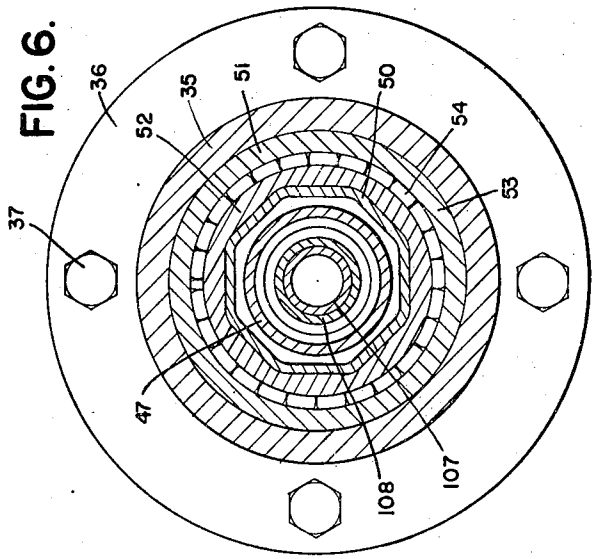
Oct. 7, 1941. F. BOWERS ET AL 2,257,936

BOILER CLEANER

Original Filed July 19, 1937 5 Sheets-Sheet 1

FIG. 6.



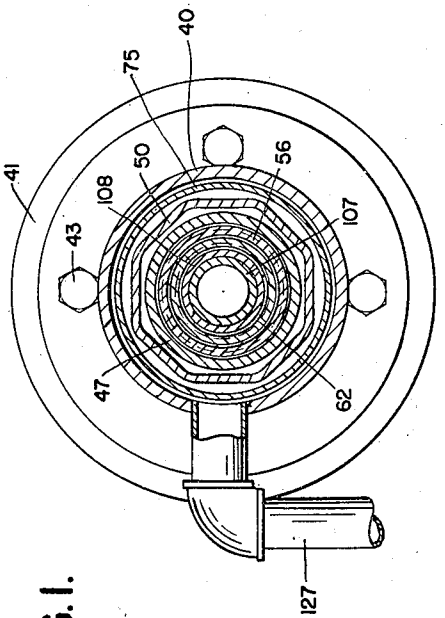


FIG. 7.

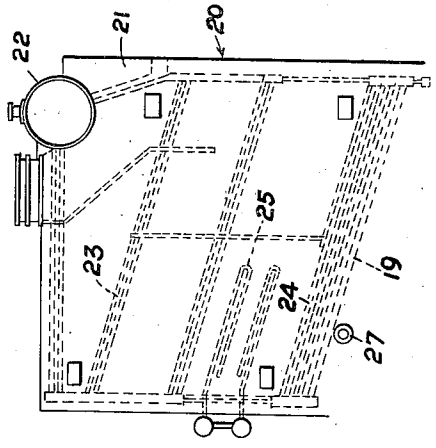


FIG. 1.

Inventors
Frank Bowers
Harry E. Brelsford

By Henderson Davis

Attorney

Oct. 7, 1941. F. BOWERS ET AL 2,257,936

BOILER CLEANER

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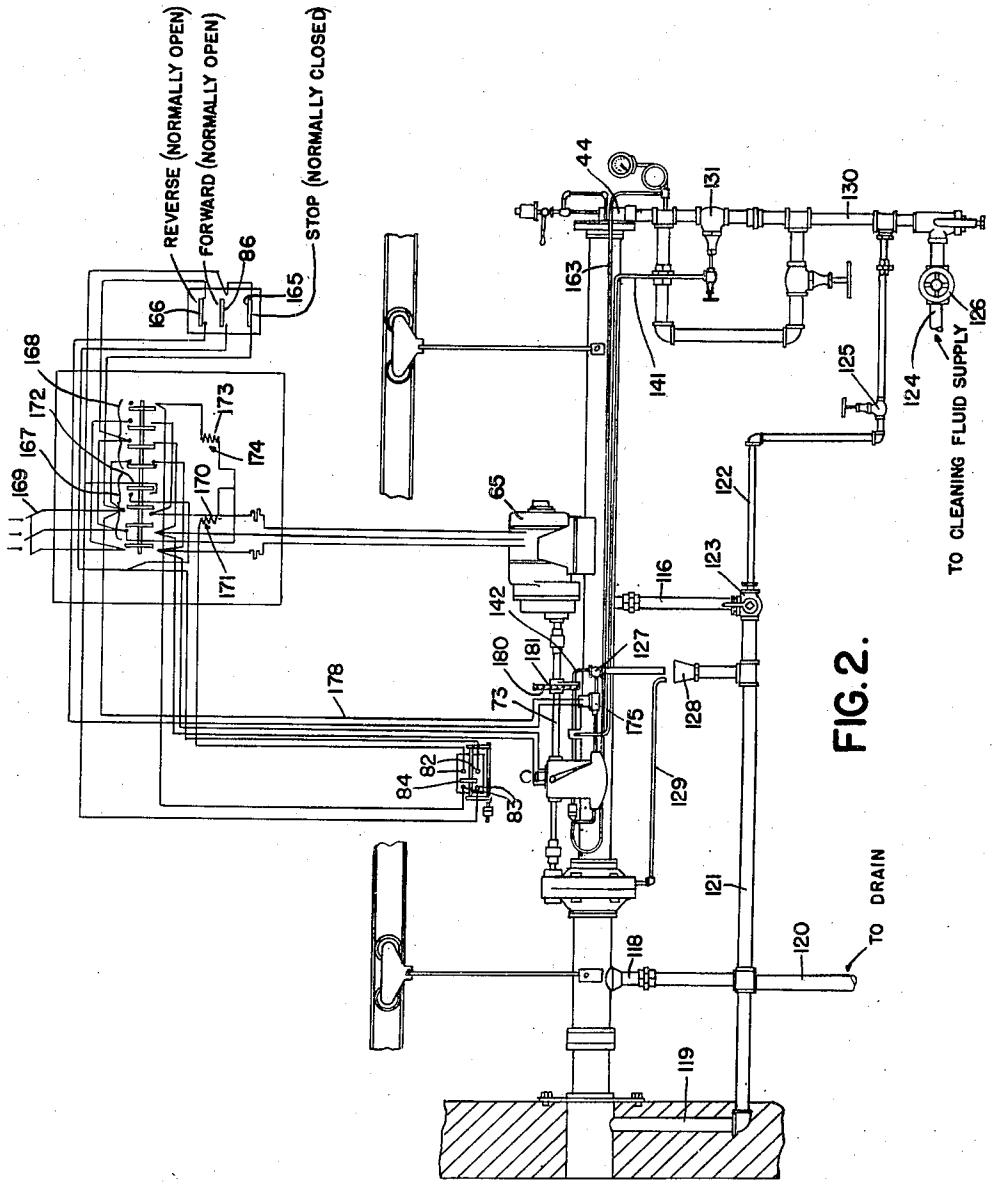


FIG. 2.

