May 14, 1935. C. E. STURGIS 2,001,635

REAMING TOOL

Original Filed Feb. 21, 1933

Fig. 1.

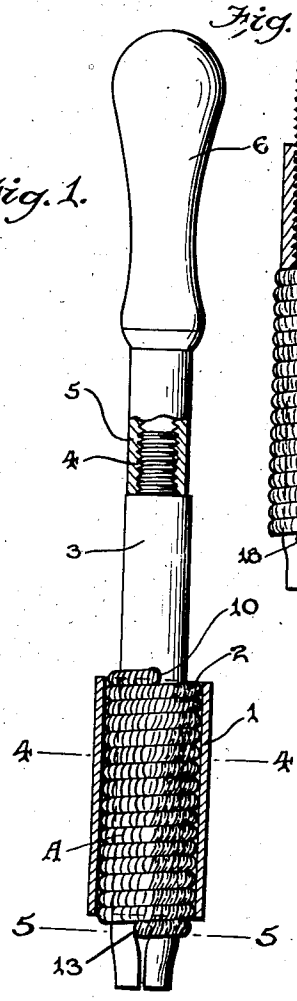


Fig. 6.



Fig. 7.

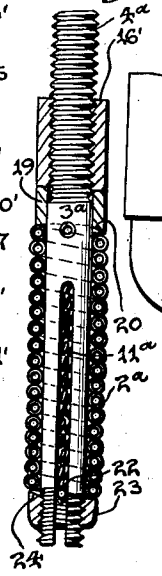


Fig. 2.

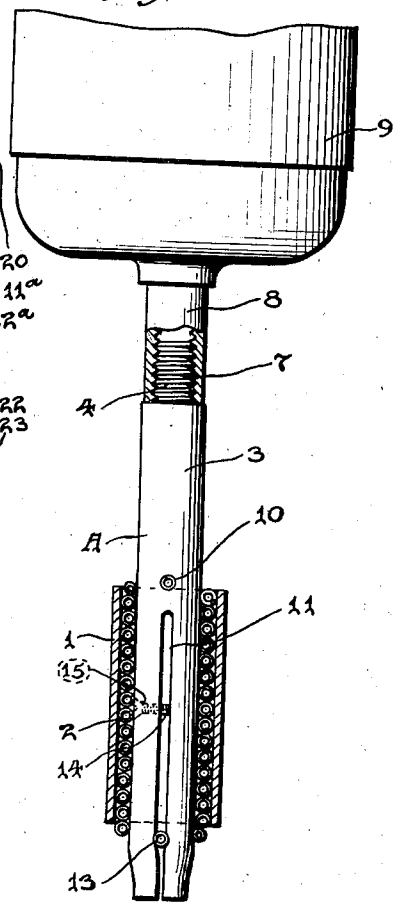


Fig. 3.

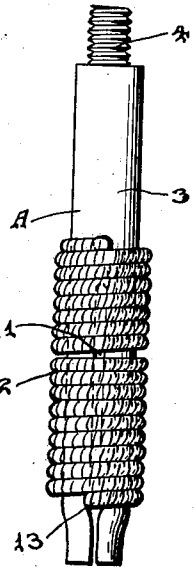


Fig. 4.

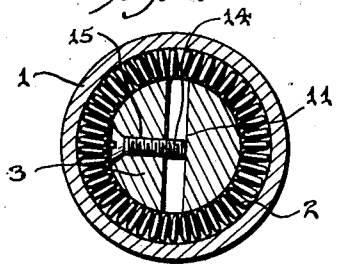
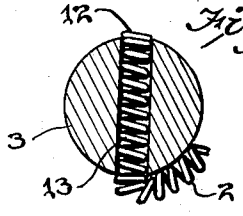


Fig. 5.



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2,001,635

REAMING TOOL

Charles E. Sturgis, Rochester, N. Y.

