P. J. DARLINGTON.

ROTARY TUBE CLEANER.

APPLICATION FILED DEC. 2, 1907.

942,312.

Patented Dec. 7, 1909.

2 SHEETS—SHEET 1.

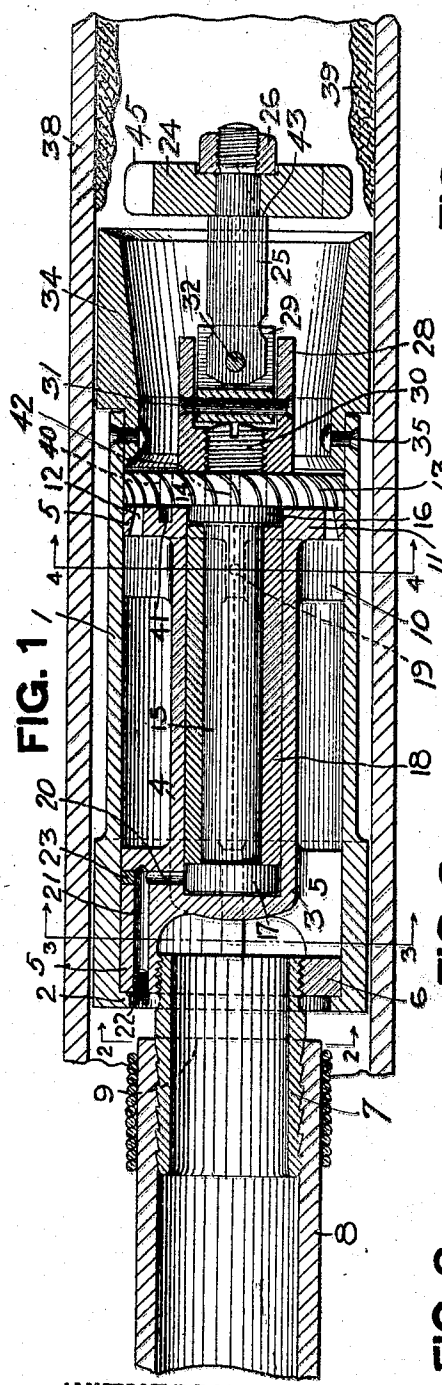

FIG. 1

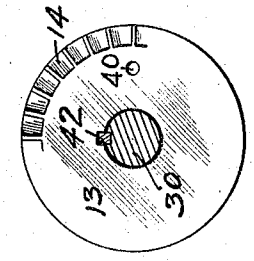

FIG. 5

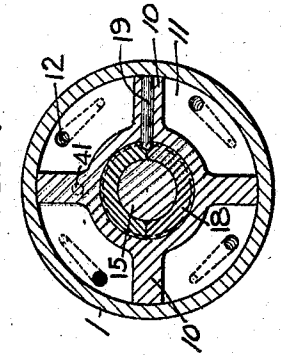

FIG. 4

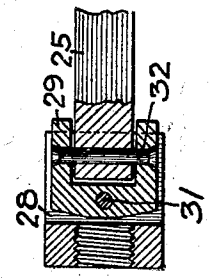

FIG. 7

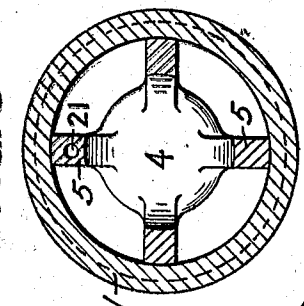

FIG. 3

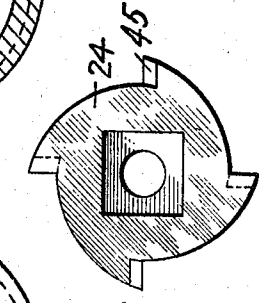

FIG. 6

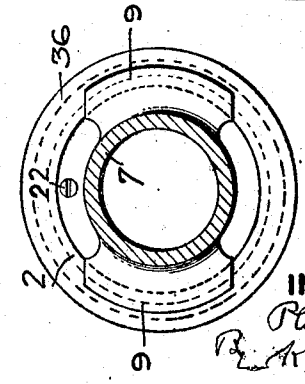

FIG. 2

WITNESSES.

