Oct. 11, 1932. F. F. FISHER 1,881,441

TUBE END CLEANER

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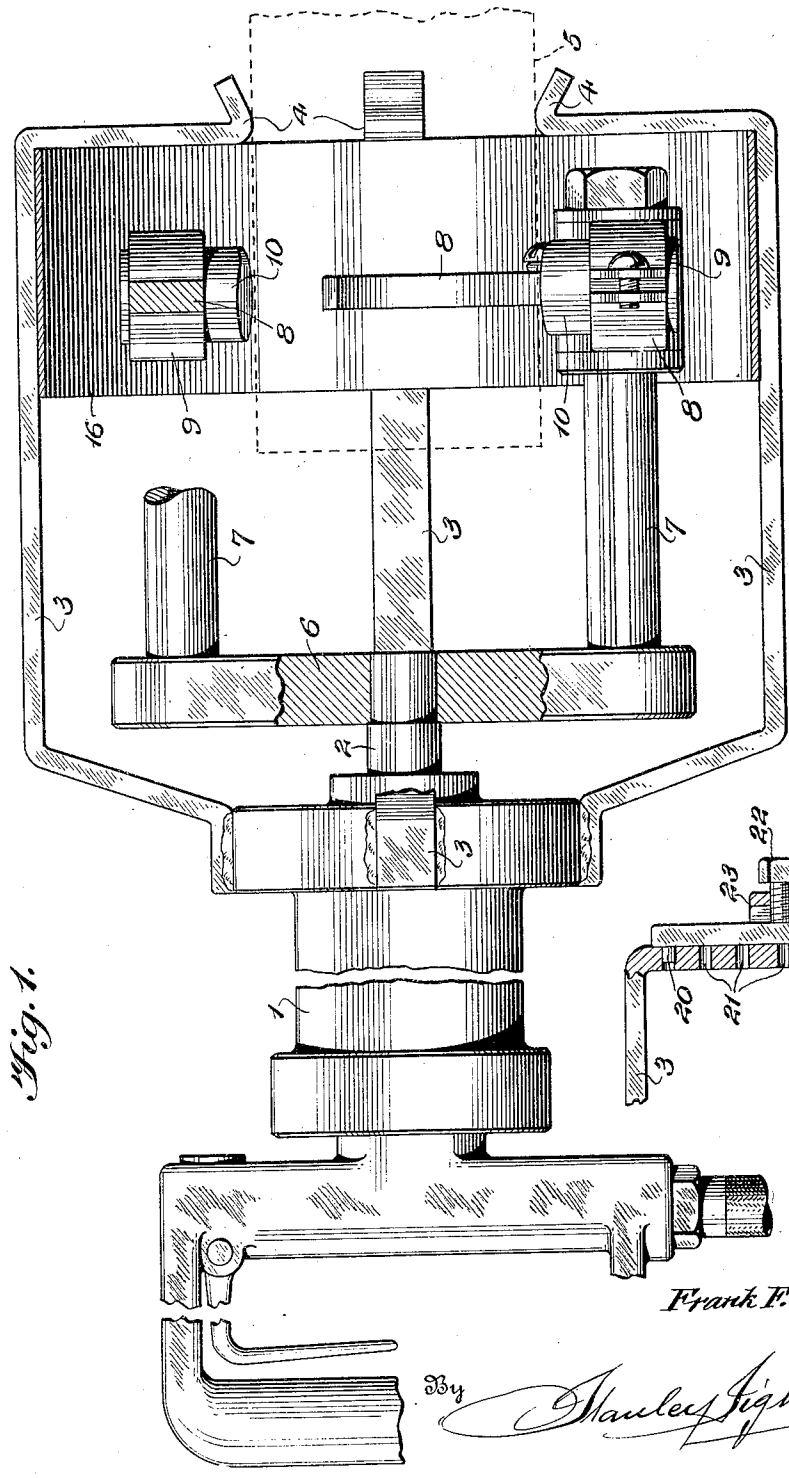


Fig. 1.

Fig. 6.

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Fig. 2.

