July 10, 1934. N. L. SNOW 1,966,190

BOILER CLEANER

Original Filed July 5, 1924 3 Sheets-Sheet 1

Fig. 2.

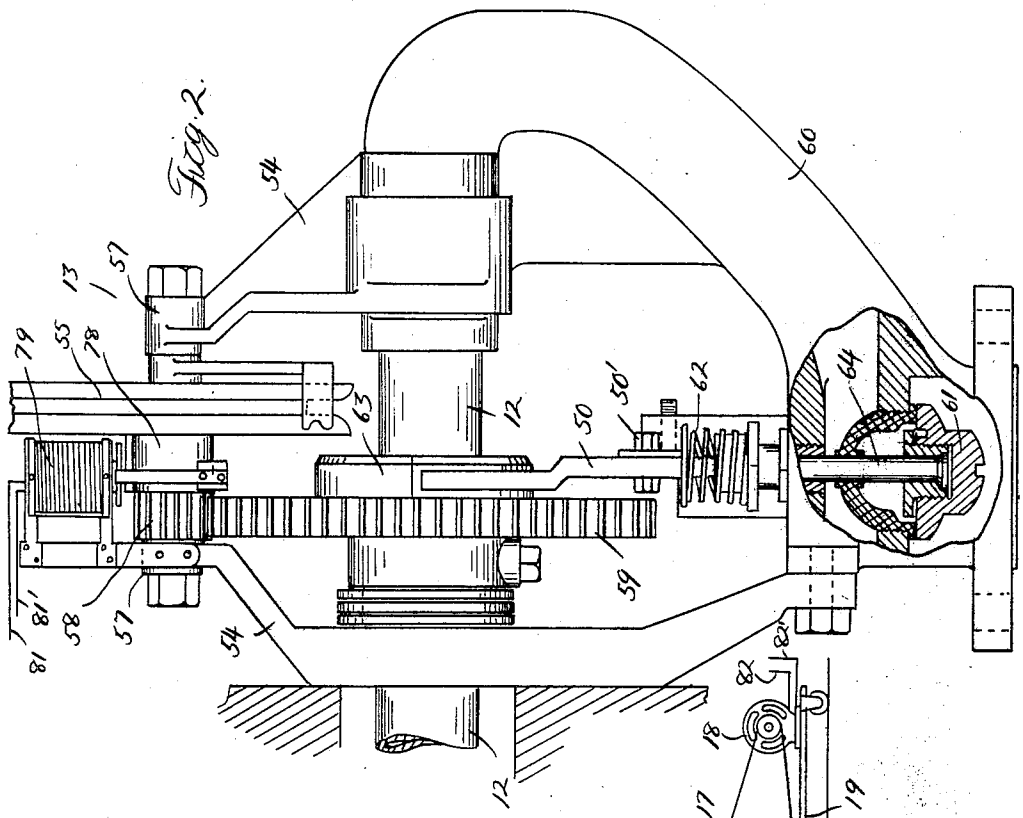
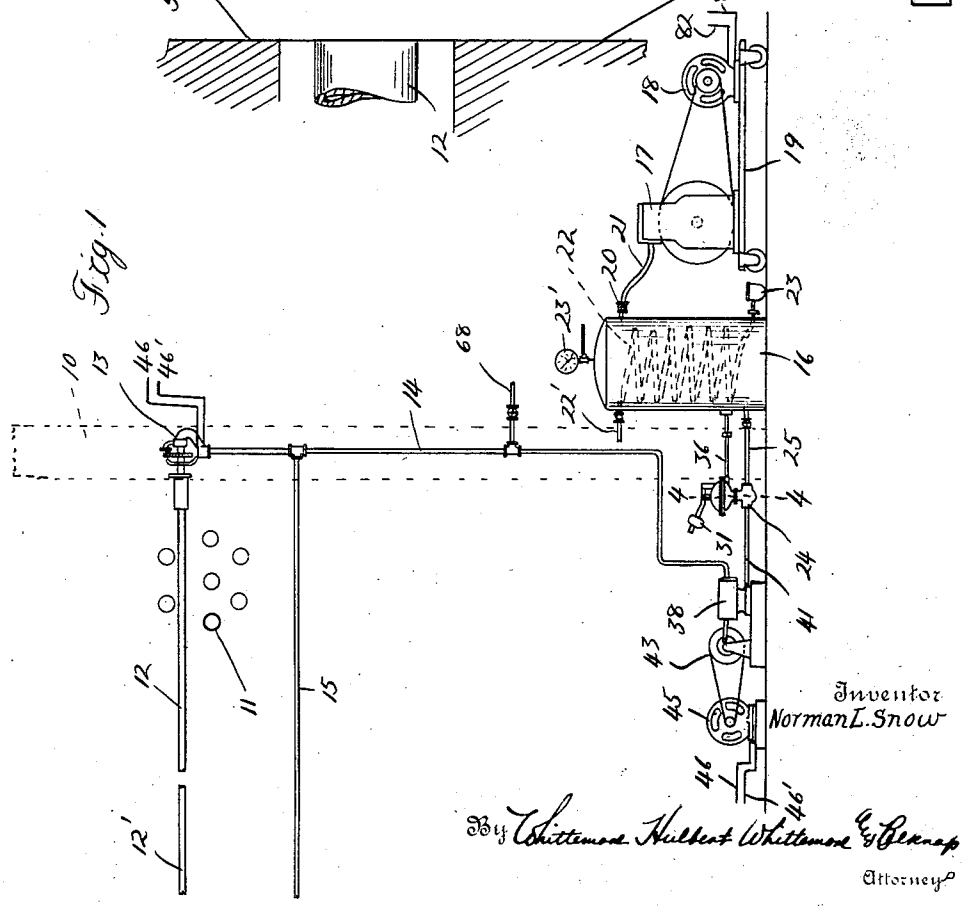


