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PIPE OR TUBE CUTTER.

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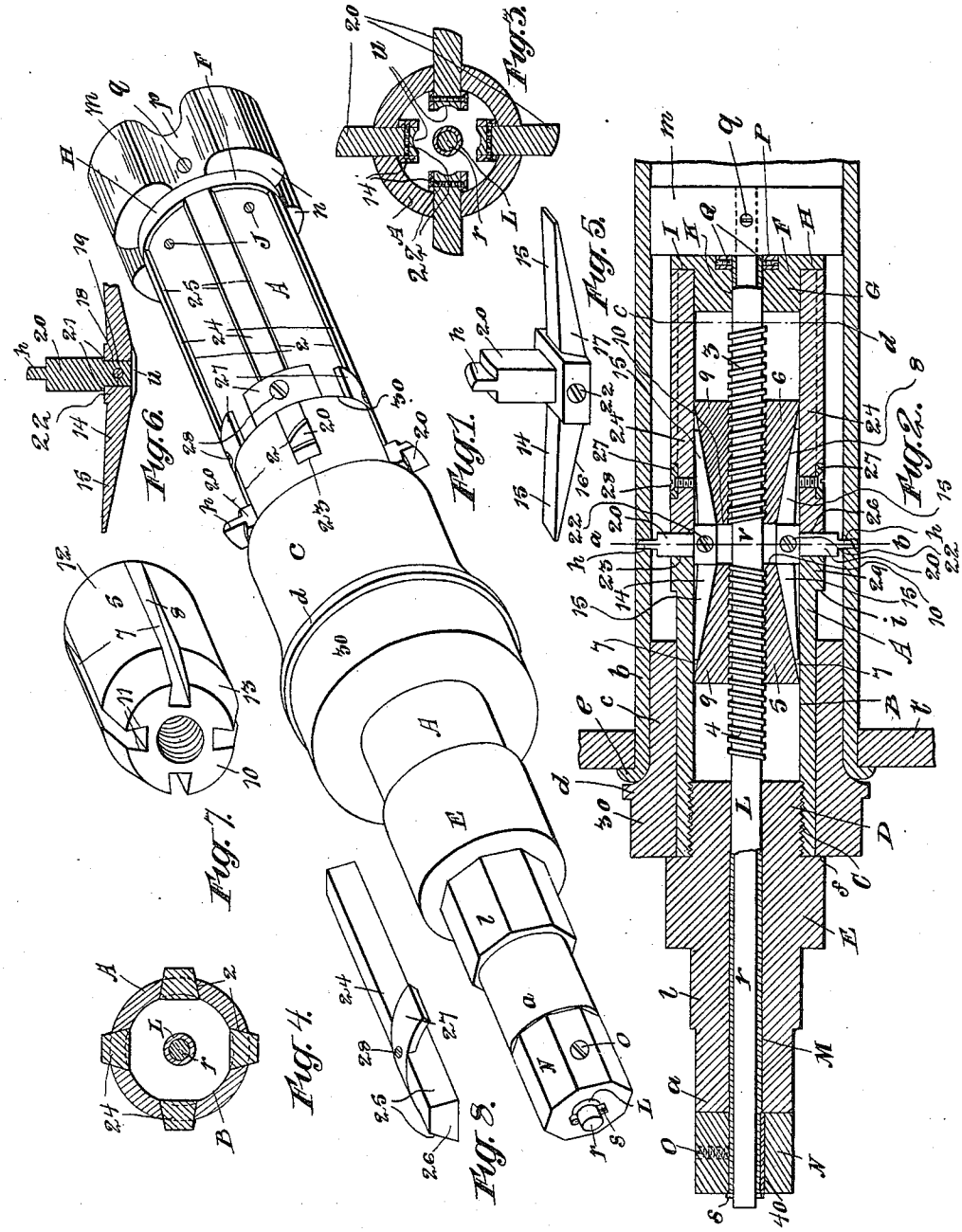

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PIPE OR TUBE CUTTER.

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Application filed June 15, 1912. Serial No. 703,810.

