April 30, 1940. C. MAXWELL ET AL 2,199,109

TUBE CLEANING DEVICE

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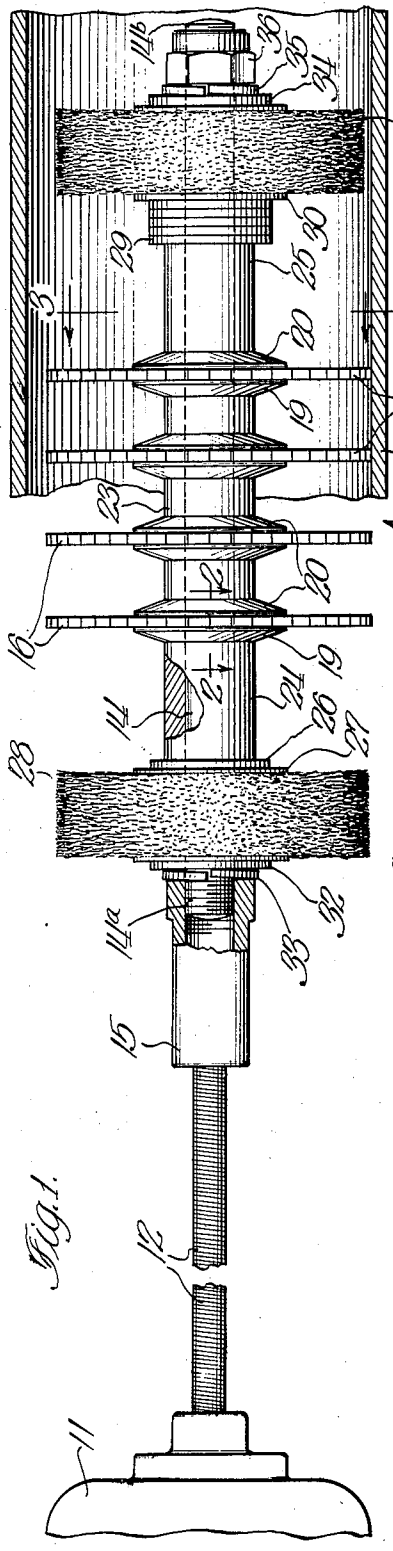


Fig. 1.