Application February 21, 1933, Serial No. 657,874
Renewed October 15, 1934

10 Claims. (Cl. 15—104.16)

This invention relates to a reaming and polishing tool.

One object of the invention is to provide a reaming tool for cleaning and polishing the interior of valve stem guides or other tubular articles or devices and which embodies a resilient, coiled wire strand, spirally wrapped or wound upon a mandrel or stem and fixed thereto, and while possessing resilient characteristics, yet embodying sufficient stiffness to sufficiently act upon and remove carbon deposits from valve stem guides or foreign matter from the interior walls of gun barrels, pipes, or other tubular articles and serviceable as a lapping tool.

Another object of the present invention resides in the provision of a reaming tool of the nature stated, embodying among other characteristics, a resilient element peculiarly formed and peculiarly mounted on a mandrel or stem and possessing a multitude of rounded burnishing points designed to effectively remove carbon deposits or other foreign substances from the interior of tubular articles or devices and accomplish the purpose in such a manner as not to scratch or score the interior walls of the articles.

Another object of the present invention is to provide a reaming tool for cleaning the interior of tubular elements including a coiled wire resilient strand spirally wound upon a suitable operating stem or member in such a manner as to provide for slight variations in diameter for effectiveness in use of the tool in the event of a relatively tight fit thereof within a tubular element and which, while possessing the requisite stiffness for such cleaning purposes, yet permitting such adjustment in variation of size as to diameter as to provide for effective use of the tool.

A still further object of the invention is to provide a reaming tool including a coiled wire resilient strand which is spirally wound upon a suitable operating stem or member with the spirals arranged normally in contact with one another, and yet, by virtue of the resiliency of the strand adjacent spirals may be separated by hand or otherwise to permit the insertion therebetween of a suitable tool so that in the event of any irregularities with respect to one or more spirals being found to be out of the plane of other spirals such spirals may be operated upon by the insertion of such a tool in the manner stated to operate upon the irregular spirals in order to effect a uniform diameter of the spirals throughout the length of the strand.

It is still further designed to provide a simple, inexpensive, durable and effective reaming tool for use in valve connections and in which a resilient metallic element is so formed and mounted and arranged as to provide for a peculiar arrangement of burnishing portions operable without danger of scratching or scoring the articles worked upon.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing:—

Figure 1 is an elevation of the invention partly in section, illustrating a valve stem guide in section and partly illustrating a hand operated tool embodying the present invention.

Fig. 2 is a similar view except that the operating stem is shown as operated through the instrumentality of motor driven means.

Fig. 3 is an elevation of the invention illustrating adjacent coils separated for the purpose of operating upon coils out of alignment with respect to diameter of adjacent coils to give to all coils a substantially uniform diameter.

Fig. 4 is an enlarged transverse sectional view on the line 4—4 of Fig. 1.

Fig. 5 is an enlarged transverse sectional view on the line 5—5 of Fig. 1.

Fig. 6 is a view partly in elevation and partly in section of a modified form of the invention.

Fig. 7 is a similar view of another modification of the invention.

Referring now more particularly to the accompanying drawing, the reference character 1 indicates a cylindrical valve stem guide or other tubular member, shown in longitudinal section with the reaming tool A mounted therein.

The reaming tool A may be reciprocated longitudinally or it may be oscillated transversely or rotated in the tubular member 1 for the purpose of cleaning the interior of the tubular member of carbon or other foreign matter.

The reamer A embodies, as one of its essential features, a coiled wire strand 2 having its coils wound close together and which is preferably spirally wound tightly around a stem or operating member 3, with its ends fixed to the

member 3, and while the strand is rather tightly wound around the stem yet intermediate coils of the strand of the coiled wire may be separated by hand or tool movement longitudinally of the stem 3 for a purpose presently explained.

The stem 3 may be reduced at its inner end and screw threaded as at 4, for screw threaded working fit in the screw threaded socket 5 of a hand operating handle 6; or, as shown in Fig. 2 the reduced screw threaded end 4 of the stem 3 may be secured in a screw threaded socket 7 of a shaft 8 of an electric drill 9 or other motor, the connection in any event, regardless of how made, being such that the one reaming tool may have either the handle 6 or the motor 9 attached thereto for operating the same.