Inventors
Frank Bowers
Harry E. Brelsford
By Lindsay Davis
Attorney

Oct. 7, 1941. F. BOWERS ET AL 2,257,936

BOILER CLEANER

Original Filed July 19, 1937 5 Sheets-Sheet 3

FIG. 3.

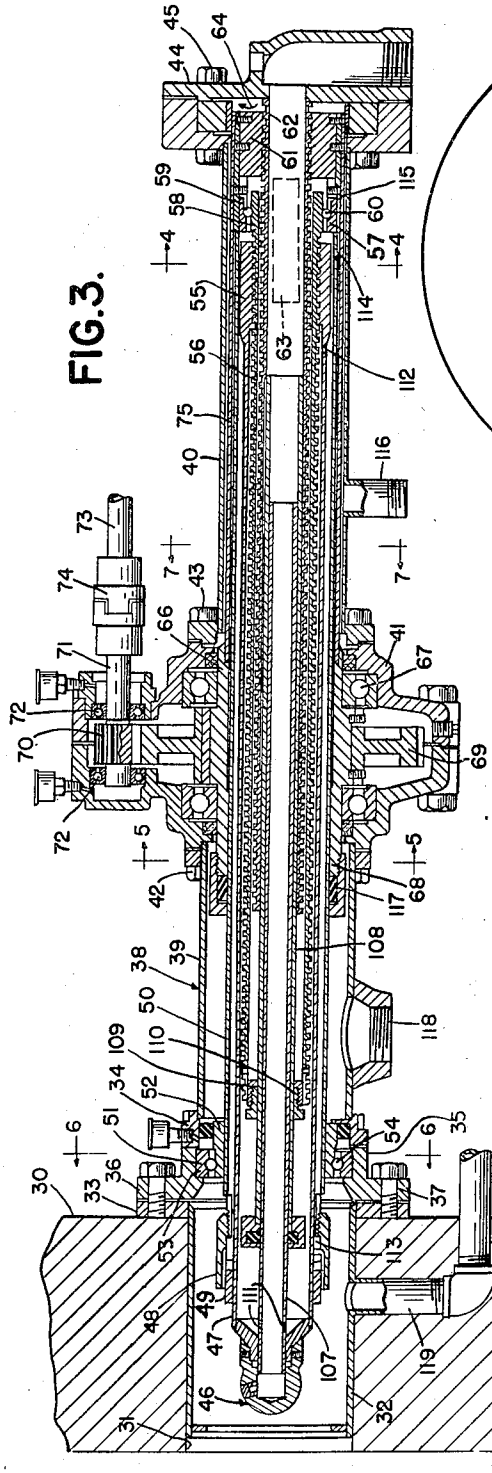


FIG. 4.

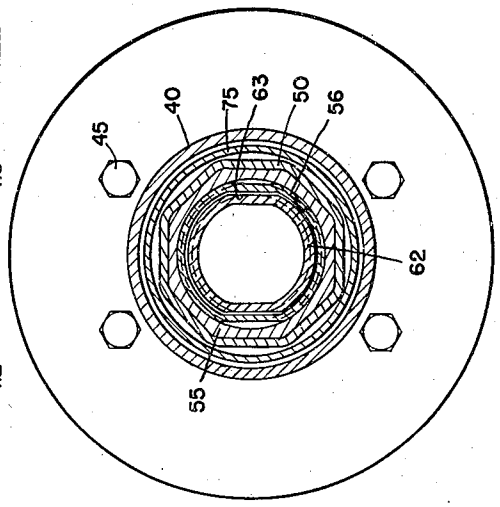
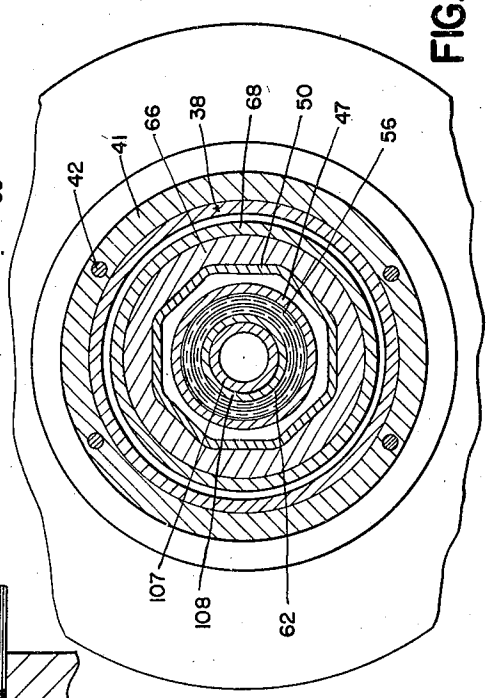


FIG. 5.