Fig. 1



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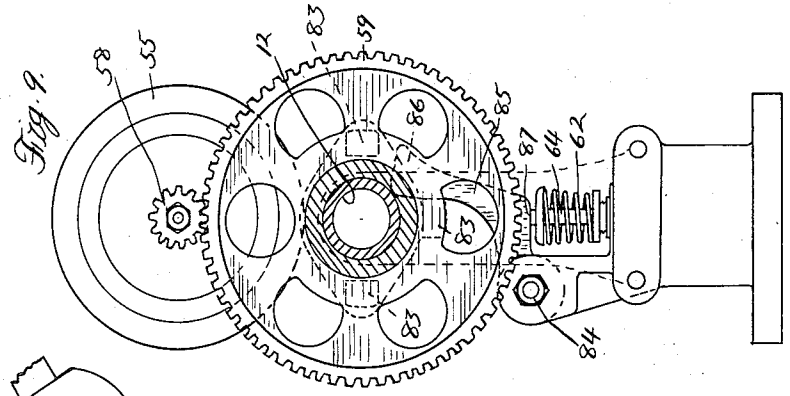


Fig. 9.

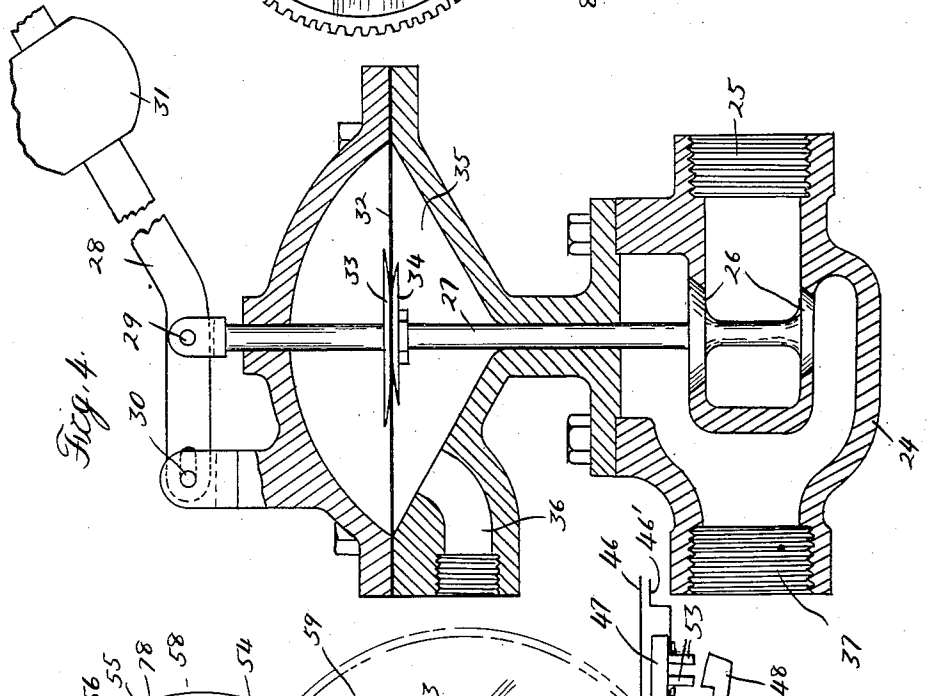


Fig. 4.

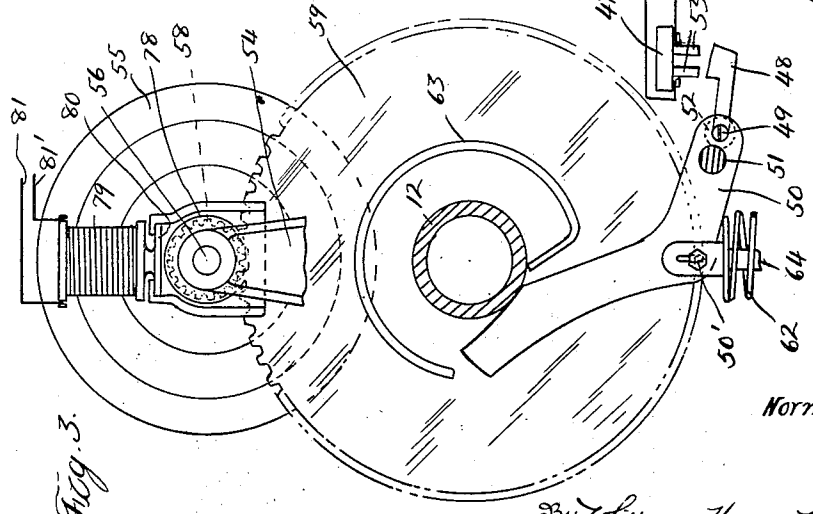


