is placed, its upper surface marked to correspond to an oblique section of cylinders, such that the plan of lines will correspond with the plan of rail, as Fig. 6; but as this auxiliary table cannot be traversed about the machine table, the plank must have a traversing motion of its own, of such a character that though the plank may be moved anywhere about the inclined surface upon which it rests, yet any horizontal line upon it, as, for example, the minor axis of our directing curves, shall at all times be horizontal. This done, the plank can be cylindrically cut, as Fig. 8, the same as when horsed, subject, as then, to there being sufficient space under the machine arm for the plank to clear—a proviso that effectually limits the application of these methods to cases in which the inclination of the plank is extremely small, and then in very few instances would the end warrant the means.

If, instead of forming an auxiliary table to work upon the level table of the machine, the machine table can itself be inclined from the horizontal and caused to turn around the saw, as I have done in my machine, and the movements upon the table of the material to be cut can be suitably controlled, as they can be by means of my adjustable guide fence, with its double sliding action—viz., that in the direction of its length, and that transverse to the table—then, as in the manner described, any point upon the material can be brought into contact with the saw teeth, and the material advanced against the saw in such a manner as to cause the saw to cut in any required direction, the result being as before. It will also be evident that by working direct upon the machine table we gain in convenience, safety, and range of capabilities; and the table that is adjustable for one pitch is adjustable for any within its range of inclination.

As I am strongly desirous that there shall be no misapprehension in the minds of any with reference to the description given, and that the character of the cut and the principles involved in forming it shall be clearly understood, I shall, at the risk of being thought unnecessarily tedious, beg my readers' indulgence for a moment, for the sake of those, if any, who may have failed to follow me in the foregoing description, whilst I present the conditions in the form of a comparative illustration. Imagine the wreath-piece required, and the containing plank of least thickness for same fixed in space at its proper inclination and position, as Figs. 6, 7, and also a narrow saw, as a bow-saw, working vertically and cutting to guide lines upon the upper surface of the plank, the guide lines to be the projection upwards upon the inclined face of the plank of the plan of rail, Fig. 6, and the saw caused to advance in the cut, as made—then the form cut out will be that shown by Fig. 8. Suppose, next, that instead of the saw being advanced to the material and turned to suit the curve, the material is advanced to the saw and itself turned, then the same result must follow as before; the motion between saw and material being relatively the same whichever way we work. This movement of the material to the saw in the manner stated is that which it will be seen is obtained by means of my table and guide fence as described.

The method of working this machine for the production of oblique parallel cuts is further illustrated by Fig. 9, in which a block or piece of plank *a*, corresponding to that shown in Figs. 6, 7, is shown in position upon the inclined table of the machine; the inner cylindric surface having been cut and the outer cylindric surface partly cut. The block *a* is secured to the fence *b* by any suitable means; it can be secured by a screw passed through the side of the fence into the waste wood of the block, screw-holes being provided in the fence for such purposes, or in the manner I have shown. A strip of wood *c*, whose width is equal to the thickness of the plank, can be screwed to the fence and the plank secured to that, either by a couple of metal dogs *d*, *d*, or, what is often preferable, by a thin strip of wood lightly nailed to the batten *c* and the plank *a*. With various conditions various modes of attachment will readily suggest themselves to the practical workman, and need not be further dealt with here. It must be distinctly understood that any horizontal ordinate of the directing curves upon the surface of the plank must be placed horizontal when attaching the plank to the machine, and this position can always be found by placing the line parallel to the sliding plate *g* in the table. If then the sliding plate *g* and the sliding portion of the fence *b* are each free to move in the direction of their lengths, and the table is free to turn around the saw, the plank can be readily and easily cut as shown, no thought being given by the operator to the movements of slides and table, which movements take place, as it were, automatically, subject to the pressure necessary for guiding and feeding the work to the saw.

Having cut the cylindrical surfaces of the rail, the inside falling lines are next marked upon the concave side of the block, and the upper and lower surfaces of rail cut by "cradling" our block or wreath-piece upon the level table of the machine, the block being caused to turn therein, and kept axially in line with the cradle as advanced to the saw. In Figs. 10 and 11 a simple form of cradle is shown, consisting of two straight pieces of wood extending from side to side of the table, parallel to each other, and secured in position by thumb-cramps or hand-screws (not shown in drawing), so that the outer surface of the wreath-piece may bear on their inner edges and on the table, as shown. It will be noticed that the cutting edge of the saw does not intersect the axis of the cradle—*i.e.*, of rail—but will correspond in position with the lines *a b* and *c d*, Figs. 4 and 5. For this work it is necessary to use a very narrow saw having a large amount of set, as the work is all atwist. When, as in our example, the wreath is of equal pitch throughout its length, the table may be a fixture; but if the pitch varies the table must be free to turn around the saw, as otherwise the rail could not be cut to the proper line. In Fig. 10 the wreath-piece is shown in plan with one twist cut completed, and in position for commencing the other. Fig. 11 is end elevation of same. The dotted lines show position of completed wreath at end of cut.

The heading joint of wreath described is formed at right angles to the axis or falling element of rail, but it would be outside the scope of this paper to explain how this is done.

It may be objected by some that however suitable these machines may be for the production of wreaths by the so called bevel-cut system of handrailing—my illustrations being of that character—that they would be useless for the production of rails by the square-cut system of working. This is not so. What applies to one system of working will, in the main, apply to both, each system being based upon the same fundamental principles. In fact, wreaths exactly alike have been cut by these machines to the bevel and square-cut systems respectively; the waste wood removed by process of sawing being in each case glued together again in such a manner as to form a hollow case the original shape of the block, in which the wreath-piece could be replaced, making all solid as at first, the wreaths being interchangeable, each fitting either case. Several large buildings in London have also been fitted with continued rails cut to shape with this machine by the square-cut system of working.

Circle-upon-circle framing is cut in a similar manner to handrail wreaths. Thus in the case of a circular-headed frame in a circular wall, the jambs of frame being parallel on plan and crown of soffit horizontal, the intrados and extrados and the inner and outer faces of frame are cylindrical surfaces, and as such can be cut in the manner shown. If the jambs are radial on plan and the crown of soffit horizontal, then the intrados and extrados of head are twisted surfaces, and the cradle must be used.

Fig. 12 shows plan of table as applied for angular cutting, such as roofing; the sliding plate in table is parallel to the saw and free to move a determinate distance, regulated by an adjustable stop, not shown in drawing. The arrow in this and subsequent diagrams indicates direction of motion.

Fig. 13 is plan of table adjusted for cutting dovetails. An accessory fence *h* is here shown affixed to one end of the fence *b*, but can be affixed to either end.

Figs. 14, 15, 16, and 17 show plan and end elevation of canted table in two positions, adjusted for cutting dovetail pins. In this case the sliding plate can be made fast, and the material only moved.

Fig. 18 is plan of table as adjusted for cutting the mitres to nosings of stair-treads.

Figs. 19, 20, and 21 are illustrations of work for which these machines have been found to possess considerable advantages.

Fig. 19 is a sketch of part of a staircase, having a housed wall string-board and a cut outer string-board. The outer string is detached from the treads and risers to show the manner in which the various parts are cut, every part being cut to the required form and dimension by these machines, by the aid of the adjustable fence and stops and the sliding plate in table. The mitres to risers are cut upon a canted table, the sliding plate in table being parallel to the side of saw, and free to slide, and the fence

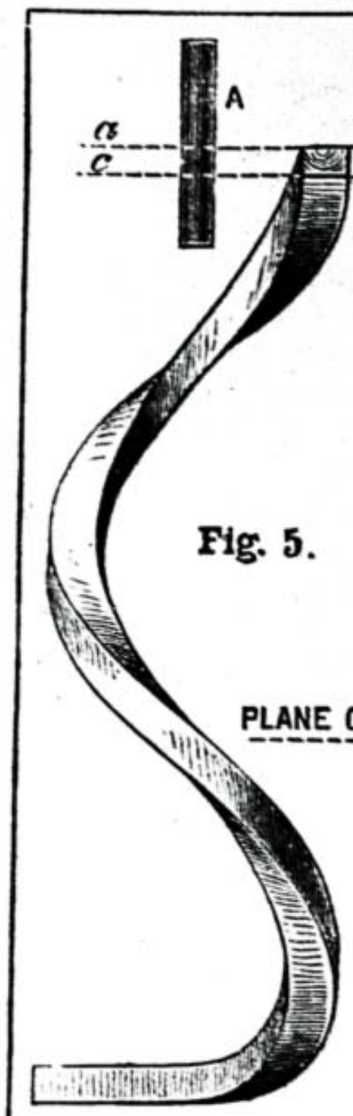


Fig. 5.

Fig 11.

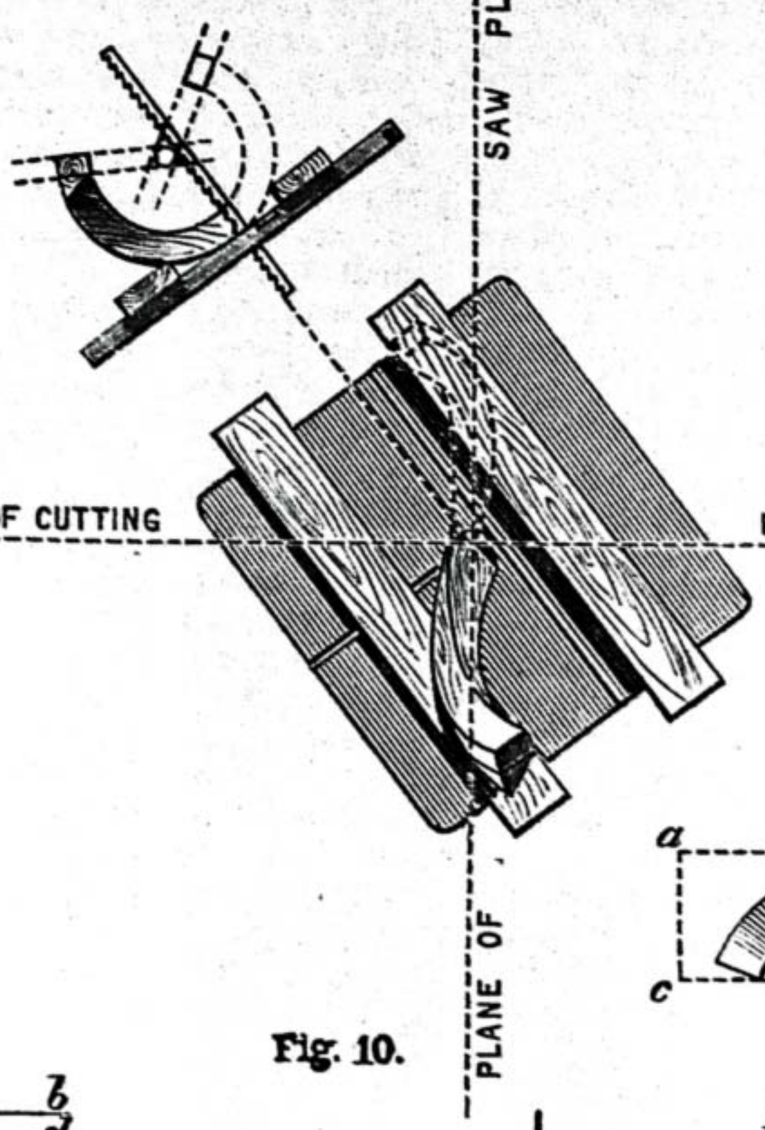


Fig. 10.

Fig. 8.

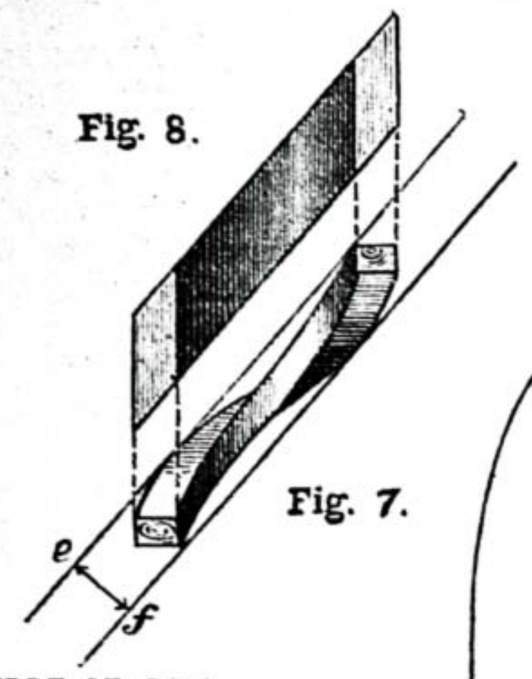


Fig. 7.

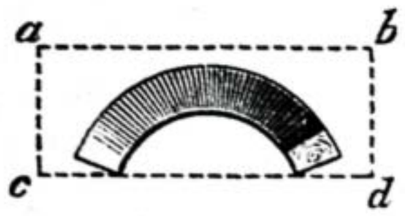


Fig. 6.

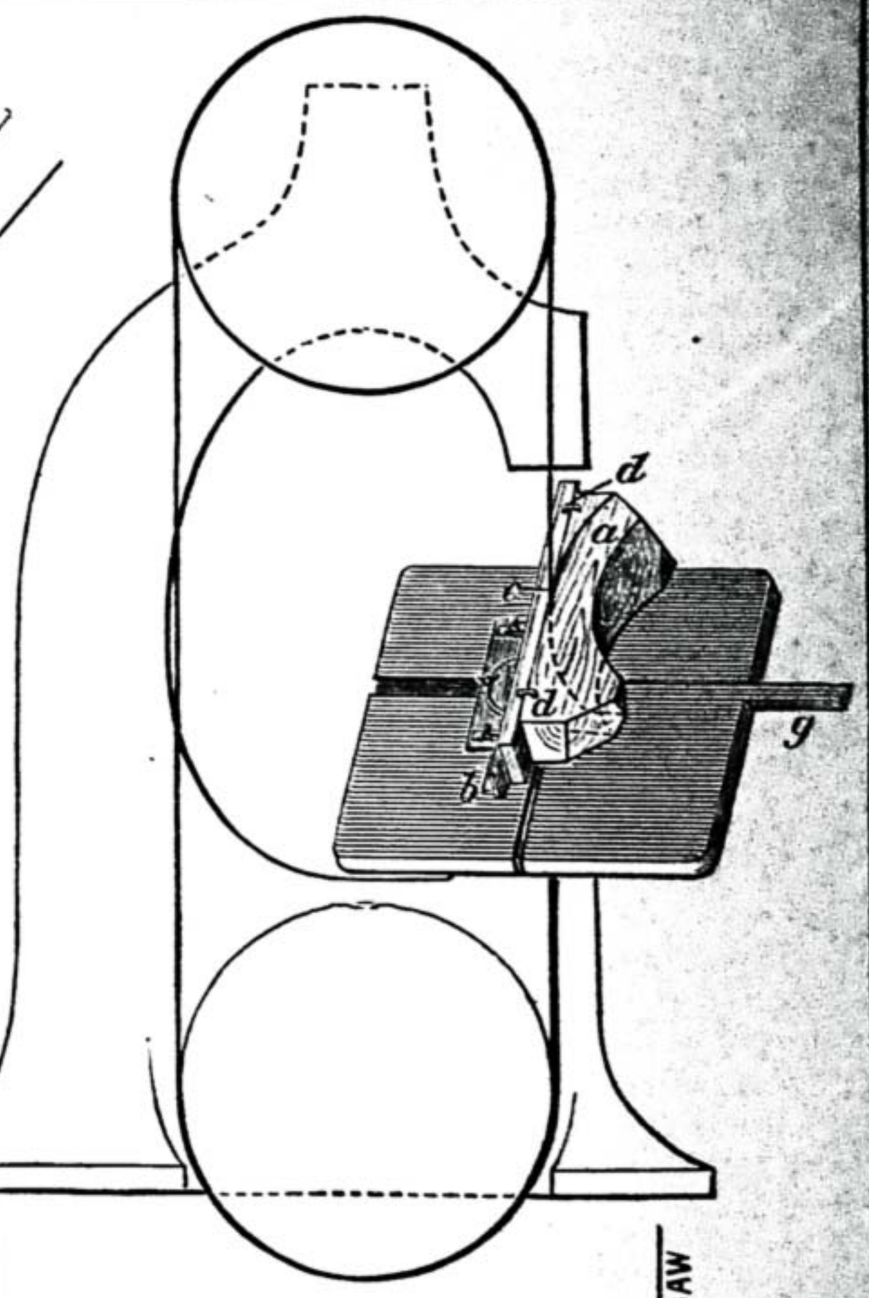


Fig. 9.