To all whom it may concern:

Be it known that I, WILLIAM THOMAS RAMAGE, of the city of Toronto, county of York, Province of Ontario, Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Pipe or Tube Cutters, of which the following is a specification.

My invention relates to improvements in pipe or tube cutters, and more particularly to that class of tool known as an "inside" cutter, and the principal object of my invention is to provide a tool of the class described which will actually sever the end or a section from a tube or pipe by removing a section of the metal thereof, and not displace it, until the pipe or tube has been cut, as is now done by the class of tube or pipe cutters with which I am acquainted.

Another object of my invention is to provide a tool of the class described which is comparatively simple in construction, and one which can be made very strong and durable.

A still further object of my invention is to provide an improved construction for supporting the cutters so that they may be readily moved radially inward and outward.

A still further object of my invention is to provide a tool of this class with a removable supporting-block whereby the inner end of the tool will be supported to rotate around the longitudinal axis of the tool.

The construction of my invention will be set forth particularly in the following specification.

Figure 1 is a perspective view of my tool. Fig. 2 is a central longitudinal section through my tool showing the same inserted in a tube or flue, a portion of which is also shown in longitudinal section, mounted in a portion of a tube-sheet which is shown in section. Fig. 3 is a cross section on the line *a*—*b*, Fig. 2, through my tool. Fig. 4 is a cross section on the line *c*—*d*, Fig. 2, through my tool. Fig. 5 is a perspective view of one of the cutter-holders and a cutter supported thereby. Fig. 6 is a longitudinal central section through a cutter and through the major portion of the cutter-holder therefor. Fig. 7 is a perspective view of one of the screw-wedges, and Fig. 8 is a perspective view of one of the retaining bars for preventing longitudinal movement of said cutter-holders.

In the drawings like characters of reference indicate corresponding parts in each figure.

A is the tubular stock, which is provided with a bore B of uniform diameter. The outer end of the said tubular stock is provided with a right-hand thread C into which screws the reduced threaded inner end D of the stock-handle or head E.

F is the circular cap-plug, the reduced inner portion G of which fits within the inner end of the tubular stock A. The cap-plug F is integrally-provided with a flange H which rests against the inner end I of the tubular stock A.

J are set-screws which pass through the inner end of the tubular stock A and into the reduced inner portion G of the cap-plug F, thus securing this cap-plug in place. I of course may use any other suitable means for closing the inner end of the said tubular stock. This cap-plug is centrally provided with a hole K in which has bearing the inner end of the spindle L. This spindle also has bearing in the bore M formed in the stock-handle or head E, and extends beyond the said handle or head, and keyed thereto by any suitable means such as the set-screw O, and key 40, is the feeding-nut N.

P is a retaining washer locked by the set-screws Q to the inner end of the spindle L. The retaining washer P is counter-sunk in the outer face of the cap-plug F. As the feeding-nut N rests against the outer end "*a*" of the stock-handle or head E, and by reason of the retaining washer P mounted as described, it will be understood that the spindle L is prevented from having longitudinal movement.

2 are a plurality of slots formed longitudinally in the tubular stock and opening through the inner end thereof. As will be seen upon referring particularly to Fig. 4, the said slots are dove-tailed in cross section.

3 and 4 are right-hand and left-hand threads respectively formed on the spindle L.

5 and 6 are a pair of screw-wedges mount-

ed on the spindle L, and coacting respectively with the left-hand and right-hand threads 4 and 3. These screw-wedges are each provided with a plurality of tapered slots 7 which are dove-tailed in cross section, the slots being positioned substantially at right-angles to each other in pairs in each screw-wedge, and the floors 8 thereof taper from the outer end 9 of each screw-wedge to the inner end 10 thereof. The walls 11 of the said slots 7 are equidistant. The formation of the slots 7 provide each screw-wedge with bearing segments 12 which easily fit the bore B. It will therefore be understood that the portion of the spindle L intermediate the stock-handle or head E and the cap-plug F will be held in alinement with the other portions thereof. The inner ends of the bearing-segments 12 are chamfered as shown at 13, so as to lighten construction.