Fig. 3.

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BOILER CLEANER

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Fig. 7.

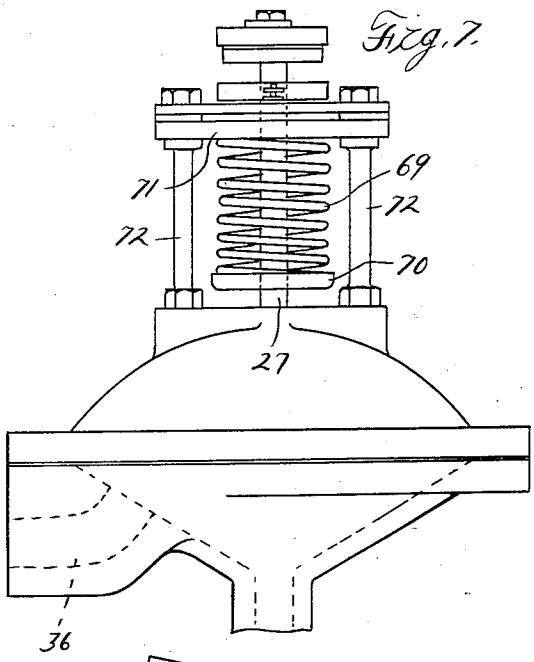


Fig. 8.