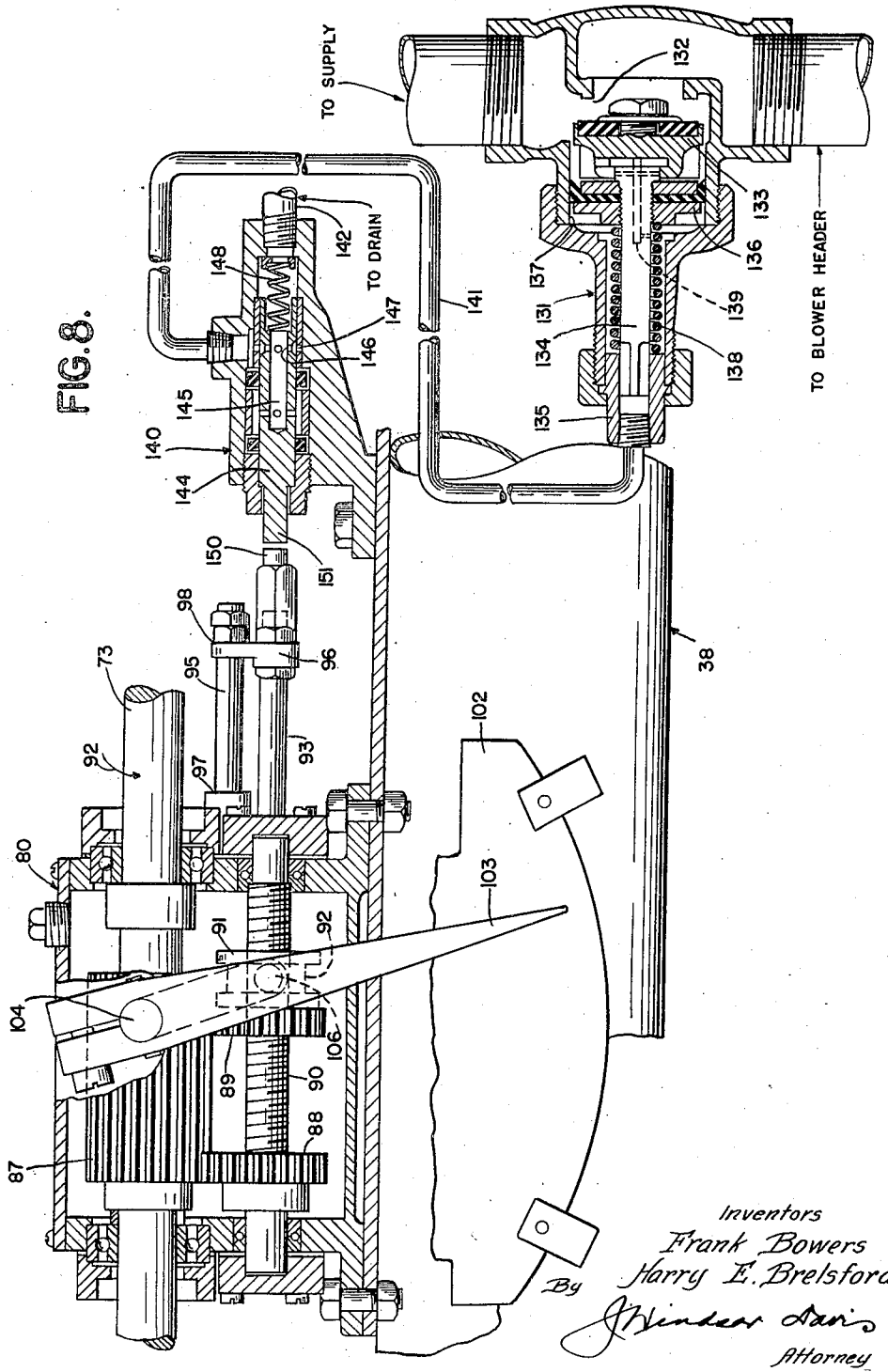
Inventors
Frank Bowers
Harry E. Brelsford
By J. Hindson Davis
Attorney

Oct. 7, 1941. F. BOWERS ET AL 2,257,936

BOILER CLEANER

Original Filed July 19, 1937 5 Sheets-Sheet 4

FIG. 8.



Inventors
Frank Bowers
Harry E. Brelsford
By J. Windsor Davis
Attorney

Oct. 7, 1941. F. BOWERS ET AL 2,257,936

BOILER CLEANER

Original Filed July 19, 1937 5 Sheets-Sheet 5

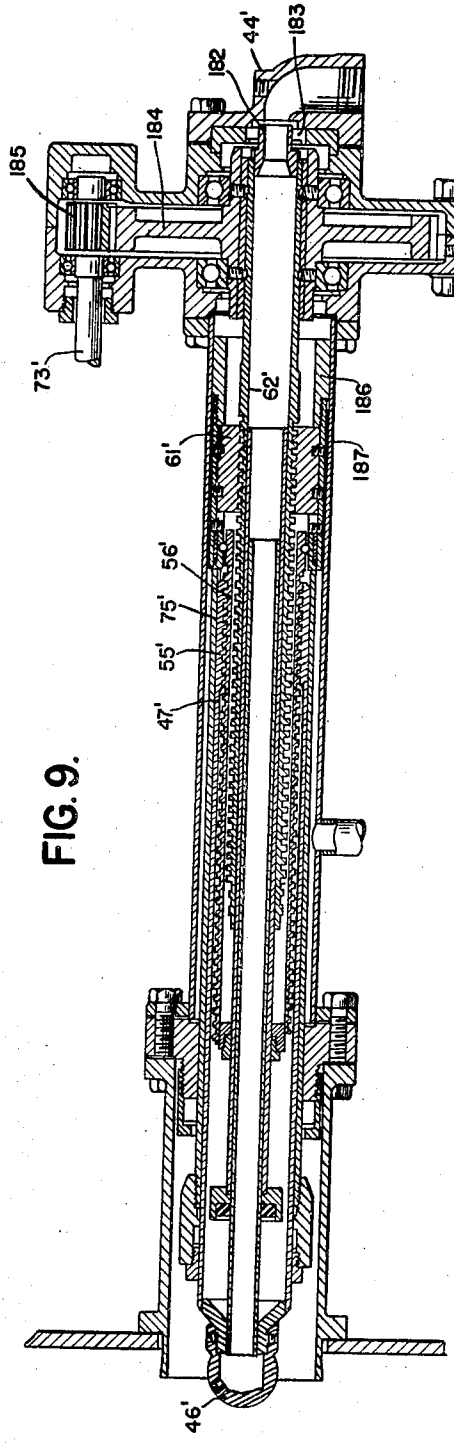


FIG. 9.

Inventors
Frank Bowers
By Harry E. Brelsford
J. Windsor Davis
Attorney

Patented Oct. 7, 1941 2,257,936

UNITED STATES PATENT OFFICE

2,257,936

BOILER CLEANER

Frank Bowers, Detroit, and Harry E. Brelsford, Birmingham, Mich., assignors to Diamond Power Specialty Corporation, Detroit, Mich., a corporation of Michigan

Original application July 19, 1937, Serial No. 154,522. Divided and this application January 2, 1940, Serial No. 312,016

12 Claims. (Cl. 122—392)

This invention relates generally to boiler cleaners and refers more particularly to a boiler cleaner of the type having provision for discharging cleaning fluid adjacent portions of a boiler to dislodge deposits from the same.