14 are the cutter-holders which are provided at each end with a wing 15. These wings operate, one in one of the slots 7 formed in one of the screw-wedges, and the other wing operates in one of the slots 7 formed in the other screw-wedge. As these said wings are placed opposite each other, when the parts are assembled, the slots 7 in one of the said screw-wedges will be directly opposite its associated slot in the other screw-wedge. The under-sides 16 of each wing 15 is tapered, and the same rests against the tapered floors 8. The sides 17 of each of the said wings flare outward as shown in Fig. 5, and therefore the said wings are dove-tailed in cross section as they must have sliding-fit each within its respective slot 7. Each cutter-holder 14 is provided with a socket 18 in which extends the shank 19 of the cutter. The shank 19 of each cutter is narrower than the cutter proper, thus forming shoulders 21 which rest upon the outer side of each cutter-holder, and so take up the strain of the work on the cutter.

22 are screws screwing through the holder 14 and through the shank 19 held therein, thus securely fixing each cutter in its respective cutter-holder.

In assembling the parts, the screw-wedges 5 and 6 are threaded on the spindle L, and placed far enough apart so that the wings 15 may be positioned, when the said screw-wedges are moved toward each other so as to give the said wings sufficient bearing in their respective slots so that the cutters will be held in position. The spindle L is then passed into the tubular stock A through the inner end thereof and is passed into the stock-handle or head E. Each of the cutters 20 is moved into its respective slot 2 until it abuts against the inner end 23 of the said slot. Then a retaining bar 24 provided with flaring sides 25 is passed into each of the slots 2 through the end thereof until the inner end 26 of each of the said bars rests lightly against its associated cutter 20. The construction of the retaining bars 24 gives them a shape dove-tailed in cross section so that they may fit snugly the slots 2. The construction thus described, when the said retaining bars are snugly fitted, prevents said retaining bars from movement radially outward. Each retaining bar is provided near its inner end with a bridge-plate 27, which overlaps the sides of the slots 2 and rests against the tubular stock A. These bridge plates are connected each to its retaining-bar by a screw 28 which screws thereinto. The screws 28 are loosened when the retaining-bars 24 are being placed in position, and so soon as the said retaining-bars are placed, the said screws are tightened up, and as a result of the coaction between the bridge-plates 27 and the tubular stock A, the said retaining bars are snugly locked in place. After the said parts have been positioned as described, the cap-plug F and retaining washer P are secured in place.

The tubular stock A, where the cutters 20 operate therethrough, is provided with an annular flange 29 which increases the thickness of the said tubular stock at the point where the strain is exerted thereagainst when the cutters 20 are doing work. This annular flange 29 also performs another function in that the edge or shoulder 30 thereof forms a stop for the bridge-plates 27 when the retaining-bars 24 are being positioned, so that these retaining-bars will not be jammed against the cutters 20.

The bridge-plates 27 are segmental in shape so as to fit snugly against the tubular stock A.

Before the stock-handle or head E is secured in place, the stock collar 30 which has a circular bore, is slid onto the tubular stock A.

I shall now describe the operation and use of my tool: By manipulating the spindle L to the left, the screw-wedges 5 and 6 are forced apart, and consequently the cutters 20 are drawn inward far enough so that they may be readily inserted within the tube or pipe "*b*" to be cut, as the tubular-stock A is passed thereinto. The said tubular-stock A, together with the extension "*c*" of the stock-collar 30 are moved into the tube "*b*" until the annular flange "*d*" of the stock-collar 30 abuts against the end "*e*" of the pipe or tube "*b*," and the shoulder "*f*" of the stock-handle or head E comes into contact with the stock-collar 30. The tool has now been moved as far inward as possible, and by manipulating the spindle L through the medium of the spindle nut N, the screw-wedges 4 and 5 are moved toward each other thus forcing the cutters 20 read-

ily outward until they come in contact with the tube or flue "*b*." By any suitable means, the stock-handle or head E is turned to the right, and consequently it rotates the tubular stock A and the said cutters, causing the cutting ends "*h*" to cut the pipe or flue. As occasion demands, the feeding-nut N operates the spindle L so that the cutters 20 will be in position to do work. So soon as the said cutters have severed the tube or flue, they are withdrawn as before described, and the tool may be then removed. The tubular stock A has bearing within the stock-collar 30 when the tool is doing work.