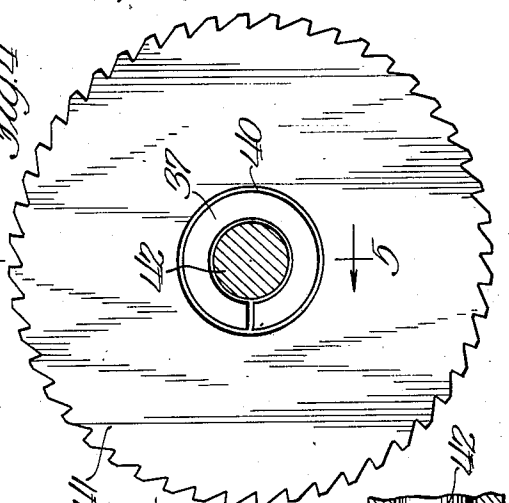


Fig. 4



Fig. 5

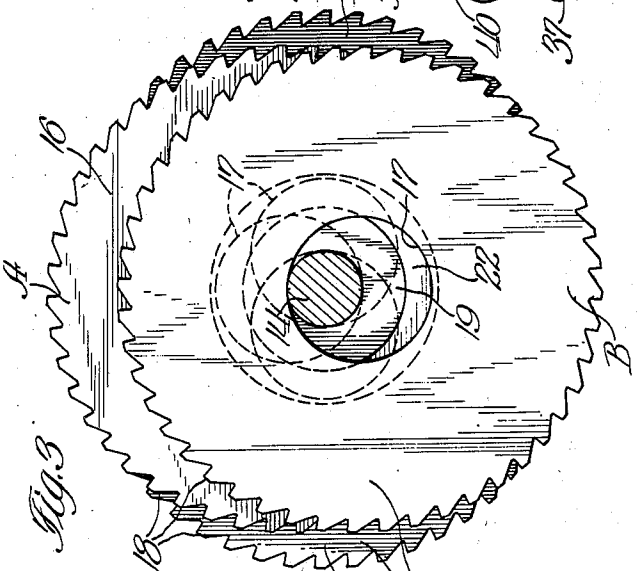


Fig. 3

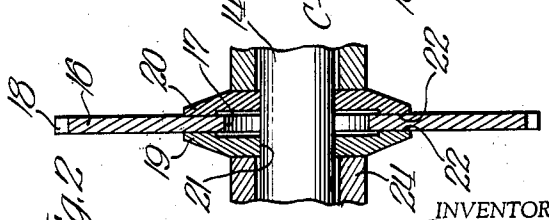


Fig. 2

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TUBE CLEANING DEVICE

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Application October 31, 1938, Serial No. 237,800

3 Claims. (Cl. 15—104.10)

This invention relates to a tube cleaning device, and it has to do more particularly with a device adapted for the removal of scale, carbon, lime and other deposits from the inner walls of boiler tubes, flues, or the like.

One of the objects of this invention is to provide an improved and sturdy tube cleaning device which is quite simple in construction, is inexpensive to manufacture, and is so constructed and arranged that tubes, flues and the like may be thoroughly cleaned with ease in a minimum of time and with a minimum of expense.

Another object is to provide a device of the foregoing character having disk members with toothed peripheries, which disk members are loosely insertable within the tube to be cleaned and which are adapted to be rotated with a vibratory or chatter-like or bouncing action whereby the scale or other deposit is quickly removed by a combined impact and chipping action.

A further object is to provide a tool of the foregoing character having a rotatable support carrying a plurality of axially spaced cleaning disks, which disks are adjustable laterally relative to the axis of the support to accommodate tubes of different diameters as well as varying deposit thicknesses.

Still another object is to provide a tube cleaning device having a rotatable support upon which are mounted spaced-apart cleaning disks, which disks are frictionally supported in such a manner that they rotate with the support as a unit under normal tube cleaning conditions, but automatically shift and adjust themselves back and forth laterally of the support when abnormal pressures are exerted on their peripheries as when blisters or excessive scale thicknesses, or tube disalignment is encountered in moving a rotating tool through a tube.

Additional objects are to provide a tool of the foregoing character having a tensioned mounting for the cleaning disks permitting them to shift laterally of the axis of their support, thereby preventing injury to the disks and breakage of the device as a whole; and to provide a device for cleaning tubes which is readily adaptable for cleaning long tubes, whether they be hot or cold, and which tends to prevent excessive heating or sticking of the rotating tool as it is passed through the tube, whatever its length may be.

Other objects and advantages will become apparent as this description progresses and by reference to the drawing wherein,

Figure 1 is a side elevational view of one form of tube cleaning device embodying my invention, the same being illustrated in a normal position of rest within a tube;

Fig. 2 is a section taken substantially on line 2—2 of Fig. 1;

Fig. 3 is an enlarged transverse section through one end of the tool support, as along line 3—3 of Fig. 1, and illustrating the cleaning disks in laterally adjusted positions for accommodating a tube of greater diameter than that shown in Fig. 1;

