

per care in the respect above mentioned fails to induce a proper growth, then the plant must be re-potted with fresh earth, and have a portion of its top cut back. Irregularities in shape must be corrected from time to time by pinching off the shoots which may start to grow out of place.

The red spider is quite averse to moisture; the green fly, however, likes it, but may be destroyed so readily by tobacco smoke that only neglected plants will suffer from this cause. The mealy bug is so large that it may be easily picked off.

Watering must be properly attended to; and while the plant must not suffer from lack of moisture, the roots must not be kept saturated with water. The sound of the pot when struck by the knuckles is quite different from what it is when dry. This, and the lagging look of the plant, will indicate that water is needed. A little practice will soon enable one to anticipate the wants of the plant and to supply water at the proper time. Plants growing in a cool atmosphere will be found to flourish much better by giving them water which is almost hot. House plants that have bloomed freely during the winter should be denied their usual supply of water, and be placed in the open air for a few hours during the middle of bright days, if this course is practicable.

PRACTICAL MECHANISM.

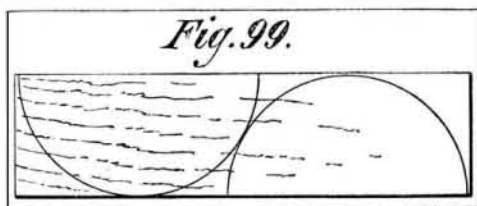
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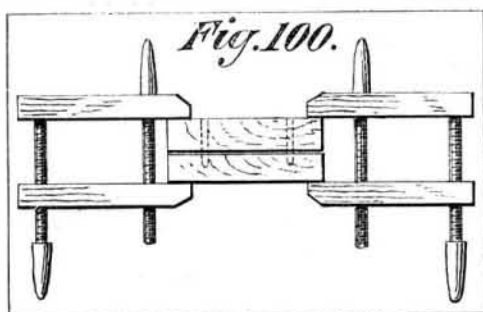
PATTERN MAKING.

The construction shown in Figs. 92, 93, and 94 is so nearly the same, and the slight difference is so obvious, that an explanation of Fig. 94 will cover the ground. For Fig. 94 we plane up a piece over twice as long and more than half the size of the required flange, and out of this piece cut the two half flanges. If, however, the flange is of sufficient size to make it necessary to study economy, the two half flanges may be set out on the plank, lapping each other, as shown in Fig. 99. We next, with a flat scriber, draw a line on the chuck exactly through its center, and set the half flanges to this line, and then screw them to the chuck and turn them as if they were solid. By setting the halves exactly true to the line, it is insured that the flange shall part exactly at the center.

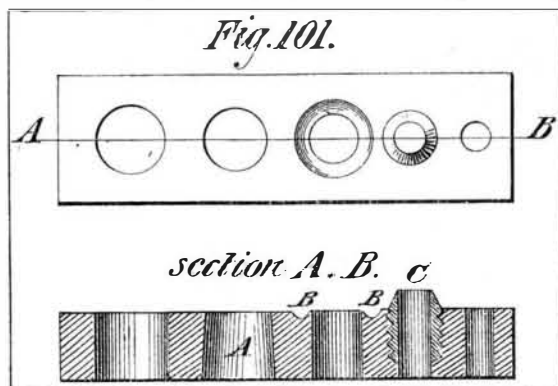
To make the pattern shown in Fig. 98, we take two pieces



of wood long enough to make the two halves, and allow about half an inch or an inch to turn off each end, so that the impressions of the fork and center may not appear on and disfigure the finished work, and for other reasons hereafter to be mentioned. We plane these pieces on one edge and on one face, making them of equal thickness. We make the flat surfaces, which come together, true, trying them with the winding strips shown in Fig. 37, to detect any twist. Our next operation is to insert the pegs, and we may, for this purpose, adopt either of the two following methods, the more ready of which we will take first: Clamping the two jointed faces together, as shown in Fig. 100, we bore



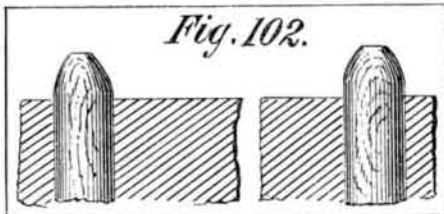
two holes right through the top piece and into the bottom, one to a little greater depth than the height to which the pin is intended to project, as shown by the dotted lines. We then plane up a piece of hard wood, about two and a half feet long, to fit the holes tightly. It is just as easy to plane a long piece as a short one, and what is left over will serve for a future occasion. A useful tool for preparing pin stuff is illustrated in Fig. 101, which represents a hardened plate



of steel, pierced with holes of the sizes of the pins usually required. The wood for the pins, having been planed up to the required size, is driven with a mallet through the plate, saving a great deal of time, and making the pins more nearly round than is possible by hand work. In some of these

