

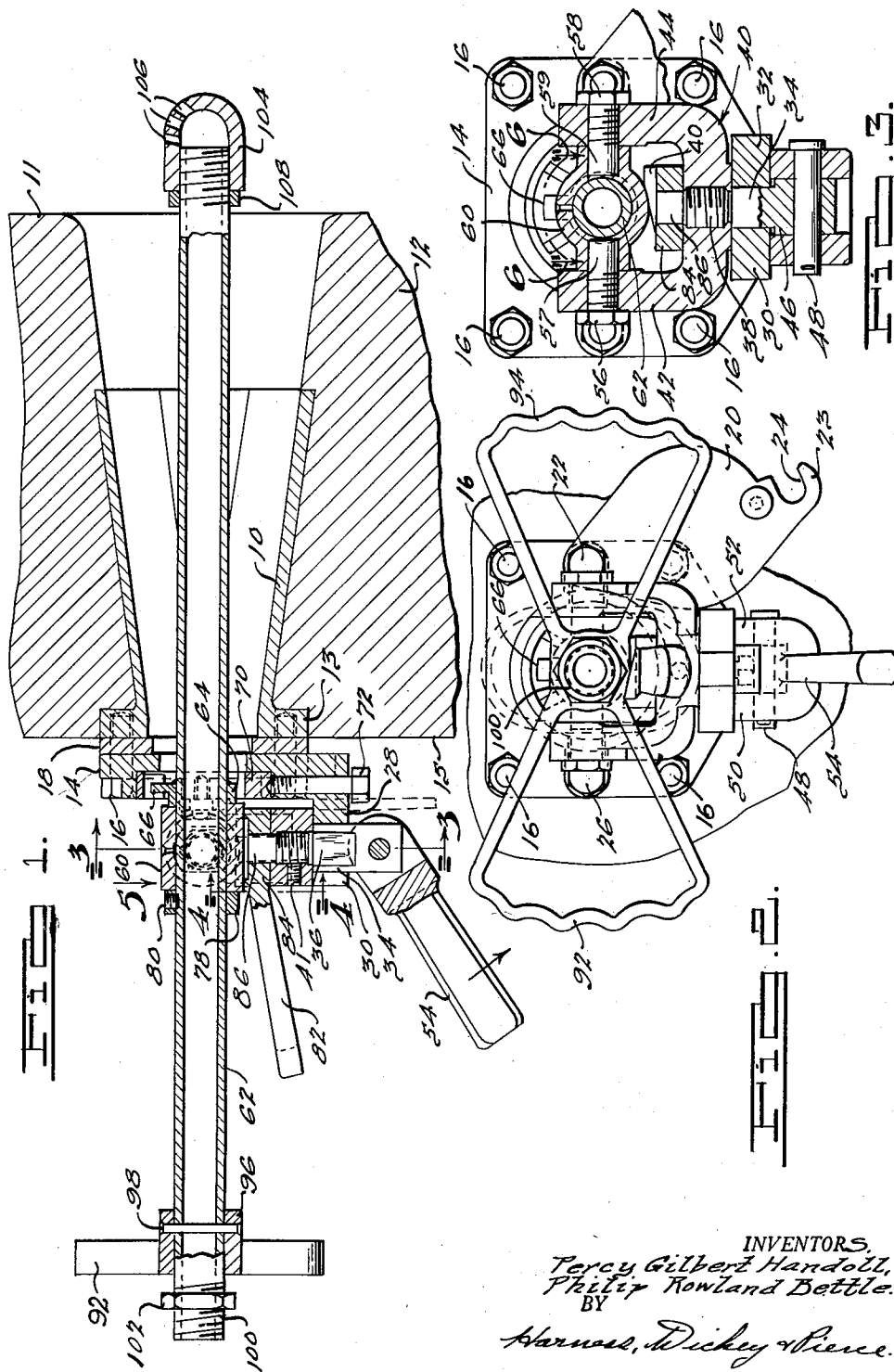
Dec. 5, 1950

P. G. HANDOLL ET AL
MANUALLY OSCILLATABLE AND ROTATABLE
PORTABLE SOOT BLOWER

2,532,447

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3 Sheets-Sheet 1



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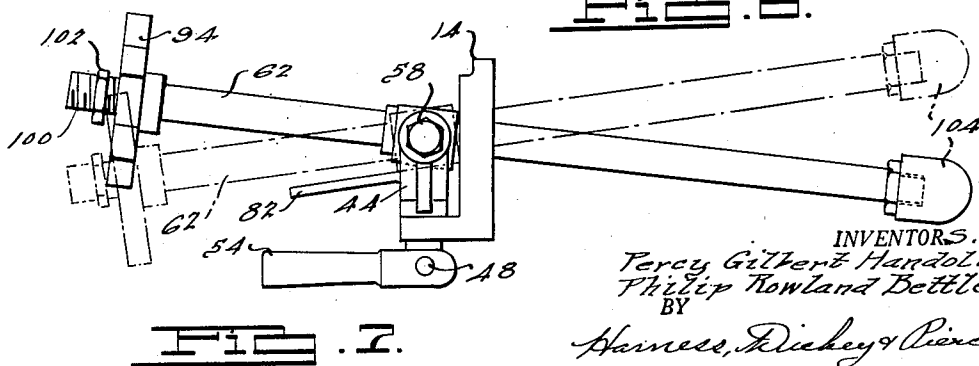
