Machine Construction & Drawing.

(From *Collin's Elementary Science Series.*)

(Continued from page 60.)

22. Rivets.—Another method of connecting two pieces is given in figs. 52, 53, illustrating a *single riveted lap-joint*, as used for boilers, &c. Rivets are used where the pieces are not required to be separated, and where the nature of the material will permit of the process of riveting. We may say, speaking generally, rivets are used to form a permanent connection, and bolts a temporary one. There are also other considerations besides these which determine the method to be adopted. The *lap* is the distance *a*, the *pitch* *p* is the distance of the rivets apart from centre to centre. Fig. 52 is a front elevation; on the right of the line *bc*, the rivets are shown in section. Fig. 53 is a cross-section through *bc* in fig. 52.

Figs. 54, 55, show two views of the rivets used in the example given in figs. 52, 53, before they are heated and fixed in position; allowance is made in the length *l* for the head *d*, fig. 53.

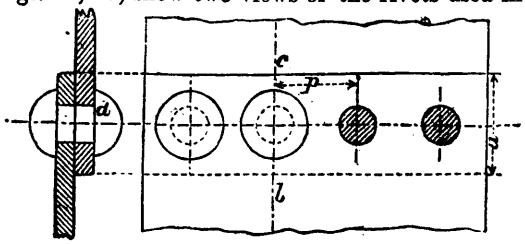

Fig. 53. Fig. 52.

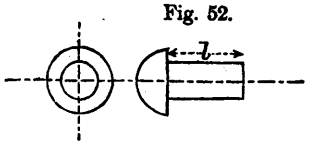

Fig. 54. Fig. 55.

23. Shafting.—Shafts are used for the purpose of transmitting motion; they are provided with wheels, pulleys or drums, cams, &c., according to the kind of motion required, and are generally made of a circular cross-section, in some cases the section is square or of other form. The material chiefly used is *wrought-iron; cast-iron* and also *steel* are, however, in some cases employed. The relative strength of shafts varies as the cube of their diameters; that is to say, if a shaft of 2 inches diameter is strong enough to transmit four horse-power, then one four inches in diameter, under the same conditions, would transmit thirty-two horse-power.*

24. The wheels, pulleys, &c., are firmly connected to the shafts by means of *keys*, which are pieces of metal, generally steel, of a square or rectangular cross-section, and slightly taper in direction *de*, fig. 56, to admit of being driven *home* tight; they should fit easily on the sides of the *key-bed* or *key-way*. In some cases the key is required to slide along the groove in the shaft with the wheel, the key being fixed to the wheel. Figs. 58, 59, illustrate one method of doing this, the key being *dove-tailed* into the *boss a* of the wheel. In the example shown in figs. 56, 57, the key has a *head f* to allow of its being *drawn*. Fig. 56 is a sectional elevation, with part of the shaft in section, so as to show the key in full. Fig. 57 is an end-view.

Figs. 58, 59, are similar views of the dovetailed key arrangement; fig. 58, a sectional elevation, fig. 59 an end-view. The boss of the wheel is marked *a*, the shaft *b*, and the key *c*. Scale ¼ for both examples.

KEYS FOR SHAFTS.

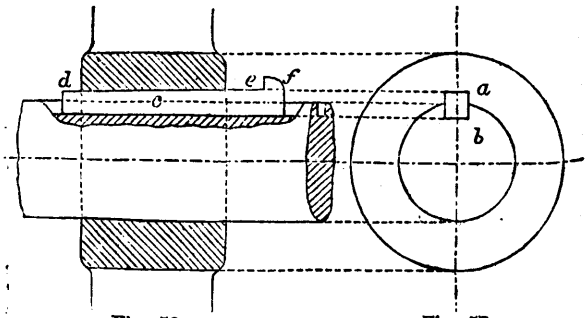

Fig. 56. Fig. 57.

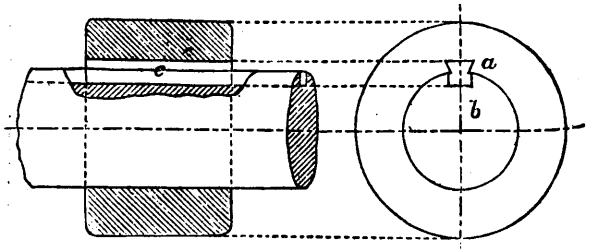

Fig. 58. Fig. 59.

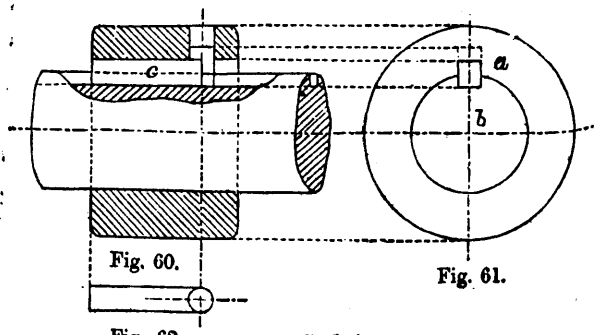

Fig. 60. Fig. 61.

Fig. 62. *Scale ¼.*

25. Another form of sliding key is shown in figs. 60, 61, 62; the key has a head which fits into a circular hole in the boss of the wheel. Fig. 62 is a plan of the key.

26. Fig. 63 is a front-elevation, and fig. 64 an end-elevation, of an ordinary shaft; if the length is such that it cannot be shown in full according to scale, it is *broken off*,† as at *ab*, and the length is marked in figures, as shown. Projecting cylindrical pieces *cc*, termed *collars*, are *welded* to the shaft, their object is to prevent the shaft from leaving the *bearings* in direction of its length. The portion between the collars is called the *neck*, and is supported in an accurately fitting surface termed a *bearing*. The length of the neck is generally made 1½ times the diameter of the shaft, for shafts under 6 inches diameter; some makers allow as much as two diameters, and in special cases even more than this.

*If d = dia. of the first shaft (2 in.), h = horse-power transmitted, d' = dia. of the second shaft (4 in.), h' = horse-power transmitted;

Then $h : h' :: d^3 : d'^3$

$4 : h' :: 8 : 64$

$h' = 32$

† This is the usual way of representing parts of machinery, which, for the reason stated, cannot be drawn in full.