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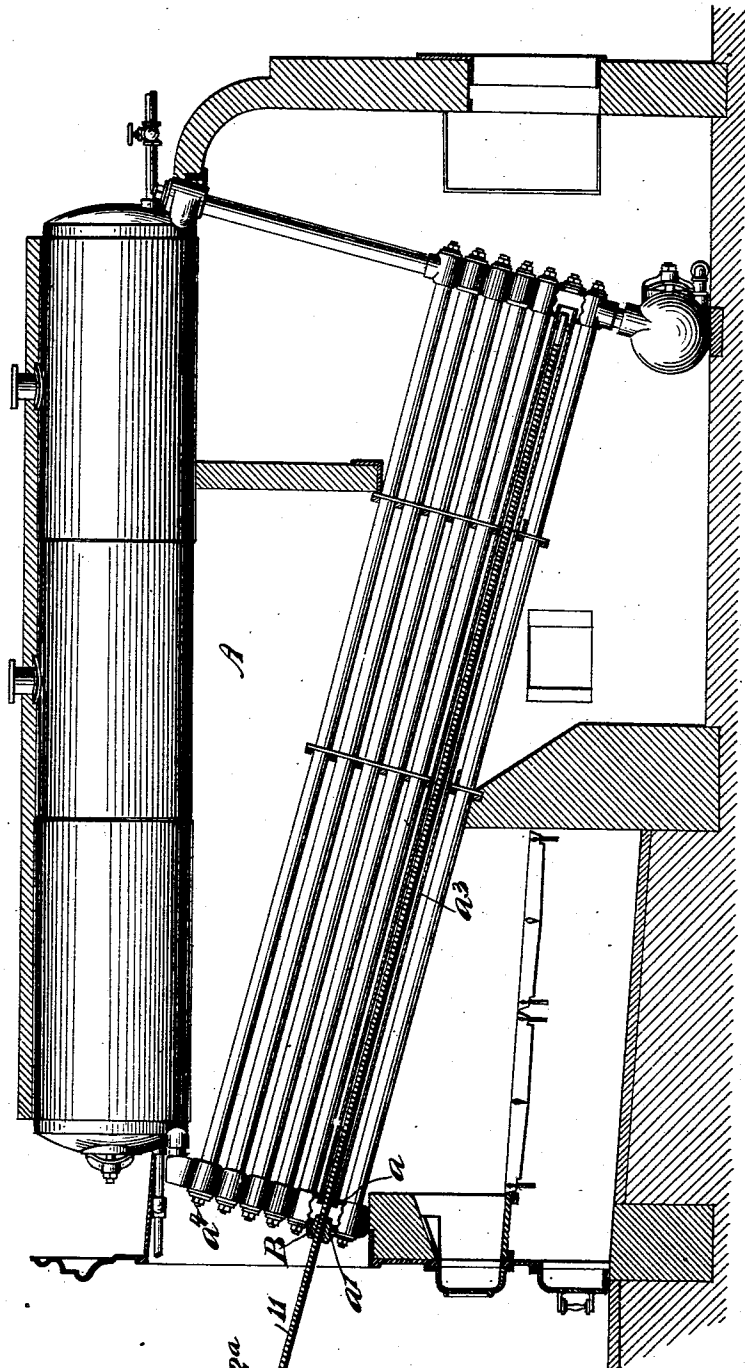
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J. H. VOORHEES.
STEAM BOILER TUBE CLEANER.

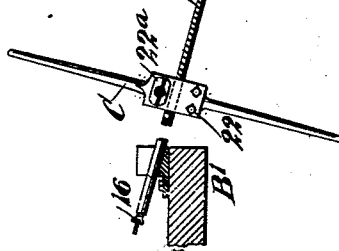
No. 572,037.

Patented Nov. 24, 1896.