The stem 3, as shown, is provided with a transverse perforation 10 intermediate its ends and from a point adjacent this perforation the stem 3 is slotted longitudinally as at 11, to and through its outer end. This perforation 10 and the longitudinal slot 11 provide one form of means for securing the opposite ends of the coiled wire strand 2 to the stem.

For instance, one end of the coiled wire or resilient strand 2 may pass entirely through said perforation 10 and from this point the resilient coiled wire strand extends in spiral wound form about the stem over the slot 11, with the spirals close together and contacting with one another, to a point immediately adjacent the outer end of the slot 11 when the outer extremity or terminal 13 of the coiled wire strand is directed transversely into said slot as shown in Figs. 1, 2 and 3 and the outer end of the stem then compressed, as shown in Figs. 1, 2 and 3 to cause the sides of the slot 11 to pinch, bind or clamp the terminal 13 of the strand in the outer end of said slot as may be readily understood by reference to the accompanying drawing.

If desired, a screw 14 may have screw threaded working fit in a screw threaded perforation 15 of the stem 3 and at its inner end bear against one side of the slot 11 to maintain the slot 11 uniform in width throughout the length of the coiled strand and thereby insure a uniform diameter of coiled strand, the head of the screw 14 being countersunk in the stem 3, as shown. In other words, I employ the screw 14 or other suitable means to prevent collapse of the slot incident to lateral force on the stem 3 during cleaning operation.

The diameter of the coiled strand may be varied, depending upon the article to be operated upon, but for certain uses, such as the cleaning and polishing of valve stem guides of engines, the diameter of the strand is small, say for instance about three-sixteenths of an inch, more or less, and the coils of the strand in any event are formed close together and in fact contact and as the coiled strand thus formed is wound rather tightly about the stem 3 the coils or spirals of the wound coiled strand are also arranged close together in compact relation and so compactly arranged that the slot 11 is hardly discernible through the spirally wound strand except when the tool is held up to the light.

The result of the compactness of coils of the strand and the compactness of spirals of the wound coiled strand is that a great multitude of close together burnishing points are provided with the burnishing points rounded in all directions, due to the coils and spirals, and so as to obviate danger of scoring or scratching the interior of the valve stem guide or other tubular member and giving a polish and smoothness to the interior of the tubular member by an effective removal of carbon deposits or other foreign matter.

Where the interior of valve stem guides are scratched or scored by carbon cleaning tools it follows that carbon will enter such scratches and scores and it has been found in practice that the deposit of carbon in scratches and scores is difficult of removal in a subsequent attempt to clean the guides, and therefore, the rounded or curved surfaces of the coils and spirals of the strand perform the cleaning function without this defect resulting from tools which scratch and score the interior walls of the guides.

Provision is made for a ready insertion of the assembled tool into or removal thereof from the valve stem guide or other tubular elements and this may be accomplished by a slight tapering of the ends of the coiled strand and this tapering may be effected in one manner by stretching slightly and almost imperceptibly the first wound spiral of the coiled strand at the transverse perforation 10 so as to bring the outer surface of such end spiral slightly within the plane or external diameter of the adjacent spiral as shown in Fig. 1, the outermost spiral at the outer end of the stem having its outer surface brought slightly within the diameter of the adjacent spiral when the outer end of the stem is compressed to secure the outer end of the strand in the slot 11 as shown in Fig. 1, this tapering at the end coils, if employed, being illustrated particularly in Fig. 1.