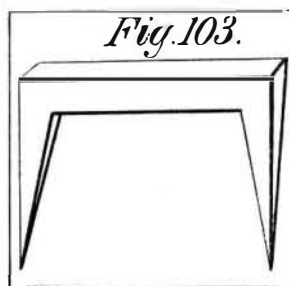
plates the holes are made taper, as shown at A, in Fig. 101; this, however, is detrimental, and the parallel hole is the best, because it guides and supports the stick while it does not impede the cutting action of the tool. A hollow formed around the edge of the hole, as shown in the sectional view, at B B, would improve that action; or it might be still further improved by inserting bushes in the plate, with a portion left projecting above the plate and beveled off to resemble a chisel, as shown at C.

The pin stuff being prepared and inserted into one half of the pattern, the projecting end is then tapered off as shown in Fig. 102. The formation of this projecting pin may seem

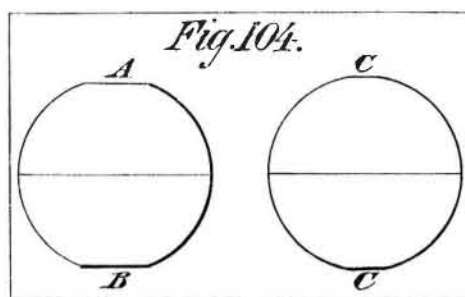


a very simple matter; but if sufficient consideration is not given to it, a great deal of annoyance is caused to the molder, and the castings will be imperfect. If we reflect for what purpose these pins are inserted, we shall find the proper shape. First, with regard to the projecting length, some workmen seem to be guided by the diameter of the pin, making it project to a distance equal to its diameter; but it is obvious that a short peg or pin will govern the position as well as a long one, and will be less liable to stick in the loose half of the pattern: hence it is better to let the protruding end stand out from three sixteenths to one half inch, and let from one sixteenth to one eighth inch of the large part fit the hole, the nut being tapered off so as to be sure that the pin can be released easily. These conditions inevitably bring us to the parabolic form shown in Fig. 102. Another point to be observed is to make the pin of as large a diameter as is consistent with the work; for the larger the pin, the longer it will remain free from shake. Above all, it is essential that the pin be perfectly round at the part that fits the hole; and if these elements are neglected, castings will be produced of which the halves will not match, which is always very unsightly. Nothing is gained by making the pins to a tight fit in the loose half of the pattern, as they will not work that way; and the molder will enlarge the holes with a red hot rod, and then, after a little while, the charred part around the hole falls out, and the pin becomes too slack.

After inserting our pins, the two halves of our patterns are to be fastened firmly together; and this may be readily done by brushing the end faces with hot glue for a breadth of one half or one inch, according to the amount we have allowed our pieces to be larger than the finished work. Then we hold them firmly together with a screw clamp, leaving them until they are perfectly dry. If there is not time for the gluing, the two halves may be screwed together; and indeed, if the job be a heavy one, it will not be safe to trust entirely to glue, but to use screws or dogs. Dogs are a kind of square staple, made of steel, and of the form shown in Fig. 103; and two of them driven in each end of a pattern will hold its loose halves very firmly together. While very handy, however, on large or small work, they are cumbersome; and the gluing or screwing is preferable. The work can now be mounted in the lathe, and turned as though it were solid. Care must be taken that the center points are exactly in the joint, and it was to ascertain if this was the case that our two halves were planed of



equal thickness; for if, in the process of turning, one flat is seen to be narrower than the other, as shown in Fig. 104,



at A B, it is proof that the centers are not in the joint; and unless the error is corrected, one half of the finished pattern would be thicker than the other. To remedy the error, we tap the pattern lightly with a hammer in the required direction, and then screw up the lathe centers a little more, continuing the process until the flat sides upon the pattern, when very nearly trued up, as shown in Fig. 104, at C C, are equal, and finally disappear.

