May 25, 1948. C. L. HOWSE 2,442,045

SOOT BLOWER CONSTRUCTION

Filed Dec. 22, 1945 3 Sheets-Sheet 1

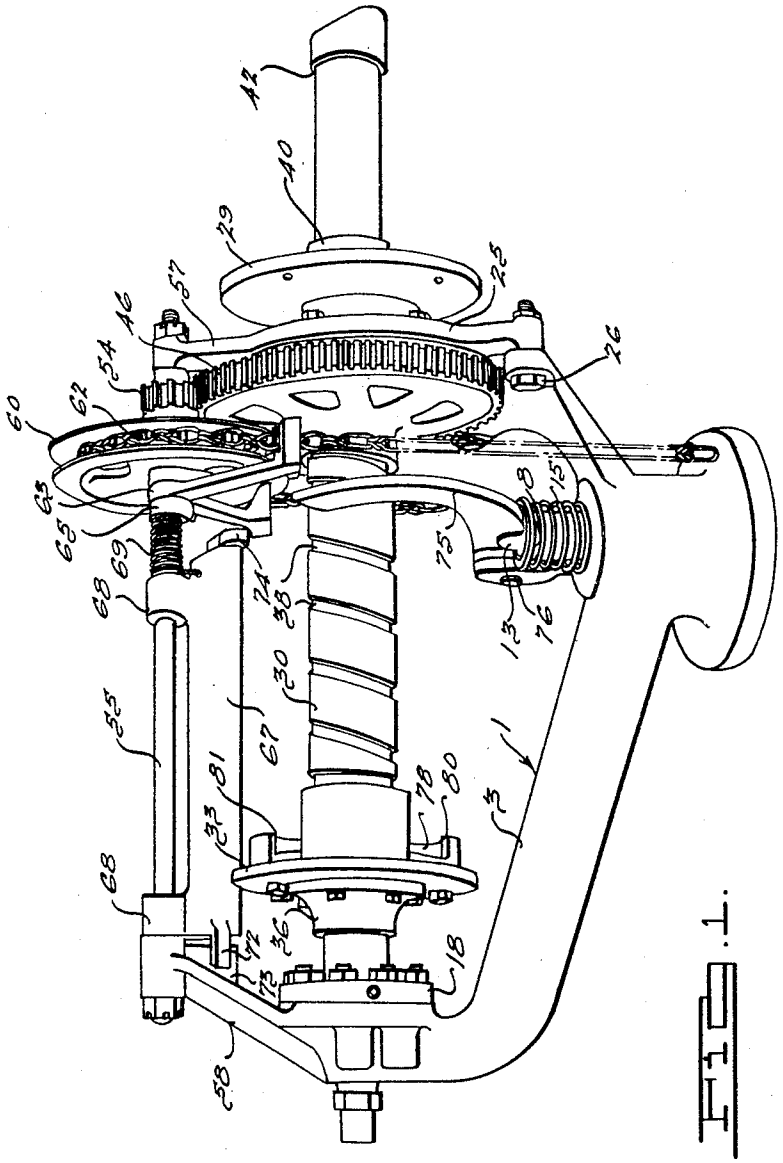

FIG. 1.

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Filed Dec. 22, 1945 3 Sheets-Sheet 2