If one of the spiral windings between the end coils should be found to be out of the plane of an adjacent intermediate spiral such outer plane spiral or a plurality of them can be readily expanded or otherwise operated upon to bring them to the proper plane with respect to diameter of the remaining spirals, due to the resiliency of the coiled spirals which enables independent movement of the coiled spirals longitudinally along the stem 2 so as to separate certain spirals to permit the insertion of a tool of any suitable character (not shown) between adjacent coiled spirals and into and through the slot 11 to act upon the spirals to expand them into proper plane with relation to the other spirals, as may be gathered from the separation illustrated in Fig. 3. After this operation has been accomplished the tool (not shown) may be withdrawn from between the spirals and then by finger or hand manipulation, owing to the said resiliency of the strand, the coiled spirals may be brought into normal close together relation. The fact is that the coils of the strand possess sufficient resiliency to permit a slight variation in the normal diameter of the reamer to permit of a cleaning operation even in the event of an unusually tight fit of the tool or reamer in the tubular valve stem guide or other tubular member.

In Fig. 6 there is shown a modified form of the invention wherein the stem 3' may be formed of much shorter length than the stem 3 and preferably of one diameter but the wound strand 2' is preferably secured to the stem 3' in the same manner in which the strand 2 is secured to the stem 3, the slot 11' in Fig. 6 being shown in dotted lines. The stem 3' is screw threaded, as at 41, from its inner end to a point substantially close to the aperture 10'. The sleeve 16, which is interiorly screw

threaded, has threaded working fit with the thread 4' of stem 3' and at its inner end the sleeve is slightly beveled, as indicated at 17. The inner end of the strand 2' is inserted in the transverse perforation 10' and the sleeve 16 is worked along the thread 4' until its inner beveled end lies adjacent the inner end of the strand 2'. The strand 2' is then coiled or wrapped around the stem 3' toward the outer end of the latter and directed transversely and secured at 18, as in the case of the strand 2. After pinching the outer end of the strand at 18 in the outer end of the slot 11' the sleeve 16 is worked further inwardly on the thread 4' of the stem and thereby insuring tight compact relation of the coils of the strand 2', there being sufficient exposure of the thread 4' beyond the sleeve 16 to take the screw thread socket of a handle such as 6, shown in Fig. 1, or a threaded socket of a shaft 8 of a motor 9, as shown in Fig. 2.

Another modification of the invention is shown in Fig. 7, wherein the sleeve 16' works on the threaded end 4a of the stem 3a to force a collar 19 tightly against the inner end of the coil of the strand 2a, the inner end of the collar 19 being beveled or tapered as shown, for the same purpose as the tapered or beveled end 17 of the sleeve 16 shown in Fig. 6. The stem 3a has a slot 11a the same as the slots 11 and 11' of the forms previously described. However, the stem 3a has its outer end screw threaded as indicated at 21 and instead of pinching the slotted outer end of the stem 3a onto the inwardly directed outer end 22 of the strand 2a located in the outer end of said slot 11a, I provide an interiorly screw threaded collar 23, which has a tapered inner end 24 adapted to engage the outer end of the strand 2a whereby the latter may have its coils maintained in close compact condition between the collars 19 and 23 and the strand 29, consequently held firmly against accidental disconnection from the stem 3a.

In Figs. 6 and 7 it is obvious that, if desired, there may be employed a screw like screw 14 shown in Fig. 2 to prevent collapsing of the slot in the stem, and for the same purpose as that described in connection with screw 14 illustrated in Fig. 2, and which seems unnecessary to illustrate in view of the showing made in Fig. 2 and the fact that this screw may be eliminated if desired.

It will be understood from the foregoing that I provide a simple, inexpensive, durable and effective tool for reaming out the interior of valve stem guides without danger of scratching or scoring of the guide and that I accomplish this result mainly through the use of a spiral strand spirally wrapped about a stem or other operating member and fixed thereon and which strand by virtue of its resiliency possesses characteristics permitting adjustment of the diameter of the reamer under tight working conditions as well as an adjustment of separate coils in the length of the coiled wire strand.

It will also be apparent that the present reamer is equally as effective for use in reaming out the interior of valve guides or other tubular devices, including for instance, gun barrels, pipes, and other tubular devices unnecessary to mention herein, and may be used as a lapping tool.

