PRACTICAL MECHANISM.

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NEW SERIES—NO. XX.

PATTERN MAKING.

Economy in timber and in the cutting must be studied as much in the core box as in the pattern; hence, when the pattern is of such a size as to render it economical to build it in pieces, it will be equally desirable to build the core box in like manner. For the bend itself, however, it is scarcely necessary to speak, for the core can be made with a simple contrivance; whereas the building of a half box, though not offering any elements of difficulty, demands so much labor in the cutting out, compared with the extra labor devolving upon the core maker employing the contrivance referred to, that such boxes are for large work seldom or ever constructed. We proceed, therefore, to describe the contrivance with which the core maker is usually supplied. It is applicable to all sizes where loam cores are used: but the core box is preferable when its construction involves no great outlay.

Having determined upon the size of the core from end to end of the prints, we proceed to make a pattern from which one or two iron plates may be cast. Upon these plates the core, in separate halves, is made and dried. The plates are generally about $\frac{3}{8}$ inch thick, and of such a width as to leave a small margin around the core to support what is called the strike. In Fig. 141, P represents the plate, C the core, and

Fig. 141.

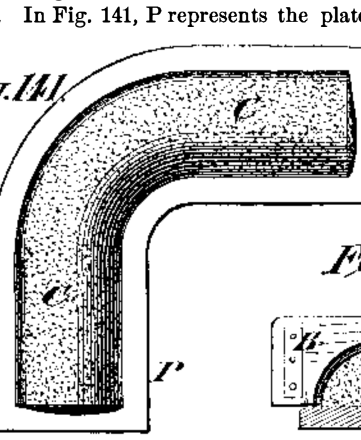
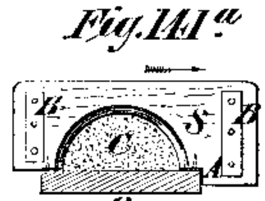


Fig. 141 a.

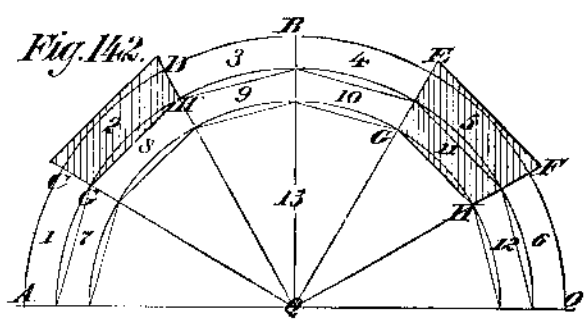


S the strike: this latter is cut from a piece of board from $\frac{3}{8}$ to 1 inch thick, the semicircular hole cut in it being the size of the required core. The grain of the wood may run in the direction of the arrow. It is strengthened, if necessary, by the two battens shown in Fig. 141 *a*, at B B. The edges of the semicircle are beveled off, which causes the strike to work more smoothly and correctly over the composition forming the core.

A few flat-headed tacks should be driven into the surfaces of the strike that come into contact with the iron plate, so as to prevent the wood from wearing rapidly away, and thus altering the shape of the core and causing it to be oval. The core maker places upon the iron plate enough material to make the core, and, taking the strike, places it so that the edge or shoulder, A in Fig. 141 *a*, contacts with the edge of the plate. He then sweeps the strike over the material; the semicircle leaves the core upon the plate, and sweeps off the surplus material, the sweeping process being completed until the perfect half core is formed. In Fig. 141 *a*, P represents the plate, S the sweep, and C the material or core, the figure being an end view, and the tacks referred to being shown so as to mark their location.

We have hitherto treated of building patterns of such size that they could be made cut of the solid; it often happens, however, that the pattern maker is required to build up a pattern by what is called staving or lagging. As an example of this kind of work, let it be required to stave up a pipe, 18 inches diameter inside, with 1 inch thickness of metal. We proceed by taking a clean board and drawing on it the line, A O, in Fig. 142; and then we describe upon it the semi-

Fig. 142.