The shoulder "*i*" of the annular flange 29 contacts with the inner end of the stock-collar 30 upon the withdrawal of the tubular stock A, and so removes the said stock collar.

The portion "*l*" of the stock-handle or head E may be constructed as illustrated in Fig. 1, so that a wrench or other operating device may coact with the said head to rotate the tool.

In order to maintain the inner end of the tubular-stock A in alinement, I provide a supporting block "*m*" which is composed of a plurality of segmental sections "*n*" spaced apart as shown at "*p*." This supporting-block "*m*" is keyed by the screw "*q*" to the rod "*r*" which extends through the spindle L which is hollow.

"*s*" is a split-pin passed through the outer end of the rod "*r*" thus locking it from longitudinal movement, together with the supporting-block "*m*."

The segmental sections "*n*" will fit easily the bore of the tube or flue "*b*" and thus coact with the stock-collar 30 to keep the inner end of the tool in alinement. The rod "*r*" together with the supporting-block "*m*" and the supporting parts therefor form a mandrel for the purpose already set forth.

The pipe or tube cutters with which I am acquainted are provided with circular cutters which do not remove the metal but merely displace it. When the tube or pipe is badly worn, the walls thereof are of different thicknesses, and it has often been my experience that circular cutters will pierce through a thin part and thus render it very difficult if not impossible to make the desired cutting at that point. Not only do the said circular cutters at times break through the walls of said tubular pipe, but they also form a bur or flange on the inner end of the sections of the pipe or tube, thus causing difficulty in removing the separated portions through the hole in the tube-sheet. Now upon referring to Fig. 2 it will be noticed that the pipe or tube "*b*" has been cut through without forming a bur or flange, and therefore the separated section can be withdrawn from the tube-sheet "*t*" without meeting any obstruction at this end.

By reason of my cutters, the same must of necessity cut through a thicker portion of the tube or pipe before they reach the thinner portion thereof, thus preventing the cutters bursting through the tube or pipe and forming holes in which they can catch.

The underside of each cutter-holder 14 is concaved as shown at "*u*" in Figs. 3 and 6, and this concaved surface is formed with the same radius as the circumference of the portion "*v*" of the spindle L so that when the said cutters are withdrawn to their innermost position, the cutter-holders 14 may fit snugly against the said spindle L.

I do not confine myself to the details of construction herein shown and described except in so far as that may be rendered necessary by the prior state of the art and the terms of my claims.

The object of providing the spaces *p* is that is will be easier to insert the supporting-block *m* within the tube or pipe than were these spaces absent, because then all of the scale or other obstructions within the tube or pipe for the distance the said supporting-block is moved thereinto, would have to be moved, thus making it more difficult to insert the supporting-block. Furthermore when the said supporting-block is withdrawn from the tube or pipe, it will not remove as much of the scale or other matter, as would otherwise be the case.

What I claim as my invention is:

1. In a device of the class described, the combination with a tubular stock having a plurality of parallel slots formed longitudinally therein and opening through to one end thereof, and a spindle longitudinally mounted to operate within said tubular stock and provided with right-hand and left-hand threads, of a pair of internally-threaded screw-wedges reversely arranged on said spindle to coact with their respective threads, the said screw wedges being each provided with a plurality of longitudinal slots dove-tailed in cross-section and opening each through to the inner end of its wedge, and each having a floor slanting downward and inward; a socket-provided cutter-holder provided at each end with a wing, each in alinement with the other, each wing being formed to be held in its associated slot formed in the said screw wedges; a cutter mounted in the socket formed in each of the said cutter holders, and extending each through its associated one of said slots, and means supported in each of the said slots and designed to coact with said tubular stock to prevent said cutters from having movement longitudinally of said stock.