More in detail, this invention contemplates improving boiler cleaners of the type wherein the blower element is movable from a retracted position exteriorly of the boiler into and out of the latter during the blowing operation in order to prevent the excessive heat generated in the combustion chamber of the boiler from burning or otherwise detrimentally affecting the boiler cleaner.

This application is a division of our application Serial Number 154,522, filed July 19, 1937.

One object of the present invention resides in the provision of a boiler cleaner of the telescoping tube type embodying means within the blower nozzle supporting tubing for conducting cleaning fluid under pressure from the source of supply to the nozzle in such a manner that the packing joints associated with the outer supporting tubing will not be subjected to the maximum pressure of the cleaning fluid.

A further feature of this invention is to provide a boiler cleaner of the character set forth in the preceding paragraph wherein a limited amount of the cleaning fluid flowing directly to the spray nozzle from the source of supply is permitted to escape into the outer supporting tubing and wherein this fluid is circulated at a lower pressure through the outer tubing to effectively cool the latter as the blower is projected into the boiler.

An additional object of the present invention resides in the provision of a boiler cleaner embodying means for insuring effectively cooling the blower throughout its travel in the boiler by directing a spray of cleaning fluid against the outer surface of the spray nozzle supporting tube during the interval the latter is subjected to the heat of the combustion chamber in the boiler.

A still further advantageous feature of the present invention consists in the provision of means for by-passing cleaning fluid into the blower prior to projecting the blower into the boiler so that normal circulation of the cleaning fluid through the blower tubing will be in effect at the time the blower is initially projected into the boiler.

A still further object of the present invention consists in the provision of means for draining the boiler wall box through which the blower extends from cleaning fluid escaping from the blower.

In addition to the foregoing, this invention contemplates a novel driving arrangement for projecting the telescoping tubes into the boiler and this construction, as well as the foregoing features and other objects, will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein—

Figure 1 is a semi-diagrammatic side elevational view of one type of a boiler having a boiler cleaner constructed in accordance with the present invention;

Figure 2 is a semi-diagrammatic view of a boiler cleaner installation;

Figure 3 is a longitudinal sectional view through the boiler cleaner assembly;

Figures 4, 5, and 6 are, respectively, cross sectional views taken substantially on the planes indicated by the lines 4—4, 5—5, and 6—6 of Figure 3;

Figure 7 is a cross sectional view taken substantially on the plane indicated by the line 7—7 of Figure 3;

Fig. 8 is a sectional view of the control valves shown in their relation to the control mechanism; and

Figure 9 is a longitudinal sectional view through a slightly modified form of boiler cleaner construction.

Steam boilers are usually operated at relatively high ratings and when certain types of fuel are utilized in the combustion chamber, slag is formed on the lower generating tubes of the boiler to such an extent that the gas passages between the tubes become partially or completely blocked in a relatively short period of time. As a consequence, the efficiency of the boiler is materially lower and some means must be provided to periodically remove the slag from the boiler tubes. It has been proposed to accomplish the above result by providing a projectable and retractable blowing nozzle or element which is exposed to the high temperatures within the boiler only during the blowing period when the cleaning fluid discharged through the blower performs the additional function of keeping all the exposed parts of the blower at a temperature sufficiently low to prevent any liability of damage by the heat generated in the combustion chamber of the boiler. In the interests of compactness, blowers of the above type are usually formed of a plurality of telescopically engaging tubes and it is this general type of blower that the present invention contemplates improving.

For the purpose of illustration, we have shown

our improved telescopic blower in connection with a boiler of the general type diagrammatically illustrated in Figure 1 of the drawings by the reference character 20. Briefly described, the boiler 20 comprises a casing 21, a cross drum 22, upper and lower decks of generating tubes 23 and 24, respectively, and a superheater 25. In accordance with conventional practice, a fire box forming a combustion chamber is located immediately below the lower deck 19 of the generating tubes, and a boiler cleaner 27 is supported on the casing 21 for movement into the latter beneath the tubing 19.

Referring now more in detail to the blower illustrated in Figures 3 to 7, inclusive, it will be noted that the reference character 30 in Figure 3 designates one side wall of a boiler having an opening 31 therein through which the blower extends into the boiler from the collapsed position thereof exteriorly of the boiler shown in Figure 3. In the present instance, the opening 31 through the boiler wall 30 is lined by a wall box 32 having a radially outwardly extending annular flange 33 at the outer end abutting the exterior surface of the wall 30. Positioned at the outer end of the wall box 32 is a hub 34 having an axially extending barrel portion 35 and having a radially outwardly extending flange 36 at the inner end demountably secured to the flange 33 of the wall box by means of the fastener elements 37.

Supported by the hub 33 is a tubular casing 38 comprising a pair of axially aligned tubes 39 and 40 having the adjacent ends spaced axially from each other to receive the gear housing 41 therebetween. The inner end of the tube 39 is suitably detachably secured to the hub 34 and the outer end of this tube is demountably secured to the adjacent side of the housing 41 by the fastener elements 42. The inner end of the tube 40 is secured to the opposite side of the housing 41 by the fastener elements 43 and the outer end of the tube is secured to a header 44 by means of the fastener elements 45.

In general, the blower element comprises a plurality of telescopic tubes supported within the housing 38 for movement from the collapsed positions thereof shown in Figure 3 to an extended position into the steam boiler. In detail, the blower element comprises, among other parts, a nozzle 46 secured to the inner end of a tube 47 and having a plurality of circumferentially spaced openings therethrough for the discharge of cleaning fluid under pressure. The inner end of the tube 47 is slidably supported in a packing joint 48 having a packing ring 49 frictionally engaging the outer surface of the tube 47 and being welded, or otherwise permanently secured to the inner end of a tube 50. Upon reference to Figure 6, it will be noted that the tube 50 surrounds the tube 47 and is octagonal in cross section. It will also be observed from Figure 6 that the outer end of the tube 50 is slidably and rotatably supported in the hub 34 by means of a ball bearing 51 having an inner race 52 provided with a bore therethrough corresponding in cross section to the cross sectional contour of the tube 50 in order to slidably receive the latter. The outer race 53 of the ball bearing 51 is secured in the hub 34 and rotatably supports the inner race 52 through the medium of the balls 54. With the construction as thus far described, it will be noted that both of the tubes 47 and 50 are capable of axial sliding movement and are permitted to rotate relative to the surrounding housing 38.