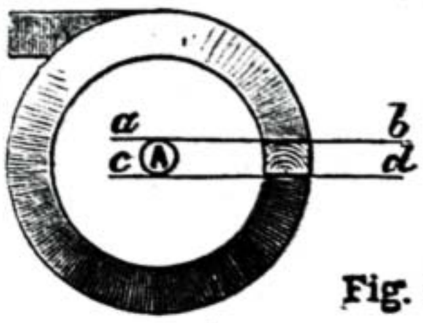


Fig. 4.

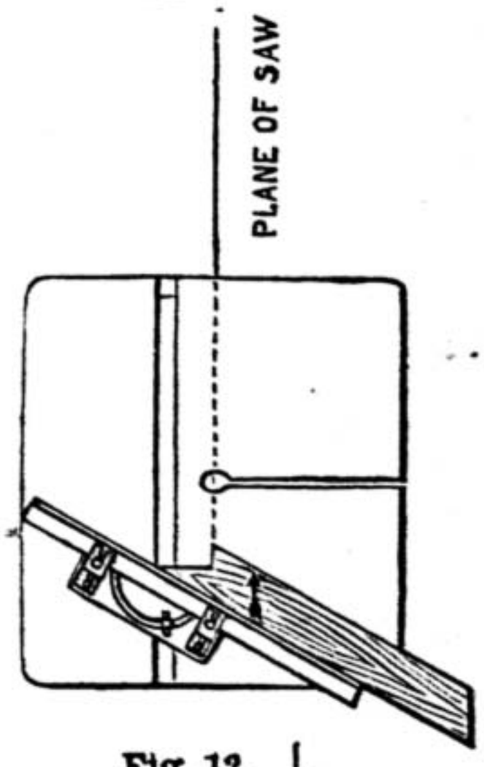


Fig. 12.

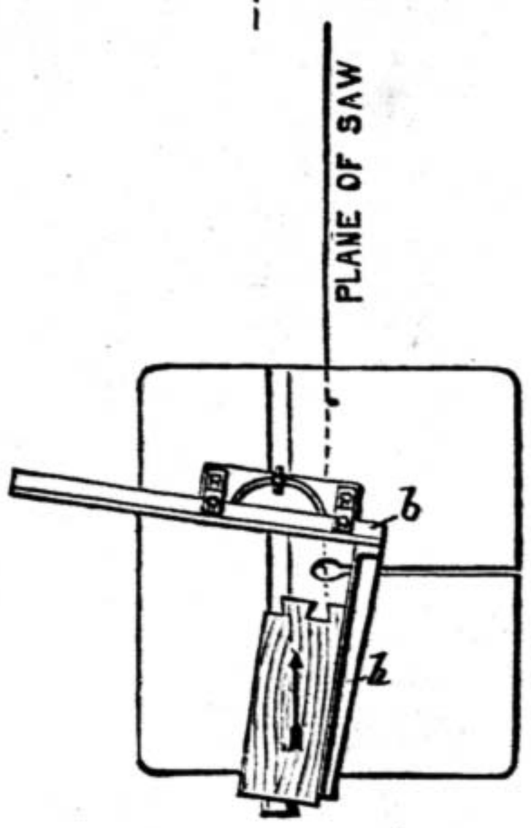


Fig. 13.

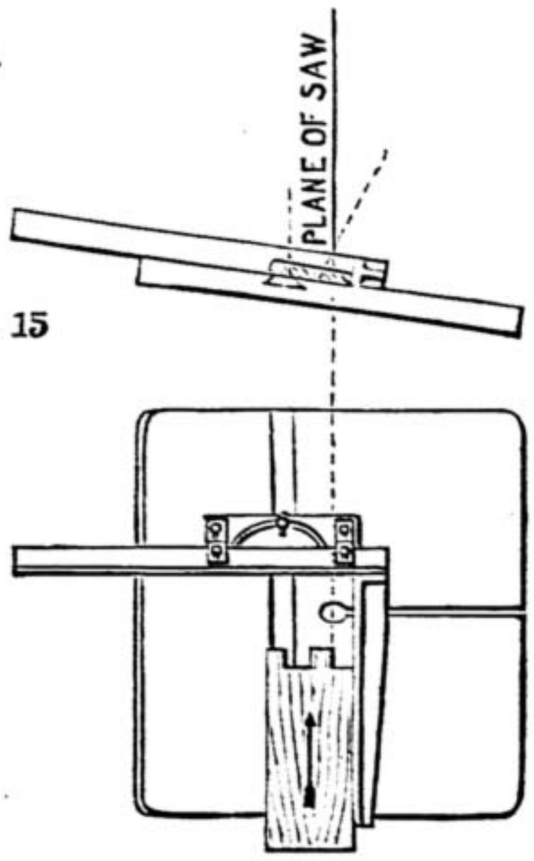


Fig. 15

Fig. 14.

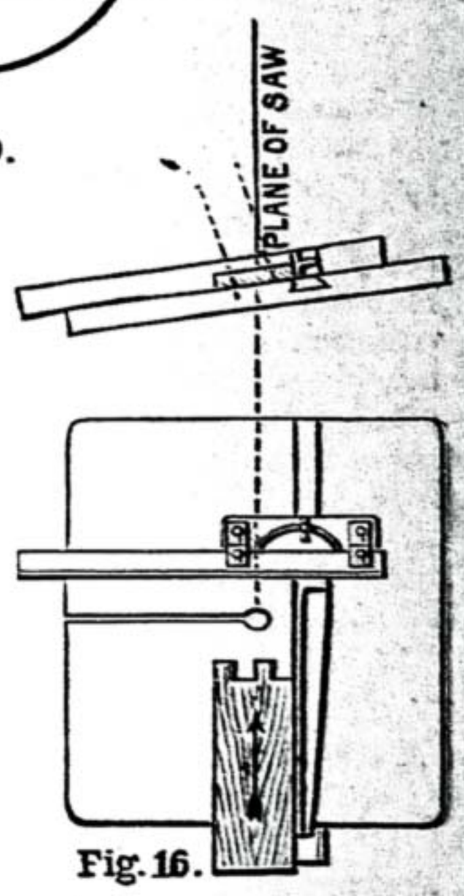


Fig. 17

Fig. 16.

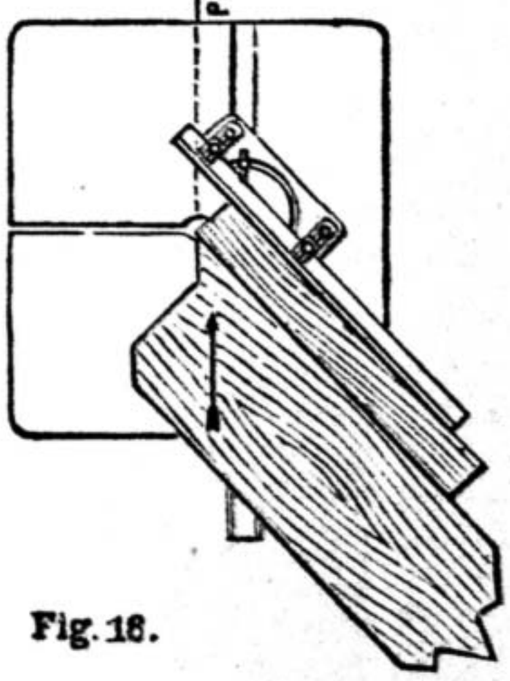


Fig. 18.

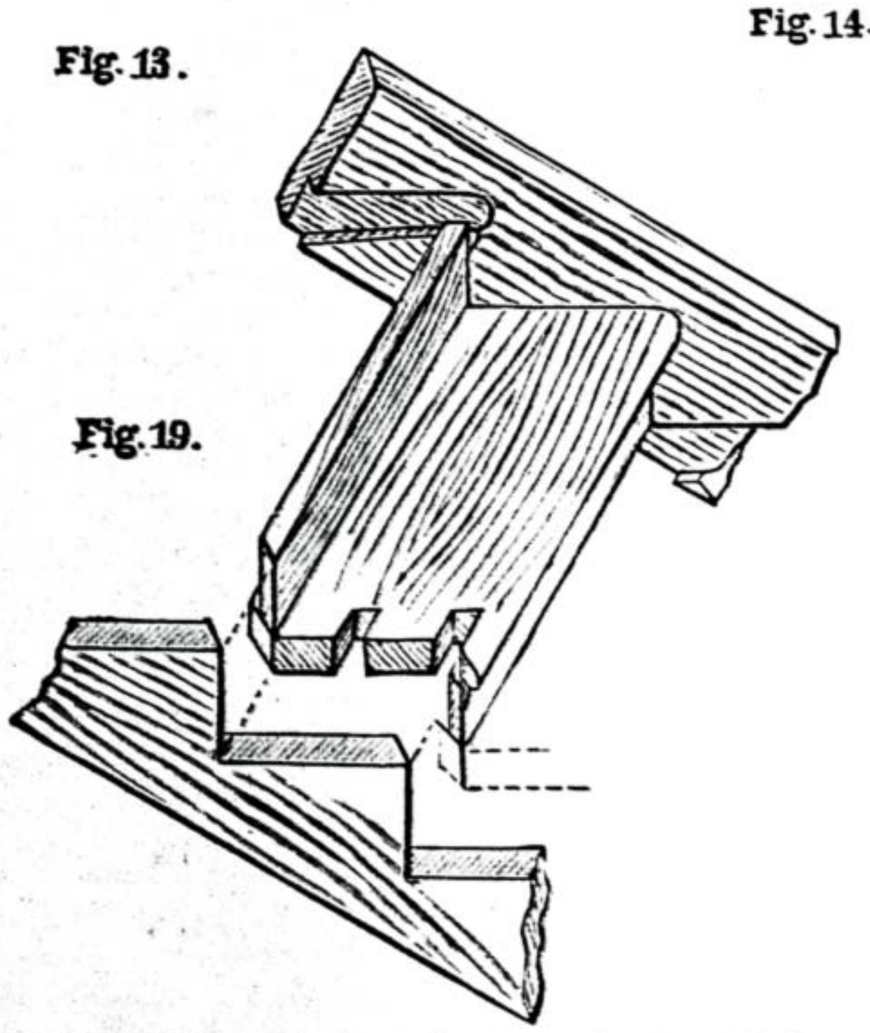


Fig. 19.

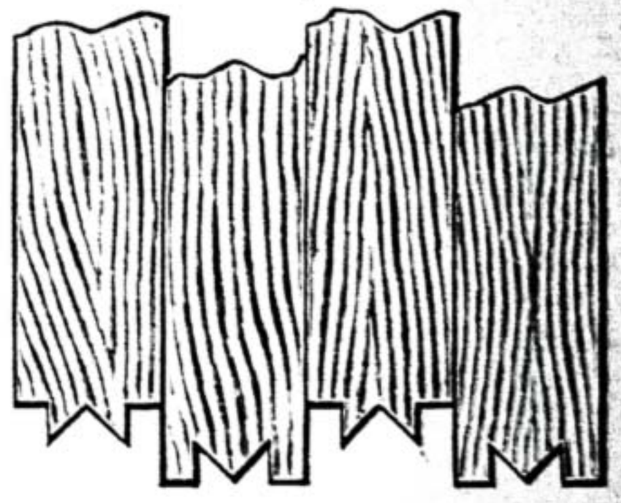


Fig. 20.

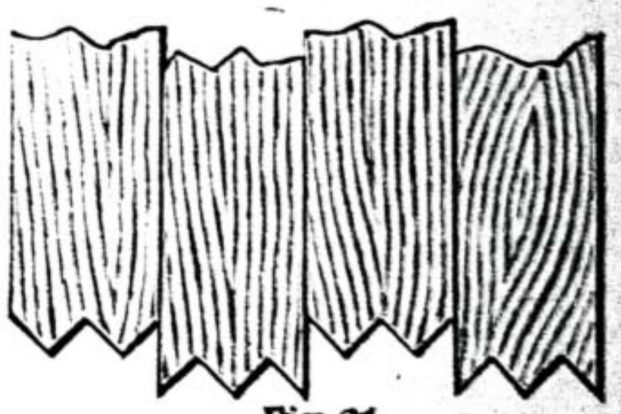


Fig. 21.

Figs. 4, 5.—Plan and Elevation of Handrail Wreath—A, Imaginary Cylinder against which Generating Lines $a\,b$, $c\,d$ move horizontally. Figs. 6, 7.—Plan and Elevation of Portion of Rail. Fig. 8.—Edge Elevation of Plank obliquely cut to form of Cylinder. Fig. 9.—Machine with Handrail partly cut. Figs. 10, 11.—Plan and End Elevation of Table, with Wreath Piece cradled for cutting Twist Surface. Fig. 12.—Plan of Table with Fence angularly adjusted for cutting Rafters, etc. Figs. 13, 14, 15, 16, 17.—Arrangement of Table and Fence for Dovetailing and other like purposes. Fig. 18.—Ditto for cutting Mitres to Return End of Stair Ends, etc. Figs. 19, 20, 21.—Work done on this Table.

at right angles thereto. To cut the corresponding mitres in string-board, the fence must be angularly adjusted to suit the angle made by mitre with edge of string. The stopped square cut at end of treads next outer string is made with table level (as Fig. 12), but with fence at right angles to the saw or sliding plate. By adjusting the fence angularly to sliding plate (as Fig. 12), the square cuts to string-boards for treads to rest on can be made, as also the mitres to treads, by working the back edge of treads next the fence. A better arrangement for the mitres is that shown in Fig. 18—a strip of wood three or four inches wide being placed between edge of tread and fence, to which it may be secured; this to give clearance to saw between the cuts. As when cutting this way the fence is simply a guide giving no support to the material operated on, the material and fence must be held firmly together whilst cut is being made.

The dovetailed notches to treads, and dovetailed ends to balusters, can be cut as shown in Figs. 13 to 17.

Figs. 20 and 21 are two common patterns of valance-boards, used extensively for the platform roofs of railway stations, verandahs, etc.

The whole of the various operations illustrated by Figs. 12 to 21, inclusive, can be executed accurately to form and dimensions by unskilled labour, no previous marking or setting out of the work being required.

The examples here given are but a representative few of very many special to these machines, as apart from those possessed in common with other band-saw and fret-saw machines; but sufficient has been shown to give some idea of the many advantages these machines possess over other forms. It is, however, only by use of these machines that any adequate idea can be formed of their capabilities and value as labour-saving appliances.

MODEL ELECTRIC LIGHTS.

BY GEORGE EDWINSON BONNEY.

ACCUMULATORS OR STORAGE BATTERIES—ACCUMULATOR PLATES—CHARGING ACCUMULATORS—POCKET ACCUMULATORS.