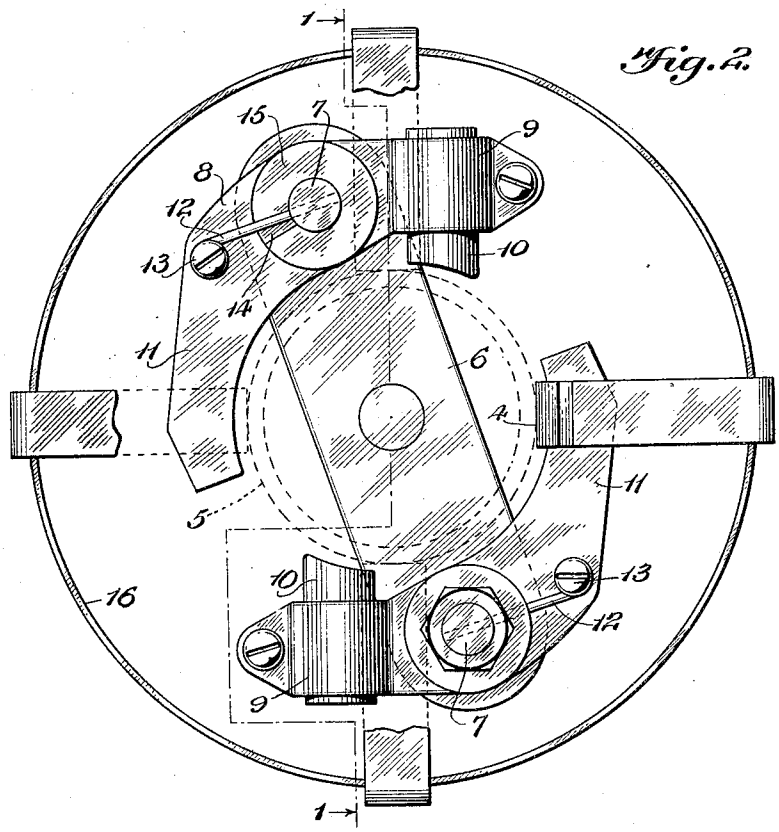
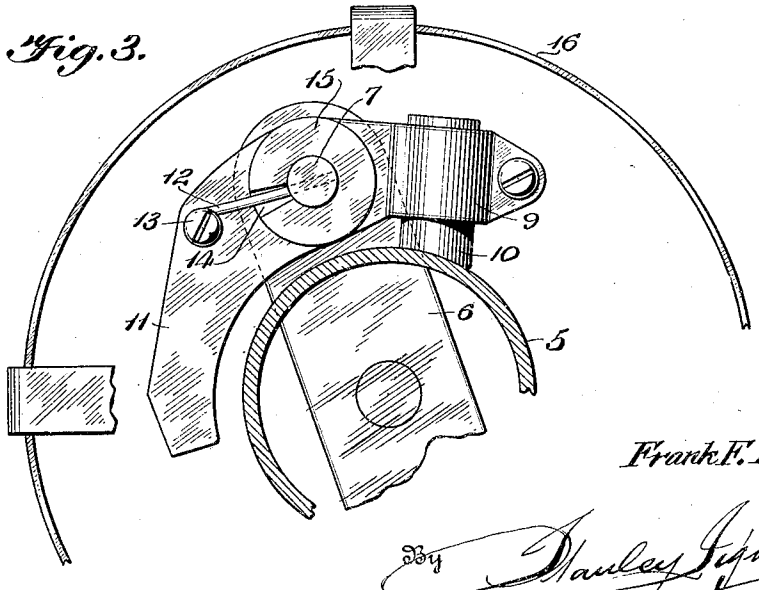


Fig. 3.



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Fig. 4.

