F. P. LOVEJOY.

METAL WORKING TOOL.

APPLICATION FILED DEC. 13, 1916.

1,222,643. Patented Apr. 17, 1917.

FIG. 1.

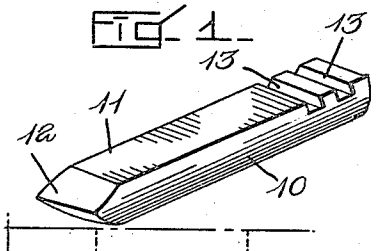


FIG. 2.

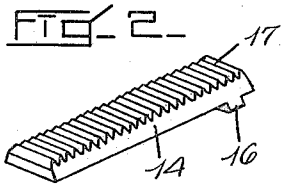


FIG. 3.

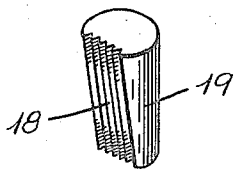


FIG. 4.

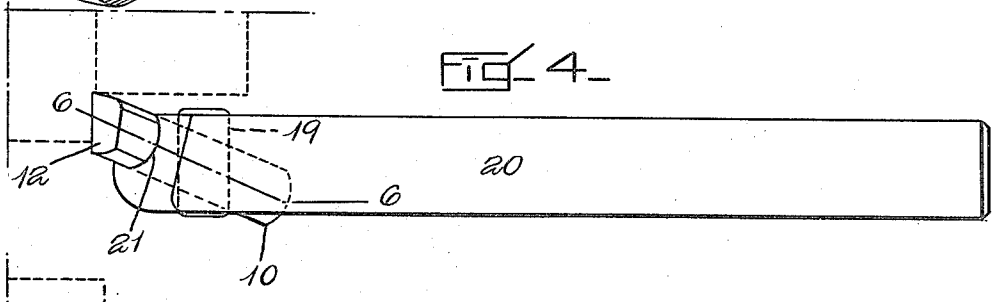


FIG. 5.

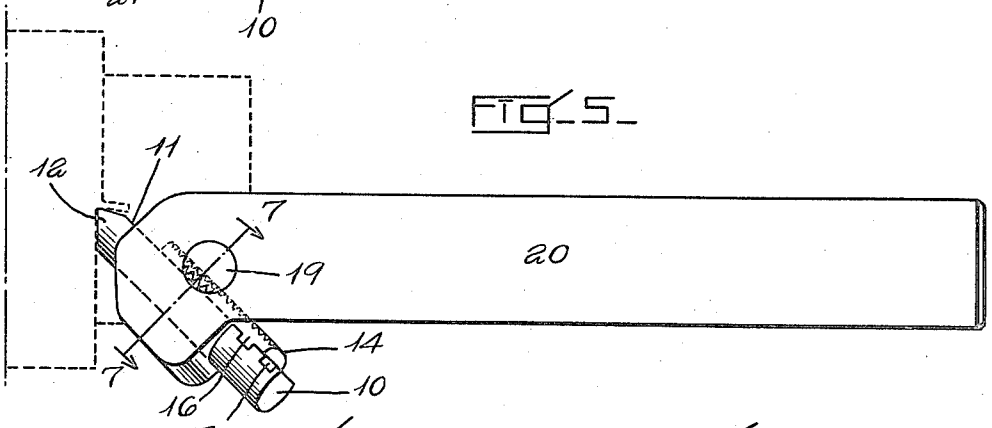


FIG. 6.

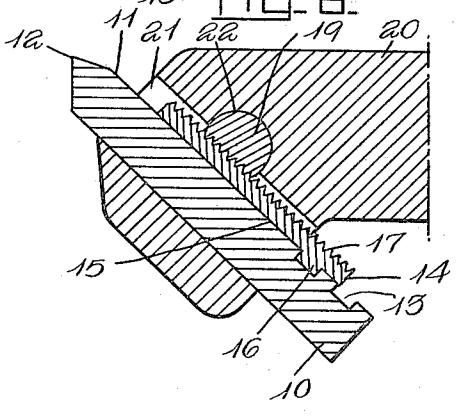
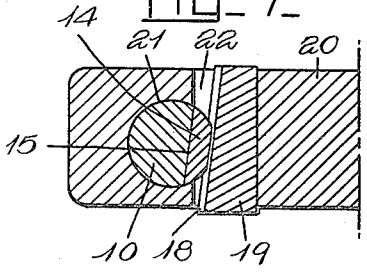


FIG. 7.



INVENTOR:
FRED P. LOVEJOY
by. Wright Brown Quinby & May
ATTORNEYS

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRED P. LOVEJOY, OF SPRINGFIELD, VERMONT.

METAL-WORKING TOOL.

1,222,643. Specification of Letters Patent. Patented Apr. 17, 1917.

Application filed December 13, 1916. Serial No. 136,647.