Accumulators or Storage Batteries.—If we can ensure a constant, steady, and equable source of power to drive our dynamo machines, such as that obtainable from a good steam engine fitted with a sensitive governor, or from a water motor fed with a constant and equable flow of water, or from a large gas engine working with a constant heavy load, we shall be able to ensure steady electric lights, free from pulsating effects and flickering. But if the engine is doing other work beside electric lighting, such as driving lathes, planers, drilling machines, and drawing machines, where the work is always varying, consequent upon machines being taken off or put on at intervals, or heavy cuts being taken on the material operated on in the machines, we must not expect to have steady electric lights. At one time the speed will slow down until the red light of the lamps will be intolerable, and at another time the engine will race until the lamps twinkle with the unwonted radiancy imparted by extra current to their filaments. Such usage must shorten the existence of the filaments, and there is always a danger of total and instantaneous disruption of all or nearly all the lamp filaments when an engine races off in this manner. Under such circumstances as these, it is advisable not to attempt electric lighting direct from the dynamo machines, but to use these in the work of charging accumulators, and thus store up the surplus energy of the engine. The accumulators can be placed in circuit with the dynamo during the day, and be made to receive the surplus energy of the engine whilst it is also doing other work. At night the dynamo may be stopped, and the electric lights fed with the energy stored up in the accumulators. This is also a convenient method of obtaining an electric light after an engine has stopped running, as during a breakdown of machinery, or after the ordinary day's work has been done in the workship. It will also solve the difficulty of obtaining electric lights from windmills and from tidal movement.

Accumulators, or storage batteries, or secondary batteries, as they are sometimes named, are not, as some persons suppose, reservoirs of electricity. They are as truly generators of electricity as any primary battery in which zinc is oxidised to generate an electric current. The electric current made to pass through the cells of an accumulator for the purpose of charging it, does not remain in those cells as a fluid, but merely passes onward, and effects in its passage a chemical change in the materials contained in the cells. This change is similar to that effected in a plating vat by electrolysis, where the electric current breaks up a salt of a metal and deposits the metal itself on the negative element in the vat. There is, however, this difference: The deposited metal on the negative element in a plating vat is usually identical with that composing the positive element in the same vat, and, being thus alike in composition, they do not form in themselves the positive and negative elements of a battery or generator of electricity as do the plates of an accumulator. At first, as in the Planté accumulator, it is true that both negative and positive plates are exact in composition, being both of sheet lead. The passage of the electric current from one to the other through a solution of dilute sulphuric acid soon alters the composition of their surfaces, for, as the oxygen of the solution is set free at the negative plates, it unites with the lead to form lead peroxide, and thus coats the negative plates with a salt that becomes highly positive to those plates which formed the positive elements whilst the cells were being charged. By frequently charging and discharging the cells of his battery, Planté "formed" the battery plates and built up his accumulator. Modern accumulators are made up in a more expeditious manner, as will be seen, but even now much time is consumed in "forming" the plates of an accumulator, or, in other words, making them fit to undergo the chemical change which converts them into the positive and negative elements of a primary battery.

Accumulator Plates.—In the accumulator invented by M. Planté, the plates were made of long strips of lead rolled on a wooden cylinder, with insulating strips of rubber placed between the plates. This roll of lead was then placed in the containing cell in a dilute solution of sulphuric acid, and a strong current of electricity passed from one plate to the other, backward and forward, until both plates had been formed. This tedious process of "forming" went on for some fourteen days, or until the surfaces of both plates had been rendered spongy. He subsequently found that he could shorten the process of forming by roughing the plates with nitric acid before making them up into a roll.

But it was left to M. Faure to discover that the process could be much more shortened by coating the plates with red lead before immersing them in the acid mixture. Since his discovery the process has received much attention from inventors, and innumerable patents have been taken out for its improvement. No real advance has been made, however, on M. Faure's discovery in substituting any other material for plates, although some important improvements have been effected in the application of lead peroxide to the plates of accumulators. It was soon found that the red lead paint put on the battery plates peeled off whilst the plates were being charged and discharged, and this peeled-off coat fell to the bottom of the cells, where it short-circuited the plates. To fix this coat securely on the plates has been the chief aim of improvers, and the many patents taken out represent various devices to secure that end. I cannot here stay to mention all the many "improved methods" of preparing accumulator plates by means of envelopes, and grids, and pastes, and perforations, but will proceed to describe one method which has the double merit of being as good as any other in its practical results, and far superior to many in its simplicity and cheapness.

The roll form of accumulator plates introduced by Planté has been superseded by the oblong form now in general use. A number of oblong plates are vertically placed in a rectangular trough or cell, parallel to each other, after being first prepared so as to ensure the plates following each other alternately positive and negative. To explain this arrangement, I will give a detailed account of how a cell may be made up:—First, then, the cell itself—that is, the vessel to contain the plates and the acid charge. This may be made of stoneware, or of wood rendered watertight, but is best made of glass when required for general purposes. Ebonite cells are used when lightness and portability are desired, as in the small accumulators used for lighting up "gem" or "fairy" lamps. Cells made of wood will recommend themselves to amateurs and readers living away from districts in which glass cells can be procured, because wood cells can be made at home. The best wood for the purpose is teak. The planks, or boards, of teak should be at least $\frac{3}{4}$ in. in thickness for small and medium-sized cells, and 1 in. for very large cells. It must be understood at the outset that the cells have to be made not only water-tight, but also acid-proof; and this is not an easy thing to do, seeing how rapidly sulphuric acid will disintegrate woody fibre. The joints of the wood must be well made and closely fitted. The edges of the boards must be grooved and tongued when more than one width is employed. The end joints are best dovetailed. Some makers put the cells together with brass screws. After the cells are put together, they must be made water-tight and acid-proof. Where cells have been put together with screws, a little white or red lead priming may be run in the joints, and the whole cell soaked in hot linseed oil to which a little resin has been added. The most recent method of treating the cells is to put the parts together with dovetailed or morticed joints, and then soak the cells in melted paraffin wax made boiling hot. The cells are kept in this until bubbles cease from coming off the wood, when it is known

that all crevices and pores have been filled up with the hot wax. Cells may be made of *papier-mâché* and then boiled in paraffin wax to render them impermeable to acid.

The dimensions of the various parts of a cell must be determined by our requirements. If we wish to store up a large volume of electric energy, we must use large cells. It matters but very little whether we make the cell to hold a small number of large plates or a large number of small plates connected together, as regards the quantity of energy to be put in them. But experience points to the use of a large number of medium-sized plates coupled together in an oblong cell rather than a small number of large plates placed in a large square cell.

The table at foot of page will give some idea of the dimensions required :—

At first sight the dimensions of the cells would appear to be wrongly stated—the width will appear to be greater than the length. This is due to the fact of the cell being viewed from the front, with one set of terminals on the right and the other set on the left hand. In the seven-plate cell (No. 1) each plate will have a length of 12 in. and a width of 10 in. The plates will be fixed in the cell, side by side, nearly ¼ in. apart, the longest way of the plate, taking up the depth of the inside of the cell, consequently the cell must be wide enough to take the width of the plate. The cells Nos. 1 and 2 will be found most suitable for all ordinary electric light work in small installations. No. 3 will also be found a useful size. Nos. 4 and 5 are suitable for storage batteries where these have to be placed away under seats, or in other similar low recesses. Nos. 6 and 7 will be the best sizes for portable accumulators. No. 6 must be divided into four water-tight and acid-proof compartments of equal dimensions, and No. 7 must be divided into eight similar compartments. Each compartment will then take the place of a separate cell, and be fitted with its own pair of plates, thus actually enclosing several cells in one box.

The plates for these cells are made of sheet lead, which may be of any thickness from $\frac{1}{16}$ in. upwards. Thinner plates are not desirable, since these are apt to buckle whilst in work. If the plates are intended for small accumulators, they may be cut to the shape shown at Fig. 64, but the plates for larger accumulators should be shaped as shown at Fig. 67, the notched lugs on each side being intended to fit on a wooden frame let into the cells to support the plates. Each plate must have a lug at the top for making connection to the main connecting bar running along over each set of plates, as shown at Fig. 68. When the plates are cut out to fit the cells, they should be mapped out into ¼ in. sections, as shown at Fig. 65, by first drawing a square with the help of a ruler and a scribing awl, and then scribing the surface with lines. A hole must next be punched in each square section, as shown at Fig. 66, and this may be done with a large bradawl by amateurs. The perforations thus made must next be filled up with a paste formed of red lead mixed with a small quantity of diluted sulphuric acid, one part acid to two of water. This should be mixed in an earthenware or stoneware vessel, and applied with a wooden spatula, pressing the paste well into the perforations and coating the plates on both sides. Set the plates aside until the coat of red lead becomes firm, then mount them in the positions they are to occupy in their respective cells. If the plates for one side of the cell are coated with a paste made of litharge and sulphuric acid instead of the red-lead paste, these may be marked at once with N on the lugs, to denote negative plates, whilst the red lead plates may be marked with P, to denote the positive, and all the negative plates should have thick rubber bands placed around them, to insulate them from the positive plates when placed in the cell. The arrangement of the whole set of plates is shown at Figs. 68 and 69. If the cell is to contain eleven plates, six of these must be negative, and their lugs must all be soldered to one thick strip of lead (as shown at Fig. 68), with one end projecting a few inches beyond the cell for convenience in connecting the plates to those in another cell. This strip should be marked N. The other five plates must be soldered to a corresponding cross strip of lead, with its free end projecting beyond the cell in the opposite direction. This strip should be marked P. The strips of wood for the supporting frame must be fitted to the plates when in position, before placing them in their cells, and their ends dovetailed together. Then these, and also the wooden grid at the bottom of the cells (on which the plates rest), should be well soaked in melted paraffin before putting the whole together and fitting in the cells.

Fig. 64.

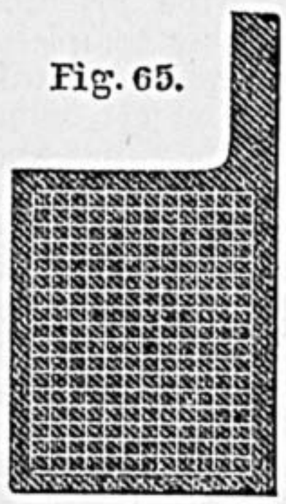


Fig. 65.

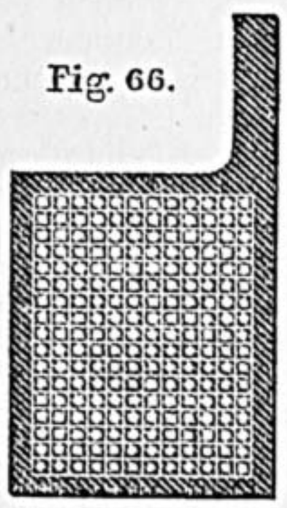


Fig. 66.

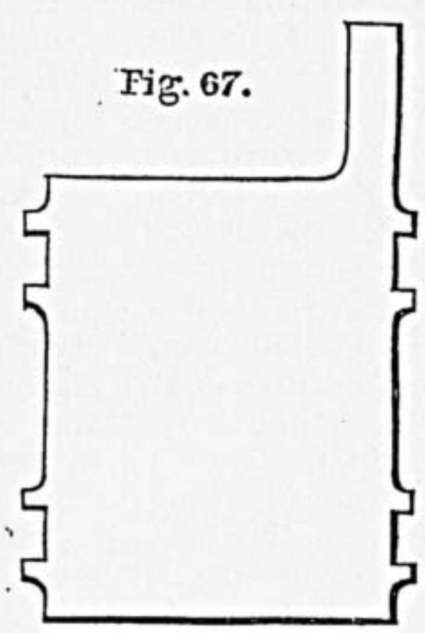


Fig. 67.

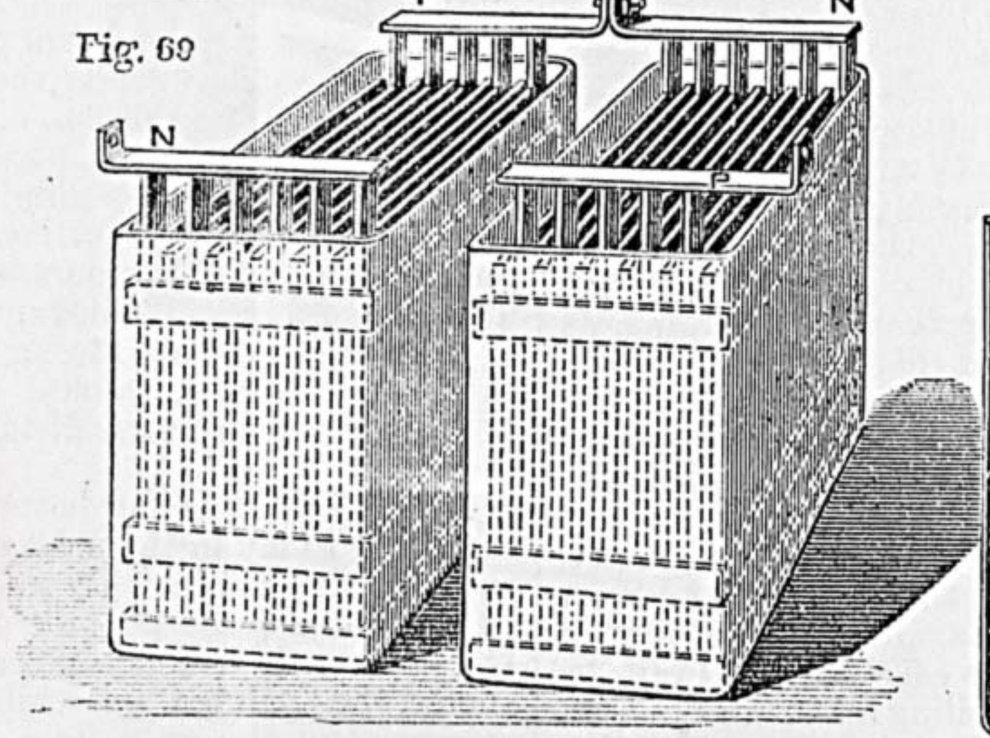


Fig. 69

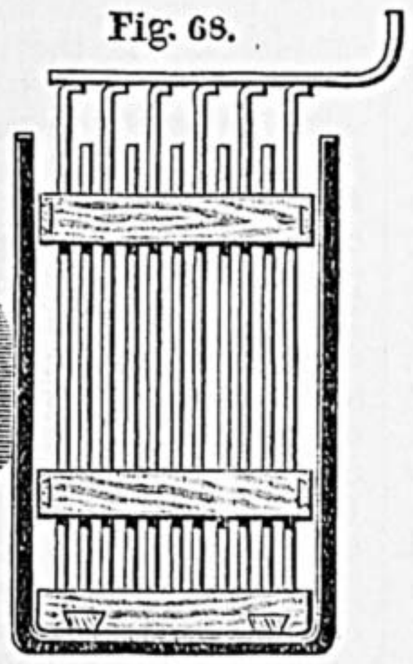


Fig. 68.

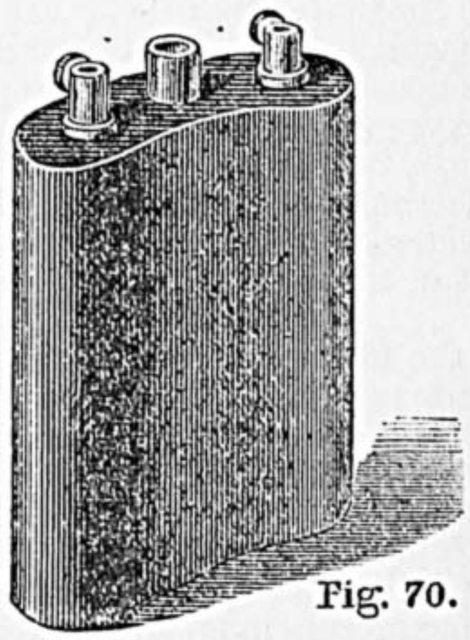


Fig. 70.