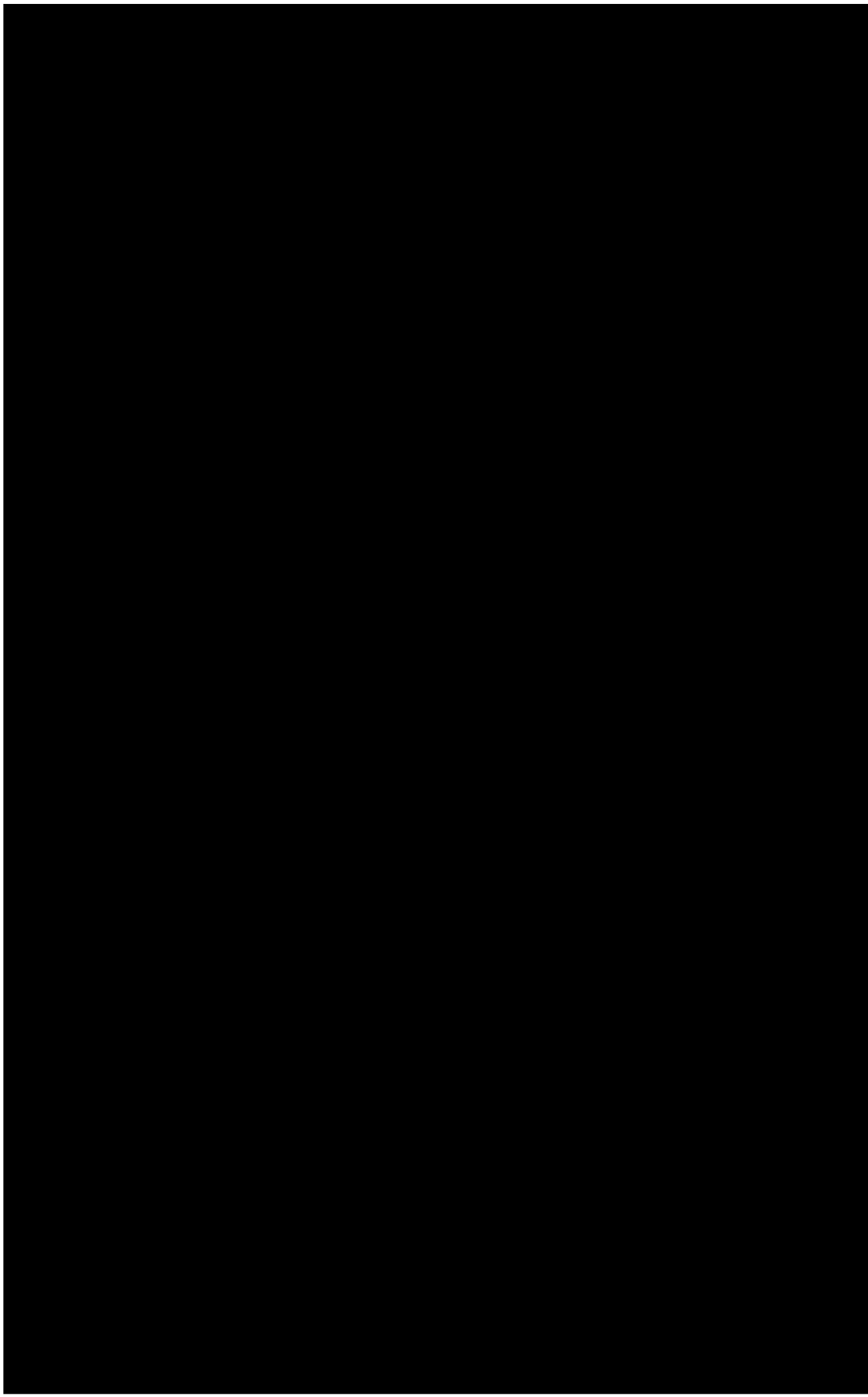
Fig. 4 is a transverse sectional view illustrating a modified form of tool embodying the invention; and

Fig. 5 is a section taken substantially on line 5—5 of Fig. 4.

Referring to the tube cleaning device 10 shown in Figs. 1 to 3, it is driven rotatably by a motor 11 through a flexible drive shaft 12. The drive shaft 12 is of such length that it accommodates the movement of the device 10 throughout the length of the tube 13.