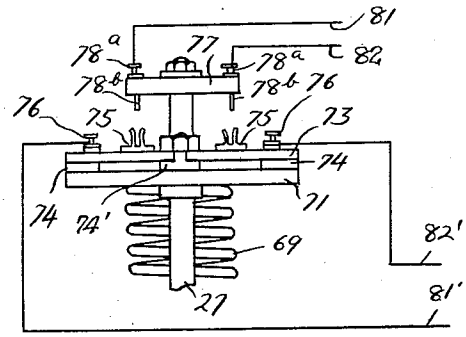


Fig. 5.

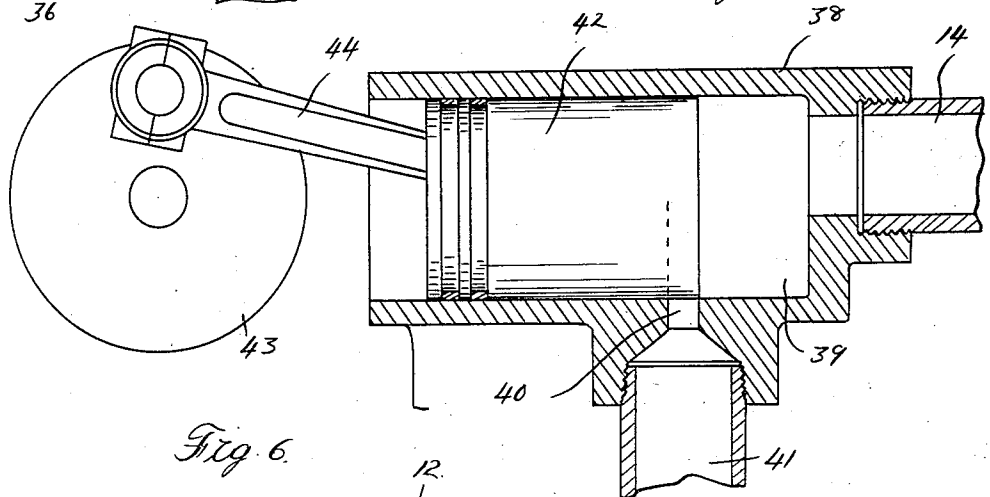
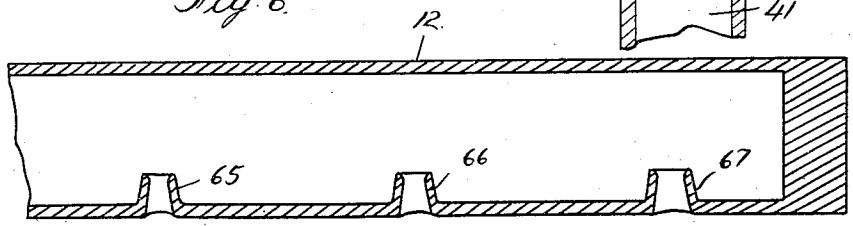


Fig. 6.



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UNITED STATES PATENT OFFICE

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BOILER CLEANER

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Application July 5, 1924, Serial No. 724,434
Renewed October 28, 1932

26 Claims. (Cl. 122—392)

The invention relates to boiler cleaners and has for its object to provide an improved method and apparatus for cleaning the tubes or other surfaces of boilers.

In the drawings:

Figure 1 is an assembly of the apparatus showing the relation of the parts thereof to the boiler;

Figure 2 is an elevation of the blower head showing attached thereto a brake;

Figure 3 is a front elevation of the upper portion of the blower head shown in Figure 2 showing the switch for the motor operating the puff controller;

Figure 4 is a section in elevation of the pressure control valve taken along the line 4—4 of Figure 1;

Figure 5 is a view of the puff controller showing the cylinder thereof in cross section;

Figure 6 is a sectional view of the distal end of a blower tube;

Figure 7 is a modification of the pressure control valve shown in Figure 4;

Figure 8 is a further modification of a pressure control valve fitted with switches for operating the brake and the air supply, and;

Figure 9 is a modification in which the puff controller is combined with the blower head.