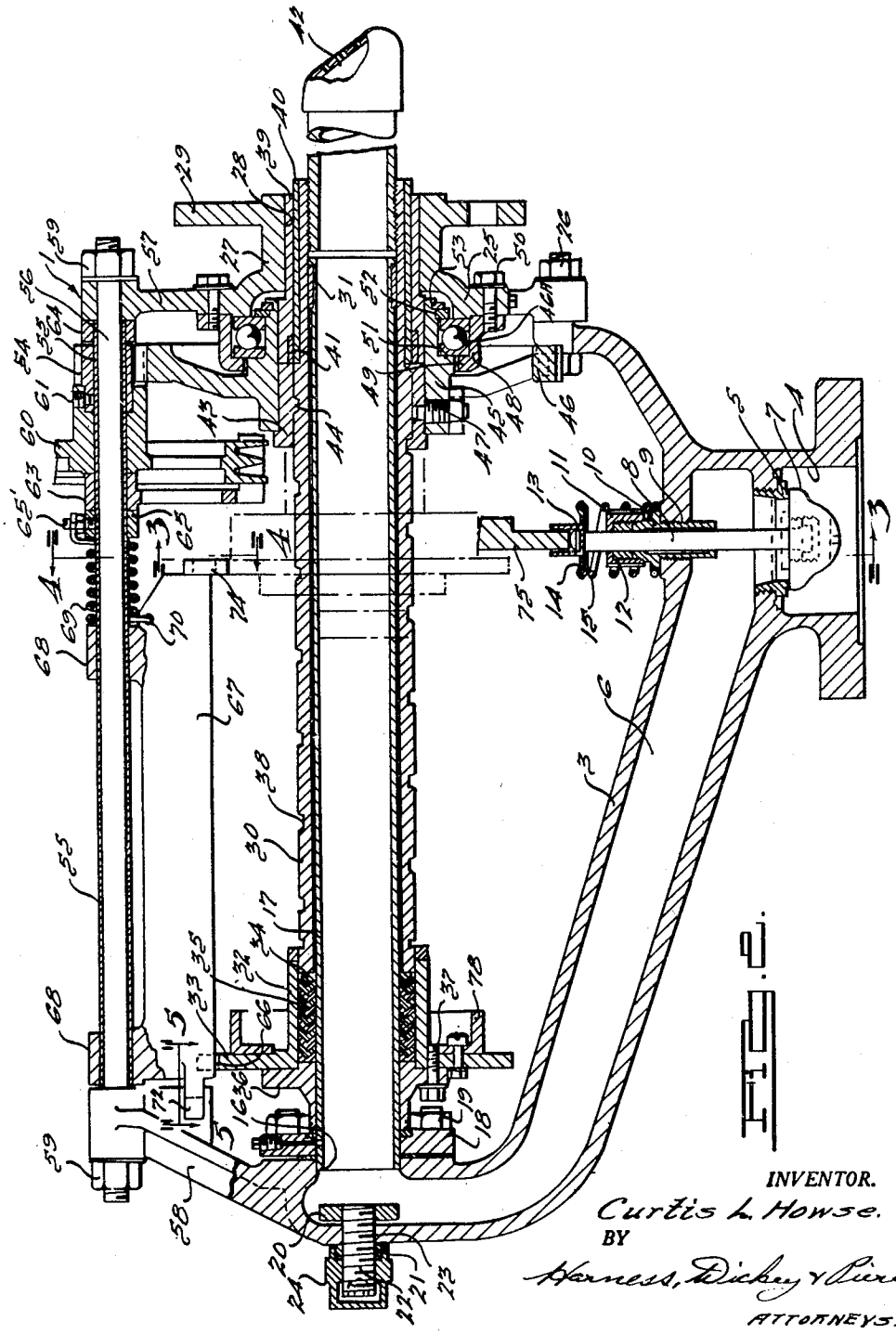

Fig. 2

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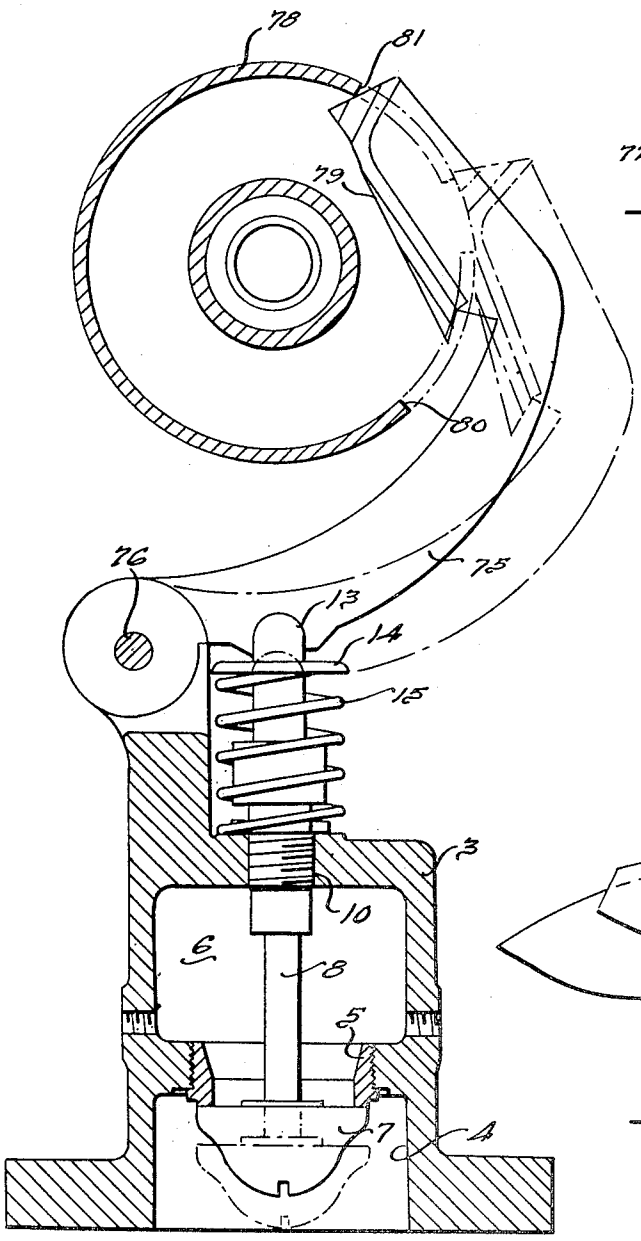

Fig. 2.

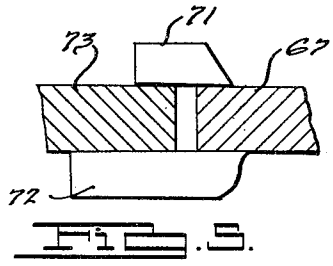

Fig. 5.

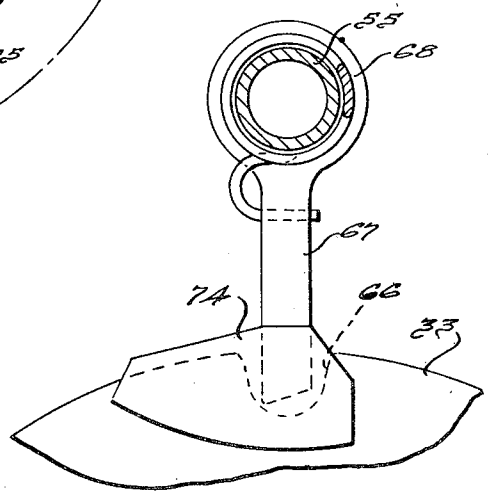

Fig. 4.

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UNITED STATES PATENT OFFICE

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SOOT BLOWER CONSTRUCTION

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8 Claims. (Cl. 15—104.055)

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The present invention relates to improvements in soot-blower head constructions.

One of the primary objects of the present invention is to provide an improved soot-blower head construction which is particularly adapted for use in the hottest part of the furnace and which is so constructed and arranged as to increase the life of the soot-blower nozzle.

A further object of the invention is to provide improvements in soot-blower head construction of the type mentioned in which the nozzle is projected into the furnace only during the blowing operation and is protected in a retracted position when not operating.

Other objects of the present invention will become clearly apparent from the following description, the drawings relating thereto, and the claims hereinafter set forth.

In the drawings, in which like figures refer to like parts in the several different views:

Fig. 1 is a perspective view of a soot-blower head construction embodying features of the present invention;

Fig. 2 is a vertical cross-sectional view taken substantially through the center of the structure shown in Fig. 1;

Fig. 3 is an enlarged cross-sectional view taken substantially along the line 3—3 of Fig. 2 with the actuator in the position shown in the broken lines in Fig. 2;

Fig. 4 is a cross-sectional and elevational view taken substantially along the line 4—4 of Fig. 2; and

Fig. 5 is a cross-sectional and elevational view taken substantially along the line 5—5 of Fig. 2.