Fig. 64.—Shape of Lead Plate for Small Accumulator. Fig. 65.—Accumulator Plate marked out for Perforations. Fig. 66.—Accumulator Plate perforated. Fig. 67.—Shape of Bed-Plate for Large Accumulators. Fig. 68.—Section of Cell showing arrangement of Plates. Fig. 69.—Two Accumulator Cells connected in Series—P, Positive Plates; N, Negative Plates. Fig. 70.—Cathcart and Peto's Pocket Accumulator.

The cells may now be filled with the charging fluid, which is composed of one part sulphuric acid in four parts of water; or, in other words, sulphuric acid diluted with from 75 to 80 per cent. of water.* The mixture should be made in a strong and large vessel capable of withstanding the sudden expansion caused by an evolution of scalding heat generated in the water by mixing it with sulphuric acid, and this is best made of wood lined with lead, the seams being burnt, not soldered. The acid must be poured slowly and carefully into the water whilst this is being stirred with a stick. As the acid is very corrosive and very destructive to clothing, even when thus diluted with water, great care must be exercised in handling it and its solutions. The best antidote to its corrosive action is liquor ammonia, diluted with ten times its bulk of water to prevent the stinging effect of its fumes on eyes and nostrils. The mixture must be poured into the cells carefully and brought up nearly, but not quite, to the tops of the plates. The cells are now ready to be charged with electric current.

Charging Accumulators. — Before we connect up the plates of the accumulator to the dynamo selected to charge them, it will be advisable to

TABLE SHOWING DIMENSIONS, ETC., OF ACCUMULATORS.

No.	External Dimensions. Length.	Width.	Height.	Number of Plates.	Weight of Acid.	Weight when complete.	Capacity in amp. hours.
1	5½ in.	13 in.	17½ in.	7	18 lbs.	74 lbs.	130
2	7½ ,,	13 ,,	17½ ,,	11	25 ,,	107 ,,	220
3	8¾ ,,	8¾ ,,	11⅝ ,,	15	14 ,,	52 ,,	95
4	6 ,,	13½ ,,	6½ ,,	9	8½ ,,	38 ,,	72
5	9½ ,,	13½ ,,	6½ ,,	15	14 ,,	62 ,,	136
6	9 ,,	8¾ ,,	13⅜ ,,	8	4¾ ,,	51 ,,	18
7	16¾ ,,	9⅛ ,,	13⅜ ,,	16	9⅛ ,,	101 ,,	18

* The solution for charging the cells should have a specific gravity of not less than 1·130, nor more than 1·170.

clearly understand what happens in the cell of an accumulator when an electric current is passed through its plates and solution. The red lead put on the positive plates is composed of three parts lead and four parts of oxygen. On adding the dilute sulphuric acid to form the paste, this red lead is decomposed into brown lead, composed partly of lead sulphate and partly of brown oxide of lead. The paste on the positive plates is therefore really an oxide and a sulphate of lead, whilst that on the negative plates is oxide of lead if litharge instead of red lead has been used in making the paste for the negative plates. On sending the charging current from the positive to the negative plates, a part of the paste on the positive plates is converted, first into oxide of lead, and then, as the charging proceeds, into a higher oxide of lead containing four parts of oxygen to one part of lead. At the same time a part of the lead oxide paste on the negative plates is converted into spongy lead. The positive plates will therefore, at starting the charge, have a dark brown appearance, with white blotches on the brown coat, and the negatives the yellowish appearance of litharge. As the charging proceeds, the brown of the positive plates changes to chocolate, then plum colour, and finally, when fully charged, to the colour of wet slate. The negatives change from yellow to a slate colour, which becomes a more decidedly lead tint as the charging advances. We therefore convert the lead sulphate coating of one set of plates into a coating of lead oxide, and reduce the lead oxide on the other set of plates to pure spongy lead. As this spongy lead has an affinity for oxygen, and the highly oxidised plates on the opposite side are ready to part with their oxygen, we have formed, by electrical energy, two chemical compounds capable of effecting an exchange of their constituents under favourable circumstances, and giving out in this interchange a current of electricity.

If plates of the Planté type are used, the sulphate of lead, as well as the lead oxide, has to be formed on them by electrolytic action, hence the necessity of frequent reversals to "form" both plates. If red lead is used on both plates, intead of red lead on the positive and litharge on the negative, a similar reversing process must be adopted at the outset to convert the lead sulphate into lead oxide on the negative plate.

During the process of charging the cells, there is created in the cells themselves an opposing force to the charging current. This is known as the counter or back E.M.F. of the cells. It is low at first, but gradually rises as the charging proceeds, until at the last, when the cells are fully charged, it reaches as much as from 2·2 to 2·5 volts per cell. In choosing a current to charge the cells, we must therefore take into consideration the maximum counter E.M.F. of all the cells (if these are to be charged in series, as arranged in Fig. 69), and see to it that the E.M.F. of the charging current exceeds by ten per cent. the combined E.M.F. of the charged cells. The volume of current required in charging accumulators should be at the rate of 5½ ampères per square foot of positive surface. Less than this will do no harm to the plates, but a larger current is liable to cause buckling of the plates through unequal expansion. When this takes place, the coating peels off in patches, and the plates are ruined. If, therefore, a small accumulator with seven plates (each 12 in. by 12 in.) is about to be charged, we should employ a generator capable of giving a current of 16 ampères at a pressure of from three to five volts, because there are three positive plates in the cell, and each will take 5½ ampères of current. If we have more cells than one to charge, it is best to arrange them in series up to within ten per cent. of their combined maximum voltage, and to charge them thus with a generator having a voltage ten per cent. above the combined voltage of the cells in series. Thus, if we have ten cells of the size mentioned above, and have a dynamo capable of giving a current of 16 ampères at a pressure of 15 volts, the cells must be arranged in series of five, and only one set charged at a time. If the voltage of the dynamo is over 30, the whole ten cells may be arranged in series. Even then it must be distinctly understood that a shunt-wound dynamo must be employed, and the current switched off at once should the machine stop, as also when the charging is complete. Unless this is done, the charged cells will discharge themselves by way of the commutator on a shunt-wound machine and injure the plates by a too rapid discharge; or discharge themselves through the coils of a series or compound-wound machine, and burn up the insulation of the coils as well as reverse the polarity of the field magnets. Automatic switches and governors are made and sold by dealers in dynamo machines to prevent accidental reversals of the current from accumulators.

The charging current should have a low E.M.F. at starting, or the volume passing into the cells be controlled by a resistance board to prevent a rush of current and buckling of plates. As the charging proceeds, the full current should be switched on, or the E.M.F. raised by increasing the speed of the machine until the maximum has been reached. The colour of the plates will change during the process of charging, as previously noted, and this will indicate the progress made. As the charge approaches completion, the solution in the cells becomes agitated and appears to boil. This may be continued for some time without injury, unless the boiling commences at the outset. If this happens, stop the charging for a short time, and commence again with a current of lower pressure. The cells should always be charged until this boiling appearance is well pronounced, but a long period of over-charging should be avoided. These are the main points to be noticed in charging and forming accumulators, but there are many little hints and wrinkles required to ensure success under the special conditions which crop up from time to time in practice. I have not space to notice these here, but have pleasure in referring my readers to an excellent little work on the "Management of Accumulators," by Sir D. Salomons, price 5s., in which most of those difficulties are met and explained.

Pocket Accumulators.—These differ from those already described, only in the kind of vessel employed as a cell. The cells in general use are made of ebonite, of book form, or curved to fit the pocket, as shown at Fig. 70. Such cells are not easily made by amateurs from ebonite. They are made and sold by Messrs. Cathcart and Peto, 57B, Hatton Garden, London, E.C., in the following sizes:—

No.	Weight.	Dimensions.	Capacity in amp. hours.	Voltage.	Price.
No. 2	11 oz.	2⅞×1×4 in.	2	2	10s.
3 S	15½ „	3¼×1×4 „	3	2	13s.
3 D	15½ „	3¼×1×4 „	1½	4	21s.

The same firm make and sell portable accumulators for table lamps, carriage lamps, and other similar purposes. Amateurs wishing to try their hands at making pocket accumulators, can make fairly good ones out of thick sheet gutta-percha. This should be soaked in hot water until soft, then moulded on a slab of polished slate or marble cut to the size of the intended cell. The softened sheet, or pieces of sheet cut to the required sizes, are moulded to the shape of the slab and then allowed to harden. All joints are then to be caulked with a hot iron and thus made acid-tight. The plates are prepared as already directed and enclosed in the cell, which is then sealed with a cover of gutta-percha, leaving one or two holes for the solution, which are also sealed after the solution has been poured in the cell. If the cell is divided into two acid-proof compartments, with a pair of plates in each part, a four-volt cell may be obtained.

Hints on working accumulators must stand over to my next paper, in which I hope to show how to fit up electric light installations.

THE ART AND PRACTICE OF SCENE PAINTING.

BY WILLIAM CORBOULD.

FLAT OR LOCAL COLOURING — DISTANCES — REFLECTIONS — ROADS — SHADOW COLOURS — GLAZES—LANDSCAPE SCENERY—PRODUCTION OF EFFECTS IN FOLIAGE.

Flat or Local Colouring.—The artist is now ready to lay in all the flat or local colouring, and, as I have said before, the outlines will remain perceptible through all the colouring until the finish.

The great object in beginning this part of your work is the perspective. The painter must lay in the first colours with this firmly fixed in his mind; for instance, the colours of the foreground are strong and bold, but the middle distance would be very much less so, and the third distance would get quite grey in tone.

Distances.—It is far better, if the artist can do it, to lay in the most distant objects, such as mountains or undulating hills, pasture lands, the sea, distant lakes, etc., etc., with as little delay as possible. These should be painted in while the horizon colours, and the grey tints that are being used are still wet, and then the whole, in drying up together, gives that aerial perspective that is so necessary, but which could not be obtained in an after-painting.

All the distances, especially the farthest, must be low in tone—that is, they must present only a slightest indication of colour—the sky colours being used freely with the tints that are employed for the distances. Supposing it is a green that is being used for very distant pasture land, or foliage, the said greens would be quite grey. I do not mean that the artist is to mix the distant colours with the blues and greys, but to lay them on in juxtaposition, reducing the grey tints and using the colours stronger as he gets more to the foreground. He thus keeps up his perspective, and by taking notice of these instructions makes the scene natural to the eye. With a little patience and perseverance he will soon be successful in pleasing himself and others also. The hand is but the servant of the eye. Every artist has a different way of working practically—that is to say, he falls into tricky ways of his own. As we go on, I shall explain a few ways of using the brush to produce certain effects, which, perhaps, could not be got by

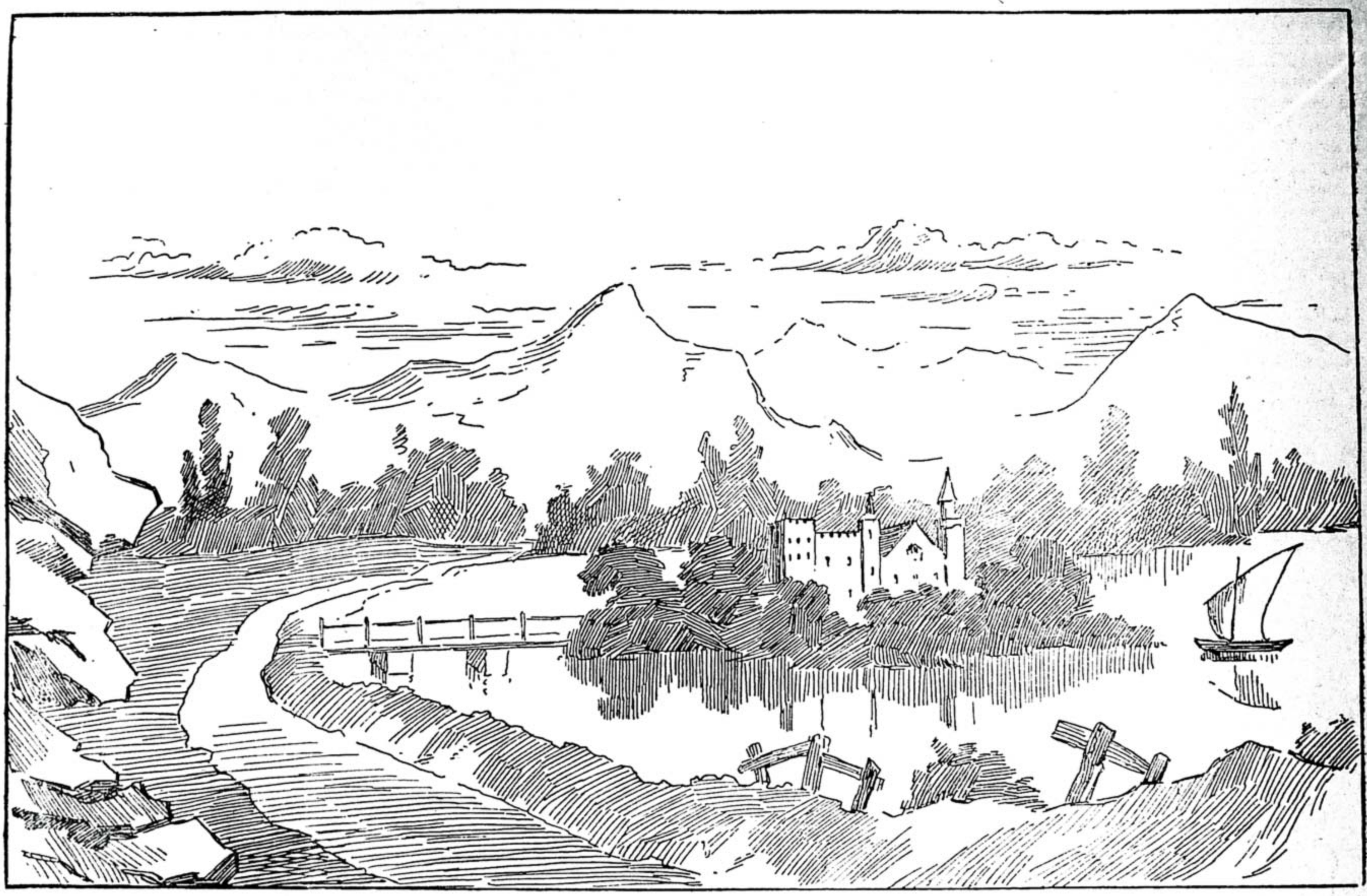


Fig. 1.—Sketch showing Scene with all the First or Local Colouring laid on and the Sky finished.

