No. 894,557. PATENTED JULY 28, 1908.

H. F. WEINLAND.

APPARATUS FOR CLEANING BOILER TUBES.

APPLICATION FILED JUNE 12, 1905. 2 SHEETS—SHEET 1.

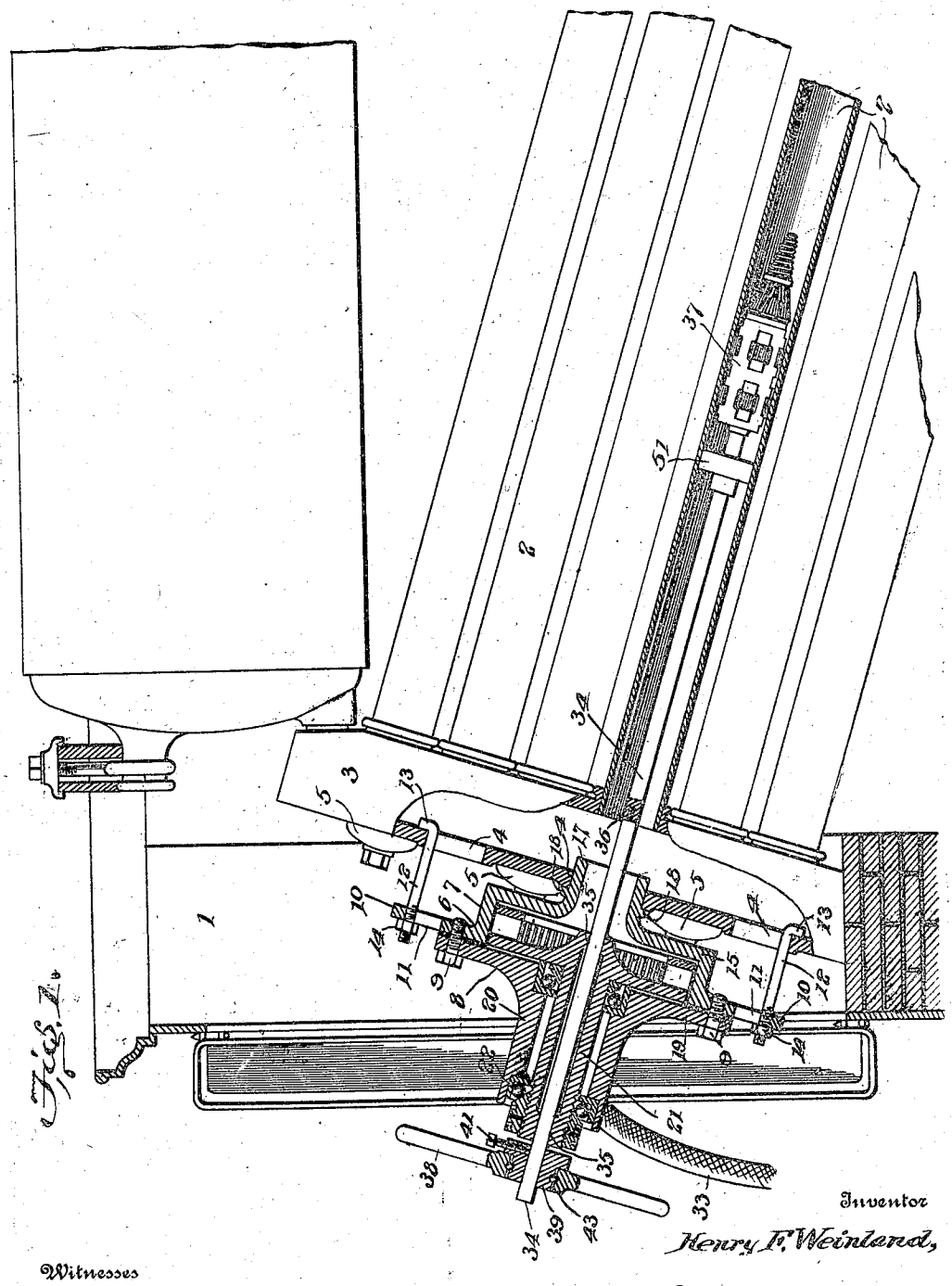


Fig. 1.