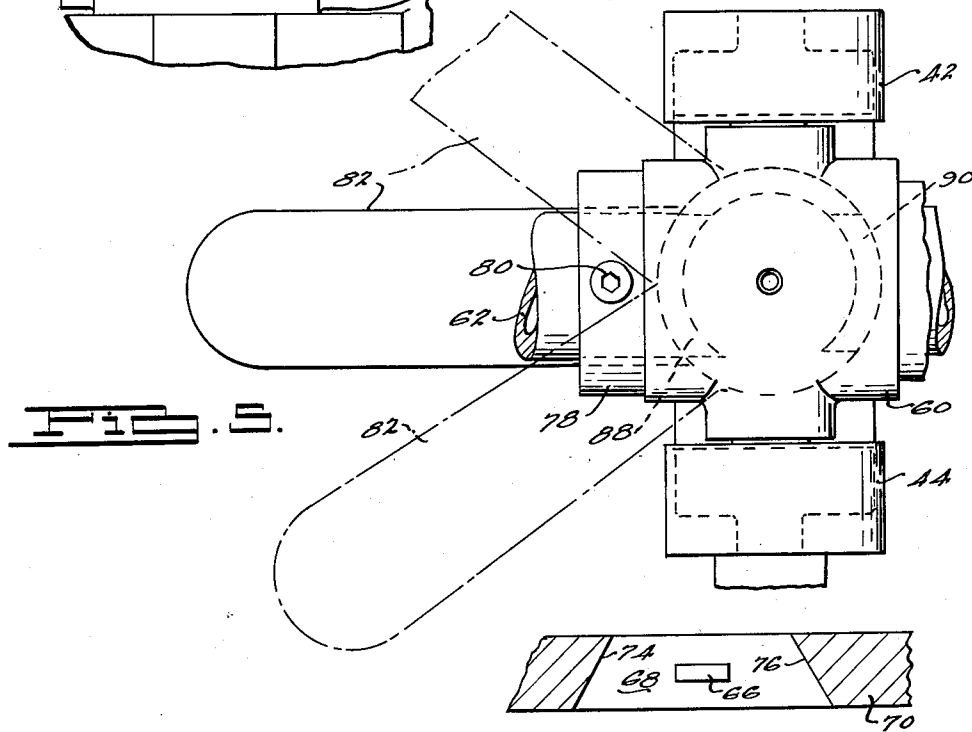
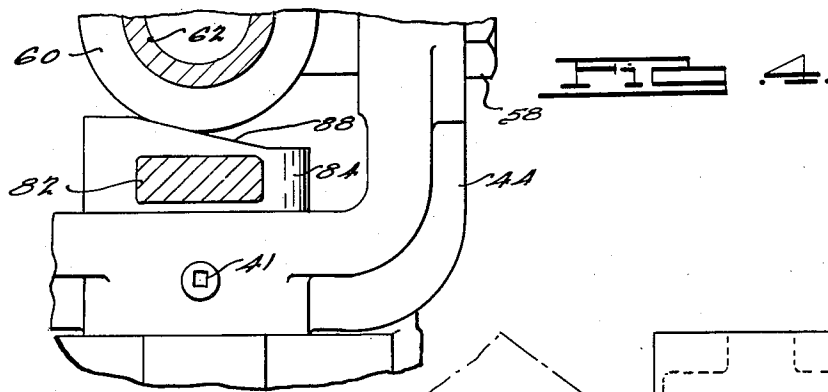
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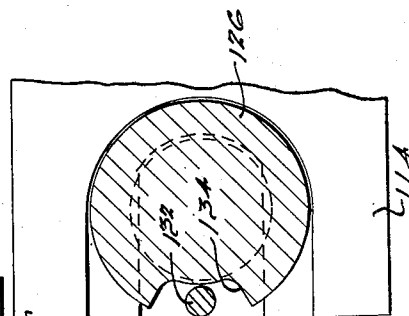
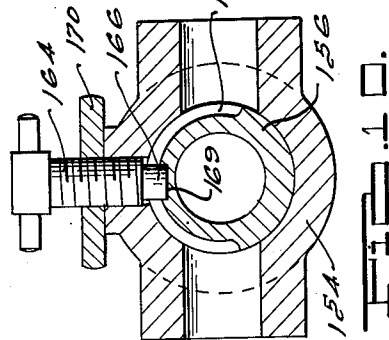
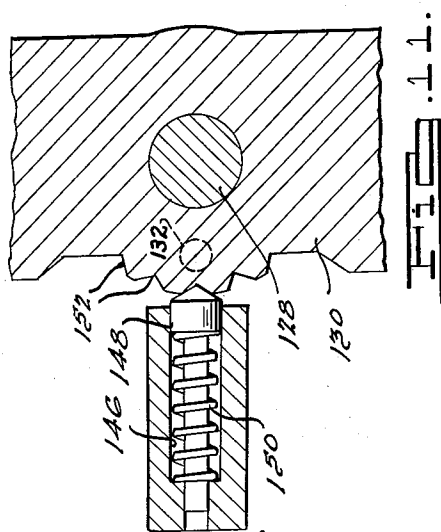
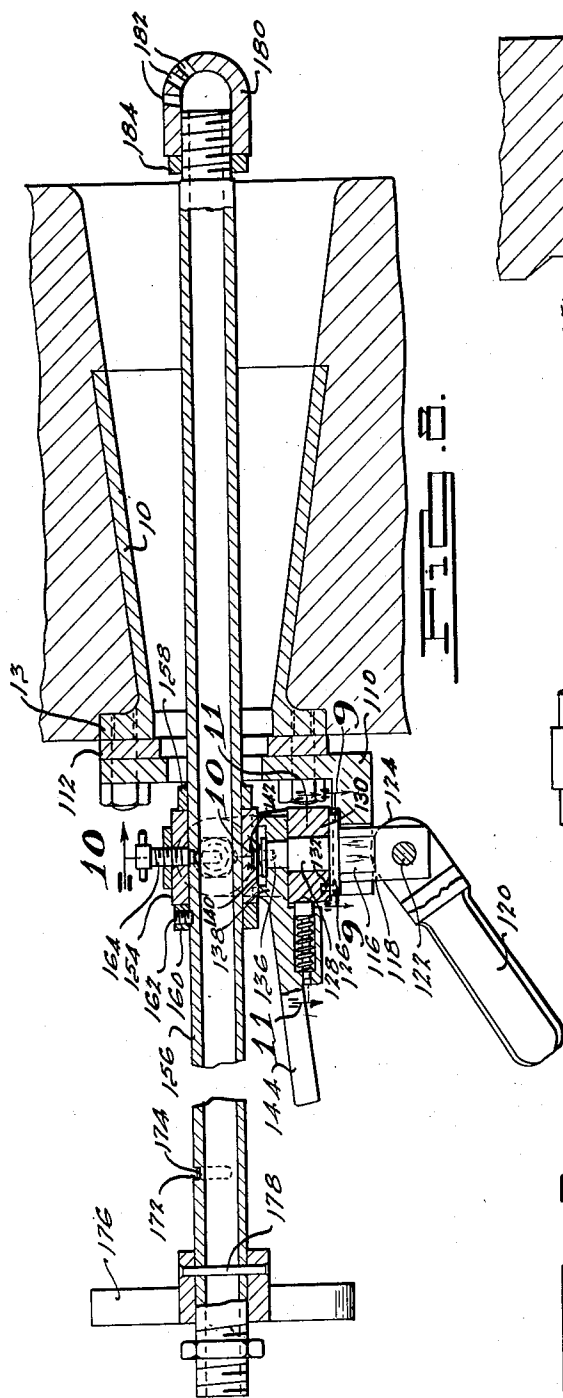
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UNITED STATES PATENT OFFICE

2,532,447

MANUALLY OSCILLATABLE AND ROTATABLE PORTABLE SOOT BLOWER

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5 Claims. (Cl. 15—316)

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This invention relates to boiler tube cleaners.

