PRACTICAL MECHANISM.

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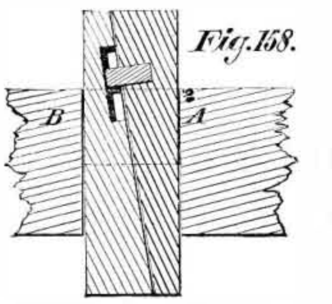
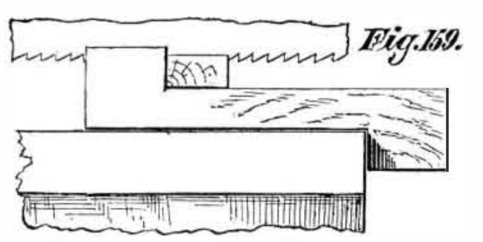
BENCH WORK.

Turningnow for a space from examples requiring so much lathe work, we come to deal more particularly with the bench and the devices and operations connected with it.

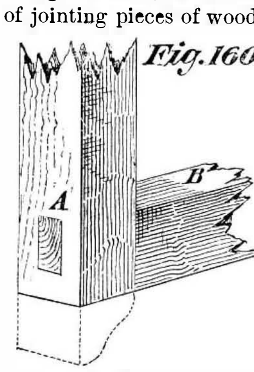
A good bench is a great assistance to a pattern maker. It should be perfectly true on its upper surface, which is best made of hard wood and covered with a coat of varnish to prevent dust or drippings of glue from adhering to it, so that it is always cleanly in appearance. The vise, when screwed close to the bench, should come level with its top, and the butt or stop for work to press against should be so constructed that its height may be readily altered, as this will have to be done perhaps fifty times a day. In the absence of a well contrived mechanical stop, which always admits of re-adjustment without stooping, I should recommend a stop of wood made by placing two wedges together, as shown at A and B, Fig. 158. A pin is fixed tightly in the wedge, A, which slides in a groove in B for a short distance; this prevents the wedges from falling apart when loosened. A light tap on B loosens, and one on A tightens, the stop. The ordinary contrivances used at the bench, in addition to the workman's tools, are the shooting board (already described), the mitre box, and the bench hook. The mitre box is a contrivance to enable a workman to saw mouldings, pipe patterns, etc., to an angle of 45° ; it is simply a trough with saw cuts made at the required angle. The stuff to be cut is laid

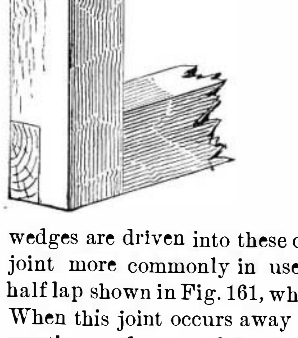


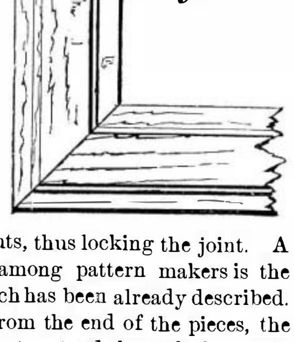


in the trough and pressed to one of its sides, the saw being guided by the saw cut. The bench hook is a piece of wood sawn to the shape shown in Fig. 159, and is used as a butt; for timber, in cross-cutting work, should not be sawn directly on the bench.

Figs. 160, 161, and 162 are illustrations of different methods of jointing pieces of wood together so as to form a square or any angle. Fig. 160 represents a tenon and mortise joint, made as follows: The two pieces, A and B, having been planed or otherwise made to size as required, are marked for the position and length of the mortise in one case, and for the length of the tenon in the other; both pieces are now gauged with a mortise gauge, both being marked alike; and then from the face side we mark a tenon or mortise of the size required, which is generally a third of the thickness of the stuff. Where the mortise approaches the end of the piece, a provision has to be made to insure strength by adding the extension denoted in Fig. 160 by the dotted lines. This practice, however, though often adopted in carpentry, is rarely admissable in pattern work; and in its stead, the tenon or the piece, B, is diminished in width, as shown in Fig. 163, the mortise being made to correspond. In order to avoid breakage during the cutting of the mortise, the piece, A, Fig. 160, is got out an inch or two longer, which excess is sawn off after the glue is dry; an excess of a $\frac{1}{4}$ to $\frac{1}{2}$ an inch should also be allowed on the tenon, as it is necessary to chamfer off the corners of the tenon so that in driving it may not damage the mortise. To prevent the tenon from, in time, working out, the mortise is slightly tapered; that is, made wider on the side remote from the piece carrying the tenon. Then the tenon is provided with two saw cuts, one on each side, near the edge; and after being driven home,