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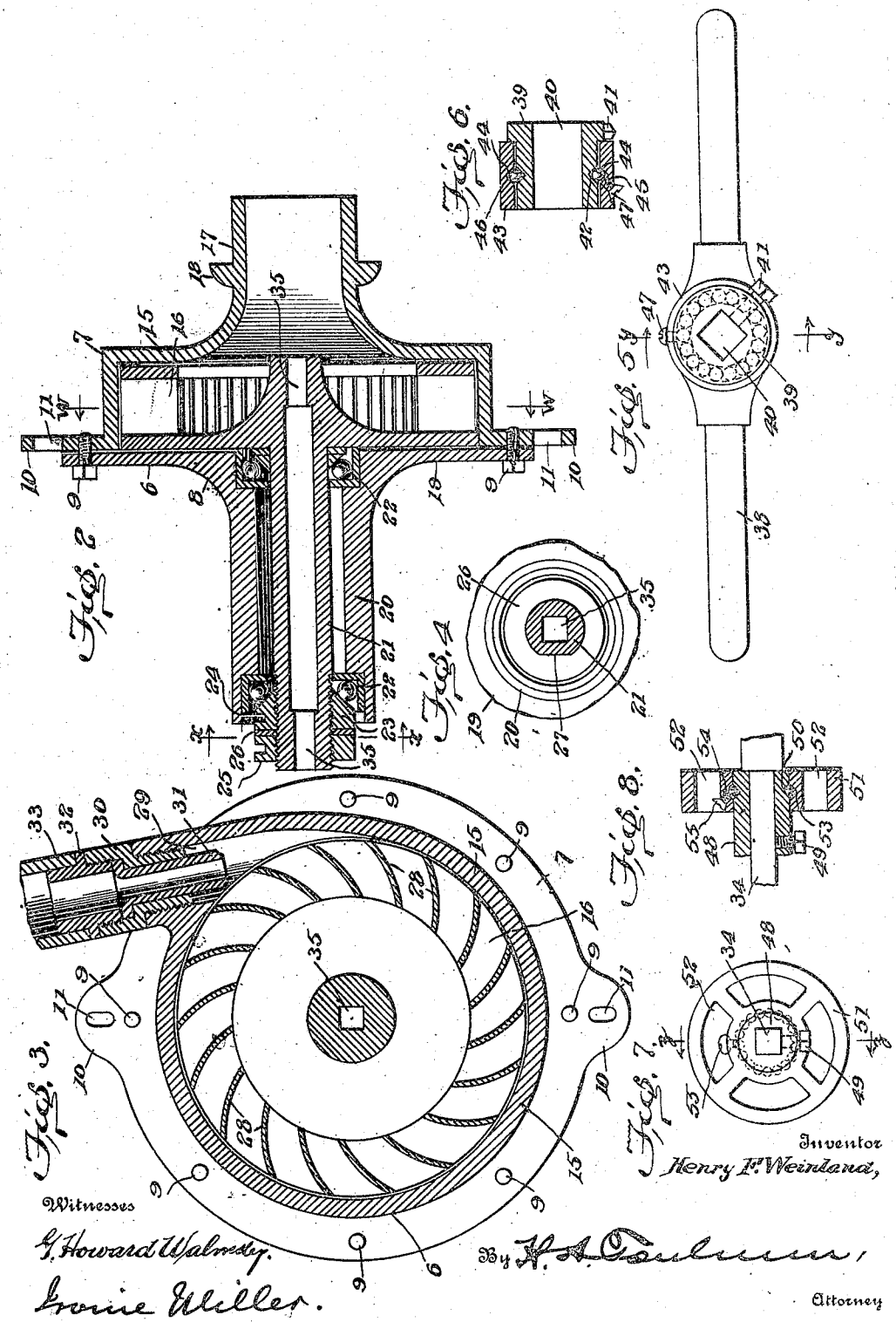
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Witnesses

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CLEANING BOILER-TUBES.

No. 894,557. Specification of Letters Patent. Patented July 28, 1908.

Application filed June 12, 1905. Serial No. 264,746.

To all whom it may concern:

Be it known that I, HENRY F. WEINLAND, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Apparatus for Cleaning Boiler-Tubes, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to apparatus for cleaning boiler tubes, and more particularly to the mechanism whereby rotary motion at a high rate of speed is imparted to the cleaner head or cleaning tool proper, and whereby the said head or tool is fed to its work.

It is the object of my invention to provide an apparatus in which the motor is external with relation to the boiler, being located outside of the tubes to be cleaned, while the cleaner head or cleaning tool proper is adapted to enter and be fed through the tubes by hand, being freely movable back and forth therein in line of the axis of the tube operated upon, the cleaner shaft having a sliding engagement with the motor shaft, in unison with which it rotates.