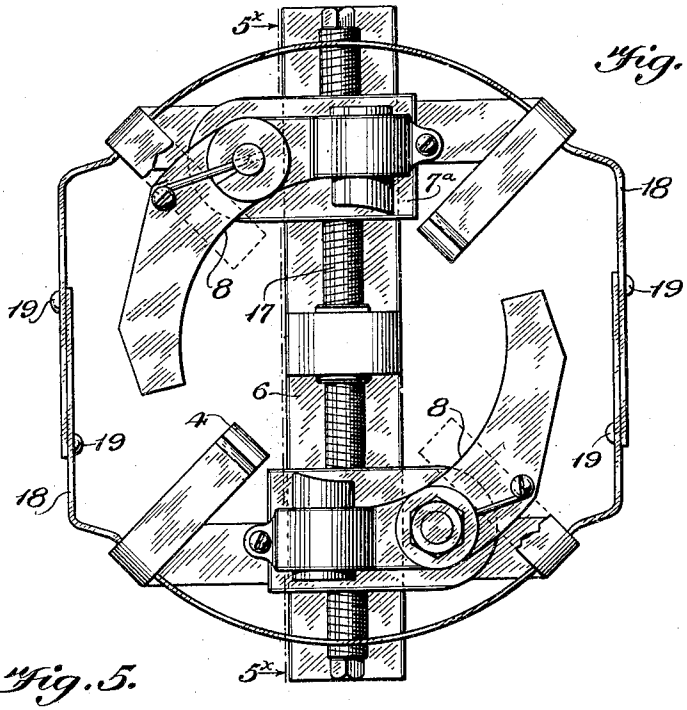
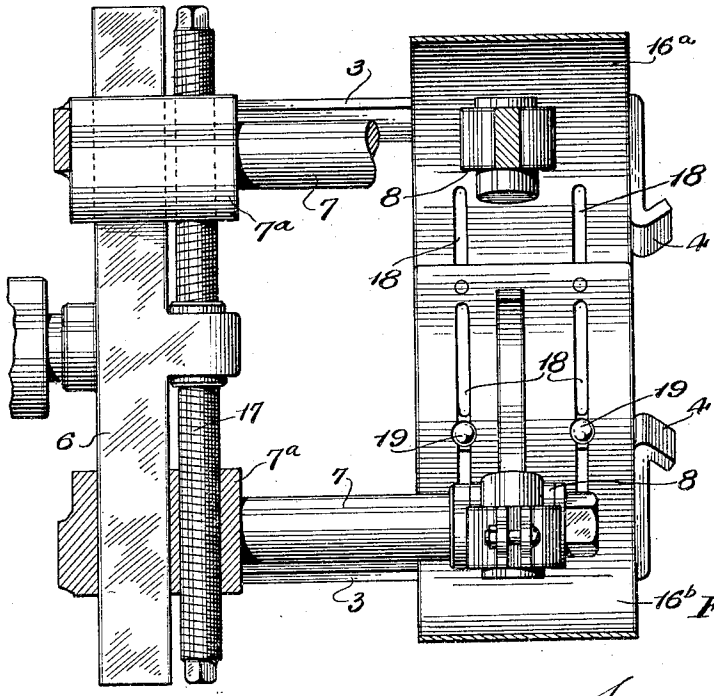


Fig. 5.



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UNITED STATES PATENT OFFICE

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TUBE END CLEANER

Application filed May 2, 1929. Serial No. 359,788.

This invention relates to means for the cleaning of tubular bodies, such as boiler tubes, wherein it is desired to obtain a clean and more or less polished outer surface at the ends of the tubes. In boiler tubes, clean metal to metal contact is desirable between the tube ends and the boiler sheet, and to obtain such contact various means have been employed for abrading or polishing that part of the tubes which enter the boiler plates.

Usually such devices have included rotary polishing wheels suitably driven and held in contact with the tube end surface while the wheels have been moved around the tube or the tube rotated between wheels, but such devices have various disadvantages as to use and application. For instance, they usually include inside pilots or guides which enter the tube and are, therefore, influenced by the gauge of the tube, thus limiting the application of such devices to tubes of predetermined gauge or requiring interchangeable or specially adjustable internal pilots.

Another disadvantage of such devices is that they require very careful handling to insure even pressure of the polishing wheels on the tube throughout the operation, otherwise undesirable depressions or flat spots may be formed in the surface of the tube. The use of wire brushes as heretofore known in the art, involves the objection that such brushes do not stand up very long to the work and that they dig into holes in the surface of the tube, exaggerating such depressions. Furthermore, the use of such brushes does not result in speedy work.

The present invention has for its object to provide a very simple device which will effectively clean tubes in the manner desired without requiring any special skill in handling or in its application to the work; which will be free of the hereinbefore mentioned disadvantages found in other devices, and which will further effect the polishing of the tube ends in an even manner, with a minimum abrasion of material from the tube so that the diameter and strength of the tube are not reduced to any appreciable extent.

Further objects of the invention are to utilize the rubbing action of an abrasive, as distinguished from a pure cutting action, as a means of cleaning and polishing tube ends, and to effect this action by wiping the abrasive around the outer surface of the tube end, in contradistinction to rotating the abrasive about an axis other than the axis of the tube as in the case of the ordinary polishing or grinding wheels or brushes generally employed for that purpose.

The invention further contemplates the utilizing of an abrasive carrier rotating about the tube axis and, solely by such movement of the carrier, effecting the wiping of abrasive over the exterior surface of the tube.

Still further the said invention contemplates pilot or guide means engaging the exterior of the tube, in contradistinction of the interior thereof, for maintaining the desired axial alignment of the tube and the device during polishing operations.

A further and important object of the invention is to provide for the utilizing of centrifugal force set up in operation of the device to effect contacting of the abrasive with the tube, and to control the pressure of such contact.

Provision for adapting the device to tubes of different sizes where thought necessary or desirable may be also made.