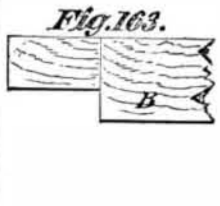


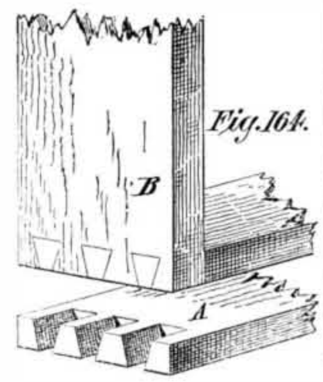




wedges are driven into these cuts, thus locking the joint. A joint more commonly in use among pattern makers is the half lap shown in Fig. 161, which has been already described. When this joint occurs away from the end of the pieces, the mortise need not, and should not, extend through the piece. This joint, besides being glued, may be fastened with screws, or, if very thin, riveted with short pieces of lead wire.

A very superior method of jointing is the dovetail, shown in Fig. 164, which is serviceable for connecting the ends and sides of a box, or any article in that form. The strength of the corner formed in this way is only limited by that of the

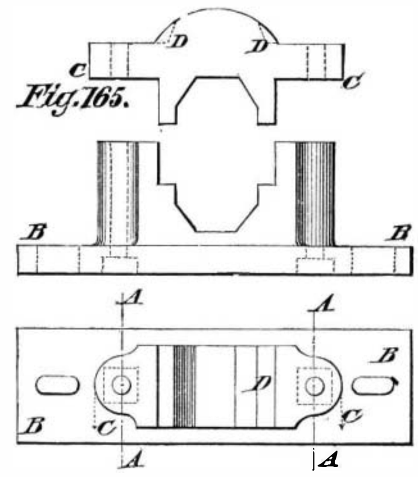




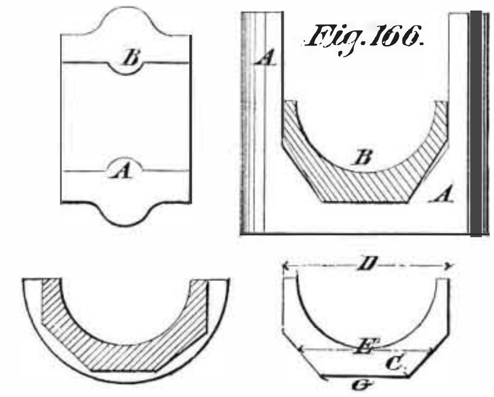
material itself; therefore it should be preferred when available in making standard patterns, or for work too thin to admit nails or screws; the corner formed by this joint is not limited to 90° or a square, so called, but may form any angle. Nor is it imperative that the sides or ends of the box or other article be parallel. They may incline towards one another like a pyramid; a mill hopper is a familiar example of this. If it be required to dovetail a box together, get out four pieces for the sides and ends, to be of the full length and width of the box outside, respectively. They are to be planed all over, not omitting the ends. The gauge, that is already set to the thickness of the stuff, must now be run along the ends, marking a line on both sides of each piece. Then mark and cut out the pins as on the piece, A; the dovetail openings, in B, are traced from the pins in A. The pieces, having been tried and found to go together, are finally brought into contact and held in their places with glue.

Fig. 162 is a mitre joint, the only one serviceable to mouldings, pipes, and other curved pieces. It is not a strong form of joint, and is only used where the preceding kinds are inapplicable. It is made with glue, the pieces having been previously sized; and as an additional precaution, if the work will admit, nails, brads, or screws are inserted at right angles to one another.

As an example, to make the pattern for a pillow block, as shown in Fig. 165. This pattern will be more easily moulded with the base up; that is to say, it will lie in the sand in the reverse position to what it is drawn in Fig. 165. Prints will be required for the bolt holes, square prints for the recesses in the block intended to be cored out to receive the heads of