The main objects of this invention are to provide a boiler tube cleaner which may be moved about within certain desired limits to project the cleaning fluid on the tubes to be cleaned in a thorough and efficient manner; to provide a cleaner of this character which is portable in nature and may be used successively in a plurality of desired locations, thereby effecting a substantial economy over constructions where a separate cleaner is installed at each of the desired locations; to provide a boiler tube cleaner of this character which may be projected into the space occupied by the boiler tubes to be cleaned and withdrawal therefrom without disconnecting the unit from its mounting; to provide a boiler tube cleaner which may be moved in both vertical and horizontal planes within desired prescribed limits and may be rotated while in any position so as to direct the projected cleaning fluid in any desired arc; and to provide a cleaner of this character which may be oscillated in a vertical plane by horizontal oscillation of an operating handle.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which

Fig. 1 is a medial, vertical, longitudinal, sectional view taken through the preferred form of the device mounted in position in a furnace wall opening;

Fig. 2 is a rear end elevational view of the same;

Fig. 3 is a sectional view taken on the 3—3 of Fig. 1, looking in the direction indicated by the arrows;

Fig. 4 is an enlarged, fragmentary view, partly in section and partly in elevation, taken on the line 4—4 of Fig. 1, looking in the direction indicated by the arrows;

Fig. 5 is an enlarged, fragmentary, plan view taken as indicated by the arrow 5 of Fig. 1;

Fig. 6 is an enlarged, fragmentary, sectional view taken on the curved line 6—6 of Fig. 3;

Fig. 7 is a reduced view in side elevation showing the cleaning tube depressed to its lowermost position in full lines and elevated to its uppermost position in broken lines;

Fig. 8 is a vertical, medial, longitudinal, sectional view of a modified form of the apparatus;

Fig. 9 is an enlarged, fragmentary, sectional view taken on the line 9—9 of Fig. 8, looking in the direction indicated by the arrows;

Fig. 10 is an enlarged, fragmentary, sectional view taken on the line 10—10 of Fig. 8, looking in the direction indicated by the arrows; and

Fig. 11 is an enlarged, fragmentary, sectional view taken on the line 11—11 of Fig. 8, looking in the direction indicated by the arrows.

In the construction shown in the drawings, a

wall box 10 of generally hollow, frusto-conical shape is shown mounted in horizontal position in a furnace wall 12 as part of the permanent construction thereof, its inner and larger end terminating short of the inner side 11 of the furnace wall. The smaller end of the wall box 10 is surrounded by a radially-extending, generally rectangular flange 13 which is embedded within the furnace wall so that its outer face is flush with the outside surface 15 of the wall 12.

An L-shaped bracket mounting 14, having the vertically disposed portion of generally rectangular shape, as shown most clearly in Figs. 2 and 3, is rigidly secured to the flange 13 of the wall box 10 by four cap screws 16 which pass therethrough and are threaded into the flange 13, a shim plate 18 being interposed between the bracket 14 and the flange 13 for spacing the bracket away from the furnace wall. The plate 18 may be of insulating material for retarding the conduction of heat from the wall box 10 to the bracket 14.

The bracket plate 14 and shim plate 18 both have openings therethrough concentric with the opening in the wall box 10, and means are provided for closing this opening when desired and comprises an elongated cover plate 20 hinged at one end on a cap screw 22 mounted in the bracket plate 14 and adapted to rotate thereabout as a pivot. The other end of the cover plate 20 is hook shaped as shown at 23 to provide a notch 24 for embracing the shank of a stud 26 also mounted in the bracket plate 14, the shank of the stud 26 being shouldered so that the head of the stud is in spaced relation to the bracket plate for receiving the hooked end 23 therebeneath.