Still further objects or advantages subsidiary or incidental to the aforesaid objects, or resulting from the construction or operation of the invention as it may be carried into effect, will become apparent as the said invention is hereinafter further disclosed.

In carrying the invention into effect, I may provide guiding means in the form of a frame adapted to engage the perimeter of a tube and suitably driven rotatable means mounted in said guiding means and carrying

abrasive holders in the form of rocker arms, spring loaded to normally hold abrasive elements in spaced relation to the perimeter of the tube, and weighted to provide a centrifugal component in said arms which will operate, when the rotatable means are rotated, to move the abrasive elements into wiping contact with the perimeter of the tube end and exert an abrasive pressure thereon controlled by the speed of operation of the rotatable means.

All of which is more particularly described and ascertained, by way of example, in and by the following description of the accompanying drawings, wherein

Figure 1 is a broken side elevation of the improved device;

Figure 2 is a front elevation of the same with parts of the pilot arms broken away for clarity of illustration;

Figure 3 is a fragmentary view similar to Figure 2 showing the rocker arm in operative position;

Figure 4 is a similar view to Figure 2 of a moderate form of the device;

Figure 5 is a side elevation partly in section on the line 5x—5x of Figure 4; and

Figure 6 is a fragmentary detail view showing a modified form of pilot arms.

Similar characters of reference indicate similar parts in the several figures of the drawings.

Referring first to Figures 1, 2 and 3, 1 represents the barrel of a pneumatic motor from the front end of which a rotary shaft 2 extends, and 3 are pilot arms extending from the forward part of the said barrel and having terminal portions 4 adapted to engage and fit the perimeter of a tube 5, the end of which it is desired to polish.

Fixed to the forward end of the shaft 2 is a transverse member 6 carrying forwardly projecting arms 7 on which members 8 are rockably mounted. These members each include as one of their end portions a clamp 9 for an abrasive 10 and as their other end portions a counterweight 11. A spring 12 secured by a screw 13 to the counterweight extends into engagement with the end portion of each arm 7, as clearly shown in Figures 2 and 3, and passes through a notch 14 in the boss 15 of each rocker arm, this spring normally acting on the counterweight to depress it in the direction of the axis of the device whereby the abrasive is moved away from the said axis to an extent limited by one of the walls of the notch 14, as shown in Figure 2.

When the device is applied to the work, by passing the pilot terminals 4 over the tube end to an extent permitting the abrasive elements 10 to also pass over the tube end, the device is ready for operation; and it will be seen that when the shaft 2 is rotated by its motor, the abrasive elements, by virtue of their mounting in associating with the said shaft, will be moved around the tube end. It will be further seen that as this movement is accelerated, centrifugal force acting on the counterweights 11 will cause them to move outwardly of the axis of the tube, against the resistance of the springs 12, thereby bringing the inner faces of the elements 10 into contact with the outer surface of the tube, the resulting pressure of the said abrasive elements on the tube being determined by the speed of rotation of the shaft 2. This speed, therefore, may be regulated to produce exactly the desired amount of pressure, and the continued operation of the device will result in a wiping and polishing action of the abrasive on the surface of the tube producing a very desirable and even cleaning due to the even pressure which may be readily maintained.

It will be obvious that if rotation of the abrasive carrier be stopped at any stage of the cleaning operation, no localized abrasion will take place on the tube and no flat spots or depresssions created. It will also be apparent that when the operation of the abrasive carrier is interrupted, the abrasive elements 10 will be automatically removed from contact of the tube, and the device without further setting or special operation may be removed from the tube and immediately put into further operation by merely restarting the motor.

It is preferred to make the abrasive element narrower than the portion of the tube to be cleaned and to reciprocate the device over the end of the tube to clean the required extent of surface. The nature of the support of the parts and the application of the abrasive to the surface lends itself extremely to this operation.

16 is a safety guard extending about the region of the abrasive carriers and mounted within the pilot arms 3.

In the modified form, Figures 4 and 5, provision for special adjustment of the abrasive carrying members and of the pilot arms to adapt the device to use on tubes of different sizes is made, although in general for the sake of simplicity of construction and similar reasons it is preferred to use a non-adjustable device of the type hereinbefore described where a large number of tubes are to be polished.