the cap bolts, and round prints on the tops of the cheeks and oval prints on the base. We first plane a piece for the base, B B, to the correct size, allowing $\frac{1}{16}$ inch to the foot for the contraction of the casting in cooling. We next draw center lines upon it on both sides. It must now be observed that a hollow or filleted corner appears where the cheeks of the block meet the base; and, further, that the recess in the block to receive the brasses is drawn to a depth coinciding with the height of the hollow or fillet. It will be advisable, therefore, to prepare a piece of the length from C to C, and to shape the ends to the outline of the cheeks, and, forming in this piece all the fillet, the cheeks may next be prepared of a thickness from the line, A to D. These must be strongly fastened, and are best mortised clear through the base, and glued fast. Two semicircular pieces must be turned for the portions outside the lines, A A, and three-cornered pieces must be fitted in the square recess to make it octagonal as required. Nothing now remains but to attach the core prints and make a suitable core box. A half box will suffice for the cap bolt holes, and a whole one for the holes in the base, as the cores for these latter will stand on end. To make the cap, we take a piece of timber large enough to make that portion of the cap that is above the line, C C; and we line or mark out the form of the cap on both sides (using a center line to make the marking on the two sides correspond), and pare away the surplus wood down to the lines. The pieces below the line, C C, are to be afterwards glued and nailed on. It is advisable to cut out a recess in the top of the cap, as shown in Fig. 166 at A B, to afford convenience to the machinist in using the wrench upon the nuts. Fig. 167 is a sectional view of a pattern for the brasses; and this pattern requires great care in its making, for the following reasons: Brasses of this kind, and of a size not larger than is required for a journal about ten inches in diameter, can be fitted in much quicker by chipping and filing than by any other method; and in any event, a great deal of labor and metal can be saved by constructing the pattern of the necessary shape. Since, however, to give the required shape without the reasons therefor would not convince the reader of the correctness of the method, I will fully explain the two. It has been stated in former remarks that brass castings are smaller than the patterns from which they are cast by an amount of $\frac{1}{8}$ inch per foot, which is due to the contraction of the metal in cooling. Now, in addition to this contraction, the casting of a brass also contracts across the bore. Suppose, for example, that, in Fig. 166, A A represents a locomotive axle box, and that B represents the brass for the same, the two being shown in section, while C represents the casting for the brass. Beginning, then, with the casting, C, we have the following considerations: The diameter of the brass across D will be less than it should be, because such castings always close in that direction more than is due to the contraction in cooling. As a consequence of this, the top of the bevels, as denoted by the dotted line, E, becomes less than it should be; and when the brass is fitted on the sides and let



down in the box ready to fit on the crown and on the bevels, the bottom of the brass will bed and the bevels will not, as shown in the illustration. Now, supposing the angles to be at the top $\frac{1}{16}$ of an inch from the bevels of the box, then it will require about $\frac{1}{8}$ of an inch to be taken off the bottom of the brass to let the sides come to a fit, whereas if, when the bevels of the brass contact with the bevels of the box, the bottom of the brass were $\frac{1}{8}$ inch from the bottom of the box, $\frac{1}{16}$ inch taken off the bevels would let the bottom come home. It is then easy to see that the pattern maker should make the pattern so as to allow for the shrinkage across D, and at the same time insure that the bevels of the brass shall contact with the box before the bottom does. Then by the time that the machinist has taken sufficient off the bevels of the brass to fit them to the bevels of the box, the crown will come home, and the best way to insure this is to make the bevels of the brass of the same shape as those in the box, and then take a certain amount off the crown face of the brass (G in Fig. 166). What this amount should be depends upon the angle of the bevels; for bevels of 45° the proportions should be, for brasses of two and less inches bore, a full $\frac{1}{32}$ inch; for brasses having a bore of from two to four inches, $\frac{1}{16}$ inch will answer; while, if the bore is from four to seven inches diameter, $\frac{1}{8}$ inch will be a good proportion. If, however, the bevel is greater, these proportions may be increased. This is an important matter, and should never be overlooked or neglected, since it reduces the labor of fitting the brasses by at least one half.

Roumanian Amber.

According to H. Biziste, of Bucharest, Roumanian amber differs totally from the German amber found on the shores of the Baltic Sea. Both are the fossil resins of antediluvian trees and agree in chemical composition, but differ in color. German amber is found only of light colors—yellow, white, and pink—while Roumanian amber is red, pink, brown, blue, green, and black. These colors are frequently found mixed in a single piece, and we also have lumps with silver-colored veins and gold specks. On account of this variety of colors, the Roumanian amber is highly esteemed, and the darker and more beautiful pieces are more costly than yellow amber, especially as they are more rare.

German amber is found in the sea or in alluvial earth; the Roumanian amber is only found in mountainous places and highlands, where it is sought and dug out by the peasants. The collection of amber languishes, or, more properly speaking, is never conducted in a rational manner. The peasants being ignorant, and lead only by instinct, dig here and there, wherever they guess that amber is to be found. Formerly, this amber was found in larger quantities, and also in much larger pieces than at present. Biziste is of the opinion that if the search for amber and its collection should be carried on in a scientific manner, by competent judges, it would prove remunerative. At the Vienna Exhibition, Biziste took a diploma for a beautiful collection of cigar holders, ornaments, etc., made of black amber.

SALICYLIC ACID AS A SYRUP PRESERVATIVE.—M. Lagoux, after a series of experiments to determine the minimum percentage of salicylic acid to be added to fruit syrups to prevent fermentation in hot weather, reports the proper quantity of acid to be equal to $\frac{1}{1000}$ the weight of the sugar contained in the syrup.