It is frequently desirable or necessary to place soot blower heads on the sides of boilers so that they may project into the hottest part of the combustion space in order to direct the cleaning fluid onto the underside of the generating tubes, or other parts of the boiler, and where the location is so hot that the nozzle could not stand the temperature conditions if it remained there any substantial length of time. In general, the construction of the present invention involves projecting the nozzle into such space in the furnace and when it is so projected automatically starting the blowing operation. At the completion of the blowing operation, the nozzle is retracted to a position within the furnace wall where it is protected from the hot gases. For very long travels, up to twenty feet, telescopic nozzles have been employed, but the present invention is primarily concerned with nozzles having much less travel when it is only desired to clean heating surfaces close to the furnace walls. The blower head of the present invention has only one nozzle tube which moves or rotates and such nozzle tube has a travel of approximately twelve inches forward from the boiler to its retracted position. The blower head, including the nozzle, may thus be positioned within the boiler wall space, where it is protected from the heat while it is inoperative, and yet it can be projected sufficiently far into the combustion space so as to efficiently direct the cleaning fluid onto the surfaces of the boiler to be cleaned.

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Because of the nature of the surface, it is desirable that the cleaning fluid be turned on automatically as soon as the nozzle reaches its maximum projection, and before it becomes appreciably hotter so as to endanger its life. The construction of the present invention is, therefore, automatically valved in order to protect it, and such automatic valving is also beneficial from the standpoint of efficiency of use of the cleaning medium. The soot blower head may be either manually or automatically operated, that is, it may either be projected into the furnace manually or automatically; and in either case it is desirable that the traversing motion be rapid to conserve time. When automatically operated by a power motor, the speed is fixed and the time interval of traverse becomes a definite fixed interval and is important where there are a great many units on a boiler to be operated in a given time. The construction of the present invention accomplishes the rapid travel and at the same time maintains rigidity and proper position of the nozzle while blowing.

Referring to the drawings, the soot blower head generally indicated at 1 is adapted to be mounted to the exterior surface of a furnace wall (not shown) in registry with an opening communicating with the interior of the furnace, in the usual way. In the present instance it may be considered that the opening is located in the hottest part of the furnace.

The head 1 includes a frame portion in the form of a casting 3. The casting 3 is formed with a fluid inlet chamber 4 which communicates through valve seat 5 with an inlet passageway 6. The flange adjacent the inlet chamber 4 serves to connect the unit to a suitable source of cleaning fluid under pressure. Inlet chamber 4 and passageway 6 are separated by a valve 7 disposed in the inlet chamber 4 and having a valve stem 8 which projects upwardly through an opening 9 formed in casting 3. A seal fitting 10 is thread-

ably received within the threaded opening 9 and has a cap 11 embracing the upper end of the valve stem 8. The cap 11 is threadably received on the upper end of the fitting 10 and has a packing 12 disposed therein to prevent leakage past the valve stem. The upper end of the valve stem 8 has an actuating guide 13 fixed thereto and also has a washer 14 fixed thereto. A coil spring 15 is disposed between the top of the casting and the under surface of the washer so that the valve 7 is normally urged to its closed position. The manner in which valve 7 is opened to permit passage of the cleaning fluid from the inlet chamber 4 to the passageway 6 will be described in detail hereinafter.

The passageway 6 in the casing 3 terminates at its upper end in a horizontally disposed outlet 16. A feed tube 17, open at both ends, is mounted within the opening 16 and is in open communication with the passageway 6. The left end (view Fig. 2) of the tube 17 is fixedly mounted to the casing 3 by means of a disc 18 to which it is welded. The disc 18 may be attached to the casing 3 by means of a suitable nut and bolt arrangement 19.