To these and other ends my invention consists in certain novel features which I will now proceed to describe, and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a view partly in elevation and partly in vertical section, showing an apparatus embodying my invention in one form in operative position in relation to a boiler; Fig. 2 is an enlarged view of so much of Fig. 1 as constitutes the motor proper; Fig. 3 is a sectional view, taken on the line *w w* of Fig. 2 and looking in the direction of the arrows; Fig. 4 is a detail sectional view, taken on the line *x x* of Fig. 2 and looking in the direction of the arrows; Fig. 5 is a detail elevation of the feed controlling handle, detached; Fig. 6 is a sectional view of the same, taken on the line *y y* of Fig. 5 and looking in the direction of the arrows; Fig. 7 is a detail view of the combined guide and gage, the same being shown in position upon the cleaner shaft, which is shown in section; and Fig. 8 is a sectional view, taken on the line *z z* of Fig. 7 and looking in the direction of the arrows.

In the said drawings, 1 indicates the casing or housing of a boiler, which, in the present instance, is shown as comprising a plurality of parallel tubes 2, and a header or manifold 3, into the rear wall of which the tubes open, the front wall being provided with hand holes 4, closed when in use by the usual caps 5. This form of boiler is chosen for purposes of illustration only, as the apparatus is capable of use with other types of boiler.

The apparatus comprises a motor adapted to be supported in a fixed working position in front of the boiler, preferably by means of connecting devices by which it is secured directly to the boiler, the connection being such that the position of the motor may be shifted from tube to tube during the cleaning operations. In the present instance, I have shown the motor as a water motor, which I prefer. 6 indicates the motor casing as a whole, comprising two separable parts 7 and 8, united by screw bolts 9. The part 7 is provided with flanges or extensions 10, slotted as indicated at 11 to receive hook bolts 12, the hooked ends 13 of which are adapted to engage with the margins of the hand holes 4 of the header front, while the other, threaded ends of said hook-bolts are provided with nuts 14, which bear against the outer faces of the flanges or extensions 10. The casing member 7 comprises also a housing 15 for the motor wheel 16, and a central discharge tube 17, which is adapted to pass through one of the hand holes 4 of the header front, and which is provided with a stop flange 18 to bear against the front surface thereof. By reason of the slots 11, the hook bolts 12 may be adjusted so as to properly engage the header front, and by tightening up the nuts 14, the casing may be drawn against said front until the stop flange 18 bears firmly against the same, thus securing the motor casing in position. The casing member 8 comprises a disk-like body portion 19, which forms one wall of the motor wheel housing, its margin receiving the screw bolts 9, and said casing member further comprises a bearing sleeve 20, in which the motor shaft or hub 21 is supported in suitable bearings. These bearings are so constructed as to prevent longitudinal motion of the motor shaft in the bearing sleeve, and, in the present instance, I have shown for this purpose ball bearings 22. In order to provide an adjustment for said bearings, and to take up any wear that may occur, the outer end of the motor shaft

is threaded, and the bearing cone 23 of the outer bearing is correspondingly threaded and mounted on said threaded end of the shaft, so that, by turning said cone on said shaft in the proper direction, the desired adjustment may be effected. To this end said cone is shown as provided with apertures 24 in its periphery, to receive a pin or other suitable device by means of which it may be turned. To hold the cone in position after it is adjusted, I employ a lock nut 25, also mounted on the threaded end of the motor shaft, and to prevent the turning of said lock nut when screwed home from turning the bearing cone and thereby disturbing its adjustment, I interpose between the locking nut and cone a washer 26, which is prevented from rotation by reason of the fact that the end of the motor shaft is flattened at one side, as indicated at 27 in Fig. 4, the aperture of the washer being similarly shaped.

The motor wheel 16 is shown as provided with peripheral vanes or buckets 28, said wheel having a central discharge into the discharge tube 17. The motor housing 15 is provided with a tangential inlet tube 29, threaded to receive a bushing 30, in which is mounted a jet nozzle 31, so directed as to deliver a jet of water under pressure against the buckets or vanes 28 of the motor wheel to rotate the same with the desired speed and power. A coupling 32, to which a hose 33 is attached, is screwed into the outer end of the bushing 30, said hose being connected to any suitable source of supply of water under pressure. The water is discharged from the motor through the discharge pipe 17 into the header 3, from which the greater portion of it is discharged through the lower boiler tubes, a sufficient quantity being carried over by the force of its discharge to the tube being operated on to supply said tube with the water necessary to the efficient working of the cleaner head in the operation of removing the scale.