To all whom it may concern:

Be it known that I, FRED P. LOVEJOY, a citizen of the United States, residing at Springfield, in the county of Windsor and State of Vermont, have invented new and useful Improvements in Metal-Working Tools, of which the following is a specification.

This invention relates to metal-working tools, and its object is to provide improved means for securing a cutter or cutters in a holder.

The invention embodies all the principles exemplified in my Letters Patent of the United States, No. 1,197,136, granted September 5, 1916, and in addition thereto it embodies other improvements. Referring to the aforesaid patent, the cutter is secured in a holder by a cylindric cotter, and the cutter and cotter are formed with coöperative ribs adapted to be interlocked, the cutter having a greater number of locking ribs than the cotter, to afford lengthwise adjustment of the cutter relatively to the cotter and holder. These ribs are preferably small and closely related, to afford relatively fine degrees of adjustment of the cutter, and when the cutter is made of steel that is not exceedingly hard it is possible to form the ribs thereon by cutting them before the cutter is finally hardened. For some kinds of work, however, it is necessary to make the cutter of exceedingly hard steel, and in such cases it is impossible to form the ribs thereon by cutting. Such ribs can be formed only by grinding. The operation of grinding the ribs is comparatively difficult and expensive, because it requires a great deal more time to grind them than to cut them, even when cutting is possible.

I therefore interpose between the cotter and cutter a locking shoe made of steel that is susceptible of being cut to form the fine ribs that coöperate with the ribs of the cotter, and provide the cutter with one or more transverse grooves adapted to receive a relatively coarse tongue formed upon the contiguous face of the locking shoe. In this case the groove that is formed in the cutter may be formed by grinding; and if more than one such groove is provided, they will be a relatively great distance apart in comparison to the spacing of the coöperative ribs that are formed upon the shoe and cotter. In the majority of cases it would be sufficient to form only two grooves in the cutter, to receive the tongue of the shoe, and such grooves would afford the necessary degree of adjustment of the cutter relatively to the shoe to compensate for shortening of the tool as the latter is worn and resharpened, the relatively fine coöperative ribs of the shoe and cotter being sufficient to afford all the necessary fine adjustments of the cutter relatively to the holder.

Of the accompanying drawings, which illustrate the invention embodied in what I now consider the preferred form:

Figure 1 represents a perspective view of the cutter.

Fig. 2 represents a perspective view of the locking shoe for the cutter.

Fig. 3 represents a perspective view of the cotter that coacts with the locking shoe.

Fig. 4 represents a top plan view of an assembled tool ready for use, a portion of a piece of work in position to be turned being indicated by dotted lines.

Fig. 5 represents an elevation of the assemblage shown by Fig. 4.

Fig. 6 represents a sectional view, on a larger scale, through the structure intersected by line 6—6 of Fig. 4.

Fig. 7 is a sectional view through the structure intersected by line 7—7 of Fig. 5.

The same reference characters indicate the same parts wherever they occur.

The cutter 10 is made of a cylindric piece of steel, and is formed with a flat face 11 that is arranged in a plane parallel to the axis of cylindricity. The forward or cutting end of the cutter is indicated at 12. One or more transverse grooves 13, in the present instance two, are formed in the flat face 11, preferably as near the rear end of the cutter as may be convenient, the arrangement near the rear end being preferred for the reason that the cutter will not be appreciably weakened thereby. These grooves are preferably rectangular in cross section, and each is wide enough to receive a tongue of sufficient size and strength to sustain the cutter against the stresses encountered while the cutter is operating.

The locking shoe 14 is formed with a flat face 15 (see Fig. 7) that is adapted to bear on the flat face 11 of the cutter. A transverse tongue 16 of rectangular cross section is formed upon the face 15 of the shoe and is adapted to fit in and conform to either of the grooves 13 of the cutter. By shifting the shoe and cutter relatively to each other

to transfer the tongue 16 from one groove 13 to the other, a relatively coarse adjustment may be obtained. This means of adjustment is desirable to advance the cutter relatively to the shoe, to compensate for the shortening of the cutter due to wearing and resharpening, and the final adjustments of the cutter are obtained by the relatively fine and closely related ribs 17 of the shoe and by the coöperative ribs 18 that are formed upon the cotter 19.

The cotter and shoe have, conjointly, a substantially cylindric formation, whereby they are adapted to lie in contiguous relation in, and conform to, a cylindric socket that is formed in the holder 20 for their reception. This conjoint cylindric formation is shown best by Fig. 7. The socket just referred to is indicated at 21 in Figs. 6 and 7. The cutter and shoe may therefore be moved longitudinally and rotatively in the socket 21 without sacrificing the close fit, relatively to the holder, that is necessary to avoid chattering when the tool is operating.