Referring to the drawings, 10 represents the wall of a boiler having the boiler tubes 11. Between the tubes at desirable points are located the rotary blower pipes 12 and 12', rotation being effected by the usual chain sheave mounted on the blower head 13. The blowers may be arranged at suitable intervals along opposite sides of the boiler, in which case the blower pipes terminate midway of the boiler. Figure 1 shows two of such pipes, it being understood that the pipe 12' is connected with a blower head similar to the blower head 13 connected with pipe 12.

Cleaning fluid, preferably air, is supplied to the blowers by pipe 14, from which a branch pipe may be run to the opposite side of the boiler to supply the head connected to blower pipe 12'. Air for the blowers is supplied from a supply tank 16 which in turn is filled by the compressor 17 operated by a motor 18. The compressor and motor are preferably portably mounted as on a wheeled truck 19 so that by providing a detachable coupling 20, in the air supply pipe 21, the compressor may be transported to the various supply tanks used for a battery of boilers. The supply tank 16 could, however, be supplied from a stationary compressor or a central supply reservoir or other source of compressed fluid.

Within the supply tank is preferably coiled a pipe 22 supplied with steam or other heating medium through a connection 22' for heating the air prior to its passage to the blowers. A steam trap 23 is provided for the condensate. A gauge 23' indicates the air pressure in the supply tank 16. Outlet pipe 25 conducts the air from the supply tank to the minimum pressure control valve 24.

The pressure control valve 24 comprises valve disks 26 carried by the stem 27 pivotally secured at 29 to arm 28. The arm 28 is fulcrumed at 30 and is provided with a weight 31 slidably mounted along the arm 28 to vary the pressure acting on the stem 27. The control valve 24 is provided with a diaphragm 32 suitably coupled with the stem 27 as between the complementary clamping plates 33 and 34. The under face of the diaphragm forms the upper wall of chamber 35 which communicates with the supply tank 16 by way of passage 36. The under face of the diaphragm is thus continuously subjected to the air pressure of the supply tank while weight 31 acts in the opposite direction. The proportions are such that the air pressure acting on the diaphragm is normally sufficient to unseat the valves 26 but will be overbalanced by the weight 31 to seat the valves 26 upon a predetermined minimum pressure in the supply tank 16 as will be readily understood. The outlet 37 conducts the air from the pressure controlling valve to the puff controller 38 by way of connection 41.

Puff controller 38 comprises a cylinder 39 having the inlet port 40 supplied with air from the pressure control valve. Piston 42 is reciprocated within the cylinder by a wheel 43 and connecting rod 44 to successively cover and uncover the port 40. The wheel 43 is driven from a suitable motor 45 preferably of the electric type. Wires 46 and 46' supply current to the motor preferably through a switch 47 (see Figure 3) which is closed whenever the trigger actuating the soot blower control valve is depressed, as will be hereinafter explained. This switch comprises the switch arm 48 secured at 49 to the valve-actuating trigger 50 which is pivotally mounted at 51 to the blower. An insulating washer 52 may be provided. Thus, when the trigger 50 is depressed switch arm 48 will engage the switch points 53, closing the circuit to operate the motor 45.

In the blower shown in Figures 2 and 3, 54 constitutes the supports and carried thereby is the chain sheave 55 suitably mounted on shaft 56 journaled in the bearings 57 carried by the supports 54. Pinion 58 is mounted on the shaft 56 and is adapted to drive gear 59 which is mount-

ed to rotate the blower pipe 12. This pipe is supplied with air through the supply pipe 14 through a valve 61 which is normally held by spring 62 seated to prevent the flow of air to the blower pipe.

For unseating the valve when the blower pipe is rotating, I provide cam 63 rotatably carried with the gear 59. The trigger 50 is adapted to be engaged by the cam 63 and is connected at 50' with the valve 61 by a valve stem 64 whereby the valve is held unseated during any desired portion of the rotation of the blower pipe depending upon the length of the cam 63 engaging the trigger 50. By rotation of the blower pipe, I mean either a complete rotation or oscillation thereof.