The inner end of the cylindrical tube 47 is provided with an enlargement 55 shown in Figure 4 as having an outer surface corresponding in cross section to the octagonal cross sectional contour of the tube 50 to slidably engage the inner surface of the latter and is internally threaded for engagement with the corresponding threads on a tube 56. The tube 56 extends axially within the tube 47 and is rotatably supported on the tube 47 within the tube 50 axially beyond the inner end of the enlargement 55 by means of a ball bearing 57. The radially inner race 58 of the ball bearing is formed by the outer extremity of the tube 56 and the outer race 59 is secured to the tube 50 within the latter. It will be observed from Figure 3 that the two races are formed with registering annular grooves for receiving the balls 60.

The outer end of the tube 50 extends axially beyond the ball bearing 57 and has a nut 61 secured thereto. The nut 61 is internally threaded for engaging corresponding threads on the exterior surface of a tube 62 having the outer end fixedly secured to the header 44 and extending axially inwardly through the threaded tube 56. Referring again to Figure 4, it will be noted that the threaded tube 56 is prevented from rotation relative to the fixed tube 62 by forming cooperating engaging longitudinally extending flats 63 at diametrically opposite sides of the two tubes.

With the construction as thus far described and assuming that the tube 50 is rotated in the direction of the arrow 64 by suitable power means to be presently described, it will be noted that the nut 61 secured to the outer extremity of this tube will advance in an inward direction on the tubular fixed screw 62. Inasmuch as the enlargement 55 on the outer extremity of the tube 47 has a sliding fit within the octagonal tube 50, it follows that the tube 47 is rotated directly from the tube 50. Owing to the fact that the cooperating engaging flats on the threaded tubes 56 and 62 prevent rotation of the tube 56, the tube 47 is also advanced in an inward direction. It will, of course, be understood that although the tube 50 rotates relative to the threaded tube 56, nevertheless, this latter tube must advance as a unit with the tube 50 and, as a consequence, the tube 47 or spray nozzle 46 is advanced into the boiler at a rate twice as fast as the rate of advancement of the tube 50. In other words, the spray nozzle 46 advances a distance equal to the sum of the threads on the tubes 56 and 62 for each revolution of the tube 50. In the event that the threads on the two tubes have a lead of one inch, the nozzle 46 will advance two inches for each revolution of the driving tube 50.

The tube 50 is driven from a prime mover 65 through suitable reduction gearing located in the housing 41. In detail, it will be noted from Figure 3 that a driving sleeve 66 is totatably supported in the housing 39 by a pair of axially spaced ball bearings 67 supported in the housing 41 and the inner end 68 of the bore through the driving sleeve is octagonal in cross section to slidably receive the correspondingly shaped tube 50 in the manner clearly shown in Figure 5 of the drawings. The driving sleeve is rotated by means of a gear 69 secured thereto between the ball bearings 67 and adapted to mesh with a pinion 70 fixed to a stub shaft 71. The stub shaft 71 is journelled in bearings 72 supported in the housing 41 and is coupled to the drive shaft 73 of the prime mover through the medium of the coupling 74.

In the present instance, the prime mover 65

is in the form of an electric motor of the reversible type for driving the tube 50 in opposite directions to permit successively extending and collapsing the blower. Referring again to Figure 3 of the drawings, attention is called to the fact that the stresses effected by the overhanging portion of the blower as it is projected into the boiler are taken by a tube 75 surrounding the tube 50 and engageable with the outer end portion of the same. The inner end of the tube 75 is fixed to the driving sleeve 66 for rotation therewith as a unit, and the outer end of this tube is journalled in the header 44.

As the blower approaches the limit of its extended position in the boiler, the prime mover 65 is automatically reversed and the several telescopic tubes of the blower are retracted to the collapsed position of the blower shown in Figure 3. When the blower reaches the position illustrated in Figure 3, the operation of the prime mover is discontinued and the parts remain in their inoperative positions until the circuit to the prime mover is again closed. The specific mechanism for automatically controlling the operation of the prime mover to effect the above function is fully described in our co-opending application Serial No. 154,522, and is diagrammatically shown in its relation to the control valves in Fig. 8.

The mechanism referred to comprises a control unit 80 supported on the housing 39 of the blower between the prime mover 65 and the reduction gear housing 41.

In a manner to be more fully hereinafter set forth, a cleaning fluid under pressure is discharged into the outer end of the tube 62 through the header 44 in timed relation to movement of the blower into the boiler and, in the present instance, this cleaning fluid is caused to flow directly from the header to the nozzle without subjecting the several packing joints between the cooperating telescopic tubes to the maximum pressure of the cleaning fluid. This is accomplished herein by providing two telescopically engaging tubes 107 and 108 within the blower. Upon reference to Figure 3, it will be noted that the smaller tube 107 is secured at its inner end to the nozzle 46 and the outer tube 108 is slidably supported at its inner end on the tube 107 through the medium of a packing joint 109. The outer tube 108 also supports the free end of the tube 56 through the packing gland 110 and, in addition, has a sliding fit within the inner end of the tube 62. The arrangement is such that both tubes communicate directly with the source of cleaning fluid under pressure admitted to the outer end of the tube 62 through the header 44 and the tube 107 moves as a unit with the spray nozzle 46. The relative length of the two tubes is such as to provide a continuous conduit for the flow of cleaning fluid from the header 44 to the nozzle in the extreme extended position of the blower. It follows from the above that the cleaning fluid flows directly from the tube 62 to the spray nozzle 46 without subjecting the packing glands to the relatively high pressure thereof and, as a consequence, more effective spraying of the boiler tubes with the cleaning fluid is accomplished.

It is desired, however, to effect a circulation of cleaning fluid under a relatively lower pressure through the telescopic tubing of the blower in order to maintain the outer tubes relatively cool when projected into the boiler. This is accomplished in the present instance by forming outlet openings 111 in the inner end of the pressure tube 107 permitting cleaning fluid to escape into the interior of the tube 47. The cleaning fluid thus discharged into the tube 47 flows in a direction toward the outer ends of the tubes between the tubes 47 and 56. As shown in Figure 3, suitable openings 112 are formed through the tube 47 adjacent the enlargement 55 on the outer end thereof and the fluid passes through these openings into the tube 50, whereupon the fluid returns to the inner end of the blower and is discharged out of the blower against the projecting tube 47 through a relatively small passage 113 formed in the packing joint 48 in such a manner as to by-pass the packing ring 49. Thus, a circulation of the cleaning fluid is provided in the blower tubes and a jet of cleaning fluid under the circulating pressure is constantly discharged against the projecting tube during the blowing operation.