The tube cleaning device 10 includes an elongated, rigid and circular supporting body 14 having threaded ends 14a and 14b. A coupling member 15 is threaded upon the support end 14a, which coupling member may be permanently secured to the adjacent end of the flexible drive shaft 12 so as to form, in effect, a part thereof. A plurality of cleaning disks 16 are mounted upon and driven with the support 14. All of the disks 16 are of similar construction and each is provided at its center with a concentric opening 17 of larger diameter than the support 14 which extends therethrough. The enlarged disk openings 17 permit the disks to shift or be shifted laterally of the support 14, as will be explained more fully hereinafter.

The disks 16 have toothed peripheries 18 and they are so mounted on the support 14 that the peripheral teeth 18 of all disks extend in the direction of rotation of the device. Also, the disks are, preferably, made of a highly durable material capable of withstanding the pounding and chipping action imposed thereon during the operation of the tool; and I have found, for example, that excellent results may be obtained by employing disks formed of tempered carbon steel. The disks 16 are of less diameter than the tube to be cleaned and while this dimensional requirement may be varied it should, in every instance, be such that the desired vibratory, chatter-like or bouncing action will take place as the device is rotated. For example, I have found that excellent results may be obtained by employing



by merely removing the spring washers **33** and **35** and inserting the requisite number of the same in the disk openings as above explained.

It is believed that the operation and advantages of the invention will be readily understood from the foregoing description. As the device is rotated and passed through the tube **13**, it tends to gyrate within the tube with a bouncing, vibrating or chatter-like action, during which the teeth of the disks engage the scale, etc., on the tube wall with a chipping or skiving-like action, quickly loosening and removing the same. This action takes place throughout the length of the device and any abnormal irregularities in the tube or the surface being cleaned are accommodated by the shifting of the cleaning disks to the end that the removing and cleaning action is positive and quite rapid. Also, this action takes place with less drag on the motor **11**, even though there is a tendency toward heating up of the tool as friction increases in the continued operation thereof. It has been found that, if the disks are set up rigidly, the excessive friction and heat developed would soon break the tool, particularly in the cleaning of a long tube. This invention avoids that condition. Also, the arrangement described is well adapted for cleaning either hot or cold tubes with a minimum tendency of the device to crystallize. The tool is simply constructed and arranged and the parts thereof may readily be assembled and replaced. The tool is self-acting in operation once it has been started into the tube to be cleaned, and boiler tubes may readily and quickly be cleaned by unskilled labor without damage to the tube.

It will be understood that, while two adaptations of the invention have been illustrated and described, other changes in details and arrangements of parts may be made without departing from the spirit and scope of the invention as defined by the claims that follow.

We claim:

1. In a tube cleaning tool, a support adapted to be rotated, disks having central openings larger than said support and through which said support extends, and means for supporting said disks for rotation normally with said support, including a pair of members between which each disk is confined, said members of each pair having friction surfaces engaging the opposite side of said disk adjacent the central opening therein, and means including a spring tensioning element for resiliently urging said members and disks axially of said support and for frictionally locking them to said support for rotation normally therewith, while permitting said disks to shift back and forth laterally of said support as abnormal obstruction to rotation thereof is offered.

2. A device of the class described comprising an elongated support adapted to be driven rotatably, a plurality of disks mounted upon said support in spaced relation, said disks each having a central opening of larger size than said support, compression spring members of less diameter than the openings in said disks carried by said support and disposed in said disk openings whereby said disks have a slight lateral movement relative to the axis of said support, and means for securing said disks to said support for rotation therewith including shoe members, one pair for each disk, engaging the opposite sides of each disk, and means for urging said members into frictional engagement with said disks and at the same time compressing said spring members axially and placing them under compression.

3. A device of the class described comprising an elongated support adapted to be driven rotatably, a plurality of disks mounted upon said support in spaced relation, said disks each having a central opening of larger size than said support, means for securing said disks to said support for rotation therewith including a pair of members for each disk carried by said support and frictionally engaging the opposite sides of said disk, and means for frictionally engaging said members and disks for rotation of the latter with said support, including lock washers mounted on said support within the openings of said disks and adapted to be compressed axially and placed under compression as said members and disks are frictionally engaged.

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