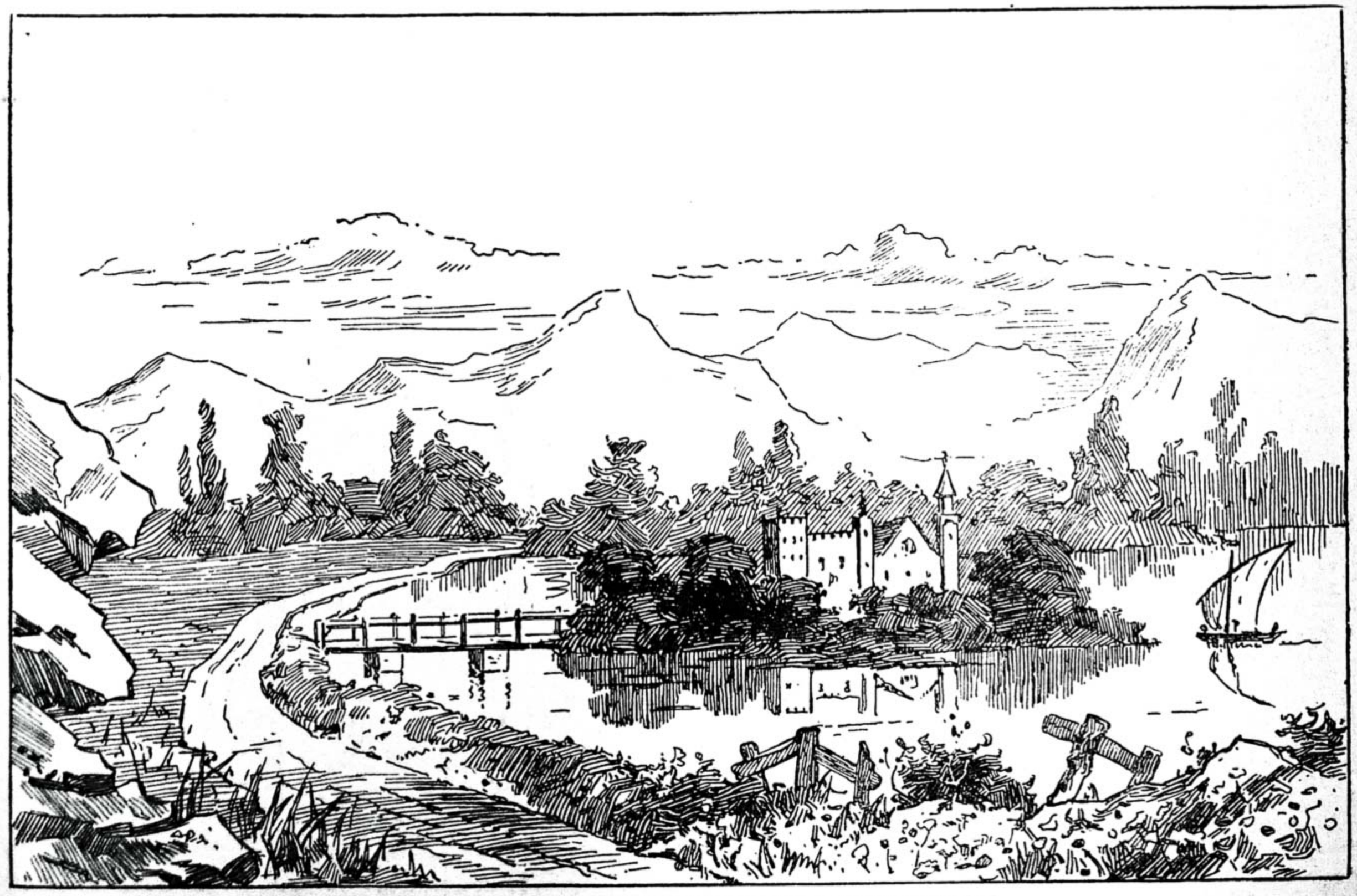


Fig. 2.—Sketch showing appearance of Scene when completely finished.

niggling over them for an hour or more, but which may be done with one touch of the brush and be far more effective.

Reflections.—Should the artist have water in his scene, whether river, lake, or the sea, he should always lay it in flat with the sky colours; and whatever objects are reflected in the water, the reflections must take the same colours as the objects themselves. A large sheet of still water is a natural looking-glass; and if the scene around it be mountainous, perhaps deeply wooded here and there, or picturesque buildings, or a beautiful sky, every object will be reflected in its own colours. When painting such objects it would be as well to paint their reflections at the same time. A fine white line, or a ripple on the surface over the reflections and shadows, will give transparency and depth. The artist will get the necessary effects after a little practice.

Roads.—In our scene we have a road winding round the lake, and losing itself in the distance. I have chosen this road as a lesson in colouring in perspective—that is to say, the road must appear flat and recede into the distance. Take burnt sienna, and white, and a little umber, or vandyke brown — burnt sienna might be a little too red for the road—and very little of either vandyke brown or umber will tone it to anything.

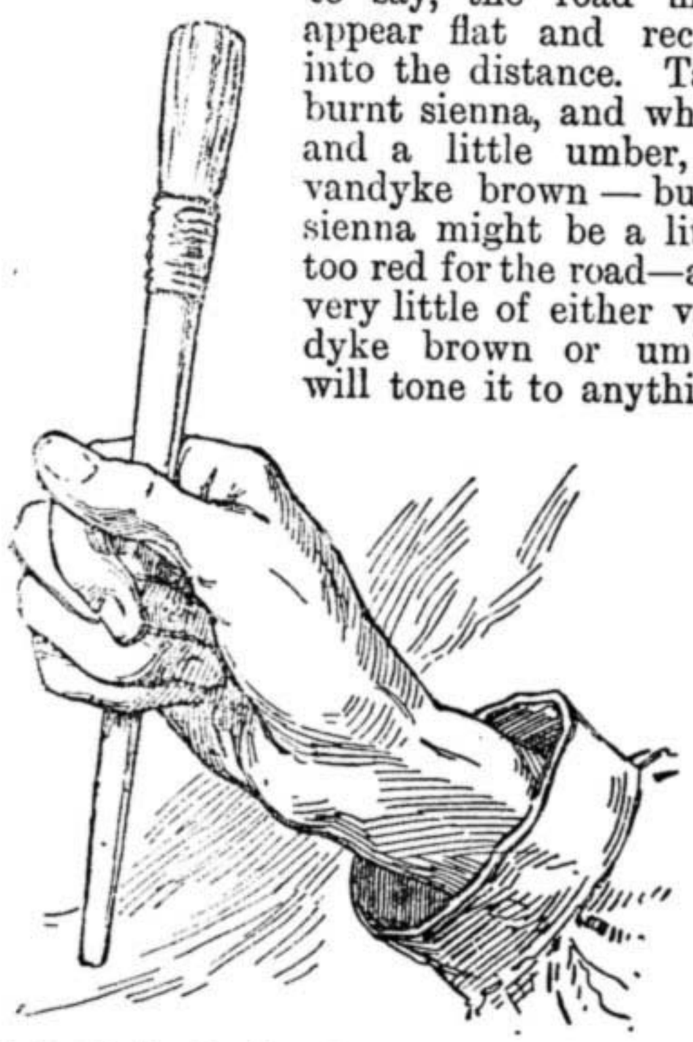


Fig. 3.—Mode of using Brush to produce Effects in Foliage.

This is for the foreground of the road. Lay this at the bottom, and as the artist gets higher up, let him use yellow ochre, or raw sienna and white, adding more white as he proceeds upwards, and a little grey in the far distance. As the road disappears from view, by graduating the colours as I have described, it will appear flat and in perspective.

Assuming that the scenic artist has now covered the whole of the cloth with the local colouring, he will have now brought his work to its third stage, as shown in Fig. 1, ready for finishing, as shown in Fig. 2.

Shadow Colours.—First of all, there are one or two colours that he had better prepare, such as the shadow colour, which is a thin glaze of indigo, or a little celestial blue subdued with a very little vegetable black, or vandyke brown, which should be brought to about the same tint as indigo. This shadow colour must be perfectly transparent, and of a bluish tinge. The best way to try the strength of this tint is to pass the brush over the back of the hand, leaving the colour on the hand. You should be able to see the hand distinctly through the colour. When using this colour, keep it well stirred, as the blue will sink to the bottom, and the artist will fail to get an even tint. In making this colour, do not use much size, as it must be liquid to flow evenly.

Glazes.—The remarks just made apply equally to the following colour as well. Take another clean pot and mix some celestial blue with a little size and water. This is for glazing and working in and under foliage. If you look under or through the branches of trees, shrubbery, hedgerows, or any mass of foliage, particularly an avenue of trees, you will see a bluish, misty shadow. If this tint is mixed and used properly, you will get the desired effect.

Take another pot, and mix some yellow ochre and damp lake with size and water, to be used also as a glaze, but not too strong in colour. This is for glazing the parts of foliage where the sun's rays are shining through. More or less red—that is to say, damp lake—should be used in the yellow according to the tints of the sky: for instance, if it were a sunset that the artist were depicting, he should glaze with nearly all lake, if a red sky; but if a yellow sky, yellow ochre would predominate, according to the brightness of the sky and clouds. This is another point in which, with practice, the artist's own taste and judgment will aid him.

Landscape Scenery.—The different greens required for landscape scenery are compounded with several colours, such as indigo and Dutch pink. A splendid set of greens can be got from these two colours; celestial blue and azure blue, as well as indigo, will, in combination with burnt sienna, raw sienna, and the yellows, produce good useful greens. Avoid raw, cold-looking greens. We know at one time of the year, at least, the trees are green, but a little burnt sienna, or damp lake, or the yellows judiciously used, will take off the raw, cold look. The under side of the leaves are much paler and less glossy than the upper surface. When moved by the slightest breeze, they all catch up, as it were, different lights and tints in the sky, producing all those beautiful tints seen in good painting.

Production of Effects in Foliage.—The scene painter has many ways of producing certain effects by the tricky way in which he uses his brushes. I will here explain two or three ways to get a few effects which would never be obtained by niggling over them. Take the foliage brush, fill it with colour by laying one side of the brush in green, and the other side in red or yellow—that is to say, burnt sienna, or damp lake, or one of the yellows, lemon or orange—so that there are two distinct tints in the brush. Let the artist balance the brush between his thumb and forefinger as shown in Fig. 3. Now by patting the brush on the canvas, the brush rolling backwards and forwards on the finger, the painter will in this way produce the touch required to represent leaves, and in two different tints; and as each leaf has its light and shade he gets it in this way. When this part of the work is quite dry he may glaze over with sunlight, or shadow colour, as the case may be, according as he is working on the part in the light or shadow. When dry, he may again use his foliage brush to put on more leaves; and in this way he may get as much depth and boldness as he pleases. Tone down the branches and foliage farthest from the eye, using brighter colours on the front foliage, as, by this, flatness is avoided, and the trees are made to appear round as in Nature. For the branches, twigs, and other dark markings of the trees and foliage, use brown lake with celestial blue, more or less of either being used according to the depth of colour required, touching and marking them with high light colours where the light may catch them. When the branches of trees are buried in the foliage and shadow, they will look almost black at a little distance. The trunks of some trees are very rugged, and must be boldly painted and well marked out, as well as being brought into strong relief by light and shadow. For hedgerows, shrubbery, and all foliage with small leaves, use smaller foliage brushes. Some trees have much larger leaves than others, and to paint these, the artist will require larger brushes. Sometimes the leaves differ in shape, but it is not necessary they should be depicted with accuracy of form and outline like an illustration in a work on Botany. Still, every kind of tree has a distinct form on the landscape. The reader may buy at any artist's colour shop a small work, "Outlines of Foliage"—I think by Birket Foster, and published by Winsor and Newton. This book would be found useful by all intending scene painters.

THE JURORS' AWARDS, "WORK" EXHIBITION, 1890-91.

COMPLETE AND CORRECT OFFICIAL LIST.

THE Proprietors of WORK have the pleasure to announce that the following Prizes and Honours have been awarded by the Jurors as under:—

GOLD MEDAL for best Exhibit in whole Exhibition, with first-class Certificate, Mr. THOMAS COATES, *Peckham.*

SILVER MEDAL for second best Exhibit in whole Exhibition, with first-class Certificate, Mr. R. A. MCFEETER, *Southport.*

EXTRA BRONZE MEDAL for third best Exhibit in whole Exhibition, with second-class Certificate, Mr. J PYVES, *Westminster.*

GROUP I.—WORK IN WOOD.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. R. A. McFeeter, *Southport.*

FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. H. Selmes, *Eastbourne.*

IN DIVISION A (FURNITURE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. F. Hollidge, *Norwood.*
Apprentice's—Mr. G. J. White, *Leytonstone.*
Amateur's—Mr. N. T. Lee, *Battersea.*
Extra Prizes for Carving:—
Amateur's—Mr. J. R. Hall, *Carnforth.*
" —Mr. G. Heward, *Darlington.*
Extra Prize for Fretwork:—
Amateur's—Mr. W. Ironside, *Laurencekirk.*
Extra Prize for Turning:—
Workman's—Mr. W. Gleeson, Cardiff.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Workman's—Mr. W. E. George, *Sutton.*
Apprentice's—Mr. H. Tomkinson, *Birmingham.*
Amateur's—Mr. C. W. Selves, *Sydenham.*
Extra Prize for Carving:—
Amateur's—Mr. R. D. Dugdale, *Carnforth.*
Extra Prize for Fretwork:—
Amateur's—Mr. J. T. Willis, *Sunderland.*

FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention:—
Workman's—Mr. J. P. Lunn, *Stepney.*
Apprentice's—Mr. J. G. Borrows, *Islington.*
Amateur's—Mr. T. Evans, *Carnforth.*
Extra Prize for Carving:—
Amateur's—Mr. A. T. Castle, *Roehampton.*
Extra Prize for Fretwork:—
Amateur's—Mr. W. H. Saunders, *Wetley.*

IN DIVISION B (WOOD PATTERNS FOR CASTINGS, MODELS FOR FORGING, ETC.).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. A. E. Turner, *Gloucester.*

FOR SECOND BEST EXHIBIT.—Second-class Certificate of Honourable Mention:—
Workman's—Mr. C. B. Maltby, *Sheffield.*

*** Entries by Apprentices, *one;* by Amateurs, *none.* No Awards.

IN DIVISION C (CARTS, CARRIAGES, ETC.).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. H. Selmes, *Eastbourne.*
" —Mr. F. A. Witham, *Kilburn.*

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Amateur's—Mr. C. H. Vanner, *Bethnal Green.*
—Mr. W. R. Harland-Church, *Notting Hill.*

*** No Entries by Apprentices. Entries insufficient for Third-Class Prizes.

GROUP II.—WORK IN METAL.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. T. Coates, *Peckham.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. W. Surman, *New Cross.*

IN DIVISION A (DECORATIVE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. W. E. Turner, *Birmingham.*
Apprentice's—Mr. T. Blatcher, *London, W.*
Amateur's—"Opifex" (Rev. W. Falkiner), *Navan.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. J. S. Barwick, *Plymouth.*
Apprentice's—Mr. H. F. Boult, *Euston.*
Amateur's—Rev. C. C. Ellison, *Lincoln.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. W. E. Dobner, *Thirsk.*
Apprentice's—Mr. J. Drielsma, *Hackney.*
Amateur's—Mr. T. Holt, *Nottingham.*

IN DIVISION B (ARMS, ARMOUR, ETC.).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. W. E. Main, *London.*
FOR SECOND BEST EXHIBIT.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. C. Thurkle, *Clapham Junction.*
*** Entries by Apprentices, *none;* by Amateurs, *none.* No further Awards.

IN DIVISION C (MISCELLANEOUS).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. C. E. Turner, *Birmingham.*
Amateur's—Mr. T. Coates, *Peckham* (also First Prize in Group).
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. W. Osborne, *Birmingham.*
Amateur's—Not Awarded.
*** No Entries by Apprentices. Entries insufficient for third-class Prizes.

