G; the oil passes down the hole M through the step on to the shaft; to distribute the oil over the neck of the shaft, *oil-ways* N (see also figs. 188, 189, Plate XXV.) are cut in the steps. For millwright purposes there is generally a packing of wood inserted between the base-plate and the frame, to which it is connected, as shown in Plate XXVI.; but for many purposes this lining of wood is not employed, as the object is to get a rigid connection between the pedestal and the frame, corresponding as nearly as possible to the case where the pedestal and frame are cast together. Where the wood packing is not used, the whole of the bottom surface is *planed*, or more commonly *chipping-pieces* H are cast to the base-plate, so as to reduce the amount of surface to be planed or chipped; the chipping-pieces are shown in dotted lines, their width and depth vary according to circumstances, from $\frac{1}{4}''$ to $1''$ wide and $\frac{1}{8}''$ to $\frac{1}{2}''$ thick.

To allow of a slight change of position of the pedestal, and for convenience in fixing, the holes K through which the bolts E pass are elongated, as shown in fig. 178; after the exact position has been determined, pieces of hard wood or metal are inserted at the ends, between the base-plate and the *lugs* on the frame, to prevent the possibility of the pedestal moving lengthwise. The body and base-plate are made of cast-iron and are cast together, the cap is also cast-iron; the steps are usually made of brass, but the top step is often made of cast-iron; the bolts are made of wrought-iron, those for the cap are $\frac{1}{2}''$ diameter, and those marked E are $\frac{5}{8}''$ diameter. The dimensions for the body, cap, and steps, are marked on the figures in Plate XXV.; the radii of the circular arcs are also shown, which should be the case in all working drawings. On each side of the cap and body of the pedestal are facings O, whose surfaces are in contact with the *flanges* P of the steps. The body of the steps is cylindrical, but thicker at the bottom and the top than at the sides, as shown in figs. 187 to 189; chipping-pieces Q are cast at each end next to the flanges. The space between the steps is to allow of their being brought together as their inner surfaces wear; the space between the cap and the body of the pedestal is for the purpose of regulating the position of the top step.

102. The figures on Plates XXIV. and XXV. the student will be able to draw without any special instructions, excepting perhaps the curve $a'b'a'$, fig. 179, which is the intersection of the cylindrical part *aba*, fig. 178, of the body of the pedestal with the interior of the cylindrical surface *cd*, $c'd'$. Figs. 180 to 183 show half the curve drawn full size; the method employed is similar to that used in former figures, and the construction lines show clearly how the curve is determined. If the angles at *a*, fig. 178, are filled-up, as is shown in dotted lines on the left-hand half of the figure and in fig. 191, there would be no line of intersection, and we should have the end-elevation as represented in fig. 192.

103. In Plate XXV., fig. 184 is a front-elevation of the pedestal with the steps and bolts removed; fig. 185 is a plan of the same with the cap removed; and fig. 186 is a plan of the cap. In figs. 184, 185, we have shown the chipping-pieces H on the base-plate. The steps are shown in figs. 187 to 189; the left-hand half of fig. 187 is in section; fig. 188 is a plan of the top step, showing the oil-hole, the oil-ways N, and the chipping-pieces Q; fig. 189 is a plan of the bottom step, showing the inside in full lines. The cylindrical surfaces of the steps are not concentric, on account of the difference in the thickness of metal at the bottom and at the sides; for small steps this difference is not always taken into account, the thickness at the sides being made the same as at the bottom. Figs. 177 to 179, and 184 to 189, are drawn to a scale of $\frac{1}{2}$; figs. 180 to 183 are drawn full size.

104. The usual proportions for the several parts are as follow*:—

The diameter of the neck	= D
Thickness of base-plate	= D × ·3.
Thickness of cap	= D × ·4.
Diameter of bolts (if 2 used)	= D × ·25.
Ditto (if 4 used)	= D × ·18.

Thickness of metal at bottom = 0·15″ + from 0·09 to 0·12 × D.
Thickness of metal at sides = ·75 of thickness at bottom.

105. In Art. 96 we stated the purpose for which *finished drawings* are usually made; there are several kinds of such drawings, but we shall confine ourselves to simple line drawings. The object for which the drawings are required must decide what kind of drawing is to be made; if there is a good scale working drawing of the whole machine, then the finished drawing may be simply an outline drawing without dotted lines, the lines may be all of the same thickness, or shade lines may be added according to taste. If however the drawing is required for general reference, then the dotted lines should be shown; the teeth of wheels should also be shown, and the centre lines omitted in all such drawings.

As an example of the former kind of finished drawings we have shown the pedestal, figs. 190 to 192, Plate XXVI. In this example shade lines are used as explained in Arts. 96 to 99. As there are no lines introduced but what have been explained, the student should have no difficulty in drawing the figures.

106. We have given in Plates XXIV. and XXV. examples of working drawings, as explained in Art. 100, page 75; we shall now give further examples of such drawings, including those for the smith. The object selected for the examples is the *Slide-Rest of a Horizontal Boring and Surfacing machine*, made by Messrs. Fairbairn, Kennedy, and Taylor, Leeds. In this example we shall treat of the colouring of working drawings, and one of the plates, showing a section, will be coloured.

In making working drawings, the draughtsman must exercise his judgment by selecting such plans, elevations, sections, and details, as will best explain the form and arrangement of every part of the machine which he wishes to represent; and, in addition, the drawings should show the extreme positions of each of the moving pieces.

In making sections, it is sometimes convenient to assume the object cut by a number of section planes, all the sections thus made being projected upon one view; that is to say, instead of making one section of the whole object, two or more sections are made of different parts, and each of these projected upon one view. All such sections should be made by parallel planes, and the position of each should be indicated by lines in the view of the object from which the sections are projected. By this means we can show the parts we wish, without making separate views for each section; however, there is a limit to the number of sections, and in no case should they be so numerous as to destroy the simple and correct reading of the drawing.

In the following example we shall show, by a simple case, a sectional elevation upon which are projected sections made by three different planes (see fig. 197, Plate XXVIII).

107. Slide-Rest.—In all Machine Tools there is employed a cutting instrument or *tool*, and the positions and motions of this tool depend upon the kind of work

* Taken from Molesworth.