Referring to Figure 6, it will be noted that I provide a blower pipe having nozzles 65, 66, and 67 of increasing throat diameter toward the distal end thereof to provide a uniform flow by accommodating for the drop in pressure of the air. Thus, the throat of nozzle 67 is of greater diameter than that of nozzle 66 which in turn is of greater diameter than that of the adjacent nozzle 65 and so on, the diameters varying as found necessary.

Water, steam, or any suitable fluid to assist in removal of slag etc., from the heating surfaces of the boiler may be introduced to the blowers separate from the air supply or into the air supply pipe at any convenient point such as 68 shown in Figure 1.

The method and apparatus thus far described includes compressing the cleaning fluid such as air, heating the air, subjecting it to a puffing control for supplying intermittent volumes of air to the blowers, introducing a slag removing fluid and interlocking the puff control and the blower pipe so that operation of the blower pipe control valve will automatically operate the puff control.

Thus, in operating the system, air in the supply tank 16 normally acts upon diaphragm 32 to open the valves 26 to permit the heated air to be acted upon by the puff controller 38. The operator rotates the chain sheaves 55 in the usual manner which automatically starts the operation of the motor 45 by reason of the switch 47. Simultaneously therewith the puff controller 38 is actuated to supply air in puffs to the blower, the valve 61 being unseated by the cam 63 and arm 50. By suitably proportioning the port 40, the stroke of the connecting rod 44, and the speed of the motor 45, air may be supplied in desired amounts. Should the air pressure fall below a predetermined amount the pressure control valve will act to shut off the air supply. The switch 47 may be dispensed with and the motor 45 actuated by a manual switch or automatically operated by suitable time mechanism (not shown).

Referring to Figure 7, I have shown a modified form of the minimum pressure valve shown in Figure 4. In this form instead of the adjustable weight 31 and arm 28, is provided the spring 69, one end of which bears against the cup 70 carried by the valve stem 27. The other end of the spring bears against the fixed support 71 carried by the upright arms 72. By interchanging the spring 69 for one of greater or less pressure, the resistance offered to the diaphragm may be made of the desired amount as will be readily understood.

In Figure 8, is shown a further modification in which the support 71 is provided with a plate 73 and insulated therefrom by suitable material 74. The plate 73 is provided intermediate its ends with the insulating strip 74'. Switch elements 75 are carried by the plate 73 and binding posts 76 are also provided as shown. In this form the valve stem 27 extends upwardly above the plate 73 and carries the insulating plate 77 on which are mounted connections 78^a and switch points 78^b.

Referring to Figures 2 and 3 the shaft 56 is provided with a brake drum 78. For acting upon this brake drum to prevent actuation of the blower pipe when the air pressure in the supply tank falls below a predetermined amount as will be presently apparent, a solenoid brake 79 is suitably mounted upon the frame 54. The brake is provided with the usual coils which when energized, are adapted to actuate the armature 80 which is shaped to present a braking surface to the drum 78.

Thus, when the pressure of the air in the supply tank falls below a predetermined amount, the diaphragm of the pressure control valve will be forced downwardly by the spring 69 acting on the valve stem 27 to seat the pressure control valve and prevent passage of the low pressure air to the blowers. At the same time the plate 77 carried by the valve stem 27 will be lowered to bring switch points 78^b into contact with switch elements 75. This will close the circuits 81, 81' leading to the solenoid brake and 82, 82' leading to the compressor so that it may be actuated to restore the pressure in the supply tank. The circuit 82, 82' may however, be connected to operate any mechanism for restoring the pressure such as a relay, motor driven valve, or to open the system to a source or higher pressure. After the pressure in the supply tank 16 has been restored the diaphragm 32 of the minimum pressure control valve will be actuated to unseat the valve 26 to permit passage of the air to the puff controller 38.