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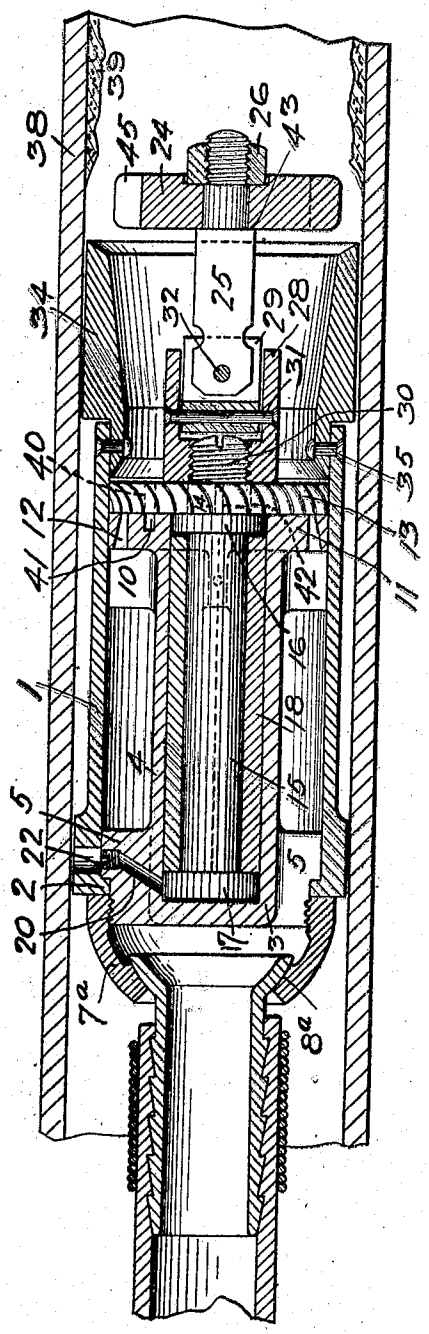

FIG. 8

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PHILIP J. DARLINGTON, OF PITTSBURG, PENNSYLVANIA.

ROTARY TUBE-CLEANER.

942,312. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed December 2, 1907. Serial No. 404,680.

To all whom it may concern:

Be it known that I, PHILIP J. DARLINGTON, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rotary Tube-Cleaners; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to a device for cleaning scale from the inside of boiler tubes, and especially to that type of such device known as rotary tube cleaners.

The object of the invention is to improve devices of this character in details of construction whereby they are rendered more effective in removing scale, more durable, cheaper to manufacture, and easier to repair.

The invention comprises the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal section through a tube cleaner constructed according to my invention; Figs. 2, 3 and 4 are transverse sections taken respectively on the lines 2—2, 3—3, and 4—4, Fig. 1; Fig. 5 is a face view of the turbine wheel with the shaft in section; Fig. 6 is an end view of the tool or cutter; Fig. 7 is a longitudinal section through the universal coupling taken at right angles to the section shown in Fig. 1; and Fig. 8 shows a modification for use in bent tubes.

The tube cleaner includes a suitable outer shell 1, preferably steel, provided at its rear end with an internal flange 2. In the shell is the frame 3 comprising a hollow cylindrical tube or hub 4, closed at its rear end and provided at its forward end with an integral external flange 11 and at its rear end with an integral flange 6, the latter abutting against the internal flange 2 of the shell. The hollow shank 7 of the hose 8 is screwed through the flange 6 and is provided with external wings or flanges 9 bearing against the rear face of the flange 2, thereby holding the shell 1 on the frame 3. The flange 6 is joined to the hub 4 by radial arms 5, thereby allowing free passage of fluid from the inside of the hose shank 7 to the rear face of the flange 11. The threads connecting the hose shank 7 with the ring 6 run in the direction of rotation of the tool, so that the working reaction of the tool causes the hose shank 7 to clamp the flange of the shell tightly to the end of the frame. Flange 11 is strengthened by ribs 10 and is pierced by inclined nozzle ports 12 through which the motive fluid, such as air, water or steam, passes to the turbine. A shaft 15 with a front shoulder in the form of a collar 16 and with a rear collar 17 is fitted in a split bushing 18 which is forced tightly into the tube or hub 4, and fits loosely around and forms a bearing for the shaft 15 between the collars 16 and 17 for which its end faces form thrust bearings. A pin 19 passes radially through one rib 10 into the bushing 18, thereby holding the latter in position with the rear end of the shaft 15 in contact with, and having a thrust bearing on, the forward face of the transverse wall closing the rear end of the tube or hub 4. Communicating with the interior of the tube or hub 4 is a transverse lubricant passage 20 permanently closed at its outer end by a soldered plug 23, or otherwise, and connecting the interior of hub 4 with a longitudinal lubricant passage 21 which is normally closed by a screw plug 22 removable for putting in lubricant.

On the outer end of shaft 15 is a turbine wheel 13 provided with inclined blades 14 arranged to receive fluid jets from the nozzles 12 and be rotated thereby. This wheel 13 is fitted upon a cylindrical section of shaft 15 in front of collar 16 and is held from turning thereon by key 42 set into the shaft 15 and projecting into a key-way in the wheel 13. A hole 40 is provided through wheel 13 and a hole 41 is drilled into flange 11, both holes being at the same radius so they can be brought into alinement to allow a bar to be entered through wheel 13 into flange 11, thereby locking these parts together for screwing the tool holder on or off.