It will, of course, be understood that there will be a leakage of cleaning fluid through the ports 114 and 115 formed in the outer ends of the tubes 50 and 75, respectively. Any fluid leaking through these ports is permitted to escape through the drain conduit 116 communicating with the interior of the casing 39. Also, any fluid escaping by the packing joint 117 between the driving sleeve 66 and the tube 60 is permitted to drain through the conduit 118 which also communicates with the interior of the casing 39. Any fluid leaking from the blower into the wall box 48 is permitted to drain out of the wall box through a conduit 119 communicating with the lower side of the wall box in the manner clearly shown in Figure 3.

Upon reference to Figure 2, it will be noted that the conduits 116, 118, and 119 communicate with a common drain 120 through the medium of a conduit 12. The outer end of the conduit 121 and the blower end of the conduit 116 communicate with a cleaning fluid supply conduit 122 through the medium of a three-way valve 123. The supply conduit 122, in turn, communicates with a source of cleaning fluid under pressure 124 through the medium of a stop valve 125 and a main shut-off valve 126. The arrangement is such as to permit the blower to be initially filled with cleaning fluid prior to projecting the blower into the boiler, and this is accomplished by opening both of the valves 126 and 125 and by manipulating the three-way valve 123 to establish communication between the conduit 116 and the supply line 122, and to close communication between the conduit 116 and drain conduit 121. When the valves are in the above named position of adjustment, cleaning fluid flows through the conduit 116 into the casing 39 and fills the blower tubes to the level of the outlet conduit 127. As shown in Figure 7, the outlet conduit 127 extends laterally outwardly from one side of the blower casing 39 and discharges into the funnel 128 which, in turn, communicates with the drain conduit 121. Referring again to Figure 2, it will be noted that the funnel also collects any leakage of cleaning fluid in the housing 41 and this is accomplished by establishing communication between the bottom of the housing 41 and the funnel through the medium of a conduit 129.

It has previously been stated that the cleaning fluid is automatically turned on in timed relation to movement of the blower into the boiler and is automatically shut off in timed relation to movement of the blower to its retracted position. In actual practice, it is desired to delay the passage

of cleaning fluid through the blower until the latter assumes a sufficient distance beyond the inner surface of the side wall 30 of the boiler to prevent spraying this wall with the cleaning fluid and for the same reason the flow of cleaning fluid is discontinued as the blower approaches the wall 30 on its return movement. As shown in Figure 2, the source of supply 124 communicates with the header 44 at the outer end of the blower through the medium of a conduit 130 and a valve 131 is located in this conduit normally closing communication therethrough. The valve is shown in Figure 8 as comprising an apertured valve seat 132 arranged to require the cleaning fluid from the source to flow through the aperture 132 in order to reach the header 144. The opening 132 is normally closed by a valve member 133 having a valve stem 134 slidably supported at its upper end in the valve casing 135. The lower end of the valve stem is slidably supported in the casing by means of a piston 136 secured to the stem 134 and mounted for reciprocation in a cylinder 137 surrounding the valve stem. The valve member 133 is maintained in its closed position with respect to the opening 132 by means of a coil spring 138 surrounding the stem 134 with one end engaging the piston and with the other end engaging a fixed abutment secured to the valve casing. It will be observed from Figure 8 that the design of the valve 131 is such that the bottom side of the piston 136 is subjected to the pressure of the cleaning fluid from the source and, in the present instance, the spring 138 is not of sufficient strength to maintain the valve member 133 seated against the action of the cleaning fluid pressure. However, communication is established between the high pressure side of the system and the portion of the cylinder 137 above the piston and, for accomplishing this communication, a passage 139 is formed through the valve stem 134. As a result, the upper side of the piston is also subjected to the action of the cleaning fluid under pressure and, consequently, the valve member 133 is normally maintained in its closed position.

The valve member 133 is lifted from its seat upon initial movement of the blower into the boiler by effecting a drop in pressure of the fluid in the cylinder 137 above the piston 136 and this is controlled by means of a slide valve 140. As shown in Figure 8, the slide valve 140 communicates with the cylinder 137 above the piston 136 through the medium of a conduit 141 and also communicates with the drain conduit 121 through the medium of a conduit 142. The general arrangement is such that when the blower is advanced into the boiler, communication is established between the portion of the cylinder 137 above the piston 136 in the valve 131 and the drain opening to effect a sufficient reduction in the pressure above the piston 136 to cause the pressure of the cleaning fluid from the source to move the piston 136 against the action of the spring 138 and thereby open the valve member 133 to permit cleaning fluid to flow into the blower. In detail, the slide valve 140 for effecting this operation comprises a plunger 144 slidably supported in the casing of the valve 140 between the conduits 141 and 142. The plunger 144 is provided with an axially extending recess 145 communicating with the drain conduit 142 and having radially extending ports 146 therethrough adapted to register with corresponding ports 147 in the innermost position of the plunger to establish communication between the conduits 141 and 142. The plunger is normally urged to a position wherein communication is established between the valve cylinder 137 and the drain conduit 142 by means of a spring 148 located in the valve casing with one end engaging the outer end of the plunger and with the other end abutting the adjacent end of the casing.

Although the spring 148 normally urges the valve plunger 144 in a position wherein the valve 131 is open, nevertheless, in the retracted position of the blower, the valve plunger 144 is held against the action of the spring 148 in a position wherein the ports 146 and 147 are out of registration and wherein the valve 131 is, accordingly, closed. Upon reference to Figure 8, it will be noted that the valve plunger is held in its closed position against the action of the spring 148 by means of an adjustable abutment 140 secured to the outer end of the rod 93 beyond the link 96. The location of the abutment 150 on the rod 93 is such that when the valve is in its retracted position, the abutment engages the forwardly projecting end 151 of the valve plunger and positively holds the latter in its inoperative position against the action of the spring 148 wherein the plunger closes communication between the valve 131 and the drain conduit 121. It follows, therefore, that when the blower is in its retracted position shown in Figure 3, communication between the source of cleaning fluid supply 124 and the blower is closed by the valve 131. However, as the blower is projected into the boiler, the rod 93 is moved in an inward direction and disengages the abutment 150 from the projecting end 151 of the valve plunger permitting the spring 148 to move the valve plunger to its operative position wherein communication is established between the valve 131 and the drain conduit 121. As a result of movement of the valve to this position, the pressure in the portion of the cylinder 137 above the piston 136 of the valve 131 is substantially lowered and the pressure of the cleaning fluid from the source of supply raises the valve member 133 from its seat to open the aperture 132. This permits the cleaning fluid to flow through the aperture 132 to the outer end of the blower through the header 44. By the time the cleaning fluid under pressure reaches the spray nozzle 46 at the inner end of the blower, the nozzle is projected a sufficient distance into the boiler to prevent the cleaning fluid from contacting with the inner surface of the side wall 30 of the boiler.