A throttling disc 20 is mounted on a screw 22 which is threadably received through a threaded opening 23 in the casing aligned with opening 16. By adjusting the position of the disc 20 with respect to the opening 16, or with respect to the inlet to the tube 17, the cleaning fluid pressure may be controlled. A cup shaped, interiorly threaded, cover 24 is provided which is threadably received over the projecting end of the screw 22. The inner end of the cover 24 is recessed to receive an annular gasket 21 which is compressed around th threads of the screw 22 so as to prevent leakage.

An upstanding bracket 25 is connected to the opposite end of the casing 3 by means of bolts 26. Such bracket 25 has a hub portion 27 provided with an axial opening 28 therethrough and terminates in an annular flange 29.

The entire soot blower head 1 is mounted to the exterior surface of the furnace wall against the usual box fitting by bolts extending through the flange 29.

The projecting means includes the member 17 and the telescopically mounted tubular member 30. A bearing ring 31 is disposed within an annular groove formed in the exterior surface adjacent the right end of the tube 17 (view Fig. 2) and serves as one of the bearings for the tube 30. The tube 30 is mounted on the tube 17 for axial sliding and rotative movement with respect thereto. The opposite end of the tube 30 telescopes slightly within the hub portion 32 of a disc member 33 and is welded thereto. A sealing ring 34 embraces the tube 17 and abuts against the adjacent axial end of the tube 30. A seal packing 35 is disposed within the hub portion 32 between its interior surface and the surface of tube 17, and an end plate 36 is detachably secured to the adjacent face of the disc 33 by means of screws 37. The disc 33, packing and end plate 36 thus move with the tube 30.

The tube 30 has a helical thread or groove 38 formed in the peripheral surface thereof. The tube 30 is thus adapted to be projected through opening 28, and it is slidably and rotatably mounted within such opening by means of an annular bushing 39 which is disposed within the opening 28. A seal ring 40 is pressed over the end of tube 30 and is adapted to bear against

the inner annular surface of the bushing 39. A contracting ring 41 is disposed within a recess formed in the bushing 39 and also bears against the ring 40 and the exterior surface of the tube 30 to prevent gas leakage.

The projecting end of the tube 30 has a blowing nozzle 42 connected thereto. The cleaning fluid is ejected through the openings in the nozzle 42 when the tube 30 is projected to its extended position within the combustion chamber.

The tube 30 is extended and rotated by means of an annular nut 43 having a projection 44 which is adapted to be received within and run along the thread 38. The nut 43 is fixed to the hub 45 of a gear 46 by means of a set screw 47, so that it rotates upon rotation of gear 46. The gear 46 is mounted to the bracket 25 for rotation with respect thereto by means of a thrust, ball bearing assembly 46A.

The assembly 46A is mounted to the bracket 25 by means of a retainer ring 48 having an inturned annular flange 49 by means of screws 50. The thrust bearing 46A takes the reaction of steam pressure load on the tube 30.

The hub 45 of the gear 46 is mounted on the thrust bearing 46A and is held against axial movement by an annular shoulder 51, engaging one of the races of the bearing assembly, and a ring 52 which engages the other race of the bearing assembly. The ring 52 is secured in an annular groove on the hub 45 by means of a snap ring 53.

It will be appreciated that rotation of the gear 46 effects rotation of the nut 43 which in turn causes the tube 30 to move longitudinally with respect to the tube 17.

This rotation of the gear 46 is effected by a meshing pinion 54 which is rotatably mounted on a tube 55. The tube 55 surrounds and is supported by a rod 56, the ends of which are received in aligned openings in an upstanding projection 57, formed on the bracket 27, and an arm 58 formed integral with the casting 3. The ends of the rod 56 are threaded for the reception of assembly nuts 59. A sheave wheel 60 is also rotatably mounted on the tube 55 and is fixed to the gear 54 by means of a set screw 61 so that they rotate together.

The sheave wheel 60 has a hand chain 62 trained therearound for rotating the pulley in either direction. A chain guide 63 is pivotally mounted on the tube 55 adjacent the sheave wheel 60 and has angularly spaced depending arms terminating in laterally directed forked ends which receive the chain therein, aligned with the periphery of the wheel 60, for the purpose of guiding the chain. It will be understood that while a hand means is here disclosed, a motor driven means may be employed for rotating the gear 46.