The lower end of the bracket plate 14 is provided with a horizontally-extending leg 28 projecting outwardly from the furnace wall and which is bifurcated to form spaced parallel arms 30 and 32 which are adapted to receive therebetween the medial portion of a vertically-disposed post 34. The post 34 is principally of circular cross section and is provided with flats 36 at diametrically-opposite sides for making a snug sliding fit between the inner opposed faces of the arms 30 and 32, thus preventing rotation of the post 34 relative to the bracket.

A portion of the post 34 immediately above that received between the arms 30 and 32 is threaded, as shown at 38, to receive, pass through, and engage the base portion of a yoke generally designated 40. A set screw 41 is threaded through the yoke base so that its inner end engages the threaded portion 38 for preventing relative rotation. The yoke 40 has integrally-formed, spaced, parallel, upstanding arms 42 and 44. That portion of the post 34 below that having the flat-

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tened sides 36 is in the form of a cylindrical head 46 having an axially-extending hole therethrough disposed at right angles to the axis of the post, for receiving the medial portion of a pin 48. The outer and opposite ends of the pin 48 extend through spaced parallel lugs 50 and 52 integrally formed with a handle 54, thus forming a bifurcated end or head on the handle. The outer ends of the lugs 50 and 52 are curved with respect to the axis of the pin 48 to form two cam surfaces which engage the under sides or lower faces of the arms 30 and 32 and, by cam action, clamp the yoke 40 in position on the bracket arm 28 when the cam handle 54 is rotated in the appropriate direction, thus providing a readily detachable means for rigidly securing the yoke 40 in position on the bracket mounting 14.

The upper ends of the yoke arms 42 and 44 are drilled and tapped in axial alignment to receive a pair of headed studs 56 and 58, the inner ends 57 and 59, respectively, of which protrude beyond the inner surfaces of their respective yoke arms and extend into radially-extending sockets formed at diametrically opposite sides of a bearing member 60, thus forming trunnions about the axis of which the bearing member 60 may be oscillated.

The bearing member 60 is provided with a cylindrical bore therethrough with an axis at right angles to the axis of the bearing trunnions 57 and 59 and slidably receives therethrough a fluid cleaner conducting tube 62. The tube 62 is surrounded by a ring or collar member 64 which is welded thereto and which carries a radially-projecting lug 66. The lug 66 is positioned within a segment-shaped recess 68 formed by cutting away a segment from the inner side of a ring 70 which is removably clamped in an annular recess formed in the outer face of the bracket plate 14 by a set screw 72. The end walls 74 and 76 of the opening 68 are sloped as shown most clearly in Fig. 6 for limiting the movement of the lug 66 variably in accordance with the position of the lug 66 toward the inner or outer face of the ring 70.

The bearing 60 abuts against one axial face of the collar 64 which is welded to the tube 62, and the other end of the bearing 60 is abutted by a collar 78 adjustably and removably secured on the tube by a set screw 80, thus restraining axial movement of the tube 62 relative to the collar 60 while permitting limited rotation therein as permitted by the lug 66 positioned between the end walls 74 and 76 of the recess 68.

Means are provided for oscillating the tube 62 in a vertical plane and comprise a handle 82 having a circular head 84 integrally formed thereon which has an axial bore therethrough for pivotal mounting on a vertically-disposed pin 86. The pin 86 is an integral extension of the threaded portion 38 of post 34. The upper surface of the head 84 is provided with two circular cam surfaces 88 and 90, forming an inclined plane, which bear against the lower cylindrical, outer surface of the bearing member 60 as shown most clearly in Fig. 4. The cams 88 and 90 are positioned to contact and bear against the bearing 60 at the opposite sides of the axis passing through the trunnions 57 and 59 of the studs 56 and 58 so that rotation of the cam member about its pivotal mounting 86 will rock the bearing 60 in a vertical plane at right angles to the axis of the bearing trunnions.

The outer end of the tube 62 is provided with oppositely-extending handles 92 and 94 which are integrally formed on a cylindrical hub 96.

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The hub 96 surrounds the tube 62, and a pin 98 passes through an axially-extending sleeve portion of the hub 96 and through the walls of the tube 62 for rigidly holding the handles on the tube for manipulating the tube as hereinafter more fully explained. The handle unit is spaced inwardly from the end of the tube 62, and the extreme end is exteriorly threaded as shown at 100 for receiving a suitable cleaner fluid connection and is provided with a lock nut 102 as is customary in connections of this character.