The motor shaft 21 is hollow, and the cleaner shaft, indicated as a whole by the reference numeral 34, extends through said hollow motor shaft and is free to slide longitudinally therein, while rotating in unison therewith. Any suitable construction may be employed to cause the two shafts to rotate in unison, but that which I prefer is the construction shown, in which the cleaner shaft 34 is made square in cross section, the motor shaft aperture being also made square in cross section for at least a portion of its length, as indicated at 35, to fit the cleaner shaft. The cleaner shaft is preferably made in sections, united by a suitable separable joint, as indicated at 36, so that, as the cleaning proceeds and the cleaning head or tool advances further into the tube, the cleaning shaft may be lengthened from time to time by the addition of other sections, as may be required. By reason of this construction, the inconvenience of operating an unnecessarily long cleaning shaft at the beginning of the cleaning of each tube is avoided, the operator stands close to the work, and the apparatus may be adapted for cleaning tubes of any length.

At its forward end the cleaner shaft has attached to it a cleaner head 37, which may be of any suitable construction, although I prefer for this purpose a power cleaner head such as is set forth in either of my prior Letters Patent No. 743,782, of November 10, 1903, or No. 784,129, of March 7, 1905, the latter form being illustrated in the present instance. The rear end of the cleaner shaft 34 extends out beyond the end of the motor shaft 21, and is there provided with a feed-controlling handle 38, so mounted thereon that the shaft is free to turn in the handle, but must move longitudinally in unison therewith. I have provided a connection whereby this handle may be attached to any one of the sections of which the cleaner shaft is composed, and to that end said connection comprises a sleeve 39, having a square aperture 40 to receive the shaft 34, upon which it is secured by means of a set screw 41. The sleeve 40 is provided externally with a circumferential groove 42, while the handle 38 is provided with a central sleeve 43, which fits over the sleeve 39, and is provided with an internal circumferential groove 44 corresponding to the groove 42. The sleeve 43 has an aperture 45, through which bearing balls 46 may be introduced into the raceway formed by the grooves 42 and 44, and after the balls are thus introduced, the aperture 45 is closed by a screw 47, which the aperture is threaded to receive. By reason of this construction, the operator may grasp the handle 38 and by its means move the cleaner shaft longitudinally back and forward through the motor shaft, thereby imparting a corresponding motion to the cleaner head or tool 37. In this way the cleaning tool may be fed to its work as occasion may require, and may be moved back and forward over the portion of the tube operated upon until the scale is entirely removed therefrom.

In order to support the inner end of the cleaner shaft so as to maintain it in proper central position within the tube and at the same time enable the operator to determine whether the scale has been completely removed from the part of the tube on which the cleaning tool is operating without a visual inspection and the removal of the apparatus which such inspection requires, I have provided a combined guide and gage, mounted on the cleaner shaft near its inner end. This device is shown in position in Fig. 1, and is illustrated in detail in Figs. 7 and 8. It comprises a sleeve 48, secured on the shaft 34 by means of a set screw 49, or in any other

suitable manner. This sleeve is provided with a circumferential groove 50 in its external surface, which is cylindric.

51 represents a ring or annulus fitting on the sleeve 48 and provided with apertures 52 for the free passage of the water which is supplied to the cleaning head. This annulus 51 is provided with an internal circumferential groove 53, corresponding to the groove 50 of the sleeve 48, and said annulus is further provided with an aperture 54, through which bearing balls may be introduced into the raceway formed by the grooves 50 and 53, said aperture being closed, after the introduction of the balls, by means of a screw 55, which the aperture is threaded to receive. The cleaner shaft and its sleeve are thus free to rotate within the annulus, while this latter moves longitudinally with them. The annulus is made of an external diameter such as to fit and slide within the tube operated upon, so that it guides and supports the inner end of the cleaner shaft, forming a bearing therefor which holds the shaft in properly centered position within the tube. Since the said annulus fits the tube somewhat closely and moves longitudinally with the cleaner shaft, any scale remaining in the tube will resist forward pressure exerted by the operator to feed the cleaner forward, and will indicate to him that the scale has not been entirely removed. In such a case, the operator draws the cleaner shaft outward until the cleaning head or tool is brought back to the unfinished section of the tube and there caused to operate until said section is properly cleaned, so as to permit the gage formed by the annulus 51 to pass by the same.