GROUP III.—TOOLS FOR WORK.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. D. Low, *Blairgowrie.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. C. Holmes, *Waterloo.*

IN DIVISION A (HAND TOOLS).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. E. Higgs, *Camden Town.*
Amateur's—Major J. D. Lysaght, *Queenstown.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. A. Cheek, *Hoxton.*
No Apprentice's Entry forthcoming.
Amateur's—Mr. G. Pope, *Leeds.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. J. S. Grant, *Bolton.*
No Apprentice.
Amateur's—Mr. A. J. Eade, *Edenbridge.*

IN DIVISION B (MACHINE TOOLS).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. W. Welbon. *Newcastle.*
Apprentice's—Mr. A. Leonard, *Tavistock Square.*
Amateur's—Tie :
Mr. J. W. Rhodes, B.A., *East Liss.* }
Mr. J. E. Galliford, *Walthamstow.* }
FOR SECOND BEST EXHIBIT.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. E. Whibley, *Peckham.*
*** No further Entries noticed by Jurors.

IN DIVISION C (TOOLS FOR SHARPENING TOOLS, APPARATUS, ETC.)

No Entries to justify Awards.

GROUP IV.—WORK IN ORIGINAL DESIGN.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. C. F. Davis, *Lisson Grove.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. W. Farr, *Reading.*

IN DIVISION A (DECORATIVE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. C. F. Davis, *Lisson Grove.*
Apprentice's—*Nil.*
Amateur's—*Nil.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. E. J. Williams, *Birmingham.*
Apprentice's—Not awarded.
Amateur's—Not awarded.
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—Not awarded.

IN DIVISION B (ARCHITECTURAL).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. W. A. Burrow, *Bradford.*
FOR SECOND BEST EXHIBIT.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. S. J. Speller, *Frome.*
*** No Awards beyond these.

IN DIVISION C (MECHANICAL AND ENGINEERING).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. Farr, *Reading.*
Amateur's—Mr. Whibley, *Peckham.*
FOR SECOND BEST EXHIBIT.—Second-class Certificate of Honourable Mention :—
Amateur's—Sergt.-Major Barry, *Brockley.*
*** No other Awards.

GROUP V.—WORK IN PRINTING.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. F. Simpson, *Corbridge.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. G. Kipling, *London, N.W.*

IN DIVISION A (ACTUAL PRINTING AND APPARATUS).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. T. Powell, *Hoxton.*
Apprentice's—Mr. A. A. G. Francis, *Brompton.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. R. A. Allen, *Islington.*
Apprentice's—Mr. J. J. Mason, *Holborn.*
Amateur's—*Nil.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—No Awards.

IN DIVISION B (DESIGNING OR DRAWING FOR ENGRAVING OR PRINTING).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. T. S. Routledge, *Liverpool.*
Apprentice's—Mr. G. Kipling, *London, N.W.*
Amateur's—Mr. J. Williams, *Haverstock Hill.*
Extra Prize :—
Amateur's—Miss H. M. Rigby, *Chester.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. White, *Canonbury.*
Apprentice's—Mr. H. Feltham, *Brixton.*
Amateur's—Mr. T. E. Petley, *London, N.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. F. C. Jessop, *Masborough.*
Apprentice's—Mr. J. F. Offord, *Dalston.*
Amateur's—Mr. H. J. Gayton, *Northampton.*

IN DIVISION C (BOOKBINDING).

FOR BEST EXHIBITS.—BronzeMedal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. W. Appleby, *Chatham.*
N.B.—No further Awards.

GROUP VI.—WORK IN DOMESTIC APPLIANCES.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Rev. C. C. Ellison, *Lincoln.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Sergt.-Major Barry, *Brockley.*

IN DIVISION A (DECORATIVE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workwoman's—Mrs. Hodgkin, *Manchester.*
Apprentice's—Mr. A. McCallum, *Helensburgh.*
Amateur's—Rev. C. C. Ellison, *Lincoln.*
Extra Prize, Miss A. M. Burgess, *Frome.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. F. C. Jessop, *Masborough.*
Apprentice's—No Award.
Workwoman's — Miss D. Barton, *Regent Street, W.* (Highly commended.)
Extra Prizes, Amateur's—Tie :
Mrs. E. M. Atkinson, *Liverpool.* }
Miss H. B. Russell, *Egremont.* }
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Amateur's—Ties :
Mr. T. S. Hartley, *Dalston.* }
Miss C. Wilkinson, *Kilmessan.* }
Miss N. Borrows, *Islington.* }

IN DIVISION B (HOME COMFORT AND CONVENIENCE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. J. Telfer, *Liverpool.*
Apprentice's—No Entries.
Amateur's—Miss E. Maybank, *Sutton.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. P. Cross, *Chelsea.*
Amateur's—Mr. J. W. Mumby, *Halifax.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. W. Osborne, *Birmingham.*
Amateur's—Mr. A. F. Winch, *Oldham.*

IN DIVISION C (HOME RECREATION, TEACHING, ETC.).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Sergt.-Major Barry, *Brockley.*
Apprentice's—Mr. W. G. Puleston, *Dalston.*
Amateur's—Mr. W. Carter, *Birmingham.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. A. A. Hollis, *Erith.*
No Apprentice's entry.
Amateur's—Mr. H. S. Nobbs, *Wood Green.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
No Workman's entry.
Amateur's—Mr. G. Mallett, *Wisbech.*

IN DIVISION D (APPLIANCES FOR THE SICK OR AFFLICTED: DEAF, DUMB, BLIND, OR CRIPPLED).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. J. H. Edwards, *West Kensington.*
Apprentice's—Mr. A. Dugon, *Brockley.*
Amateur's—Mr. J. H. Clymer, *Willesden.*

GROUP VII.—WORK IN WEARING APPAREL.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, not awarded.
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, not awarded.
FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. G. Moore, *Lambeth.*
No Apprentice's award.
Amateur's—Mrs. J. L. Barker, *Walham Green.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Tie :
Mr. T. W. Forster, *Acklington.* }
Mr. W. Morgan, *Chester.* }
Apprentice's—No Award.
Amateur's—Ties :
Miss L. B. Rigby, *Whitcombe.* }
Miss M. Nancollas, *St. Austell.* }
Miss A. McCallum, *Helensburgh.* }
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Amateur's—Tie :
Miss A. L. King, *Regent's Park.* }
Miss M. Borrows, *Islington.* }

GROUP VIII.—WORK IN PAINTING AND DECORATING.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. J. C. Mitchell, *Exeter.*
Extra do., Miss A. B. Woodward, *Chelsea.*
FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. F. W. Sharp, *Windsor.*

IN DIVISION A (PAINTINGS, DRAWINGS, STAINED GLASS, ETC.).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. C. F. Davis, *Lisson Grove.*
Apprentice's—Mr. R. Love, *Dundee.*
Amateur's—Miss A. B. Woodward, *Chelsea.*
Extra Prize :—
Amateur's—Mr. J. M. J. Dacombe, *Bournemouth.*
Extra Prize :—
Amateur's—Mrs. E. Green, *Norwood.*
FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention :—
Workman's—Mr. H. A. Barnes, jun., *Harrow.*
Apprentice's—No Award.
Amateur's—Mr. R. Butler, *Hertford.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. H. A. Barnes, *Harrow.*
Apprentice's—No Award.
Amateur's—Miss M. S. MacLean, *Lee.*

IN DIVISION B (HOUSE PAINTING, GRAINING, MARBLING, DECORATING, ETC.).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Mr. R. A. Dickson, *Bermondsey.*
Apprentice's—Mr. T. I. Mitchell, *Exeter.*
Amateur's—Mr. T. W. Taylor, *Birmingham.*
FOR SECOND BEST EXHIBITS. Second-class Certificate of Honourable Mention :—
Workman's—Mr. R. Ogilvie, *Elgin.*
Apprentice's—Mr. T. H. Jarman, *Margate.*
Amateur's—Mr. H. Crudgington, *Islington.*
FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention :—
Workman's—Mr. F. Kell, *Woodbridge.*
Apprentice's—Mr. A. C. Stroud, *Abingdon.*
Amateur's—Mr. W. A. Sell, *Wandsworth.*

IN DIVISION C (MISCELLANEOUS).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate :—
Workman's—Willcox Bros., *Blackfriars.*
No Apprentices' Award.
Amateur's—Mr. G. H. Marshall, *Leeds.*
*** No other Awards.

GROUP IX.—WORK IN TEXTILE FABRICS AND LEATHER.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. T. Pyves, *Westminster.*

FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. E. Lawrence, *Chelsea*.

IN DIVISION A (FABRICS).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—No Awards.
Apprentice's—No Awards.
Amateur's—Mr. W. J. Twist, *Royal Mint*.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Workman's—No Awards.
Apprentice's—No Awards.
Amateur's—Tie:
Mr. H. Harris, *London Salvage Corps*.
Mr. J. Pugh, *Hoxton*.

No Third-class Certificate of Honourable Mention awarded.

IN DIVISION B (LEATHER, ETC.).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. H. R. Hosking, *Forest Gate*.
Apprentice's—Mr. A. E. Kingsman, *Islington*.
Amateur's—"Opifex," *Navan*.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Workman's—Mr. T. Buck, *Walthamstow*.
Amateur's—Mrs. A. Credland, *Leeds*.

FOR THIRD BEST EXHIBIT.—Third-class Certificate of Honourable Mention:—
Amateur's—Mr. C. E. Kerswill, *Plymouth*.

*** No other Awards.

GROUP X.—WORK IN MUSICAL INSTRUMENTS AND MUSIC.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. P. H. Ziedler, *Hammersmith*.

FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. W. Wyatt, *Marylebone*.

IN DIVISION A (FURNITURE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. A. T. Wilmshurst, *Bermondsey*.
Apprentice's—Mr. W. C. Porter, *Walworth*.
Amateur's—Mr. W. W. Thackrah, *Leeds*.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Workman's—Not awarded.
Apprentice's—Not awarded.
Amateur's—Mr. W. H. Collins, *Tipton*.

FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention:—
Amateur's—Mr. F. Fraine, *Lambeth*.

Extra Prize:—
Amateur's—Mr. R. L. Darby, *Euston*.

IN DIVISION B (MUSICAL COMPOSITIONS AND APPLIANCES).

FOR BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Amateur's—Mr. J. S. Bickley, *Devonport*.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Amateur's—Tie:
Mr. A. Costar, *Croydon*,
Mr. W. H. Scotcher, *Hackney*,

*** No Entries by Apprentices. Entries insufficient for Third-class Prizes.

GROUP XI.—WORK IN WATCHES, CLOCKS, ALARMS, ETC.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. R. B. North, *Barnsbury*.

FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. A. Kienzle, *Old Kent Road*.

IN DIVISION A (FURNITURE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. E. M. Floyd, *Fulham*.
Apprentice's—Mr. E. Benest, *Goswell Road*.
Amateur's—Mr. W. G. Humphrey, *Plumstead*.

FOR SECOND BEST EXHIBITS.—Second-class Certificate of Honourable Mention:—
Workman's—A. Kienzle, *Old Kent Road*.
Apprentice's—No Award.
Amateur's—Mr. R. C. Watkins, *Bermondsey*.

FOR THIRD BEST EXHIBITS.—Third-class Certificate of Honourable Mention:—
Workman's*—Mr. J. T. Branwhite, *Brighton*.
Apprentice's—No Award.
Amateur's—Mr. C. Wise, *Bermondsey*.

* Extra Bronze to Branwhite for Horological Turning taken in error into Group II.

GROUP XII.—WORK IN WOOD.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group. Nothing worthy of this award.

FIRST-CLASS CERTIFICATE for second best Exhibit in Group: Not awarded.

IN DIVISION A (FURNITURE).

FOR BEST EXHIBITS.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate:—
Workman's—Mr. A. C. Hammon, *Southwark*.
Apprentice's—Mr. T. Smith, *Deptford*.

*** No other Awards.

GROUP XIII.—WORK IN CHEMICAL PROCESSES AND PRODUCTS.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group, Mr. H. B. Stocks, *Liverpool*.

FIRST-CLASS CERTIFICATE for second best Exhibit in Group, Mr. F. W. Teale, *Heathfield*.

*** No other Awards.

SPECIAL PRIZES GIVEN FOR EXHIBITS TAKEN FROM DESIGNS IN "WORK" BY THE PROPRIETORS OF "WORK."

LADIES' COMBINED WORK TABLE AND ESCRITOIRE—No. 56 OF "WORK."

1. Mr. N. T. Lee, *Battersea* (in addition to prize above), Half-Guinea Book Prize and Certificate.
2. Mr. A. S. Allen, *Wetherby*, Bronze Medal and Half-Guinea Book.
3. Mr. A. Smith, *Fulham*, Half-Guinea Book and Certificate.

CABINET FROM DESIGN IN NO. 1 OF "WORK."

1. Mr. H. Dry, *Blackheath*, Half-Guinea Volume and Certificate.
2. Mr. G. N. Macintosh, *Lavender Hill*, Second-class Certificate.
3. Mr. Collinson, *Ulverston*, Third-class Certificate.

MODEL COTTAGES FROM DESIGN—No. 70 OF "WORK." (Adapted for Doll's House.)

Mr. W. Smith, *Upper Clapton*, Bronze Medal and Half-Guinea Book.

NOVEL CHESS TABLE FROM "WORK," No. 30.

Mr. G. White (one-armed man), Third-class Certificate.

CASKET FROM NO. 10 OF "WORK."

Rev. R. H. Dunlop, *Elie, Fife*, Half-Guinea Book.

CHILDREN'S MAIL CART—No. 30 OF "WORK."

Mr. C. W. Kelly, *Clerkenwell*, Second-class Certificate.

CARVED PANEL FROM DESIGN IN "WORK."

Mr. E. C. Godfrey, *Bournemouth*, Third-class Certificate.

ENGRAVED MONOGRAMS, CRESTS, ETC., FROM "WORK."

Mr. J. Cooper (Apprentice), *London, W.*, Bronze Medal and Half-Guinea Book.

GROUP XIV.—UTILISATION OF WASTE.

N.B.—There was no entry sufficiently meritorious to warrant the Award of a Gold Medal.

SILVER MEDAL, 21s., and first-class Certificate for best Exhibit in Group.—Mr. J. B. Russell, *Mansfield*.

SECOND BEST EXHIBIT.—Bronze Medal, Book Prize 10s. 6d., and second-class Certificate.—Mr. F. W. Brookman, *Rochdale*.

THIRD BEST EXHIBIT.—Second-class Certificate.—Mr. J. Mangnall, C.E., *Manchester*.

FOURTH BEST EXHIBIT.—Third-class Certificate.—Mr. E. Ferry, *Dalston*.

JOHN W. HARLAND, Secretary.

February, 1891.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Soling.—A. B. (*No Address*).—When you have wetted the insoles, scrape off the grain, flesh the back and gently hammer them, tack them to the last (grain side to the last) with four tacks, A, A, A, A,

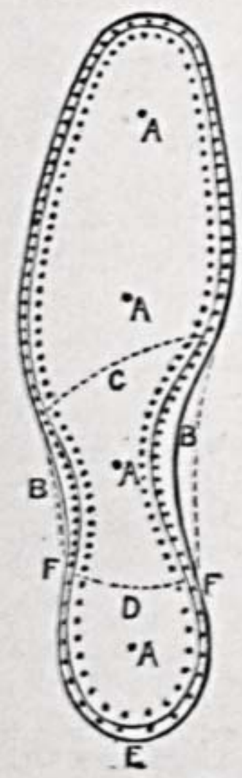


Fig. 1.

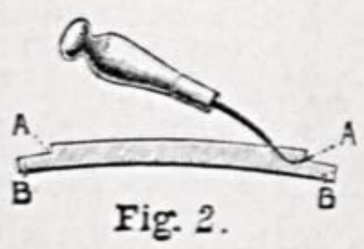


Fig. 2.

Fig. 3.

Boot Soling Tools, etc.