Fig. 1



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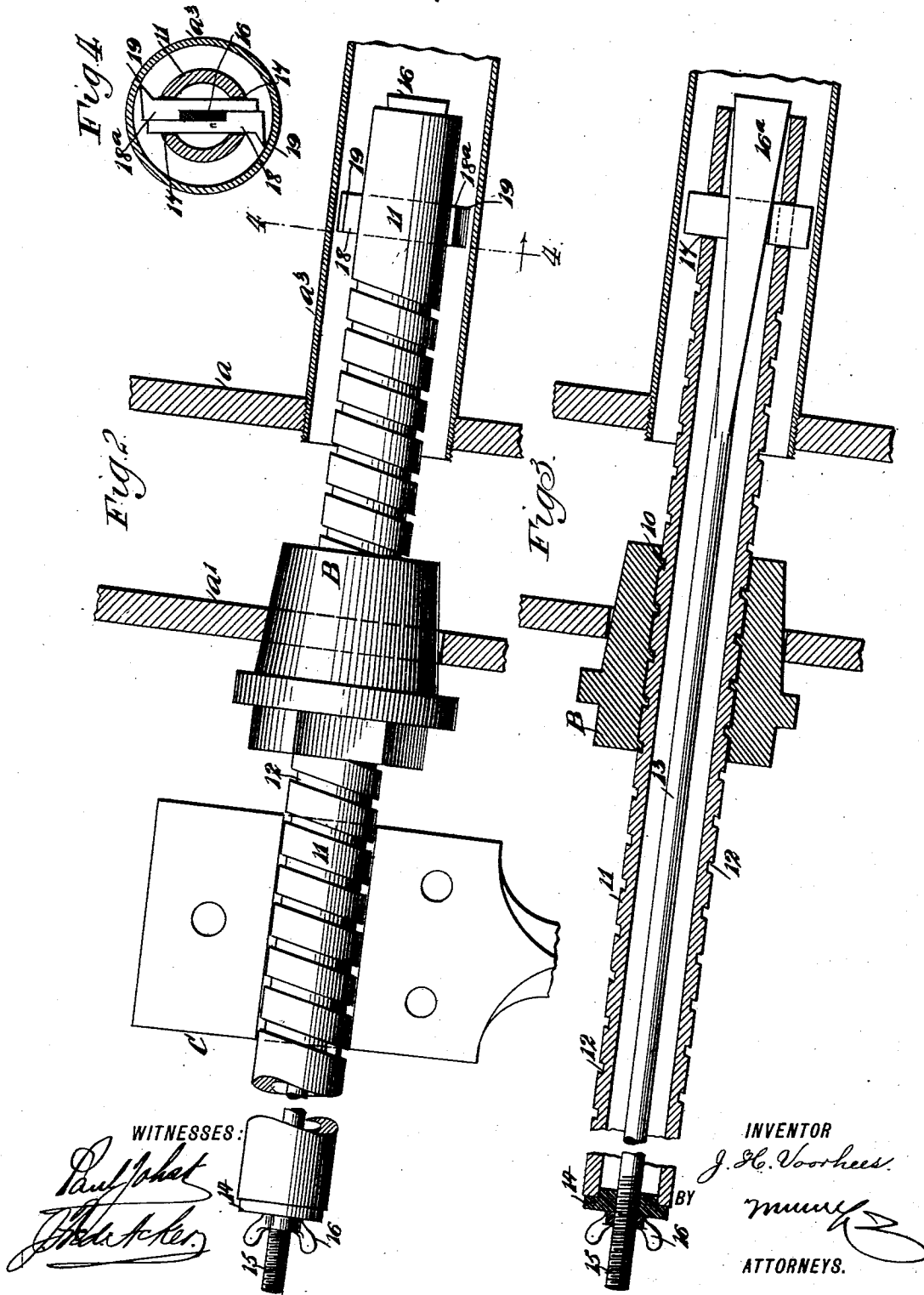