Instead of employing the type of puff controller as shown in Figures 1 and 5, I may entirely do away with the controller of this type and combine the puff controlling means with the blower structure as shown in Figure 9. With this construction the gear 59 carries the striking lugs 83 and while I have shown three such lugs, it will be understood that any suitable number may be provided. Pivoted at 84 to the blower frame is a rock arm 85 having a portion 86 adapted to be successively engaged by the lugs 83 as they rotate with the gear 59. The rock arm also has a portion 87 engaging the upper end of the valve stem 64. With this construction, the air from the pressure control valve is led directly to the valve of the blower so that when the operator actuates the chain sheave 55 to rotate the gear 59 the lugs 83 will successively engage the valve stem 64 to periodically unseat the valve to cause the air to be supplied to the blower pipe 12 in the desired puffs. This type of blower is also preferably provided with the solenoid brake which functions in a similar manner, as that described in connection with Figures 2 and 3.

The invention has, for the sake of convenience, been described as being incorporated in a device for cleaning boilers. It will be understood, however, that the invention may be incorporated in devices for cleaning apparatuses similar to boilers, and it is to be therefore understood that the term "boiler" wherever used in the specification or claims, is to be construed as meaning a heat transfer apparatus or fluid heater of any character, while the term "boiler cleaner" is to be

construed as meaning a cleaner for any such apparatus.

What I claim as my invention is:—

1. In a boiler cleaner, the combination with a rotatable blower pipe and a valve therefor, of a source of supply for the cleaning fluid, a puff controller for supplying fluid from the source of supply to the blower in puffs, means for operating the puff controller, and means dependent upon rotation of the blower pipe for unseating the blower valve and for actuating the puff controller to supply fluid to the blower pipe.

2. In a boiler cleaner, a rotatable blower pipe and a valve therefor, means for rotating the blower pipe and unseating the blower valve in timed relation, a source of cleaning fluid under pressure, a puff controller for supplying fluid in puffs to the blower pipe, a motor for operating the puff controller, and means controlled by the said blower pipe rotating means for energizing the motor.

3. In a boiler cleaner, a rotatable blower pipe and a valve therefor, means for rotating the blower pipe and unseating the blower valve in timed relation, a source of cleaning fluid under pressure, a puff controller for supplying fluid in puffs to the blower pipe, a motor for operating the puff controller, and means controlled by the said blower pipe rotating means for energizing the motor, and means for automatically cutting off the fluid supply at a predetermined pressure.

4. In a boiler cleaner, a blower pipe, means for moving said blower pipe, a source of cleaning fluid under pressure, a communication from said source to said blower pipe including means for cutting off the supply of fluid at a predetermined pressure of the fluid, and means operated by said pressure cut off means for preventing operation of the said means for moving the blower pipe.

5. In a boiler cleaner, a blower pipe, means for moving said blower pipe, a source of cleaning fluid under pressure, a communication from said source to said blower pipe including means for cutting off the supply of fluid at a predetermined pressure of the fluid, a brake for the blower pipe moving means, and means operated by said pressure cut off means for actuating the brake to prevent movement of the blower pipe.

6. In a boiler cleaner, a blower pipe, means for rotating said blower pipe, a source of fluid under pressure, a communication from said source to said blower pipe including means for cutting off the supply of fluid at a predetermined pressure of the fluid, a solenoid brake having an armature adapted to contact with the blower pipe rotating means, and an electrical switch operated by said pressure cut off means to energize the solenoid to apply the brake for preventing rotation of the blower pipe.

7. In a boiler cleaner, a blower pipe, a tank for supplying fluid to the blower pipe, means for compressing the fluid in the tank, means for cutting off the supply of fluid from the tank to the blower pipe at a predetermined low pressure, and means actuated by the last named means for causing the tank compressing means to operate to increase the pressure of the fluid in the tank.

8. In a boiler cleaner, a blower pipe, means for preventing movement of the blower pipe at times, a tank, means for conducting fluid from said tank to the blower pipe, means for compressing the fluid in the tank, means for cutting off the supply of fluid from the tank to the blower pipe at a predetermined low pressure, means actuated by the last named means for simultaneously causing the tank compressing means to operate to increase the pressure of the fluid in the tank, and actuating said means for preventing movement of the blower pipe.