Axial movement of the pinion 54, the sheave wheel 60, and the guide 63 in one direction is prevented by a spacer collar 64 disposed on the tube 55 between the pinion 54 and the upper end of the bracket 57. Movement in the other direction is prevented by a set collar 65 fixed to the tube 55 abutting the guide 63 by means of a set screw 65'.

Rotation of the tube 30 is prevented until it reaches its extended position within the combustion chamber by the following means. The disc 33 is formed with a peripheral notch 66 therein (Fig. 4). An elongated rail 67 has longitudinally spaced hubs 68 which serve to pivotally mount the rail 67 on the tube 55. The rail 67 is thus mounted on the tube 55 for pivotal and longi-

tudinal sliding movement with respect thereto. The rail 67 is normally urged toward the left, viewing Fig. 2, by means of a helical compression coil spring 69 which is disposed between the stop collar 65 and the adjacent hub 68. One end of the coil spring is fixed to the screw 65' and the opposite end is fixed to the bar 67 through an opening 70 so that the bar 67 is normally urged to turn in a counterclockwise direction, viewing Fig. 4. The bar 67 is thus normally urged to its downward position into the notch 66 on the disc 33. Rotation of the bar 67 is prevented, when the bar is in the position to the left, viewing Fig. 2, by means of forked projections 71 and 72 which embrace a projection 73 formed integral with member 58 (Fig. 5). The arm 71 is shorter than arm 72 so that the rail 67 may be pivoted in a clockwise direction, viewing Fig. 4, upon relatively short longitudinal movement of the rail 67, but is still held against rotation in the opposite direction.

A lateral projection 74 is fixed to the opposite end of the rail 67 and thus lies in the path of movement of the disc 33 when it is moved to the position shown in broken lines in Fig. 2. It will be appreciated that as the pulley 60 is turned in one direction, the rotation of nut 43 effects longitudinal movement of the tube 30 which carries therewith the disc 33. During this movement the rail 67 is received within the notch 66 to prevent rotation of the disc 33 and the tube 30. When the disc 33 reaches the position shown in broken lines shown in Fig. 2, it engages the projection 74 and urges it and the rail 67 toward the right, viewing Fig. 2. This movement of the rail releases engagement of the forked finger 71 with the abutment 73 so that the rail 67 is free to pivot in one direction. This then forces the rail out of the notch 66 so that the disc 33 may rotate. This also permits rotation of the tube 30 and rotation of the nozzle 42 in its projected position. It is at this time that the valve 7 is opened to permit the cleaning fluid to pass through conduit 6, tube 17 and through the nozzle 42.

The opening of the valve is effected by a curved trigger 75 which is pivotally connected to an upstanding lug formed integral with the casting 3, by means of a pivot pin 76. The trigger 75 has a portion which is received within the guide member 13 and bears against the top of valve stem 8 so that when the trigger 75 is pivoted downwardly about pivot pin 76, the valve stem 8 is depressed to open valve 7 and admit the cleaning fluid into the inlet passageway 6. This pivotal movement of the trigger 75 is effected by a cam 78 which is fixedly mounted to the disc 33 for movement therewith. The upper end of the trigger has a follower face 79 which is adapted to be engaged by the cam 78 to pivot the trigger 75 in a clockwise direction upon rotation of the cam 78 in a counterclockwise direction, viewing Fig. 3. The trigger 75 is normally urged toward the cam by the spring 15. The angle of rotation through which the valve 7 is open is determined by the cutout space between surfaces 80 and 81 in the cam. This may be varied depending upon what portion of the rotation of the nozzle 42 it is desired to inject the cleaning fluid into the combustion chamber against the surfaces to be cleaned.