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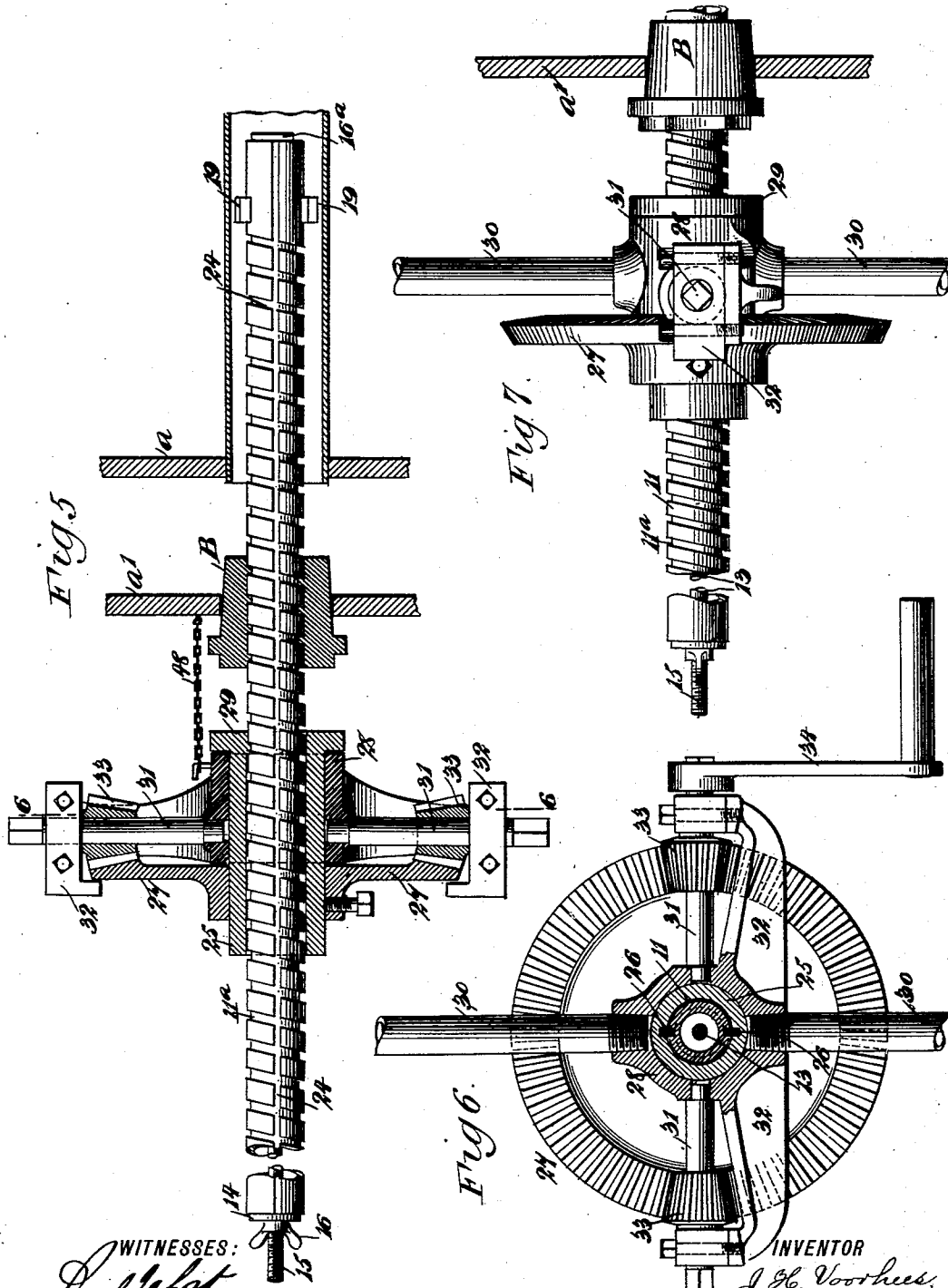
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