What is claimed is:

1. A tool of the character described comprising a stem having a transverse perforation therein and also having a relatively long longitudinal slot spaced from and leading from adjacent said perforation to and through one end of the stem, and a metallic strand spirally wound around the stem and over said longitudinal slot and having one end secured in said perforation and having its opposite end secured in said slot adjacent the outer end of the latter.

2. A tool of the character described comprising a stem having a transverse perforation therein and also having a longitudinal slot spaced from and leading from adjacent said perforation to and through one end of the stem, and a coiled wire strand spirally wound around the stem and over said longitudinal slot and having one end secured in said perforation and having its opposite end secured in said slot.

3. A tool of the character described comprising a stem having a transverse perforation therein and also having a longitudinal slot spaced from and leading from adjacent said perforation to and through one end of the stem, and a coiled wire strand spirally wound around the stem over said longitudinal slot and having one end secured in said perforation and having its opposite end secured in said slot, the intermediate spirals being independently shiftable along the stem.

4. A tool of the character described comprising a stem having a transverse perforation therein and also having a longitudinal slot spaced from and leading from adjacent said perforation to and through one end of the stem, and a coiled wire strand spirally wound around the stem over said longitudinal slot and having one end secured in said perforation and having its opposite end secured in said slot, the spirals being arranged close together in contacting relation and the intermediate spirals being independently separable and shiftable along the stem to permit passage of an instrument transversely through said slot to expand a spiral of the coiled wire strand so as to maintain regularity with respect to the diameter of the spirals.

5. A tool of the character described comprising a stem having a transverse perforation therein and also having a relatively long longitudinally disposed slot, and a wire strand wound around the stem over said longitudinal slot and having one of its ends secured in said perforation and having its other end secured in said slot.

6. A cleaning tool of the class described comprising a stem provided with a longitudinal slot extending inwardly from the outer end of the stem to provide terminal clamping portions and a tool receiving portion, and a coiled strand spirally wound around the stem over the longitudinal slot thereof and secured at its inner end to the stem beyond the slot and having its outer end held between the terminal clamping portions of the stem, the slot of the stem permitting an instrument to be passed through the stem when the spirals of the strand about the stem are separated at one side of the stem for shaping the strand.

7. A tool of the character described comprising a stem having a transverse perforation therein and also having a longitudinal slot therein which opens through one end thereof, a coiled strand spirally wound around the stem over said slot and having one end secured in said perforation and its other end secured in said slot, and

means in said slot to prevent contraction of the slot.

8. A tool of the character described comprising a stem having a transverse perforation therein and also having a longitudinal slot therein which opens through one end thereof, a coiled strand spirally wound around the stem over said slot, and having one end secured in said perforation and its other end pinched in said slot adjacent the outer end of the slot, and means in said slot intermediate the ends thereof to prevent contraction of the slot between the ends of said strand.

9. A tool of the character described comprising a stem, a closely coiled strand spirally wound around the stem and having its ends extended transversely into said stem, and a sleeve having screw threaded working fit on the stem and having an inwardly beveled end to fit over and bear against one end of the strand to maintain the spirals close together and to prevent disconnection of such end of the strand from the stem.

10. A tool of the character described comprising a stem having a relatively long slot therein, a closely coiled strand spirally wound around the stem over said slot and having its ends extended transversely into said stem, said stem being screw threaded at each end, a collar interiorly screw threaded and having working fit on the screw threaded inner end of the stem to bear against the inner end of said strand, an interiorly screw threaded sleeve having working fit on the screw threaded inner end of the stem to bear against said collar, and an interiorly screw threaded collar having threaded working fit on the screw threaded outer end of the stem and having a beveled inner end to bear against the outer end of said strand, said collars and sleeve preventing disconnection of the transversely directed ends of the strand from the stem and maintaining the spirals of the strand close together.

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