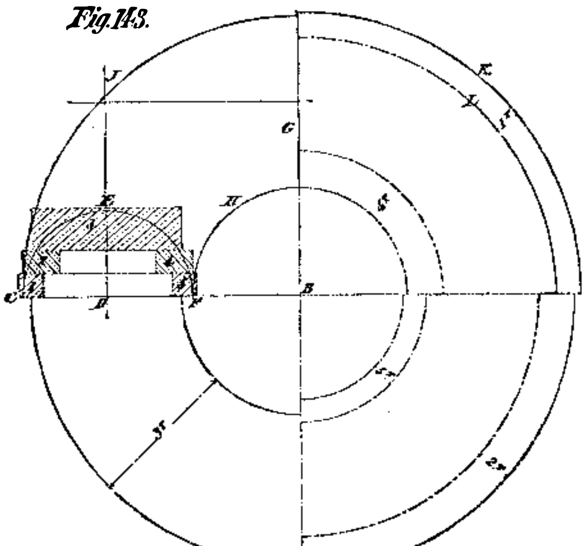


circle, A B O (for we will suppose the pattern to be made in halves), of the required finished size of the pattern, the shrinkage being allowed for. This semicircle we divide off into as many equal parts as it is intended to have staves; and we next draw radii from the points of division to the center of the semicircle. We then take any one of these divisions, of which there are six shown in Fig. 142, and draw the line, E F, parallel to an imaginary line joining the points of division, C D. The distance of the line, E F, from the arc is the amount allowed for the lathe turning, say, in this case, $\frac{1}{8}$ inch. We next draw the line, G H, parallel to E F, and the figure, E F G H, is the exact size and form required for each stave. From the center, Q, we then describe a semicircle passing through the points, G H, and cutting each of the radii, and by joining all these points, we form the half polygon shown by the whole figure. This shows the exact size and shape of the disk to which the staves are to be fixed. In Fig. 142, this whole process is drawn twice, showing thick staves and thin ones, from 1 to 6 representing the thick, and from 7 to 12 the thin, staves; while 13 represents the disk of wood. The thin staves are to form the body of the pipe; but when it is desired to have the points solid with the body, we must use the thick staves. The first procedure is to prepare the requisite number of disks, making them of the form shown; and some pattern makers do this by turning the disks and then flattening them off to form the sides of the polygon. But when a band saw is accessible, the turning is unnecessary; and we may simply draw them out and saw almost to the line, allowing, say, $\frac{1}{16}$ inch for finishing. Each half disk should be pegged to its mate, and a template, like the figure, E F G H, is useful in preparing the staves and verifying their sizes. To prepare the staves, we cut out with the rip saw the required number of pieces, a little wider than E F in Fig. 142; or if there is a circular saw at hand, we use it in preference, and it will save time to resaw the pieces to give them the required bevel, which may be done by canting the saw table. In the absence of any provision for canting, we may fix a packing piece to the table so as to elevate one edge of the stave. After sawing, we plane the bevel edges to correspond to the template, leaving just a shade of stuff to allow for jointing the staves at a close fit together.

Having prepared the staves, we set up the pattern as follows: On a planed board, the requisite number of half disks are placed, perfectly in line with each other; and the outer ones must be at such a distance apart as to allow for turning up the ends of the staves. The intermediate disks, if any (and they should occur about every 2 or $2\frac{1}{2}$ feet), are to be distributed at equal distances in the space that intervenes. These disks we then fix temporarily to the board, paper being laid at the ends of the disks to catch the surplus glue.

The staves are glued and each screwed with one screw to the disk. The boring of the stave to receive the screw should be performed before applying the glue, and the head of the screw should be well sunk beneath the surface, so as to admit of a wood plug being glued in on top of it. First a hole is bored in the stave, a little larger in size than the head of the screw, and nearly as deep as the screw head is to be sunk; for in tightening the screw, the head will be sure to be driven $\frac{1}{8}$ or $\frac{1}{4}$ inch deeper than the hole is bored—that is, providing the material is a soft wood, as is usually the case. The stave is now to be completely pierced with a hole just fitting the plain part of the screw. If it is larger, the head of the screw will sink deeper; while, if it is smaller, a thread will be cut in it by the screw, and it may prevent the stave from being

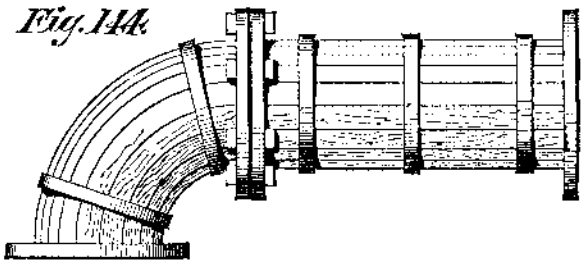
Fig. 143.



drawn to its place. The glue should be applied, and the screw inserted while the glue is hot. It is best to joint on a stave back and front; that is, at each end first, and to then put in the middle or connecting stave, thus completing one length of the staves, the top one being, preferably, the first erected. In putting on the succeeding staves, each one should be properly jointed to its fixed neighbor; a little chalk being rubbed on the fixed stave will show if its fellow bears or joints properly. When one half of the pattern is finished, we may dispense with the board, using the finished half in its stead, and taking care to insert paper between the two to prevent the glue from sticking them together.