2. In a device of the class described, the combination with a tubular stock having a plurality of parallel slots formed longitudinally therein and opening through to one

end thereof, and a spindle longitudinally mounted to operate within said tubular stock and provided with right-hand and left-hand threads, of a pair of internally-threaded screw-wedges reversely arranged on said spindle to coact with their respective threads, the said screw wedges being each provided with a plurality of bearing segments which are separated by slots dove-tailed in cross section and opening each through to the inner end of its wedge, and each having a floor slanting downward and inward; a socket-provided cutter holder provided at each end with a wing, each in alinement with the other, each wing being formed to be held in its associated slot formed in the said screw wedges; a cutter mounted in the socket formed in each of the said cutter holders, and extending each through its associated one of said slots, and means supported in each of the said slots and designed to coact with said tubular stock to prevent said cutters from having movement longitudinally of said stock.

3. In a device of the class described, the combination with a tubular stock having a plurality of parallel slots formed longitudinally therein and opening through to one end thereof; a spindle longitudinally mounted to operate within said tubular stock and provided with right-hand and left-hand threads, of a pair of internally-threaded screw-wedges reversely arranged on said spindle to coact with their respective threads, the said screw wedges being each provided with a plurality of bearing segments which are separated by slots dove-tailed in cross section and opening each through to the inner end of its wedge, and each having a floor slanting downward and inward; a socket-provided cutter holder provided at each end with a wing, each in alinement with the other, each wing being formed to be held in its associated slot formed in the said screw-wedges; a cutter mounted in the socket formed in each of the said cutter-holders, and extending each through its associated one of said slots; means supported in each of the said slots comprising a retaining bar the inner end of which rests adjacent its associated cutter, and means for supporting said retaining bars in place.

4. In a device of the class described, the combination with a tubular stock having a plurality of parallel slots formed longitudinally therein and opening through to one end thereof, the said slots being dove-tailed in cross section; and a spindle longitudinally mounted to operate within said tubular stock and provided with right-hand and left-hand threads, of a pair of internally threaded screw-wedges reversely arranged on said spindle to coact with their respective threads, the said screw wedges being each provided with a plurality of longitudinal slots dove-tailed in cross section and opening each through to the inner end of its wedge, and each having a floor slanting downward and inward; a socket-provided cutter holder provided at each end with a wing, each in alinement with the other, each wing being formed to be held in its associated slot formed in the said screw wedges; a cutter mounted in a socket formed in each of the said cutter holders, and extending each through its associated one of said slots; a retaining bar dove-tailed in cross section, positioned in each of the said slots and each with its inner end adjacent its associated cutter, and means for retaining the said retaining bars in place.

5. In a device of the class described, the combination with a tubular stock having its outer end provided with an internal thread, and having a plurality of parallel slots formed longitudinally therein and opening through to one end thereof; an external annular flange formed in said tube substantially midway the length thereof to strengthen the wall of the tube and into which the said slots extend, and a spindle longitudinally placed to operate within said tubular stock and provided with right-hand and left-hand threads, of a pair of internal-thread screw-wedges reversely arranged on said spindle to coact with their respective threads, the said screw-wedges being each provided with a plurality of longitudinal slots dove-tailed in cross section and opening each through to the inner end of its wedge, and each having a floor slanting downward and inward; a socket-provided cutter-holder provided at each end with a wing, each in alinement with the other, each wing being formed to be held in its associated slot formed in the said screw wedges; a cutter mounted in the socket formed in each of the said cutter holders, and extending out through its associated one of said slots, and positioned at the inner end thereof; means closing the inner end of said tubular stock in which the inner end of said spindle has bearing; a stock-collar mounted on the outer end of said tubular stock and designed to be withdrawn from a tube by the engagement of said annular flange with the inner end thereof, and a feeding nut screwing into the outer end of said tubular stock and provided with a shoulder to prevent withdrawal of said stock-collar, the outer end of said spindle having bearing in said feeding nut.

6. In a device of the class described, the combination with a tubular stock having a plurality of openings formed in the sides thereof; a tubular spindle longitudinally mounted to operate within said tubular stock; a plurality of cutters, each radially

operating through one of said openings; means operated by said tubular spindle whereby said cutters are moved inward and outward, of a rod mounted within said tubular spindle; a supporting member keyed to the inner end of said rod and projecting beyond the inner end of said stock, and being of greater transverse diameter than said stock, and means for locking said rod from longitudinal movement.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM THOMAS RAMAGE.

Witnesses:

S. C. T. THACHER,

D. KING.