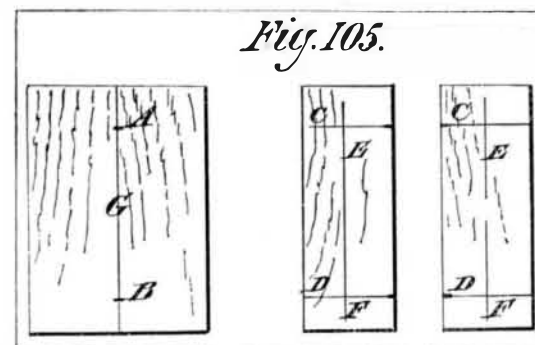
Our pattern being then turned and sandpapered, as already directed, the next proceeding is to stop up all holes or cracks that are not desired to appear, with either beeswax or putty. This is a simple process, but it may have been noticed that some workmen take a much longer time over it than others, at least when beeswax is the stopping material. One who is expert at this work guesses just the proper amount necessary for each hole or crack; then he forms the wax into a worm-like shape, and with a warm chisel (that is not hot enough to make the wax run but only to

cut it easily) he presses the wax into the hole, and seldom leaves any surplus to remove. The same knack is necessary in filleting, that is, in filling in an internal square sharp corner, when it is thought too small to be filled in with wood; for if the worm or string of wax of the right size be laid along the corner, the pressure of a warmed gouge will cause it to expand to the required fillet; while if too much wax is inserted, much time will be occupied in trimming off the surplus.

The third and last of the finishing processes is the application of two or more coats of spirit varnish, which adds to the appearance of the pattern, and increases its durability by giving it a surface impervious to water, and by producing that smoothness so necessary for its easy extraction from the sand. A varnished pattern escapes much of the rough usage commonly bestowed upon patterns, because the molder does not rap it so much as he otherwise would do. Several thin coats of varnish give a much finer appearance than fewer and thicker ones. The first coat fills up the pores of the wood, and frees the fibrous projections left by the sand paper; and after the first coat is dry, fine sand paper is again applied to remove the fibers so fixed. The second and succeeding coats give the gloss.

The pattern maker invariably mixes his own varnish, which he does in the following manner: The varnish pot should be of stone, and not of iron, which would discolor the varnish. The cover should be of thick leather, having through the middle a hole of such size that the brush handle, forced through it, will be suspended, and will not pass through to the bottom of the pot. The object of making the cover of leather is that the varnish collects around the lid and sticks the cover down, requiring sometimes so much force to remove it that wood would be liable to split. In the pot is placed so much shellac, and there is added just sufficient alcohol to cover the shellac, the whole being occasionally stirred with a piece of stick, and not with the brush. The consistence should be that of raw linseed oil; and to hasten the mixing, a little warmth may be applied. The color of the varnish used is, strictly speaking, optional; the usual plan, however, is to use clear varnish for the pattern, and black for core prints and the insides of core boxes, which thus distinguishes them. The black is made by adding the best dry ivory black to the clear varnish. A very durable varnish may be made by adding powdered oxide of iron to the clear varnish, which gives a hard varnish with a reddish brown color. In mixing colored varnishes, however, we must remember that, the lighter the pigment, the easier they work. Ivory black is the lightest pigment, and so always pervades the varnish, and does not readily settle to the bottom; hence it does not often require stirring. Oxide of iron requires frequent stirring, even in the course of varnishing one pattern, if it be a large one; because it settles so rapidly that a perceptible difference in the coat is apparent unless the varnish is stirred previously to each insertion of the brush. The brush should never go to the bottom of the pot, and the pot should always be kept covered when not in actual use. Varnishing lathe work cannot be done while running the lathe; but after the work is varnished, running the latter hastens the drying. Work should always, if possible, be varnished on a dry day; for if the air is damp, the varnish becomes what is technically termed chilled, that is, it assumes a soapy or milky appearance, as though it had absorbed water, and hence is spotty when dry.

Having thus finished our example, we may now explain the process of putting pins in patterns, which we omitted to do, when speaking upon that subject, to avoid digression. There are many cases in which it is not suitable for the pin hole to show on the outside of the pattern; and again, in large work, the holes would require to be bored so deep and the pins made so long that it would be too elaborate an affair altogether. In such circumstances, lines are resorted to, being drawn in the following manner: Place the pieces side by side, with the planed edges touching and the ends fair, as shown in Fig. 105, the line, G, representing the edges; and make two fine notches at A B. Then separate the pieces,



and square the very fine lines, C C, D D, across with a knife. Then set a gage to half the width of the pieces, and mark the intersecting lines, E F; and the centers for the respective pin holes will be the intersection of the lines, C E and D F. If, however, we have no planed edge to work from, and the job is of such size as to involve so much labor as not to admit of planing, we may take two small brads or finishing nails (or as many as we desire to have pins), and drive them almost entirely into one piece of the wood in the spots where the pins are ultimately to be, and then file the projecting part of each to a point. By then resting the other half in its proper relative position upon the filed points, and, when adjusted, applying a little pressure to it, the nail points will enter the top piece and mark the corresponding centers for the holes to receive the pins. We may then extract the brads or nails, and proceed to bore the holes and insert the pins.