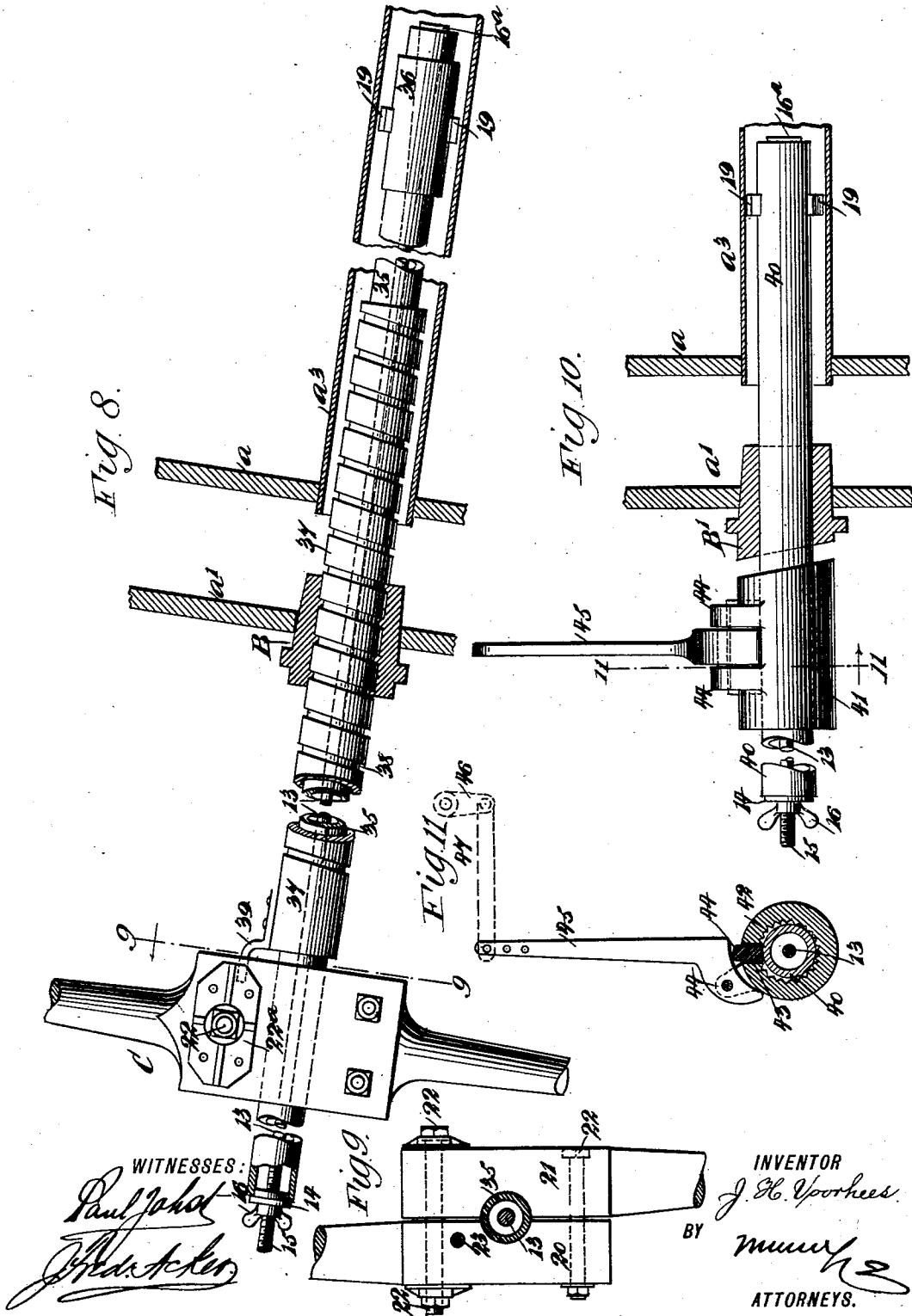
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UNITED STATES PATENT OFFICE.