Fig. 1, pull all round the sides with the pincers, and as you pull each place, put a tack through the edge of the leather into the side of the last to keep it well stretched. Then block to the last till the sole is nearly dry, take out the tacks, and round it up to the shape of the last, excepting at the waist. Here it can be curved in to make it narrower than what the last really is, as B, B, Fig. 1, assuming that the dotted lines at these points are the waist of the last. Then with a pair of compasses draw a line the whole way round (if for a gent's) from ¼ in. to ½ in. wide, mark off the two points C and D that you may know the length of the waist, and at either side (more especially the inside) make the line you have drawn a little wider; the wider you make the feather here, the smarter the waist will be, and you also make this line wider at E. This is done according to the range or pitch of the last; the more dead the waist the more the heel will want under-seating—that is, it must be feathered wide and sewn under at E and feathered narrow, and sewn full at F, F, to prevent the heel when built from pitching on the breast. This line, when you have got it even, must be cut through to about one-third of the thickness of the leather, holding the knife perpendicular, and then open it with a prickstitch (Fig. 3); then cut the whole of this narrow strip of leather away, which will, of course, leave the feather about two-thirds of the original substance. The way to hole it is to make a second line from the feather as you did from the edge for the feather, and put the sewing awl in at this line, and bring the point out on the edge of the feather, as A, A, Fig. 2, which is a transverse section of the insole, also showing the feather B, B, which must be very smooth and even all round. You say "dress up the welt after sewing;" if you mean after sewing the welt in, I have a question in hand to answer for S. T. that will answer your query, but as you speak of dividing the stitch, I conclude you must mean after *stitching* the sole on. This is done (after the channel has been set down, and the sole and seam hammered) by rubbing the stitch down with a piece of bone—say, the handle of an old tooth brush, and after the boot is in colour, the stitch is divided with the prickstitch (Fig. 3). This little tool is generally made from the handle and shank of an old iron table fork, being bluntly tapered off at A, and pressed between every stitch; or you can run a fudge wheel round and stitch in the marks it has made, and then run the wheel round again over the stitches, and finish the edge with the guard of the iron, as you must also do if the prickstitch is used.—W. G.

Bicycle Plating.—YORKSHIRE could not replate his bicycle without providing a costly plating plant, and even then he would have to provide experience. Several correspondents have proposed to themselves this same job; they seem to have no sort of conception what plating is. YORKSHIRE will get the parts of his bicycle done by practical platers for a sum of 10s. to 30s., according to the amount of nickel used and the manner of using it. Good plating has a deposit of copper underneath, cheap plating has none.—A. S. P.

Electric Breast Pin.—D. M. K. (*Glasgow*).—The following reply to your letter has been obtained from Messrs. J. E. Hartley & Co., Electric Works, St. Paul's Square, Birmingham:—"We can supply electric scarf pins mounted with small electric lamps at 12s. 6d., 15s., and 17s. 6d. each, according to quality. Batteries for the same, carved to fit the pocket, 21s. each, or of square shape, 18s. 6d. each." You will note a difference in the price of lamps quoted in this reply, and that published on p. 813, Vol. I. This difference is due to the fact that breast-pin lamps have now to be imported from Paris.—G. E. B.

Seal for Battery.—H. M. (*Bristol*).—Pitch will do for the purpose, or equal parts of pitch and asphalte with an ounce of beeswax to the pound of pitch will be even better, because more elastic.—G. E. B.

Nickel-Plating Solutions.—AMATEUR.—As I have not up to the present given in WORK directions for making a nickel-plating solution, I cannot be held responsible for your failure. This was evidently due to the directions given you by someone else. If you mix together sulphuric acid and nitric acid, and then plunge a ¼ plate of nickel in it, expecting as a result a nickel-plating solution, of course you will be doomed to failure. But if you mix the acids in a proper manner and then add the nickel, I will warrant that the metal will dissolve in them and form a sulphate of nickel solution. First, then, put half a gallon of water in a stoneware pan, add to it three pints of strong nitric acid, then add one pint of good sulphuric acid. Make this mixture hot on a sand bath and add your nickel, and it will dissolve nearly two pounds of the metal. But I do not advise you to thus prepare your bath. Better get the prepared nickel salts and anode plates from such firms as Messrs. J. E. Hartley & Co., 13, St. Paul's Square, Birmingham, who will also advise you how to set up and work a small nickel-plating plant.—G. E. B.

Demagnetising Watch.—T. K. (*Glasgow*).—Yes, you can now have a watch demagnetised without the old system of heating the plates, parts, etc., and regilding. Parties advertise to restore them by a process using a dynamo, and they charge 3s. to 5s., according to watch. Watch WORK, or any such advertisements.—J. S.

Blueing Pointers.—SOLWAY.—I find the best method for getting a good *blue* on steel parts is to make a bright fire of *old leather* scraps, and when red, place articles to blue on a copper plate or nine held a short distance over it, and watch it until the desired colour is obtained. You can have any depth, from light straw to dark blue.—J. S.

Cinder Sifter.—ECONOMY.—I am rather doubtful whether your question is of sufficient importance to the majority of our readers, for such an article as a cinder sifter is obtainable at a price so very low that many would deem it hardly worth making. Of course, I am quite aware that most amateurs do not consider the lowness of cost any article could be purchased for that they would wish to make—they look rather to the pleasure to be felt at the result of their skill. But you must agree with me that they usually aim at something more ambitious than the article you wish described. However, as our Editor does not like to turn away any question, and as a cinder sifter can be put to very good use, although unpretentious in appearance, I will explain how to make one. As you are well up in joinery, you will not want me to say anything about that part. Wood and dimensions you must be the chooser of. I must confess to ignorance of the article you name in your letter, but I daresay it is patented, and if so, that reason alone would not allow me to describe it. The article I here show will be made in two separate parts; the top one being as in Fig. 2, to fit into the top of the lower one (Fig. 3). Two boards for the long sides, curved, as shown, at the bottom, united

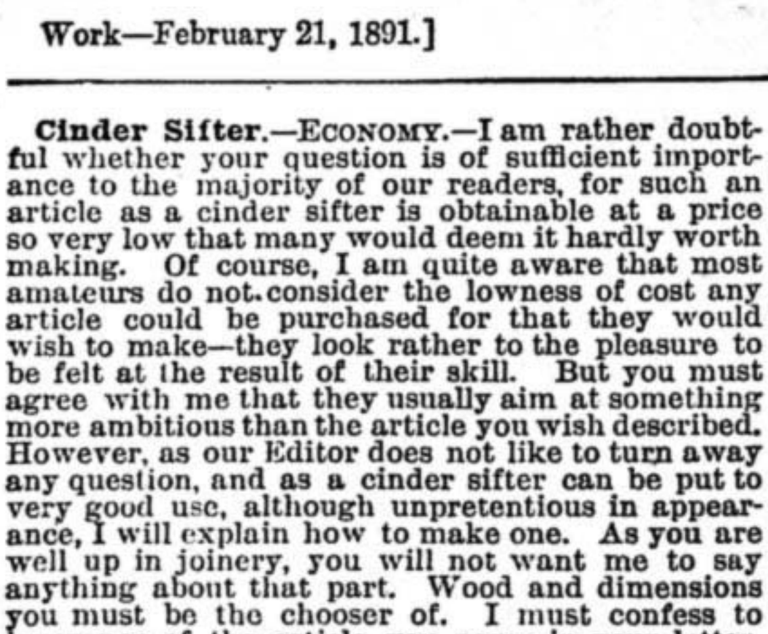


Fig. 1.—Cinder Sifter. Figs. 2 and 3.—Top and Bottom Parts respectively. Figs. 4 and 5.—Modes of fixing Wire.

by two end boards and a bottom board, will form the carcase. A narrow spindle, joined at the bottom of each end, will be found convenient for the foot to be used to rock the article in order to sift the contents. The top part can be taken out when it is desired to discharge the dust contained within the lower part; and if a lid is attached to the former, the cinders can be shaken without fear of any dust rising. You will not want very stout wire. Where to obtain it, and how to straighten it, see past numbers of WORK, particularly No. 54 (p. 20). It should be woven as shown in Fig. 5. The strongest way to fix it will be to bore holes at equal distances apart all round the bottom of the upper part, and beginning at an end hole, thread the wire through it and the hole exactly opposite, bringing it then round the wood (Figs. 2 and 4) and through the next hole, and so on until the last one is reached, when both ends can be secured in an easy manner. Thread the cross-wire in the same way, weaving it as stated above. Countersink, as in Fig. 4, the wire that shows outside by cutting grooves between the holes. A simpler way of fixing the wire will be to thread it round nails (as in Fig. 5), driving them into the bottom edge of the upper part.—J. S.

Improver.—CABINET MAKER.—There can be little doubt that on going into a shop in a larger town, where your son would be able to have more experience, he would have to begin as an improver. From what you say, I suppose his knowledge of the construction of furniture is little more than rudimentary, probably being confined to the rougher and commoner kinds of things. One important matter you omit to mention is whether he has been working chiefly in deal or whether he has been used to hard wood. It is quite impossible for me to say what wages he might get, as everything depends on his ability, and he ought to be content with a very moderate figure, probably not half of what he thinks himself worth. My experience of lads coming from small country shops after having served their time is that, to use a slang expression, they are not worth their salt, and that they very often, after a few weeks as improvers, think they know as much—if not more—than any old hand. This leads them to ask more than the powers that be think they are worth. If your son can get into a really good shop under a good foreman, on whom much of the progress of a willing youngster depends, and you can manage to help him financially for a year or so, my advice to him is not to haggle about wages. Let him take what he can get, remembering that after a time the experience he is gaining will be worth considerably more to him than a shilling or two a week higher wages at present in an inferior berth. I cannot recommend him to go to London, unless he has some friends there who could help him into a berth. He would probably drift into the shop of some small master or sweater, and his lot would be the same as that of thousands of others who have moved from the country to London in the hope of bettering themselves. If he wants to go to London, he had better defer doing so till after he has spent some time in a good provincial shop. He might then stand a better chance in London. As he has occupation now, let him stick to it, and keep his eyes open for any opportunity that may occur nearer home than the metropolis. He might obtain a situation in Exeter, where there are several good furnishing houses who have factories; and the same may also be said of Bath, where some of the best furniture in England is made. Possibly he might hear of something to suit in Plymouth. I cannot take upon myself to recommend any particular firm, but I should decidedly regard the one you name as being most unsuitable for your purpose, even without the objectives, as above given, to London. You might try the effect of an advertisement in one of the local journals of the place preferred, or in WORK. The more useful tools your son has, the better; and if he have none, I doubt very much whether he would have any chance of getting employment.—D. A.

Photographic Tent.—R. H. (*Bradford*).—Your query is rather vague; do you mean a tent in which to take portraits, or rather a portable studio, or a tent in which to develop your negatives, similar to those used by peripatetic photographers? As there is a wide difference between the two kinds of tents, will you kindly write again and specify your want as definitely as possible? and you shall have the required instructions. You might also say what size of plate you intend working, as the dimensions of the tent will depend in some measure upon whether you use quarter plates or larger sizes, say up to 12 in. by 10 in.—G. LE B.

Surveying and Levelling.—J. E. S. (*Stoke-on-Trent*).—Suitable books for you are "Subterraneous Surveying," by T. Fenwick and T. Baker, 2s. 6d.; "Levelling," by F. W. Simms, 8s. 6d., Weale's Series; or "Levelling," by T. Holloway, Spon, Strand. You can also get a good deal of information on levelling and surface-surveying from Nesbit's "Mensuration," but without practical teaching I am afraid you cannot make much progress. Take a course of lessons at the science classes which are held in most of the mining districts. In that case the teacher would tell you what books you would require. Also try to have some actual work with a mine surveyor and leveller, so as to understand how to set and read the instruments, and how to plot and lay the work down.—M.

Metal on Books.—H. S. (*Birmingham*).—The thin metal that you speak of for putting round the edges of books is mitred and soldered. It is impossible to bend, so I cannot tell you how to do it. These strips of brass are called "rims," and are made in sizes to suit certain books; but of all the things which I abhor, a brass rim on a book takes the cake. You may try cutting your metal and soldering it, as this is the only way it can be done; but don't, man! It does not add to the beauty of the book, and it really doesn't need it unless you are going to make a football of it.—G. C.

Steel Wire.—J. M. (*Southwold*).—I think pianoforte wire would suit your purpose. I cannot give you the name of a maker, but that you can get from any musical instrument maker.—F. C.

Simple Writing Cabinet.—H. G. L. (*London, E.C.*).—If you had read the article on "A Simple Writing Cabinet" right through, you must have seen the following:—"Having got, cut, and cleaned up to sizes given," etc. I think that further explanation is unnecessary.—R. F. H.

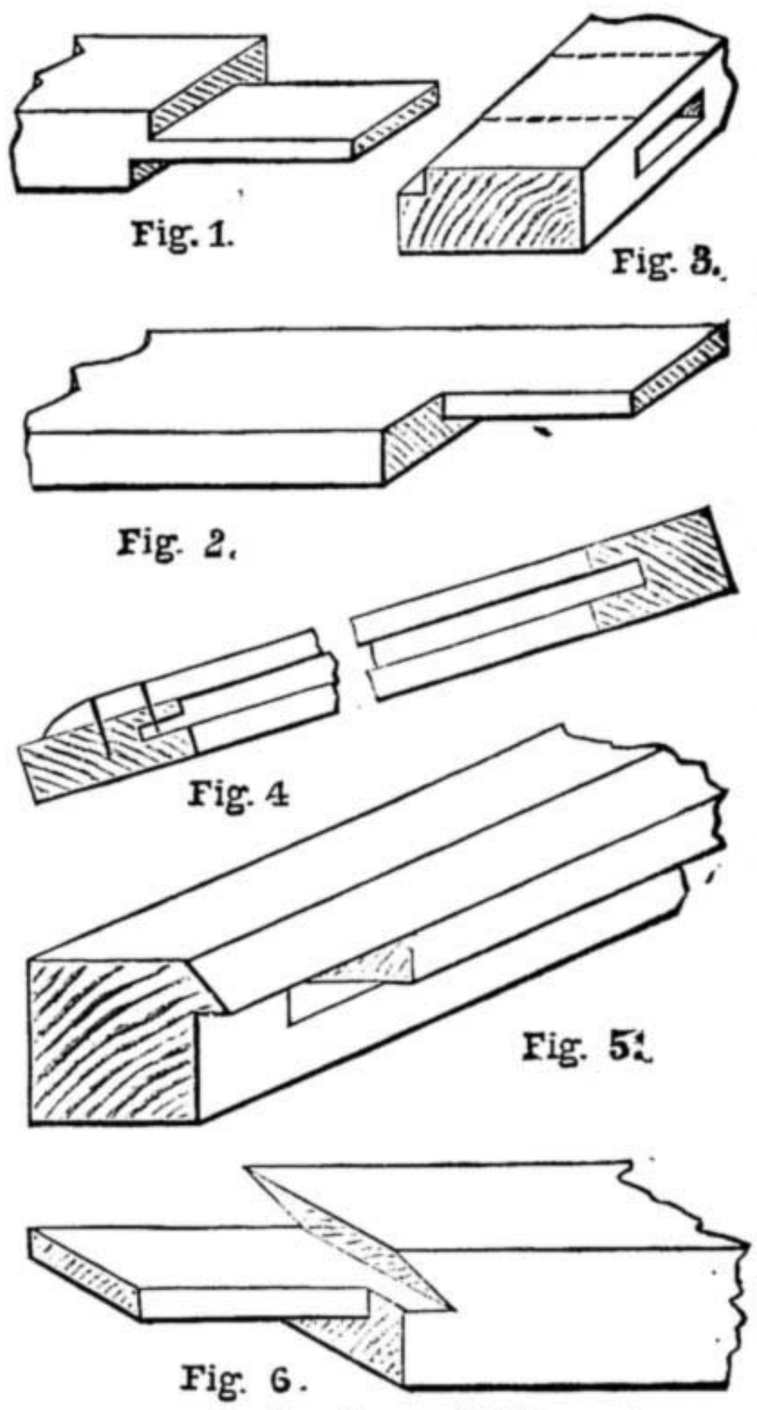
Crest Book.—G. W. (*Airdrie*).—Fairbairn's Crests and Monograms (2 Vols., cloth, 42s.), Lewin, 20, Ludgate Hill, London, would be a good book for you.