The inner end of the tube 62 is exteriorly threaded to receive a dome-shaped nozzle 104 having slots or openings 106 therein for directing the cleaning fluid in a fan-shaped spray extending radially and axially forward. The nozzle 104 is fixed in position by a lock nut 108 in the usual manner.

In the modification shown in Figs. 8 to 11 inclusive, an L-shaped bracket 110, with an interposed shim plate 112, is bolted to the flange 13 of wall box 10 in the same manner as described in connection with the preferred form, but the bracket differs slightly from that heretofore described, in that it does not have a recess in its face for receiving a control ring.

Bracket 110 has horizontally-extending, spaced parallel arms 113 and 114 for snugly embracing the flattened sides 116 of a clamping post 118. A clamping handle 120 is pivotally mounted on a pin 122 in the same manner as heretofore described and has curved surfaces 124 which engage the under sides of the arms 112 and 114 for clamping the arms, by cam action, between those surfaces and a radially-extending annular flange 126 integrally formed on the post 118 immediately above the flattened surfaces 116 and of sufficient diameter to overlap and rest upon the top surfaces of the arms 112 and 114. Post 118 extends above the flange 126, but is reduced in diameter as shown at 128 to receive the base of a yoke 130. The yoke base is provided with an axially-extending pin 132 fixed in the lower surface thereof which protrudes downwardly into a cut-away recess 134 of the flange 126 for limiting relative rotation between the yoke 130 and the flange 126.

The post 118 is again reduced in diameter at the top surface of the yoke base 130 and continues thereabove to form a cylindrical bearing 136 upon which is pivoted a cam head 138 having opposed circular cams integrally formed on its top surface in the same manner and for the same function as the cam surfaces 88 and 90 of the cam head 84. The cam head 138 is held to the top end of its mounting post by a washer 140 secured by a screw 142 threaded axially down into the top end of the post.

A handle 144 is integrally formed on the cam head 138 for conveniently rotating the cam on its pivot mounting, and the underside of the handle adjacent its inner pivoted end is provided with a horizontally-extending bore 146 in which is mounted a plunger 148 and a helical compression spring 150 for normally urging the head end of the plunger outwardly and into contact with the outer peripheral surface of the yoke base 130. The surface of the yoke base 130, adjacent the plunger 148, is provided with a plurality of spaced, axially-extending grooves 152, and the adjacent abutting end of the plunger 148 is conical in shape for engagement in the grooves, the engaging surfaces being of such shape that the plunger is retracted by camming action when sufficient force is exerted for relative rotation between the handle 144 and the yoke 130.

As in the preferred form, a bearing member 154, having a cylindrical bore therethrough for receiving a cleaning fluid tube 156, is journaled in trunnions carried by upstanding yoke arms of the yoke base 130. A collar 158 is welded to the tube 156 to abut one side of the bearing 154, and a collar 160 is adjustably secured in position by set screw 162 to abut the opposite side.

The bearing 154, at its top side, is radially drilled and tapped to receive a thumb screw 164 which has a reduced inner end 166 adapted to fit within a circumferentially-extending groove 168 formed in the outer peripheral surface of the tube 156. The groove 168 extends only partially around the tube and thus limits the degree of relative rotation. At one point the bottom of the groove 168 is drilled out to provide a socket for receiving the end 166 when the thumb screw 164 is screwed all the way in, thus clamping the tube 156 against rotation. By withdrawing the end 166 from its socket but permitting it to extend within the slot 168, the tube is permitted to have limited rotation within the confines of the slot while preventing axial movement thereof. A lock nut 170 is provided on the thumb screw 164 for securing the thumb screw in desired adjusted position.

Means are provided for positioning the tube 156 further within the confines of the furnace and comprises a second circumferentially-extending slot 172 with a socket 174 adapted to receive the end 166 of the thumb screw 164. When the tube is desired to be placed in this position, the set screw 162 is released and the collar 160 is slid rearwardly past the slot 172, thus permitting the tube 156 to be slid axially through the bearing 154 until the slot 172 is in registry with the reduced end 166 of thumb screw 164.

Means are provided for manipulating the tube 156 in the same manner as that shown in the preferred form and comprises a handle 176 of the same character as the handles 92 and 94 and which is secured to the tube in the same manner as by a pin 178. The inner end of the tube 156 is also provided with a nozzle member 180 having discharge slots 182 and held in position by a lock nut 184 in the same manner as the preferred form.