JOHN H. VOORHEES, OF BROOKLYN, NEW YORK.

STEAM-BOILER-TUBE CLEANER.

SPECIFICATION forming part of Letters Patent No. 572,037, dated November 24, 1896.

Application filed February 27, 1896. Serial No. 581,026. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. VOORHEES, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Boiler-Tube Cleaner, of which the following is a full, clear, and exact description.

The object of the invention is to provide a tool or an implement especially adapted for cleaning the interior of tubes, and to so construct the said tool that it may be loosened within the tube, or whereby the cutting edges may be brought to a greater or a less contact with the interior surface of the tube for the purpose of removing scale therefrom or any extraneous matter that may have adhered to the interior of said tube.

Another object of the invention is to provide for the adjustment of the cutting portion of the tool from a point without the boiler or beyond the outer edge of the tube which is being cleaned.

A further object of the invention is to provide for an adjustment which will enable the tool to be fed lengthwise of the tube in a desired ratio, the longitudinal adjustment of the tool being thoroughly under the control of the operator.

It is also the object of the invention to so construct the cleaning-tool that it may have a similar cutting action to that of a like tool in a lathe, whereby every vestige of scale may be removed and, if necessary, a scale or shaving may be taken from the metal of the tube, insuring a speedy and perfect removal of all obstructions.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the interior of the boiler, its setting or casing being in section, likewise one of the boiler-tubes, in which the improved cleaner is shown as introduced and in side elevation. Fig. 2 is an enlarged detail side elevation of the simple form of the tool, parts being broken away and the support for the tool and the tube in which the tool is to be operated being shown

in section. Fig. 3 is a longitudinal vertical section through the tool, the supports, and the tube into which the tool is introduced. Fig. 4 is a transverse section taken substantially on the line 4 4 of Fig. 2. Fig. 5 is a partial side elevation and partial sectional view of a modified form of the tool, the modification consisting principally in the driving mechanism for the tool. Fig. 6 is a transverse section through the modified form of the tool, the section being taken practically on the line 6 6 of Fig. 5. Fig. 7 is a side elevation of a portion of the modified form of the tool illustrated in Fig. 5. Fig. 8 is a side elevation of a further modified form of the tool, the supports and tube being in section and parts of the tool itself being broken away. Fig. 9 is a transverse section taken substantially on the line 9 9 of Fig. 8. Fig. 10 is a partial side elevation and partial sectional view of a further modified form of the tool, and Fig. 11 is a transverse section taken practically on the line 11 11 of Fig. 10.

In the simplest form of the device, as shown in Figs. 1, 2, 3, and 4, the said device comprises a casing-tube 11, having an exterior thread 12 made therein, and an expansion-rod 13 or its equivalent located within the aforesaid tube, an adjusting device for the rod, and cutters operated by the aforesaid expansion rod or device. The boiler A (shown in Fig. 1) is that of the usual construction, and the tubes a^3 are supported at their forward ends in a tube-sheet a , and beyond the said tube-sheet the ordinary front plate a' is provided, having the ordinary openings therein, registering with the tubes and normally closed by plugs a^4 . When a tube is to be cleaned, the ordinary plug a^4 at the end of the tube is removed from the boiler-casing and a guide-sleeve B is introduced into the said opening, as shown in Figs. 1, 2, and 3, and the said sleeve is provided with an interior thread 10, having suitable pitch, to mesh with or engage with the exterior thread 12 on the casing-tube of the cleaning device.

