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M. MANNION ET AL
PLUG FOR CLEANING CONDENSER TUBES

Filed Feb. 14, 1923

Fig. 1.

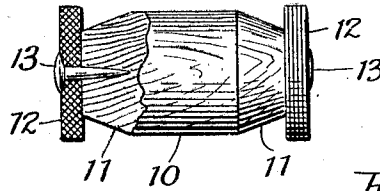


Fig. 2.

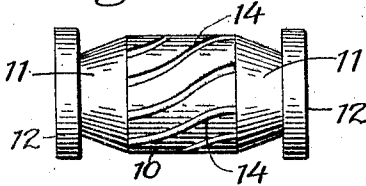


Fig. 3.

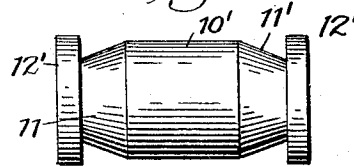


Fig. 4.

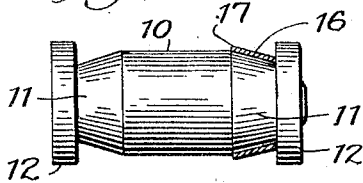


Fig. 5.

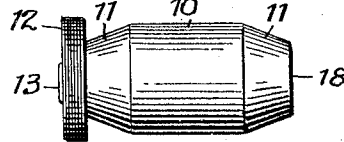


Fig. 6.

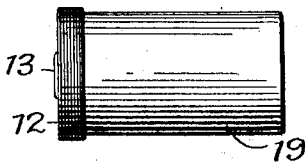


Fig. 7.

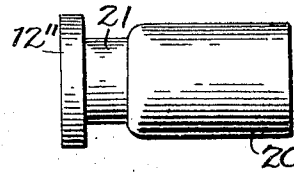
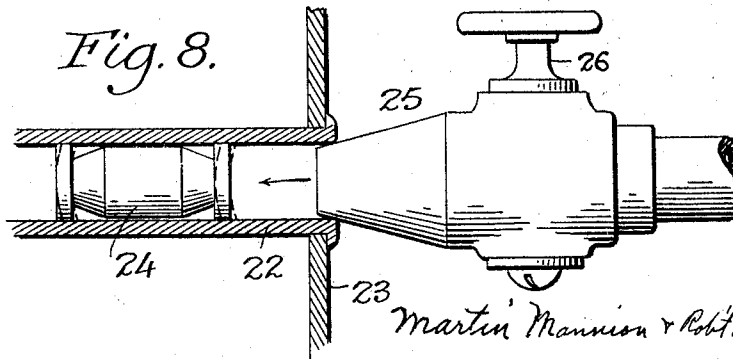


Fig. 8.



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PLUG FOR CLEANING CONDENSER TUBES.

Application filed February 14, 1923. Serial No. 619,061.

This invention relates to method of and apparatus for cleaning tubes and has for an object to provide a device to be operated by the use of compressed air or other fluid under pressure which will be forced through the tube in improved manner to remove the scale or other deposits from the interior of the tubes.

A further object of the invention is to employ a disk of relatively yieldable, elastic or flexible material with means for holding the disk with its general plane transverse to the axis of the tube and employing fluid pressure at the rear of the disk for not only forcing the disk through the tube but to expand the disk into scraping and cleaning relation with the interior surface of the tube.

A further object of the invention is to provide a device to be operated manually by the use of compressed fluid, comprising a body of some type which will serve as a guide in passing through the tube with one or more disks at one or both ends of said tube slightly larger in diameter than the interior of the tube resulting in a dishing of the disk as it is manually initially inserted in the tube and held with its general plane transverse to the axis of the tube and applying fluid pressure at the rear or concave side to force the disk and guide through the tube and at the same time tending to expand the disk to its initial plane condition to force the perimeter of said disk against the inner surface of the tube to scrape the tube in its passage as impelled by the fluid under pressure.

To this end for carrying out the method and providing an apparatus therefor, and with these and other objects in view, the invention comprises certain steps in the method and certain units, elements, parts, combinations and functions in the apparatus as disclosed in the drawings, together with mechanical and functional equivalents thereof as will be hereinafter more fully described and claimed.

In the drawings, Figure 1 is a view partly in side elevation and partly in approximately diametrical section of one embodiment of the apparatus.

Fig. 2 is a view of one embodiment of the apparatus shown in side elevation embodying spiral grooves in the guide member.

Fig. 3 is a view in side elevation of one embodiment of the invention having its body or guide portion tapered at opposite ends with an intervening substantially cylindrical portion.

Fig. 4 is a view partly in side elevation and partly in section of an embodiment of the invention similar to Figure 1, having the tapered part of the guide embraced by a tapered ferrule, the edge of which at the greater diameter serves as an additional scraper.

Fig. 5 is a view in side elevation of an embodiment of the invention having a body similar to that shown at Figure 1 but employing only a single disk.

Fig. 6 is a view in side elevation of an embodiment employing a body or guide portion substantially cylindrical throughout its length.

Fig. 7 is a view in side elevation of an embodiment having a body cylindrical throughout the greater portion of its length and terminating at one or both ends in necks connecting with the disk.