In the operation of the construction shown in Figs. 1 to 7 inclusive, it will be understood that different wall boxes 10, positioned at the various desired points about the furnace, are fitted with different limit rings 70, each of which may have a different segmental opening 68 cut therefrom so as to variably restrict or limit the amount of axial rotation of the cleaner tube 62 for that particular location.

When it is desired to clean through a certain opening, the cover plate 20 is rotated in a clockwise direction about its pivot 22 to the position shown in Fig. 2. Thereupon, the portable unit, comprising the tube 62 and its accompanying clamping mechanism, is placed in position on a mounting bracket, with the post 34 having the flat sides 36, embraced between the arms 30 and 32. The clamping handle 54 is then rotated downwardly in the direction indicated by the arrow in Fig. 1, thus causing the post to be rigidly clamped to the bracket 14 by camming action of the bifurcated end of the clamping handle 54 against the undersides of the arms 30 and 32. Cleaning fluid is then introduced into the tube 62 under pressure and the handle 82 oscillated from side to side.

This movement of the handle 82 causes the cir-

cular cams 88 and 90 to rock the bearing 60 in a vertical plane through an arc, for instance, of $7\frac{1}{2}^\circ$ above horizontal to $7\frac{1}{2}^\circ$ below horizontal. At the same time, or successively, the handles 92 and 94 are grasped by the operator and the tube 62 rotated about its longitudinal axis, the amount of such rotation being limited by the lug 66 striking against opposite sides of the cut-away segmental opening 68. It will be noted that the opposite sides 74 and 76 of the opening 68 are converged inwardly, so that as the tube 62 has its nozzle end depressed, the lug 66 will move forwardly from the position shown in Fig. 6 and thereby be restricted to a smaller arc of rotation. Likewise, when the nozzle end of the tube 62 is elevated, such as to the position shown in broken lines in Fig. 7, the lug 66 will be rocked outwardly toward the front face of the ring 70 and thereby be permitted to have a greater amount of rotation. This feature of variable amount of rotation of the cleaning tube 62 is desirable, as it has been found that as the tube is depressed below horizontal, the streams issuing from the orifices 106 cover a greater area than when the nozzle end of the tube is elevated. By thus varying the amount of the rotation of the tube, a substantially uniform field is covered by the fluid issuing from the orifices 106 regardless of the position in which the nozzle is placed.

After the boiler tubes are cleaned through one of the wall boxes 10, the cleaning unit is unclamped from its mounting bracket by raising the handle 54 to the position shown in Fig. 7 and withdrawing the tube from the wall box. Thereupon, the cover plate 20 is rotated in anti-clockwise direction to engage the hooked end 23 and notch 24 back of the stud head 26 and around the shank of the stud.

In the operation of the constructions shown in Figs. 8 to 11 inclusive, the cleaner tube unit is clamped to the bracket 110 in the same manner as described with respect to the preferred embodiment. In this construction, however, the cleaner tube 156 has limited oscillation in a horizontal plane, as determined by the stud 132 abutting the end walls of the notch 134, as shown in Fig. 9. With the cleaning tube 156 restrained from horizontal oscillation by grasping the handle 176, horizontal movement of the handle 144 is normally limited to the arc determined by the pin 132 in its notch 134. Horizontal movement of the camming handle 144 will, of course, rock the cleaning tube 156 in a vertical plane due to the circular cams formed on the upper surface of the cam head 138 engaging the undersides of the tube bearing 154 in the same manner as described with respect to the preferred embodiment.

The particular horizontal position of the vertical plane in which the cleaning tube is oscillated may be varied by grasping the handle 144 and restraining horizontal movement of the tube 156 while exerting enough pressure to compress the spring 150 to permit the plunger, or detent, 148 to be cammed out of its then engaging notch into another notch 152. When engaged in another notch, the handle 144 is again oscillated in a horizontal plane within the limits determined by the pin 132 and notch 134, and thus the nozzle 180 is oscillated in a vertical plane horizontally spaced from the vertical plane in which it was formerly oscillated.

During this vertical oscillation of the tube 156, the tube may be rotated about its longitudinal

axis by the handle 176 within the limits of the peripheral slot 168, when the inner end 166 of the thumb screw 164 is positioned therein, or the thumb screw 164 may be screwed in a greater distance to seat the end 166 in the socket 169 formed in the base of the slot 168, thus restraining the tube 156 from axial rotation.