It will, of course, be understood from the foregoing that when the blower is retracted by reversing the prime mover 65, the abutment 150 at the outer end of the slide rod 93 re-engages the outer projecting end 151 of the plunger 144 and moves this plunger to its inoperative position against the spring 148. In other words, as the plunger assumes its position of rest shown in Figure 3, the cleaning fluid under pressure from the supply line is permitted to build up in the cylinder 137 in the valve 131 above the piston 136 and, as soon as this pressure approaches the pressure of the cleaning fluid at the source of supply, the spring 138 returns the valve member 133 to its closed position wherein communication is discontinued from the source of supply to the blower.

With the above construction, it will be seen that the blower forming the subject matter of this invention is not only provided with means for automatically retracting the blower when the latter assumes its extended position in the boiler, but is also equipped with means effective upon initial movement of the blower into the boiler to

automatically supply cleaning fluid under pressure to the blower, and effective as the blower approaches its retracted position to automatically discontinue the supply of cleaning fluid to the blower.

From the circuit diagram shown in Figure 2 of the drawings, it will be noted that the circuit to the prime mover may be manually opened at any time by operating the push button switch 165 which is normally closed. Also, the forward rotation of the drive shaft 73 by the prime mover 65 may be reversed at any time during the projecting movement of the blower by closing the push button switch 166. In addition, it will be noted from the circuit diagram shown in Figure 2 that there are two sets of magnetically operated switches designated by the reference characters 167 and 168. Assuming that the line switch 169 is closed and that the forward contacts 83 are bridged by the contact member 84, it will be noted that the circuit to the prime mover may be closed by merely pressing the push button switch 86 to close the same. Closing of the switch 86 energizes the coil 170 of the electromagnet 171 and the armature of this magnet moves the several switches in the set 167 to their closed positions in a manner not shown herein. When the switches in the set 167 are closed, the prime mover 65 is connected to the source of power and rotates the drive shaft 73 in a direction to project the blower into the boiler. It may be pointed out at this time that the switch 172 of the set 167 is shunted across the push button switch 86 so that when the latter is released by the operator, the circuit to the prime mover remains closed. Attention is also directed to the fact that the stop switch 165 is in series with the switch 172 so that when this stop switch is opened, the electro-magnet 171 is de-energized and the circuit to the prime mover is broken.

When the reverse contacts 82 are bridged by the contact member 84, the coil 173 of the electromagnet 174 is energized causing the armature of this electromagnet to open the set of switches 167 and close the set of switches 168. This has the effect of reversing the polarity of the prime mover 65 and causing the latter to drive the shaft 73 in a reverse direction to withdraw the blower from the boiler. The stop switch 165 is also in series with the circuit to the electromagnet 174 so that when this stop switch is opened, the circuit to the prime mover is also opened and the power is discontinued.

It has previously been stated that provision is made herein for reversing the prime mover to retract the blower at any time during its projecting movement by closing the push button switch 166. The structure for accomplishing this is fully described in our co-pending application Serial No. 154,522.

For the purpose of manually retracting the blower in the event that the prime mover 65 should fail, there is preferably provided a sheave wheel 180 secured to the drive shaft 73. A chain 181 is engaged with the sheave wheel and this chain is accessible from the floor of the blower room so that the same may be readily manipulated by the operator.

Referring now more in detail to the modified form of blower illustrated in Figure 13, it will be noted that this blower differs principally from the one previously described in that the spray nozzle 46' is not rotatable and in that the inner threaded tube 62' is rotated by the reduction gearing instead of being fixed in the header 44' at the outer end of the blower. In detail, the outer end of the tube 62' is rotatably supported on the inner end of a tubular bushing 182 having the outer end supported on the header 44' and having a seal 183 surrounding the same to prevent leakage of the cleaning fluid under pressure admitted to the tube 62' through the header. The tube 62' is driven by a gear 184 secured to the outer end of the tube 62, adjacent the header and meshing with a piston 185 keyed, or otherwise suitably secured, to the drive shaft 73' of the prime mover 65'. Also, in this construction, the outer end of the tube 75' extends beyond the nut 61' and is secured to a bushing 186 having a sliding fit with the inner cylindrical surface of the blower casing 187.

It will be observed from the above that rotation of the tube 62' causes the nut 61' and associated tube 75' to move axially inwardly. As in the first described form of the invention, the tube 75' is octagonal in cross section to fit the correspondingly shaped outer end portion 55' of the tube 47' and, inasmuch as the portion 55' is threaded on the revoluble tube 56', it follows that the tube 47' will also be moved outwardly. As a matter of fact, this arrangement is the same as described in the first form of the invention and causes the spray nozzle 46' to move a distance equal to the sum of the threaded leads on the tubes 56' and 62'. With the noted exceptions described above, the blower illustrated in Figure 13 operates in the same manner as the blower unit described in connection with Figures 1 to 12, inclusive.

While in describing the present invention particular stress has been placed upon numerous details of construction, nevertheless, it should be understood that the advantageous results may be secured by substituting various other arrangements and, accordingly, reservation is made to make such changes in the construction as may come within the purview of the accompanying claims.

What we claim as our invention is:

1. In a fluid heater cleaner, an elongated tube element mounted for movement to projected and retracted positions, power driven means for alternately moving said tube to both of said positions, a source of cleaning fluid under pressure communicating with the interior of the tube, a nozzle at one end of the tube through which the cleaning fluid is discharged, valve means controlling communication from the source of cleaning fluid under pressure to the tube, means effective in timed relation to movement of the tube toward its projected position to open the valve means and effective as the tube assumes its retracted position to close the valve means, and means for by-passing a quantity of cleaning fluid and for discharging this cleaning fluid against the outer surface of the tube as the latter is moved to both of said positions.