The general operation of the apparatus will be readily understood from the preceding description. The motor casing is applied to the header front in proper relation to the particular tube to be operated upon, and may be shifted from tube to tube as the cleaning operation proceeds. The motor, being external with relation to the boiler, may be made of such a size as to give the necessary power and speed to effectively remove the scale, and the rotary motion of the motor shaft is transmitted directly to the cleaner shaft, giving the necessary rotary motion to the cleaning head or tool attached to the forward end of the cleaner shaft. As the scale is successively removed, first from the front end of the tube, and then from the portions thereof lying further back, the cleaner shaft and tool are fed forward by hand by the operator, the tool being freely movable backward and forward as occasion may require, so as to cause the tool to operate repeatedly upon the portion of the tube thus traversed where conditions require such repeated treatment. In case the tubes are of such a length as to require it, additional sections may be added to the cleaner shaft to lengthen the same, and this may be readily accomplished without removing the tool or shaft or displacing the motor, by simply removing the handle and coupling on an additional shaft section to the projecting end of the section from which the handle has been just removed. The handle may be then applied to the end of the added section, and the cleaning will proceed as before.

I do not wish to be understood as limiting myself to the precise details of construction hereinbefore described and shown in the accompanying drawings, as it is obvious that modifications may be made therein without departing from the principles of my invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An apparatus for cleaning boiler tubes, comprising a motor having a hollow motor shaft and a rotating power-generating member or wheel mounted directly on said shaft, means for supporting said motor in variable fixed positions relatively to the boiler front, a cleaner shaft extending centrally through the motor shaft, having a free longitudinal movement relatively thereto and rotating in unison therewith, a cleaning tool mounted on the forward end of said cleaner shaft, in front of the motor, and a feed-controlling handle mounted on the rear end of said shaft, in the rear of the motor, said cleaner shaft being free to rotate in said handle and moving longitudinally in unison therewith, substantially as described.

2. An apparatus for cleaning boiler tubes comprising a motor having a casing, a water wheel mounted in said casing and having a hollow shaft, means for supplying water under pressure to said wheel, said casing having a central water discharge pipe, means for supporting said motor in variable fixed position relatively to the boiler front, a cleaner shaft extending centrally through the casing, motor shaft and discharge pipe and beyond the same in each direction, said cleaner shaft having a free longitudinal movement relatively to the motor shaft and rotating in unison therewith, a cleaning tool mounted on the forward end of said cleaner shaft, and a feed-controlling handle mounted on the rear end of said cleaner shaft, said cleaner shaft being free to rotate in said handle and moving longitudinally in unison therewith, substantially as described.

3. In an apparatus for cleaning boiler tubes, the combination, with a water wheel having a hollow shaft extending on one side thereof, of a casing for said wheel having at one side a bearing sleeve for said shaft, and having at the other side a tubular extension alined with said bearing sleeve and constituting a water discharge pipe adapted to fit a boiler opening, and a cleaner shaft extending

through said hollow shaft, casing and discharge pipe and beyond the same in each direction, provided with a cleaning tool at one end, and with a feed-controlling handle swiveled on its other end, substantially as described.

4. In an apparatus for cleaning boiler tubes, the combination, with a water wheel having a hollow shaft extending on one side thereof, of a casing for said wheel having at one side a bearing sleeve for said shaft, and having at the other side a tubular extension alined with said bearing sleeve and constituting a water discharge pipe adapted to fit a boiler opening, and a cleaner shaft extending through said hollow shaft, casing and discharge pipe and beyond the same in each direction, provided with a cleaning tool at one end, and with a feed-controlling handle swiveled on its other end, said motor casing being provided with means for connecting it to a boiler front, substantially as described.

5. An apparatus for cleaning boiler tubes comprising a cleaner shaft having a cleaning tool at one end and a swiveled handle at the other end, in combination with a motor comprising a water wheel having a hollow shaft in which said cleaner shaft slides and with which it rotates, and a casing inclosing said water wheel and having a bearing for its shaft, a water inlet, and a central discharge pipe adapted to fit the hand hole of a boiler header and terminate within said header, being provided with a stop shoulder to bear against the front thereof, said casing being provided with means for drawing the same against the boiler front, substantially as described.

6. In an apparatus of the character described, the combination, with a motor having a fixed position, of a longitudinally slidable shaft rotated by said motor and composed of detachable sections of polygonal cross section, and a detachable controlling handle for said shaft comprising a cylindrical sleeve having an opening to fit said shaft and means for detachably securing the same in position thereon, and a handle proper having a sleeve portion in which said first mentioned sleeve is mounted to rotate and with which it moves in unison longitudinally of the shaft, substantially as described.

In testimony whereof, I affix my signature in presence of two witnesses.

HENRY F. WEINLAND.

Witnesses:

IRVINE MILLER,

HARRIET HAMMAKER.