Furthermore, if it is desired to insert the nozzle 180 further into the furnace, the thumb screw 164 is withdrawn from the slot 168, the set screw 162 loosened and collar 160 slid rearwardly of the slot 172. The tube is then slid forwardly through the bearing 154 until the slot 172 is in registry with the reduced end 166 of thumb screw 164, at which time the thumb screw is turned in the appropriate direction to cause the end 166 to engage within the slot 172. In this position, the tube may be rotated within the limits of the peripheral slot 172, but if it is desired to restrain the tube against rotation, the thumb screw is turned further in so as to seat the reduced end 166 in the socket 174.

When the cleaning operation is finished, the clamping handle 125 is raised, thus releasing the post 118 from the bracket 110 and the unit removed from the wall box in the same manner as heretofore described.

What is claimed is:

1. A boiler tube cleaner of the character described comprising a tube for conducting cleaning fluid, pivot means lying in a plane transverse to the tube for pivotally mounting said tube whereby said tube may be oscillated in a plane transverse to the axis of the pivot means, a member pivoted on an axis normal to and in the same plane as said tube pivotal mounting, a pair of cams on said member positioned one at each side of said member's pivotal mounting, said cams engaging said tube at opposite sides of said tube's pivotal mounting, and manual means for oscillating said member to thereby oscillate said tube through the medium of said cams.

2. A boiler tube cleaner comprising a mounting bracket adapted to be secured adjacent the opening in a furnace wall, said bracket having an opening therethrough, a control cam plate detachably secured to said bracket and having an opening therein, the opening in said plate having a substantially segmental notch therein with the end walls of said notch transverse to the axis of the opening and converging toward one another in a direction perpendicular to the furnace wall, a tube for conducting cleaning fluid, said tube being mounted on said bracket and extending through the openings in said bracket and plate, said tube being rotatable on its mounting about its longitudinal axis pivot means for rocking the tube about an axis substantially parallel to the furnace walls, and a lug rigidly mounted on said tube and projecting into the segmental notch in said plate for limiting the rotation of said tube, and whereby the extent of rotation of the tube permitted by the notch varies with variations in the angular position of the tube about the rocking axis.

3. A boiler tube cleaner comprising a mounting bracket adapted to be secured adjacent the opening in a furnace wall, said bracket having an opening therethrough, a control cam plate detachably secured to said bracket and having an opening therein, said plate having a substantially segmental notch therein with the end walls of said notch transverse to the axis of the opening and converging toward one another in a direction perpendicular to the furnace wall, a

tube for conducting cleaning fluid, said tube being mounted on said bracket and extending through the openings in said bracket and plate, said tube being rotatable on its mounting about its longitudinal axis, and a lug rigidly mounted on said tube and positioned within the segmental notch in said ring for limiting the rotation of said tube, said tube being pivotally mounted to oscillate in a plane such that said lug is rocked inwardly and outwardly with respect to said ring segmental notch, thereby variably limiting the rotation of said tube depending upon the position of said lug.

4. A boiler tube cleaner comprising a bracket having an opening therethrough, a pair of spaced parallel arms on said bracket extending outwardly therefrom, a tube for conducting cleaner fluid when positioned within the bracket, a yoke having a base and arms and with its arms embracing opposite sides of said tube, pivot mountings between the arms of said yoke and said tube whereby said tube may be oscillated on said pivots in a plane, a double-opposed cam pivotally mounted on the base of said yoke between the arms thereof with opposed cam surfaces operatively engaging and adapted to oscillate the tube, a post connected to the base of said yoke and adapted to be slidably and nonrotatably embraced between said bracket arms, and a cam mounted on the lower end of said post for demountably attaching said yoke on said bracket arms.

5. A portable apparatus for cleaning boiler tubes comprising a tube for conducting cleaning fluid, a bearing surrounding said tube for supporting the same, said tube being rotatable and axially slidable in said bearing, releasable means for securing said tube against axial sliding, said tube having a peripheral slot in the outer surface thereof, adjustable restraining means mounted on said bearing and protruding into said slot for limiting axial rotation of said tube, said tube having a socket in the base of said slot and means for adjusting said restraining means into said socket for locking said tube against rotation, said tube having a plurality of peripheral slots and sockets axially spaced therealong for positioning within said bearing by axial sliding of the tube therethrough.

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