The outer end of the expanding rod or device 13 is carried beyond the outer end of the casing-tube and has an exterior thread 15, the threaded portion of the expanding rod or device being loosely passed through a cap 14, closing the outer end of the casing-tube, and

a nut 16, preferably a thumb-nut, is placed upon the threaded end of the expanding-rod, engaging with the aforesaid cap 14, and by manipulating the nut 16 the expanding-rod 5 may be made to travel inward within the casing-tube 11 or outward therefrom. The inner end of the expanding-rod 13 is flattened and is given a tapering or a wedge form, as shown at 16^a in Fig. 3, and this tapering or 10 wedge portion of the expanding-tube is adapted to effect an adjustment of the cutters 18 and 18^a, which are employed for cleaning the interior of the tube. These cutters have their shanks reduced and formed with 15 shoulders on their inner faces, so that when placed together, as shown in Fig. 4, an opening will be formed between them to receive the flattened or expanding surface 16^a of the expanding rod or device 13. Each cutter 18 20 and 18^a at opposite ends is provided with a cutting surface or edge 19, and the said cutting edge or surface may be in alinement with the body of the cutters or may be at an angle thereto, as shown in Fig. 4. The cutting- 25 surfaces 19 are usually made at an angle to the body of the cutters to provide for the filing down or wearing away of the said cutting surfaces when brought in frequent operation.

The cutting-surfaces, when at an angle to the body portion of the cutters, project outward in opposite directions, so that as the tool is turned in a tube the cutters will remove the scale or any material that may cling to the inner face of the tube, the material being removed practically in shifting the former. 30

The body portions of the two cutters 18 and 18^a extend outward through openings 17, made in diametrically opposite sides of the casing-tube 11, and these openings are of such dimensions as to prevent the side movement of the cutters, yet admit of the cutters being adjusted lengthwise, or in direction of their ends, to any desired measure. 35

It is evident that when the expanding-rod 45 13 is drawn outward, bringing the wider portion of its expanding-surface in engagement with the shoulders of the cutters, the said cutters will be adjusted endwise in proportion to the increased width of their expanding medium, and that when the expander is caused to travel inward within the casing-tube the said cutters may be dropped endwise or be forced in that direction by contact with the interior of the tube, the contraction 50 being such as to prevent the cutters operating in the tube or contacting but very slightly with its inner face, and the operator at the outer end of the tool may readily determine the extent to which the cutters are to be adjusted by the amount of resistance which is afforded to the cutters during the operation of cleaning a tube. 55

It is further evident that by reason of the wedge portion of the expanding-rod engaging with the shoulders of the cutters the action of the expander upon said cutters will be uniform and so directed as to center them. It 60

may be also observed that if the cutters are sufficiently expanded a scale or shaving of metal may be removed from a tube, leaving 70 the tube as clean as when first introduced.

The tool may be turned in any desired manner, the simplest form of the device for turning being shown in Figs. 1, 2, 8, and 9, in which it will be observed that a handle is employed comprising two members 20 and 21, 75 which are made to fit closely around the outside of the casing-tube 11, being secured firmly together by bolts 22 or their equivalents, the sections of the handle extending in 80 opposite directions. Ordinarily two bolts are employed to secure one portion of the tool-sections together, while a single bolt only at the opposite side of the tube need be used, in which event the bolt is passed through a 85 clamping-plate 22^a, placed at opposite sides of the sections of the handle, as shown in Figs. 8 and 9.

It is obvious that as the casing-tube is revolved or turned through the medium of the handle or otherwise it will be fed within the 90 pipe to be cleaned by reason of its thread connection with the fixed conducting-sleeve B.