The tool or cutter 24 may be of any suitable type, being shown as provided with teeth 45 alternately inclined at opposite angles from the axis. It is mounted on the cylindrical outer end of the shank 25, being clamped between shoulder 43 and a nut 26 which screws onto the threaded outer end of said shank, and is seated loosely in a depression in the cutter, corresponding in shape to

the nut. In assembling the cutter and shank the nut and cutter are rotated as one until the cutter is clamped tightly in position. The nut is carried around with the cutter in its tendency to rotate on the shank 25, so that the cutter clamps itself tightly by its own rotative action. The tool shank is connected to the rotor, that is, the wheel 13, by a universal coupling, which is of special construction to greatly shorten the same and allow of a relatively long tool shank without unduly lengthening the implement as a whole. This universal coupling comprises an outer jaw 28 screwed onto the end 30 of the shaft 15 and serves as a nut to clamp the wheel 13, and the inner jaw 29 at right angles to the outer jaw and pivoted thereto by pin 31 so as to swing through the outer jaw. The cutter shank 25 is arranged to swing through the jaw 29 on pin 32 which is at right angles to the pin 31. This arrangement of jaws and pins forms a universal joint connection between shaft 15 and stem 25 whereby the latter rotates with the shaft 15 while its outer end is free to swing laterally in any direction. The joint is very short so as to allow of a relatively long shank 25 without projecting the cutter an undesirable distance forward. The consequence is that the tool or cutter vibrating on the pin 32 swings on a long arm or lever, rendering more effective the action of the tool.

One difficulty in the operation of tools of this kind arises from the fact that a small projection or incrustation may be left by the tool passing beyond the same and which stops the inward feed of the tool as soon as the casing comes in contact therewith, so that the tool must be drawn back and forth until the obstruction is removed. I avoid this by providing an annular guide ring or shell extension 34 extending forwardly into close proximity to the rear face of the cutter, and of slightly larger diameter than the shell 1. While this guide is shown attached rigidly to the shell 1 by rivets 35, it may evidently be integral therewith for cheaper construction or flexibly attached thereto for use in curved tubes. It serves to prevent the cutter from advancing beyond an obstruction without removing it, as the guide will abut against such obstruction and hold the tool in that position until the pounding action of the tool removes the obstruction.

The rear end of the shell 1 may be enlarged, as at 36, to serve as a guide in the tube, or the shell may be shaped as in Fig. 8 with the rounded rear portion 7^a so as to enable the same to pass more readily through curved tubes. A flexible or ball and socket hose connection 8^a is here shown.

In Fig. 1, the tube to be cleaned is shown at 38 and the incrustation at 39.

In operation the rapid rotation of cutter 24 causes it to bound about, striking the scale and cutting or breaking it away. By forcing the cleaner gently forward, keeping the front edge of guide ring 34 at all times against the scale the cutter 24 will always strike on the ragged and unsupported edge of scale and will quickly remove it and immediately move forward onto new scale without injuring the cleaned section of tube. Without such guide ring the cutter frequently passes a patch or spot of scale and the tool must be repeatedly moved toward and away from it while only a few of the blows of the cutter strike the scale.

What I claim is:

1. In a rotary tube cleaner, a frame provided with fluid passages and with an axial bore, a shaft rotatably journaled in said bore and provided with a shoulder near its front end, a cylindrical section in front of said shoulder and a threaded section at its front end, a wheel fitting said cylindrical section, and a tool holder screwed onto the threaded end of said shaft against said wheel forcing the latter against said shoulder.

2. In a rotary tube cleaner, a frame provided with fluid passages and with an axial bore, a shaft rotatably journaled in said bore and provided with a shoulder near its front end, a cylindrical section in front of said shoulder and a threaded section at its front end, a wheel fitting said cylindrical section, a key between said shaft and said wheel to prevent relative rotation, and a tool holder screwed onto the threaded end of said shaft against said wheel forcing the latter against said shoulder.

3. In a rotary tube cleaner, a solid circular body having teeth formed in its periphery and extending substantially longitudinally of the body, all of said teeth being in the same transverse plane and different ones of said teeth making different angles with the axis of said body, a rotary shaft, a shank carrying said toothed body, and flexible means connecting said shank to said rotary shaft.

4. In a rotary tube cleaning device, a rotary stem provided near its front end with a shoulder and a reduced section of circular cross-section in front of said shoulder, a cutter fitting the reduced section and bearing against the shoulder, a nut threaded onto the front end of the stem with the threads running contrawise to the direction of rotation of the stem, said nut being formed with angles, and a cutter having a correspondingly shaped socket into which said nut fits, the socket walls engaging the side faces of said nut, whereby the latter is carried with the cutter in its tendency to rotate on the stem.

5. In a rotary tube cleaner, a solid circular body having teeth formed on its periph-

ery in substantially the same transverse plane and extending substantially longitudinally of the body, the alternate ones of said teeth extending at opposite angles to the axis of the body, a rotary shaft, a shank carrying said toothed body, and flexible means connecting said shank to said rotary shaft.

In testimony whereof, I the said PHILIP J. DARLINGTON have hereunto set my hand.

PHILIP J. DARLINGTON.

Witnesses:
JNO. T. CHAMBERS,
JOHN H. VOORHEES.