In the modified form the arms 7 are adjustable inwardly and outwardly along the transverse member 6 by means of an adjusting screw 17 mounted on the said member 6 and having threaded engagement with enlarged portions 7a of the arms 7, as clearly shown in Figure 5. Thus, by means of the said adjusting screw 17, the relative spacing of the arms 7 may be varied and incidentally relative spacing of the abrasive carrying ele-

ments 8 similarly varied. Two of the pilot arms 3 in this case are carried by each of the enlarged portions 7[a] of the arms 7, so that they are movable therewith, and, as a consequence, the one pair of the pilot arm terminal portions 4 are moved outwardly from the other pair, (or inwardly as the case may be) as the abrasive carrying members are moved outwardly or inwardly by the operation of the adjusting screw 17.

It will, therefore, be readily seen that the adjustment of the pilot arms terminal portions by means of the adjusting screw 17 to suit any size of tube within the range of the device will be accompanied by a corresponding adjustment of the abrasive carrying members to such size of the tube.

Where the guard is carried by the adjustable pilot arms, it may be formed in two pieces 16[a] and 16[b] slidably overlapping and provided with slots 18 in their overlapping portions through which suitable guiding and connecting studs 19 may extend.

In the said Figures 4 and 5, the pilot arms revolve about the work with the abrasive carrying members, and, where this is not desirable, the pilot arms may be separately adjustable as indicated for example by the illustration Figure 6, wherein one of the fixed arms, such of the arrangement Figure 1, is shown as having a separate end portion 3[a] provided with a pin 20 adapted to locate the said end portion of the different positions of adjustment on the pilot arm 3 by engagement with one or other orifices 21 in the said arm. 22 is a set screw passing through a strap 23 for locking the said end portion 3[a] of the pilot arms in position of adjustment. Similar adjustment is, of course, provided on all the pilot arms.

What I claim is:

1. In a tube end polishing device, a rotating shaft, an arm transversely and fixedly mounted on said shaft, a support carried by each end of said arm extending parallel to the axis of said shaft, polishing members pivotally mounted on said supports to swing in a plane transverse to the axis of said shaft and to receive the end of a tube therebetween, counterweights comprising centrifugal means for impelling said members against said tube during rotation, a hood for said polishing members, and means for varying the position of said supports on said arm with respect to the axis of said shaft to compensate for the difference in diameter of different tubes which may be inserted between said polishing members.

2. In a tube end polishing device, rotatable polishing members pivotally mounted on an arm to loosely receive a tube therebetween, means for urging said members toward said tube during rotation, a hood for said members, tube guides on said hood, means for varying the position of said members on said arm to vary the radius of rotation of said members, said means also acting to vary the opening between said guides to accommodate different size tubes.

3. In a tube end polishing device, a rotatable shaft, an arm transversely and fixedly mounted on said shaft for rotation therewith, supports variably mounted at the outer ends of said arm extending parallel to the axis of said shaft, abrasive carrying members pivotally mounted on said supports to swing in a plane transverse to the axis of said shaft in order to loosely receive a tube end therebetween, counterweights comprising centrifugal means for urging the abrasives toward said tube during rotation, a two-part hood for said members, tube guides on each part of said hood for alining said tube end during reciprocation for polishing by said abrasives, and means for varying the supports on said arm in order to change the radius of rotation of said abrasive carrying members, said means likewise changing the perimeter of said hood whereby the opening between said guides is varied to accommodate variously sized tubes.

4. A tube end polishing device comprising a rotatable shaft, a member carried by said shaft having its ends oppositely disposed on either side of the shaft, an arm associated with each end of said member, said arm extending substantially parallel to the shaft and slidably connected to the member for movement towards and away from the shaft, polishing means carried by each of the arms, and means for simultaneously moving the arms.

5. A tube end polishing device comprising a rotatable shaft, a member carried by said shaft having its ends oppositely disposed on each side of the shaft, an arm associated with each end of said member, said arm extending substantially parallel to the shaft and slidably connected to the member for movement towards and away from the shaft, polishing means carried by each of the arms, and means for simultaneously moving the arm, said means comprising a screw member in threaded engagement with said arms.

6. A tube end polishing device comprising a rotatable shaft, a member carried by said shaft having its ends oppositely disposed on either side of the shaft, an arm associated with each end of said member, said arm extending substantially parallel to the shaft and slidably connected to the member for movement towards and away from the shaft, polishing means carried by each of the arms, and means for simultaneously moving the arms, said means comprising a screw member rotatably mounted on said first member, the opposed ends of the screw member being in threaded engagement with said arm.

7. In a tube end polishing device, a plurality of polishing members arranged for ro-

tation around a tube to be polished in engagement with the surface thereof, an adjustable hood surrounding said polishing members, and means to vary the radius of rotation of the polishing members and simultaneously adjust the hood to enable the polishing of tubes of various diameters.

In testimony whereof I affix my signature.

FRANK F. FISHER.