The extreme outer end of the casing-tube 11, when the tube is adapted for work in the boiler, is supported upon a suitable bracket B', as shown in Fig. 1. In Figs. 5, 6, and 7 I have illustrated a slight modification in the exterior contour of the tube-casing and the manner in which it is to be given its rotary 100 movement. The conducting or feed sleeve B is used in connection with this modified form, as described with reference to the more simple form of the device. In the modified form the exterior thread 11^a is interrupted at 105 opposite sides by longitudinal grooves 24, and a sleeve 25 is loosely mounted upon the casing-tube, the sleeve having feathers or splines or ribs 26, adapted to travel in the grooves 24 of the aforesaid casing-tube, as illustrated in 110 Fig. 6, so that as this sleeve is turned the casing-tube will receive like movement and may slide endwise through the sleeve while turning. A beveled gear 27 is securely fastened on the sleeve 25, as shown in Fig. 5, and a 115 collar 28 is loosely mounted on the sleeve 25 between the gear 27 and a flange 29 at the inner end of the aforesaid sleeve 25 of the body of the tool.

The collar 28 preferably has stay-rods 30 120 projected from it, one of which rods may be attached to an overhead support and one to a floor-support for the purpose of holding the collar 28 stationary, and in the said collar preferably two shafts 31 are journaled, extending therefrom in opposite directions, being supported by bracket-arms 32, connected with or secured to the aforesaid collar, as shown in Fig. 6, and each shaft 31 has a beveled pinion 33 secured thereto, the said pinions 125 meshing with the teeth on the beveled gear 27, and either of these shafts may be revolved by attaching to their outer ends a crank 34, or any equivalent of the same, as 130

is likewise shown in Fig. 6. Under this construction it will be observed that considerable power may be brought to bear upon the body of the tool to rotate the same, with comparatively little output of power on the part of the person or persons located at the crank 34. The cutting portion of the tool and the manner of expanding the cutters in this modified form are the same as in the more simple form first described.

In Fig. 8 I have illustrated a further modification in the construction of the body portion of the tool, in which the casing-tube 35 has a plain exterior surface and is preferably reinforced by a collar 36, located where the cutters pass through the said casing-tube, and the casing-tube has a second tube 37 loosely mounted thereon, the said second or outer tube having an exterior thread 38, which is engaged by the interior thread of the conducting or feed sleeve B. The expanding device and the cutters in this form of the tool are the same as those heretofore described, and the handle C is shown as attached to the inner or main casing-tube 35 near its outer end, and in the said handle an opening 23 is made, adapted to receive a slide 39, which is secured upon the outer tube 37 near its outer end, so that when the said handle is turned the outer tube will be virtually locked to the inner or main casing-tube by reason of the connection between the former and the handle C, and when it is desired to turn the cutters in the tube without advancing or withdrawing them this may be accomplished under this modified form of the tool by simply withdrawing the locking arm or bracket 39 from engagement with the handle C.

In Figs. 10 and 11 I have illustrated another modified form of the device, in which the casing or tube 40 has a smooth exterior surface, the cutters and the expanding device remaining as heretofore described, and the casing-tube is passed through the conducting-sleeve B², having a plain bore instead of the threaded bore shown in the corresponding sleeves B.

The outer end portion of the casing-tube 40 in this latter form of the tool is located within a locking or clutch sleeve 41. This locking or clutch sleeve has teeth 42 made upon its inner face and is provided with a slot 43 in its upper surface, receiving a dog 44, likewise toothed upon its under edge, so as to engage with the casing-tube 40. Ears 44 are located upon the locking-sleeve 41 near each end of the slot 43, and a lever 45 is pivoted between the aforesaid ears, having an arched foot adapted when the lever is moved in a certain direction to press the dog 44 inward against the casing-tube, causing it to bite thereon and also causing the teeth of the locking-sleeve at the bottom of its interior surface to engage with the casing-tube 40, so that a further movement of the lever 45 in the same direction will turn the locking-sleeve and likewise turn the casing-tube of the tool, and the

ratchet connection thus formed between the locking-sleeve and the casing-tube will serve to feed the latter forward within the tube to be cleaned, especially since the opposing faces of the locking-sleeve 41 and the conducting-sleeve B² are beveled for close engagement one with the other. Therefore at each rotary movement of the locking-sleeve the tool proper acted upon by the locking or clutch sleeve will receive end movement together with its rotary movement. The lever 45 may be operated through the medium of a crank 46 and link 47 or in any other desired manner, it being especially intended for the application of power.