2. In a fluid heater cleaner, an elongated tube mounted for movement to projected and retracted positions, a nozzle secured to one end of the tube, a plurality of telescopically engaging conduits of less diameter than the tube concentrically arranged in the latter, one of the conduits communicating at one end with the nozzle and secured to the tube for movement therewith as a unit relative to the other conduit, a source of cleaning fluid under pressure communicating with the nozzle through said conduits, means for by-passing a quantity of cleaning fluid flowing through the conduits into the tube and for circulating the cleaning fluid through the space

between the conduits and tube, and means for discharging the cleaning fluid circulating in the tube against the outer surface of the tube during movement of the latter to both of said positions.

3. In a telescopic blower, a pair of tube sections arranged for rotation and telescopic movement one within the other, a nozzle carried by one of the tube sections, means for rotating the tube sections, means operating upon rotation of the tube sections to move both of said sections axially and to project the inner tube section beyond the outer tube section, a pair of telescopically engaging conduits concentrically arranged within the inner tube for movement one within the other, one of said conduits having one end fixed to and communicating with the nozzle and fixed to the inner tube for movement therewith and the other of said conduits being operatively connected to the outer tube for sliding movement as a unit therewith, and a source of cleaning fluid under pressure communicating with the nozzle through said conduits.

4. In a telescopic blower, a pair of tube sections arranged for telescopic movement one within the other, a nozzle carried by one of the tube sections, means for moving the tube sections axially and to project the inner tube section beyond the outer tube section, a pair of telescopically engaging conduits concentrically arranged within the inner tube section, one end of one of the conduits being fixed to and communicating with the nozzle and secured to the inner tube section for movement therewith as a unit relative to the other conduit, and a source of cleaning fluid under pressure communicating with the nozzle through said conduits.

5. In a telescopic blower, a pair of tube sections arranged for telescopic movement one within the other, a nozzle carried by the inner tube section, means for moving the tube sections axially and to project the inner tube section beyond the outer tube section, a fluid seal between the outer tube section and the inner tube section, a pair of telescopically engaging conduits concentrically arranged within the inner tube section, one of the conduits having one end fixed to and communicating with the nozzle and secured to the inner tube section for movement therewith as a unit relative to the other tube section, a source of cleaning fluid under pressure communicating with the nozzle through the conduits, means for by-passing a quantity of cleaning fluid from the conduits and for circulating this cleaning fluid between the tube sections, and means for discharging the circulating cleaning fluid around the seal against the inner tube section.

6. In a telescopic blower, a pair of tube sections arranged for telescopic movement one within the other, a nozzle carried by the inner section, means for moving both of the tube sections axially and to project the inner tube section beyond the outer tube section, a pair of telescopically engaging conduits concentrically arranged within the inner tube section and being of smaller diameter than the latter section, one of the conduits having one end fixed to and communicating with the nozzle and secured to the inner tube section for movement therewith as a unit relative to the other conduit, a source of cleaning fluid under pressure communicating with the nozzle through said conduits, and means for by-passing a quantity of cleaning fluid into the inner tube section adjacent the nozzle and for causing circulation of this cleaning fluid toward the opposite end of the inner tube section and for effecting flow of the cleaning fluid in a direction toward the nozzle between the tube sections.

7. In a telescopic blower, a pair of tube sections arranged for telescopic movement one within the other, a nozzle carried by the inner section, means for moving both of the tube sections axially and to project the inner tube section beyond the outer tube section, a pair of telescopically engaging conduits concentrically arranged within the inner tube section and being of smaller diameter than the latter section, one of the conduits having one end fixed to and communicating with the nozzle and secured to the inner tube section for movement therewith as a unit relative to the other conduit, a source of cleaning fluid under pressure communicating with the nozzle through said conduits, means for by-passing a quantity of cleaning fluid into the inner tube section adjacent the nozzle and for causing circulation of this cleaning fluid toward the opposite end of the inner tube section and for effecting flow of the cleaning fluid in a direction toward the nozzle between the tube sections, and means at the end of the outer tube section adjacent the nozzle for discharging the cleaning fluid against the outer surface of the inner tube section.

8. In a telescopic blower, a tube section polygonal in cross section, a second tube section telescopically arranged within the polygonal tube section and provided with a portion polygonal in cross section having a sliding fit within the first tube section, means for rotating the polygonal tube section to effect a corresponding rotation of the inner tube section, and means operating upon rotation of said tube sections to move both of the latter axially and to project the inner tube section beyond the outer tube section.

9. In a telescopic blower, a tube section substantially polygonal in cross section, an inner tube section telescopically engaging within the outer tube section and provided with a portion at one end polygonal in cross section having a sliding fit within the outer tube section, a nozzle at the opposite end of the inner tube section, and means for moving both of said sections axially and to project the inner section beyond the outer section.

10. In a telescopic blower, a tube section substantially polygonal in cross section, a second tube section telescopically arranged in the first tube section and provided with a portion substantially polygonal in cross section having a sliding fit within the outer tube section, means for rotating the polygonal tube section, and a pair of threaded tubes fixed against rotation and engageable with correspondingly threaded portions carried by the tubes for moving the tubes axially upon rotation thereof and for projecting the inner tube beyond the outer tube.

11. In a telescopic blower, a tube section substantially polygonal in cross section, a second tube section telescopically arranged in the first tube section and having a portion at one end corresponding in cross sectional contour to the outer tube section, said portion slidably engaging the inner surface of the outer tube section and having threads upon the inner surface thereof, a pair of threaded tubes fixed against rotation, one of the threaded tubes engaging the threads on the portion aforesaid of the inner tube, a nut carried by the outer tube and engageable with

the other of the threaded tubes, and means for rotating the outer tube section.

12. In a telescopic blower, a tube section substantially polygonal in cross section, a second tube section telescopically arranged in the first tube section and provided with a portion polygonal in cross section having a sliding fit within the outer tube section, a nozzle carried by the inner tube section, a threaded tube extending axially within the inner tube section and threadedly engaging corresponding threads on a portion of the inner tube section, a second threaded tube telescopically engaging in the outer threaded tube and fixed against rotation, means slidably and non-rotatably supporting the outer threaded tube on the inner threaded tube, a nut carried by the outer tube section and threadedly mounted on the threaded inner tube, means for rotating the polygonal tube section, a pair of telescopically engaging conduits arranged within the inner threaded tube section, one of the conduits having one end communicating with and secured to the nozzle on the inner tube section, means securing the other conduit to the outer threaded tube section, and a source of fluid under pressure communicating with the nozzle through the conduits and inner threaded tube.

FRANK BOWERS.
HARRY E. BRELSFORD.