Fig. 8 is a view largely diagrammatic, showing a tube in diametrical section with one of the cleaners inserted therein with a manually controlled air valve inserted in the end of the tube in position to force the cleaner through the tube in cleaning relation.

Like characters of reference indicate corresponding parts throughout the several views.

The cleaning of tubes as ordinarily accomplished is by means of some cleaning implement connected with or carried upon the end of a rod or the like which is forced through the tube by means of such rod or the like manually or otherwise cleaning the interior of the tube in its passage. This method of cleaning tubes is slow in operation, requiring also considerable space in front of the end of the tube for manipulation which must usually be accomplished by removing the head or other enclosing structure. In the present invention the tube is

cleaned by forcing through the tube by air pressure or other convenient fluid under pressure, a disk larger in diameter than the diameter of the tube having means for maintaining the disk with its general plane transverse to the axis of the tube, permitting preferably the dishing of the disk as it is initially and manually inserted in one end of the tube with the concave side toward the operator. The air pressure is now applied at the end of the tube into which the device has been inserted impinging against the disk in its concavity tending to expand the disk by forcing the edges into frictional and therefore scraping engagement with the interior of the tube. The air pressure is such that it produces not only this tendency but also forces the device as an entity through the tube. Preferably two of the disks will be employed so that in case the encounter of an immovable obstruction tending to interrupt the air tight relation of the disk with the tube, another disk is provided for retaining the air pressure and continuing the movement through the tube.

With this end in view the device will preferably, though not necessarily, comprise a central body portion slightly smaller than the diameter of the tube with end disks slightly larger than the body and also slightly larger than the tube.

At Figure 1 the body is shown as provided with a cylindrical part 10 and tapered extremities 11. To this body disks 12 are attached in the form of washers which may be composed of leather, rubber or any other yieldable, elastic or flexible material.

For economy of construction the body may be of wood and the disks 12 secured thereto by any approved type of penetrating member as indicated conventionally at 13.

At Fig. 2 the body is shown as provided with a plurality of grooves 14 forming ribs which coincide with the maximum circumference of the body. These ribs are preferably spirally positioned relative to the body tending not only to serve as scraping members but also tending to rotate the device as an entity as it is forced through the tube.

At Fig. 3 the body part and disk parts are indicated as formed, cast or molded as an entity or integral structure and may therefore be produced from rubber or any material which will serve the purpose of providing disks of relative or appropriate flexibility and a body for maintaining the proper planar relation of the disks to the tube.

At Fig. 4 the tapered part 11 of the body is shown as covered with a tapered ferrule 16. In the case of the use of this ferrule the body 10 may be slightly smaller relatively than in the types previously referred

to so that the larger or wider end will present at 17 a scraping edge.

At Fig. 5 the body portion is shown as provided with only a single disk 12. In the use of a device so constructed, the end 18, which is unprovided with a disk, would be first inserted in the tube tending to serve as a guide for the disk following, forced through by the fluid under pressure.

At Fig. 6 the body 19 is shown as substantially cylindrical throughout and slightly smaller in diameter than the disk 12 secured thereto by the penetrating member 13. This embodiment is used the same as embodiment shown at Fig. 5.

At Fig. 7 a body 20 is indicated having a neck 21 with a disk 12" which is shown as indicating that this disk may be integral or attached to the body 20, the novelty of this embodiment residing in the neck 21 interposed between the body and the disk irrespective of integrality.

At Fig. 8 a conventional showing of the use of the device discloses a tube 22 with tube sheet 23 with the cleaner device of any of the types shown at Figs. 1 to 7, inclusive, being comprehended in the device shown at 24 in this diagrammatic view. A nozzle for delivering air or other fluid under pressure is inserted in the end of the tube manually controlled, such nozzle being indicated conventionally at 25 with a conventional type of manual control being shown at 26, it being understood that the invention either as to method or apparatus is in no way limited to specific features shown in Fig. 8.

It will be readily understood that the device of any of the several specific types indicated at 24 will be introduced into one end of the tube 22 and by reason of the fact that the disks are of slightly greater diameter than the tube the said disks will assume dished shapes as indicated in said figure with the concave sides of the disk directed toward the end of insertion.

The air nozzle is now applied to the end of the tube making a substantially airtight fit therewith by reason of its taper or otherwise and the valve 26 manipulated to introduce air into the tube against the concave side of the nearest disk. The air pressure tends to simultaneously force the device as an organized structure through the tube and to expand the disk or disks whereby the disks engage with considerable friction the interior surface of the tube and in passing scrape the deposit therefrom, carrying it through to the opposite end.

We claim:—

1. An apparatus for cleaning tubes comprising a body portion tapered toward its ends, flanges arranged at the ends of said body portion, and a snugly fitting ferrule carried by one of the tapered ends of the body portion and having a portion project-

ing beyond the periphery of the body portion.

2. An apparatus for cleaning tubes comprising a body portion tapered toward its ends, flanges arranged at the ends of said body portion, and a ferrule snugly fitting about one of the tapered ends of the body portion and having one of its ends abutting

against the adjacent flange, and the other of its ends projecting beyond the periphery 10 of the body portion.

In testimony whereof we affix our signatures.

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