Under the construction shown in Fig. 5 the stationary sleeve 28 is preferably connected by a chain 48 with the front sheet of the boiler in order that the said stationary sleeve may not move outward while the tool is in operation, since the tendency of the said sleeve would be to move in that direction, especially when subjected to a severe strain.

It is obvious that the tube-cleaning tool described in any of its forms designated may be economically constructed and expeditiously and conveniently applied to any boiler and operated in such manner as to thoroughly clean a tube from one end to the other.

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

1. In a device for cleaning boiler-tubes and for like purposes, the combination of blades each having the rear face of its shank reduced, the reduced portion extending from the end of the shank opposite that carrying the blade to a point beyond the center of the shank and terminating in a shoulder, the shanks being placed together with the reduced portion of one resting upon the unreduced portion of the other, whereby an opening will be formed between them, and a tapered expander movable in the opening between the shanks of the blades, and adapted to engage the shoulders of the shanks of the blades to move them endwise in opposite directions, substantially as described.

2. In a device for cleaning tubes and for like purposes, the combination of a conducting-sleeve, a tube arranged to be fed through the said sleeve and provided with opposite openings, cutters mounted in the tube and projecting out through the openings thereof, the cutters having their shanks reduced and formed with shoulders, whereby an opening is formed between them, a tapering expanding device working in the opening between the shanks of the cutters, and means for operating the expanding device, substantially as described.

3. In a device for cleaning tubes and for like purposes, the combination of an internally-threaded sleeve of an externally-threaded tube working in said sleeve and provided with opposite openings at its inner end, cutters in the tube and projecting through the

openings thereof, the said cutters having their shanks reduced and provided with shoulders forming an opening between the said shanks, a rod having a wedge-shaped end, working in said opening, said rod extending out beyond the tube, and means for moving the rod endwise, substantially as and for the purpose set forth.

4. In a device for cleaning tubes and for like purposes, the combination of an internally-threaded sleeve, an externally-threaded tube working in the sleeve and provided with opposite slots at its inner end, means for imparting rotary movement to the tube, cutters in the tube and projecting through the opening thereof, said cutters having their shanks reduced and provided with shoulders to form an opening between them, a rod having a wedge-shaped end working in the said opening, said rod extending out beyond the end of the tube, and means for imparting endwise movement to the said rod, substantially as described.

5. In a device for cleaning boiler-tubes and for like purposes, the combination of an internally-threaded sleeve, an exteriorly-threaded tube working in the sleeve and provided with opposite slots at its inner end, mechanism for turning the tube, cutters arranged in the tube and projecting through the slots thereof, said cutters being arranged side by side and provided with an opening between them, a wedge-shaped expanding-rod working in the said

opening and serving to move the cutters endwise in opposite directions, and means for operating said rod, substantially as described. 35

6. In a device for cleaning boiler-tubes, the combination with an exteriorly-threaded casing having opposite slots, knives or blades projecting through the slots of the casing, and an expanding device engaging the knives to move them outward into contact with the tube to be cleaned, of a sleeve having a feathered connection with the casing, a gear-wheel secured to the sleeve, a frame mounted on the sleeve, and pinions mounted in the said frame and engaging the said gear-wheel, substantially as described. 40 45

7. In a device for cleaning boiler-tubes, the combination with an exteriorly-threaded casing-tube having slots in opposite sides, knives projecting through the slots, and an expander for moving the knives in and out, of a flanged sleeve on the casing-tube and having a feathered connection therewith a gear-wheel secured to the sleeve, a stationary frame on the sleeve and comprising a collar and bracket-arms, shafts mounted in the collar and bracket-arms, a pinion on each shaft and meshing with the said gear-wheel, and means for operating the said shafts, substantially as described. 50 55 60

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