In lagging up a branch for a T, the disk at one end should be set back sufficiently far to allow for the part to be cut away in fitting the branch to the body of the T, as explained when treating that subject. This method of staving is that regularly employed for cylinders, pipes, rollers, and similar jobs; and though sufficiently simple for straight pieces, it becomes very complicated when applied to a bend. It is not, therefore, usual to stave up a bend, but to build it in the manner illustrated in Fig. 143. The operation is to first draw the bend in plan, of the full size, upon a board. Let B, in Fig. 143, represent the center from which it is struck, the plan in this case being a quarter circle bend denoted in Fig. 143 by the line, C D F, the line, G, and the sections of a circle, H and J. We have decided to build up our pattern with five pieces, an end view of the half pattern being denoted by the circle, C E F, and the five pieces or layers being denoted by dotted lines, so that by adopting this method we show the plan and end view of the bend in one drawing. It would be well now to cut out forms, in card or in very thin wood, as templates, one for each of the pieces, marked from 1 to 5 respectively. To obtain these templates, we draw the line, C B; and from the center, D, we describe the semicircle, C E F, representing the diameter of the half bend. We then lay off the tiers from 1 to 3, as shown by the dotted lines; and to find the bend necessary for each respective piece, we proceed as follows: Setting our compasses at a distance equal to that between the center, from which our bend is struck (B in Fig. 143), and the extreme outside of the piece marked 1, we draw the quarter circle denoted by the dotted line, K. Then setting our compasses from D to the inside of piece 1, we draw from the center, D, the quarter circle denoted by the dotted line, L. The space included between those quarter circles, and denoted by I T, is the sweep for the piece 1; and we may cut it out for use as a template wherefrom to mark out piece 1. By setting the compasses in like manner for each respective piece, 2, 3, 4, and 5, we obtain the templates, 2 T to 5 T, respectively, for use in marking out the pieces upon the board from which they are to be sawn. In building the pieces up, we lay those forming the lower tier on the plan previously drawn out on the piece of board, putting them a little outside the lines to allow for finishing. We then temporarily fix them in that position, the faces being of course planed up. We now glue on the next tier. It is well, however, to have a semicircle made of a piece of thin wood and of the size of that shown in Fig. 143, by C E F, which we may place upright against the ends of the first tier as a guide in adjusting the position of the second and succeeding tiers. The num-

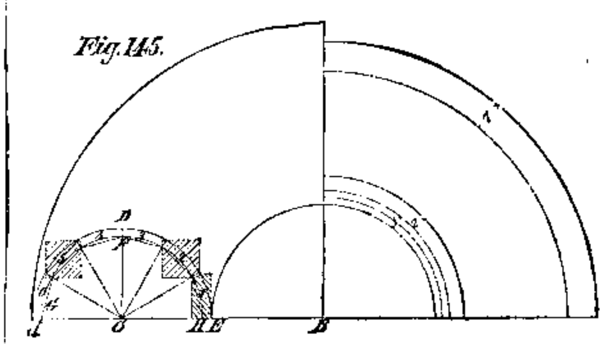
Fig. 144.



ber of tiers is discretionary; but it is well to have the top piece comparatively thick, so that it shall not be liable to curl, as it would be apt to do if the turning left it thin. If the joints of the tiers are well surfaced and well glued, neither nails nor screws will be needed. It is not compulsory to make each layer a continuous piece, and it will save stuff to make every alternate layer of two pieces; but the bottom and top layers are better if each be made in one piece.

It will be observed that this staving up a bend is both laborious and wasteful; yet there are cases in which it becomes imperatively necessary to make it in this manner. A very common job of this kind is lagging up a steam pipe, such as is shown in Fig. 144. The pipe is usually covered with felt or some other non-conducting material, and covered round with mahogany or walnut. Now it would be very unsightly to have the joints in the bend out of line with those on the straight part of the pipes. A hollow bend of wood has therefore to be constructed, having in it the same number of staves as there are for the straight pipe. To get out the pieces for such a bend, we proceed as illustrated in Fig. 145, in which there are shown 6 sections or staves, the semicircle, G H, representing the required inside diameter of the bend; while the semicircle, A E, represents the required outer diameter. We then divide off one of the semicircles into the required number of divisions; and we draw radii and then form rectangles around each division or space representing a stave, as shown by dotted lines in Fig. 145 at 2, 3, and 5. The method pursued in getting out these staves is precisely similar to that pursued in building up in our last example. In this case, however, as each stave is fitted to its fellow, it should be held to its place by dowels—that is, small pins of wire placed at frequent intervals, which will serve instead of glue, which would not answer by reason of the heat from the steam pipe. The disks upon which the bend is built, and of which there should be at least three, are merely temporary; and therefore the staves are not to be

Fig. 145.



fastened to them except for convenience, so as to keep them in position. For this purpose, a piece of paper with a little hot glue on each side should be placed between the stave and the disk; it will make a fastening sufficiently strong, if a little pressure be applied during the drying. Neither nails, screws, nor staples are admissible on this kind of job, as they would mar the appearance of the work when finished and polished. The two halves of the bend being completed, they are made to go together with loose pegs—that is to say, pegs that do not fit the holes tightly, as the dowels do. The halves should be held together by polished brass or plated bands; and the neatness of the finished appearance will amply repay the cost and trouble, for the polished wood forms a pleasing contrast to the contents of an engine room, where almost everything the eye can rest on is iron.