The cotter 19 is made from a cylindric piece of steel, and its ribs 18 extend substantially lengthwise thereof, and they are arranged in a plane that is at a slight angle relatively to the axis of the cotter, thereby producing a slight wedge-like formation without any conicity of the cotter. The holder 20 is provided with a cylindric socket 22 for the reception of the cotter. The sockets 21 and 22 intersect each other, and their axes are substantially at right angles but eccentric in their relation to each other. When the parts are assembled as shown by Figs. 4 to 7 inclusive, the cotter may be driven in as far as necessary to become tight with relation to the locking shoe and to produce a tight clamping action of the cutter relatively to the holder, in addition to the positive interlocking that occurs between the cotter and shoe and between the shoe and the cutter. The cutter and shoe are capable of turning about their common axis to enable the locking ribs 17 of the shoe to assume parallelism in relation to the locking ribs 18 of the cotter. The fact that the cotter and its socket 22 are cylindric, and the fact that the cylindricity of the cotter conforms to that of the socket, enable the cotter to advance into the socket as far as may be necessary to secure the cutter without causing any binding of the cotter relatively to the holder, excepting the binding that is caused by the coaction of the cotter with the shoe. In this respect the tool embodies the same principle as that explained in my said patent, in which the cotter bears directly upon the cutter instead of upon an intervening shoe.

It is desirable, for economy in manufacturing, to make the shoe and cotter of steel that is soft enough to be cut to form the locking ribs 17 and 18. In addition to such economical advantage there is the other advantage that the shoe and cotter will bind more securely one upon another than if they were made of exceedingly hard steel, thus making the assemblage more nearly integral in effect than would otherwise be possible. The cutter, however, may be made of the hardest kind of steel obtainable, for even if it had only one groove 13 it would have the advantage of all the relatively fine adjustments afforded by the interlocking ribs of the shoe and cotter. It will be observed that the shoe has a larger number of ribs 17 than the number of ribs formed upon the cotter, thus giving the shoe and cutter collectively a relatively long maximum range of adjustment.

Another advantage gained from using the interposed shoe is that the liability of breaking the cutter by driving the cotter too tightly is avoided. The shoe has a relatively long bearing on the cutter, and the cutter has a relatively long bearing in the holder, in comparison to the bearing that the cotter has upon the shoe, and however hard and brittle the cutter may be it will not be liable to being broken by driving the cotter too tightly.

Although I have illustrated and described the cutter, shoe, and socket 21 as being cylindric in the preferred form of the invention, it will be readily understood that the advantages gained by the interlocking formations of the cutter, shoe, and cotter are not dependent upon such cylindric formation, for if the socket 21 were of some other shape in cross section and the conjoint formation of the cutter and shoe conformed to such other formation, the net result, so far as the present improvements are concerned, would be the same. It may be remarked, however, that in most cases it is more economical to use the cylindric formation, for the reason that the socket 21 may be formed by boring, when it is to be cylindric, whereas a more expensive operation than boring would be necessary if some other form were adopted.

My patent hereinbefore referred to shows a boring and reaming head in which a plurality of cutters are arranged in a circular series and locked independently of each other by separate cotters, and it is to be understood that the present improvements that involve the use of the interposed locking shoe are adapted to be used in such cases as when a plurality of cutters are mounted in one holder and arranged in a circular series.

I claim:

1. A metal-working tool comprising a holder having a cutter-receiving socket, a cutter and a locking shoe therefor having, conjointly, a cross-sectional form that conforms substantially to that of said socket, said cutter and shoe having confronting

bearing faces extending longitudinally thereof and having a transverse tongue and groove arranged to fit, one in the other, to afford interlocked relation, said holder having a cotter-receiving socket extending substantially at right angles to and intersecting said cutter-receiving socket, said sockets being eccentric as to each other, and a cotter conforming in cross section to said cotter-receiving socket and having a series of closely related locking ribs extending lengthwise thereof, said ribs being arranged to bear upon said shoe, said shoe having a series of ribs arranged to fit between said ribs of said cotter to lock said cutter rigidly to said holder, said ribs enabling said shoe to be interlocked with said cotter in a plurality of relative positions, to afford longitudinal adjustment of said cutter relatively to said holder.

2. A metal-working tool comprising a holder having a cutter-receiving socket, a cutter and a locking shoe therefor having, conjointly, a cross-sectional form that conforms substantially to that of said socket, said cutter and shoe having confronting bearing faces extending longitudinally thereof and having interlocking formations, said holder having a cotter-receiving socket extending substantially at right angles to and intersecting said cutter-receiving socket, said sockets being eccentric as to each other, and a cotter conforming in cross section to said cotter-receiving socket and having a series of closely related locking ribs extending lengthwise thereof, said ribs being arranged to bear upon said shoe, said shoe having a series of ribs arranged to fit between said ribs of said cotter to lock said cutter rigidly to said holder, said ribs enabling said shoe to be interlocked with said cotter in a plurality of relative positions, to afford longitudinal adjustment of said cutter relatively to said holder, said interlocking formation of said cutter and shoe comprising a transverse tongue and a plurality of transverse grooves each adapted to receive said tongue, whereby said cutter is adjusted relatively to said shoe.

In testimony whereof I have affixed my signature.

FRED P. LOVEJOY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."