Continued rotation of the sheave wheel 60 in the same direction will continue rotation of the nozzle 42 in its extended position. Rotation of the sheave wheel 60 in the opposite direction will permit the bar 67 to drop back into the notch 66

thereby stopping rotation of the tube 30 and the disc 33. The bar 67 is then held against rotational movement by projection 72. The continued rotation of the sheave wheel in that direction then effects return of the tube 30 together with the nozzle 42 to its retracted position.

Formal changes may be made in the specific embodiment of the invention disclosed without departing from the spirit and substance of the invention, the scope of which is commensurate with the above claims.

What is claimed is:

1. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means for controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, movable means to restrain rotation of said second member until it reaches a particular axial position, and means engageable with said movable means and interconnectible with said valve means and responsive to the movement of the second member to move said movable means to thereby release said second member at said particular position and permit rotation thereof to then control the operation of said valve means.

2. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, a valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member, means connected to said second member for travel therewith, said last named means being interconnectible with said elongated member to restrain rotation of said second member until it reaches a particular axial position, and means interconnectible with said valve means and responsive to the movement of the second member at said particular axial position to control the operation of said valve means.

3. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member for pivotal movement, releasable means to prevent said pivotal movement, means connected to said second member for travel therewith, said last-named means being interconnectible with said elongated member to restrain rotation of said second member until it reaches a particular axial position, at which position it releases said releasable means to permit pivotal movement of said elongated member and disconnects it from said last-named means, and means interconnectible with said valve means

and responsive to the movement of the second member at said particular axial position to control the operation of said valve means.

4. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, an elongated member extending longitudinally of said first and second members, means mounting said elongated member for pivotal and axial movement, releasable means to prevent movement of said elongated member, means connected to said second member for travel therewith, said last-named means being interconnectible with said elongated member to restrain rotation of said second member until it reaches a particular axial position, at which position it moves said elongated member axially to release said elongated member from said releasable means and permit pivotal movement thereof, and means interconnectible with said valve means and responsive to the movement of the second member at said particular axial position to control the operation of said valve means.

5. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member for pivotal movement, releasable means to engage and release said elongated member to prevent said pivotal movement, means connected to said second member for travel therewith, said last-named means being interconnectible with said elongated member to restrain rotation of said second member until it reaches a particular axial position at which position it releases said releasable means to permit pivotal movement of said elongated member and disconnects it from said last-named means, means interconnectible with said valve means and responsive to the movement of the second member at said particular axial position to control the operation of said valve means, and means to reestablish engagement between said elongated member and said releasable means to restrain rotation of said second member.

6. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing said first member against axial movement, means for moving the second member axially and rotatively with respect to the first member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member for pivotal movement, releasable means to prevent said pivotal movement, a disc member having a notch in the periphery thereof connected to said second member for travel therewith, said notch being interconnectible with said elongated member to restrain rotation of said second member until it reaches a particular axial position at which position it releases said releasable means to permit pivotal movement of said elongated member and disconnects it from said last-named means, and means on said disc member and interconnectible with said valve means and responsive to the movement of the second member at said particular axial position to control the operation of said valve means.

7. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing one of said members against movement, means mounting the other of said members for relative axial and rotative movement with respect to said fixed member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member, means connected to one of said first and second members for travel therewith, said last-named means being interconnectible with said elongated member to restrain relative rotation between said first and second members until a particular relative axial position is reached, and means interconnectible with said valve means and responsive to said rotative movement to control the operation of said valve means when said particular axial position is reached.

8. A soot blower construction comprising a housing, means providing a fluid passageway in said housing, valve means controlling the flow of fluid through said passageway, first and second telescopically related tubular members mounted on said housing and communicating with said passageway, means fixing one of said members against movement, means mounting the other of said members for relative axial and rotative movement with respect to said fixed member, an elongated member extending longitudinally of said first and second members, means movably mounting said elongated member, a disc member having a notch in the periphery thereof connected to one of said first and second members for travel therewith, said notch being interconnectible with said elongated member to restrain relative rotation between said first and second members until a particular relative axial position is reached, and means on said disc member and interconnectible with said valve means and responsive to said rotative movement to control the operation of said valve means when said particular axial position is reached.

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