the drill with which they are intended to be used. They are then split longitudinally with a saw for about three fourths their length. The pieces C, when once prepared, will always answer for the same sized drill; they may also be used with an ordinary chuck having a set screw.

Fig. 5.

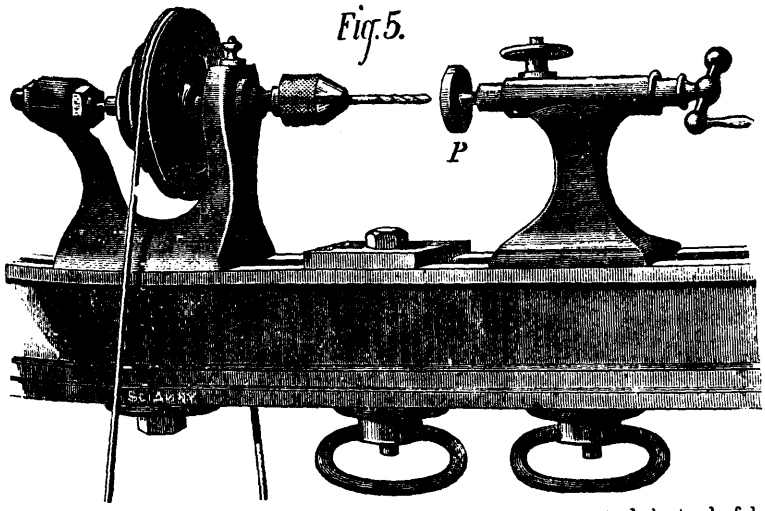
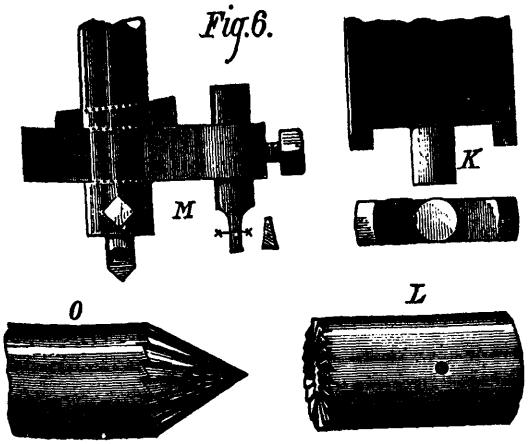


Fig. 6.



DRILLS AND ROSE BIT.

The fluted countersink, O, may be classed among the drills; its special application is to form the centers of articles to be turned. It has the same forms as the lathe centers, and makes a truly circular conical hole, providing the number of flutes or cutting edges is odd.

Every lathe should be provided with a plate, or drill rest, P, fitted to the tail spindle, for supporting plain work while drilling it. The lathe should also have a hinged or pivoted rest, Q, which may be clamped at any desired angle for drilling irregular work. This plate should have several perforations for receiving pins, for preventing the work from slipping. For supporting cylindrical objects to be drilled transversely, a fork, R, is inserted in the tail spindle.

As to the matter of drilling, little need be said, as nearly everything must be learned by experience; however, a few points may be mentioned. The work should be carried forward with a regular and not too heavy pressure. The speed of the drill will vary with the material being worked. For steel, wrought iron and copper, the speed should be slow; for brass and cast iron, it may be quite rapid. In drilling steel or wrought iron, oil is the best lubricant for the drill; in drilling glass, the drill should be wet with turpentine, to which gum camphor has been added; the drill may be used dry in drilling brass and cast iron.

A Ball Safety-Valve.—A recent English invention has for its object the adaptation and application to steam-boilers of an entire ball, for the purpose of a safety-valve for the escape of steam as required, such valve being capable of being moved repeatedly, so as to present a fresh face to the seating, and thereby economize the use of the valve. And his invention consists in the use of a ball made of brass, or other suitable material, resting on a seating of steel or other suitable metal or substance harder than that of the ball, and pressed down as required on to the seating by means of a weighted frame capable of swinging freely on the ball. This ball is sufficiently large in diameter to admit of its being moved a number of times on its seating, so as to present each time it is moved a fresh face to the seating, no one face intersecting another. The ball may also be moved at convenient intervals before being worn on any one face. The valve or ball is weighted with ordinary dead weights, but the frame by which the weights are suspended, instead of being fast to the valve, as usual, is made to swing freely on the ball at the top by means of a center piece of suitable concave form, lined with soft metal or other suitable material, to prevent injury to the ball.

Iron Galvanizing Furnace.—In galvanizing iron the main point to ensure a uniform coating of zinc is the maintenance of a thin bath of metal. Unfortunately the zinc absorbs iron, thickens, and as the temperature must be rapidly raised, when it does so this absorption goes on increasing until the metal is unfit for further use. This is aggravated by the fact that the metal is melted in cast or wrought-iron vessels heated from below. *Iron* says that in order to avoid the disadvantages of iron vessels, and yet retain ample working space above the surface of the metal, F. A. Thum, of Laubach, Germany, has constructed a furnace resembling somewhat a reverberatory furnace. It has a fireplace and a chimney at each end, the part of the hearth connecting the two being arched over. The rest of the rectangular hearth is perfectly open above, so that the heat-conducting power of the metal is relied upon to keep it at the proper temperature in that part of the hearth. The slabs of fresh zinc are introduced through doors communicating with the hot ends. The staying of the furnace has to be very strong, in order to prevent any accidents to the arching over the ends of the hearth.

Babbit Anti-Friction Metal.—This metal is made of 1 part copper, 3 parts tin, 2 parts antimony and 3 parts more tin are added after the composition is in the molten state. This composition is called hardening, and when the metal is used for filling boxes, 2 parts tin are used to 1 of hardening. The above alloy constitutes the best anti-attrition metal in use, but on account of its expense it is very little used.

Dynamite and Water.—It has recently been shown that if dynamite is poured into water, the sand falls to the bottom and the nitro-glycerine floats on the surface, and explodes with its usual violence if the temperature is slightly increased. This will explain the cause of many of the serious explosions with dynamite when used in wet holes.

All Steel Bridge.—The *American Manufacturer* says:—The new steel bridge which is being erected for the Chicago and Alton Railroad over the Missouri River at Glasgow, Mo., is to have five spans, and is to be entirely of steel made by the Hay process. Not even a nut is to be made of iron. This is believed to be the first large bridge ever built in which steel alone is used.

"Slag wool," produced, as a fine fibre of silica, by blowing steam through the slag of the iron furnaces, has been woven by Messrs. Jones, Dade & Co., into strips and sheets. This non-conducting substance can now, therefore, be very generally applied for clothing boilers or the conducting steam pipes of machinery.