Edges of Books, etc.—J. B. (*London, W.C.*).—The colour for red edges for books is dry vermilion, and it is mixed with a little white of egg and water. It is applied with a sponge. Book-edge colour may be had from Messrs. Berry and Roberts, St. Bride's Street, London, E.C., ready mixed. Say if it was the inside or outside of book that was soiled.—G. C.

Model Marine Engine.—W. E. (*Liverpool*).—Your query cannot be answered in "Shop." Be patient until I can describe such an engine in WORK.—J.

Twist Wire.—H. S. (*Wolverhampton*).—It requires special machinery. Try Selig Sonnenthal, Queen Victoria Street, for machine; and Newall, 130, Strand, for wire, or Wilkinson and Sons, Adderley Road, Saltley, near Birmingham.—J.

Garden Frames.—ALONSOA.—The wood for the framing of the lights you require having been procured, lay your stiles together in pairs, inside edge upwards, and mark off the extreme length, squaring across with a square; then measure inwards at one end the width of the top rail, and at the other end the width of the bottom rail or drop; divide the spaces thus got into three parts, the two inner parts to form the mortice, and the outer third part to be left solid; square across the marks to the back edge, and setting a mortice-gauge to ½ in., run it in the centre, and mortice carefully to all your marks, taking care to make the mortices a little longer at the back edge of the stile to allow for the insertion of the wedges. The rails must be measured off in a similar manner, and the tenons cut; of course, leaving the shoulder on the top side of the top rail, the width of the stile rebate is longer. The lower rail is only shouldered on the under side. Rough sketches of how the rails are shouldered and tenoned are given in Fig. 1 (top rail) and Fig. 2 (lower rail), and the end of stile with mortice in Fig. 3. Fig. 4 shows a section of the sash;



Garden Frame Lights.

the top end of the sash-bar is morticed in half-way, and the lower end is morticed and cut as shown, the part projecting down on top of the lower rail being secured from shifting by means of two long brads driven in. If you make your sashes of any great length, you had better mortice, say, every third bar right through both top and lower rails, to strengthen them. Put the framing together with good thick white lead, and wedge up the tenons well; also put in two pins, as you suggest, as an additional security. The ventilators you inquire about should be set out in a similar manner to the lights. Figs. 5 and 6 will give you an idea as to how to join them. Notice particularly that the rail is shouldered on one side to fit the bevel of the stile, and also that the stile is cut away outward from the mortice, to admit the square shoulder. There are other and different ways of putting this class of work together, and opinions vary as to their merits. I think, however, that you will find the way here given to be as easy for you as any other, having in view the manner in which you are purchasing your wood. These instructions are necessarily brief; but should you desire further details, write again.—G. LE B.

Force-Pump.—PLUMBER.—You can get a plumber's force-pump for the purposes you require of Messrs. Warner & Sons, Cripplegate, London, E.C., who make various kinds; about £2 would, I think, be the price. Refer to the Post-Office London Directory for the address you want.—R. A.

Combination Chuck.—A YOUNG BEGINNER.—You should repeat your question.

Joining.—A READER.—I do not know much about joining gut-bands. I believe they are joined with hooks and eyes; and I suppose the reason why your hooks and eyes keep breaking is because they are not good enough.—W. D.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Cork.—A READER writes, in answer to G. B. (*Poplar, E.*) (see page 650, Vol. II.):—"You can buy cork for making life-belts at Fisher, Howard and Son's, Cork Merchants, Minories, London, E.C. Send stamp for prices. It is sold in bundles from about 1½ or 2 cwt."

Blackboard Preparation.—E. H. (*New Brompton*) writes, in reply to A. J. L. (*Paddington*) (see page 718, No. 96):—"Take one part of Japanese gold size and two parts turps, and mix up some drop-black with a little powdered pumice-stone, and paint over. It should dry with a hard dead surface."

Blackboards.—H. B. (*Brighton*) writes, in reply to A. J. L. (*Paddington*) (see page 718, No. 96):—"I have found the following superior to anything else, and trust it may suit you. Take an ordinary jam jar, and go to a respectable oil and colour dealer; ask for ¼ lb. of best ivory or drop black ground in turps, half a pint of turps (turpentine), and half a gill of coach gold size; the black should be in a pasty condition. Thin it down with the turps to consistency of an ordinary paint, then add enough gold size to bind it, but not sufficient to cause a gloss when dry. Find the proper conditions as follows:—Put in the gold size a little at a time, stir well, then rub a little drop on your thumb-nail. It will dry very quickly; when quite dry and dead black, try to rub it off with a finger; if it all comes off easily it is rotten (*i.e.*, not bound sufficiently); add a little more gold size and try again, repeating process until the black will not rub off the thumb-nail without some difficulty; if it sticks on hard and is also dead black (*i.e.*, no gloss whatever), it is in the proper condition. If your board is new, rub down well with glass-paper, and give two good coats of Young's patent size warm, darkened with a little vegetable black; when dry, rub with fine glass-paper—old, if you can get it. Now give one good coat of the prepared black, laying the board down flat, with the side you wish to paint upwards: this will prevent the paint running into waves—or curtains, as we call them. When thoroughly dry, give another coat same as the last, and let dry also. Now get some very fine emery—the finer the better—put a good teaspoonful or little more in the remaining paint, stir up well, and give one last coat and let it dry; it should now be a dead hard black with a slightly rough surface, sufficient to bite the chalk, but allow of the lines being easily removed with a damp cloth or sponge; the quantity named above should be sufficient for a board 4 ft. by 3 ft. super."

Camera Fittings.—H. P. (*Leeds*) writes, in reply to J. C. (*Glasgow*) (see No. 89, page 602):—"You will be able to get all you require well finished and cheap at Watkinson & Lonsdale's, Harrison Street, Leeds. The following prices are what they charged me:—Half-plate rack and pinion-set, Pr. 10-inch racks, 5s.; conical leather bellows, 14-inch pull, 6s.; milled screws with plug nuts, 4d. each; camera screw with two circular nuts, 6d.; double grooving for dark slides, 6d. per foot; focus screen to register, 3d. per foot. W. and L. will supply you with any part finished or unfinished, either brasswork or woodwork. They offered to sell me all the wood machined and planed for very little more than the mahogany cost me at the wood-yard. Had I have seen their advertisement in WORK sooner it would have saved me a lot of trouble. I had no idea we had such a place in Leeds, until I saw the advertisement in WORK. I should advise every reader interested in camera making to give them a call or write. It will well repay him, and by mentioning this paper he will get all the information he requires."

H.P. Formula.—P. B. H. (*Hendon*) writes, in answer to PUZZLED (see page 718, Vol. II.):—"If you will again run the figures out according to the formula you have, viz.:—

$\frac{2\ A.S.P.R.}{33{,}000}$ where A. = area of piston = 78·54,

S. = stroke 9 in. = 0·75 of a foot,
P. = pressure = 80 lbs.,
R. = revolutions = 350,

you will get $\frac{2\times78{\cdot}54\times0{\cdot}75\times80\times350}{33{,}000}$ = 99·9 H.-P. instead of 200 H.-P. as you state. There is, however, a slight mistake in the pressure you calculate on. To get the I.H.P. by the above formula, P must equal the *average*, not the boiler pressure, which you have used in your calculations. The average pressure can only be guessed in this case, as the cut-off of the valve is not stated. This can be taken at one-half the boiler pressure or 40 lbs., which will be as near as you can guess. Then the formula would stand $\frac{2\times78{\cdot}54\times0{\cdot}75\times40\times350}{33{,}000}$ = 49·9 I.H.P., which comes very near that obtained in practice. The only way I can see how you have worked out 200 H.-P. is, that after calculating the formula you give, you have again multiplied by two as there are two cylinders; but these, as you state, are only single-acting, therefore they only count as one."

Illuminating.—A. A. B. (*Brighton*) writes, in reply to GILT (see page 601, Vol. II.):—"You will find full instructions as to gilding and burnishing in one of Messrs. Rowney's shilling treatises on the Fine Arts, entitled: "Guide to the Art of Illuminating and Missal Painting," which may be obtained of any artist's colourman. Both Rowney & Co. and Winsor & Newton supply water gold size at 1s. a bottle; the latter firm distinguishing between burnish gold size and mat gold size. W. and N. also advertise agate burnishers of various shapes at 2s. each. For marking lines on gold, an 'ivory tracer' (Rowney, 6d.) is generally used. Many illuminators prefer cakes of gold (W. and N., 5s. 6d. each), as giving a softer and more pleasing outline than gold leaf. Gold in this form requires no size, but is simply mixed with water, and applied with a brush, which, to avoid 'streakiness,' must be fully charged."

Cheffonier.—SCHEMER writes in reply to DUSTY POOL (see page 570, Vol. II.), and sends the following particulars for making a cheffonier:—"Top lined up 3 ft. 6 in. long, 18 in. wide; floor to top, 3 ft.; glass plates or panels in back, 18 in. by 16 in., and 9 in. by 7 in.; uprights in back, 2 in. wide; spindles, 2 in.

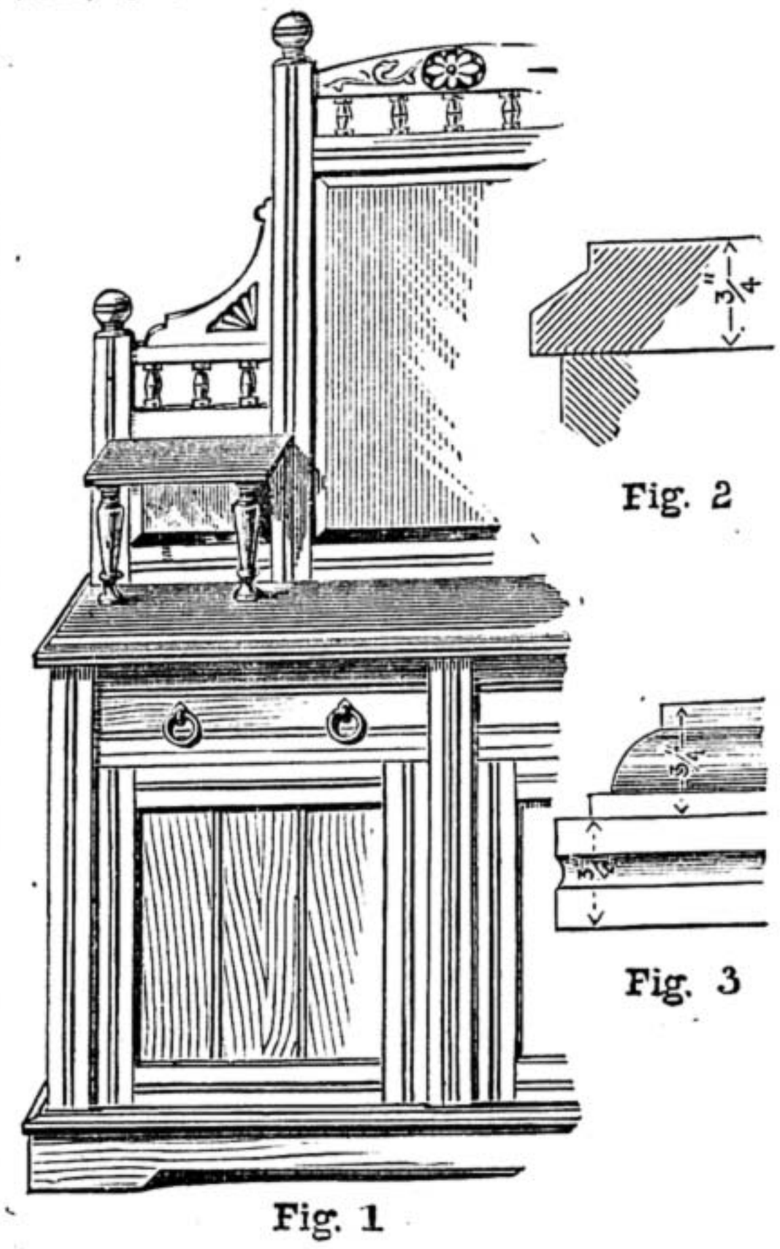


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Cheffonier and Parts. Fig. 1.—Half View as complete. Fig. 2.—Moulding on Plinth. Fig. 3.—Section of Top. Figs. 4, 5.—Mouldings on Edges of Shelves, etc.

long; shelf, 3½ in. wide, with small bead stuck round plinth, 4 in. deep; door frames, 2 in. wide; carcase uprights, 2 in. wide; drawers, 4 in. wide. A nice design in mahogany, but better in walnut. If SCHEMER wants to know anything else, I will answer in 'Shop.'"

Violin Mute.—F. S. (*Normanton*) writes, in reply to VIOLIN (see page 650, Vol. II.):—"Violin mutes are made in a great many shapes and forms. The simplest one that I have seen is made of a piece of thin brass, which can be cut with a fret saw and then bent so as to clasp over the bridge, the tongues passing between the strings. Heavier and better mutes can be made by taking pieces of brass and cutting them out, putting a piece of perforated brass between them at the top and riveted at the shoulders. Before I made a mute, I used the door-key for one, which, though it was clumsy, made a very good one, and did not hinder the bow if put on with the ring towards the tail-piece. You could buy a mute for sixpence at any musical shop, but perhaps you want to make your own."

Camera Fittings.—M. writes, in reply to J. C. (*Glasgow*) (see page 602, Vol. II.):—"You can obtain these from Messrs. Lancaster & Son, Colmore Road, Birmingham. Rack and pinion for ½ plate costs 5s. Send 4d. for catalogue, which gives drawings and prices of each fitting."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. T. B. (*near Preston*); W. J. D. (*Crediton*); H. B. S. (*Huddersfield*); G. N. (*Stratford*); J. R. (*Belfast*); WASSIE; ELECTRIC; C. A. W. (*Settle*); R. W. H. (*Glasgow*); L. S. L. (*Falmouth*); ETCHER; F. M. G.; W. H. F. (*Glasgow*); J. F. (*Bridlington*); J. D. (*Dundee*); G. O. M. (*London*); W. T. D. (*London, E.*); L. T. (*Harlesden, N.W.*); E. H. (*King's Cross, N.*); E. H. J. (*Norwich*); E. T. (*Great Yarmouth*); T. & I. W. (*London, N.*); A. S. (*Paisley, N.B.*); F. F. (*Brixton, S.W.*); J. P. (*Bethnal Green, E.*); F. H. (*London, S.E.*); AMATEUR; T. W. W. (*Hexham-on-Tyne*); NED; JACK OF ALL TRADES; N. M. (*Norwich*); H. D. (*Bury St. Edmunds*); P. H. B. (*Reigate*); J. W. (*Edinburgh*); STEEL; H. P. (*Oxford*); ONE IN TROUBLE; V. J. (*Kent*); PEN; J. H. (*Sunderland*); T. M. (*Deptford, S.E.*); A. J. A. (*London, E.C.*); G. P. (*Elgin, N.B.*); H. B. (*Hammersmith*); G. H. (*Burton-on-Trent*); H. H. M. (*Birmingham*); J. H. (*Monkwearmouth*); F. H. B. (*Halifax*); L. C.; BANJO; NIL DESPERANDUM; F. C. O.

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