9. In a boiler cleaner, a blower pipe, means for moving said blower pipe, a solenoid brake for preventing movement of said blower pipe at times, a tank, means for conducting fluid from said tank to the blower pipe, means for compressing the fluid in the tank, means for cutting off the supply of fluid from the tank to the blower pipe at a predetermined low pressure, said last named means including an electric switch for energizing the solenoid brake and simultaneously causing the tank compressing means to operate to increase the pressure of the fluid in the tank.

10. In a boiler cleaner, a blower pipe, means for moving the blower pipe, cleaning fluid pressure operated means for controlling a supply of cleaning fluid to the blower pipe, said last named means preventing actuation of the first said means when the cleaning fluid reaches a predetermined pressure.

11. In a boiler cleaner, a blower pipe adapted to discharge cleaning fluid adjacent parts of the boiler to be cleaned, said blower pipe being movable to direct the jets of cleaning fluid to different parts of the boiler heating surfaces, a source of supply of cleaning fluid under pressure, a communication from said source to said blower pipe, a pressure control device in said cleaning fluid supply line, and means operated by said pressure control means for preventing the movement of the blower pipe when the pressure of the cleaning fluid falls below a predetermined amount.

12. The method of cleaning a boiler which consists in compressing a cleaning fluid, heating the cleaning fluid, supplying the cleaning fluid to a blower pipe for discharge adjacent parts to be cleaned, controlling the supply of cleaning fluid to the blower pipe in dependence upon the pressure of the fluid, rotating the blower pipe, and effecting a discharge of the cleaning fluid from the blower pipe in puffs in dependence upon the rotation of the blower pipe.

13. In a boiler cleaner, a movable blower pipe, a source of cleaning fluid under pressure, a supply pipe for conducting cleaning fluid from said source to said blower pipe, a valve in said supply pipe for controlling the flow of cleaning fluid to said blower pipe, means for controlling the actuation of said valve in dependence upon the movement of said blower pipe, means associated with said supply pipe and arranged between said valve and said source of cleaning fluid for periodically interrupting the flow of cleaning fluid through said pipe whereby said cleaning fluid is delivered to said valve in puffs, and means controlling the operation of said last mentioned means in dependence upon the actuation of said valve.

14. In combination, a blower element, a source of supply of cleaning fluid under pressure, a supply pipe for conducting cleaning fluid from said source to said blower element, and means associated with said supply pipe and arranged between said blower element and said source of cleaning fluid for periodically interrupting the flow of cleaning fluid through said pipe whereby said cleaning fluid is delivered to said blower element in puffs, said means including a reciprocable valve member, a rotatable driving shaft, and a connection between said valve member and said shaft to effect a reciprocation of the former upon rotation of the latter.

15. In combination, a rotatable blower element, a source of cleaning fluid under pressure, a supply pipe for conducting cleaning fluid from said source to said blower element, and means associated with said supply pipe and arranged between said blower element and said source of cleaning fluid for periodically interrupting the flow of cleaning fluid through said pipe whereby said cleaning fluid is delivered to said valve in puffs, said means including a reciprocable valve member, a rotatable driving shaft, and a connection between said valve member and said shaft to effect a reciprocation of the former upon rotation of the latter, said shaft being rotatable in timed relation to the rotation of the blower element.

16. In a fluid heater cleaner, a movable blower element, means for supplying cleaning fluid to the blower element, and means operating to positively prevent movement of the blower element upon a predetermined change in the pressure of the cleaning fluid supplied to the blower element.

17. In a fluid heater cleaner, a movable blower element, means for supplying cleaning fluid under pressure to the blower element, and means operating to positively prevent movement of the blower element when the pressure of the cleaning fluid decreases below a predetermined point.

18. In a fluid heater cleaner, a movable blower element, means for moving said blower element, means for supplying a cleaning fluid under pressure to said blower element, means operable to positively prevent movement of said blower element, and means actuated by the pressure of the cleaning fluid supplied to said blower element for relieving the blower element from the actuation of said preventing means.

19. In a fluid heater cleaner, a movable blower element, means for moving said blower element, means for supplying cleaning fluid under pressure to the blower element, means for locking the blower element against movement when the pressure of the fluid supplied to the blower element falls below a predetermined point, and means for releasing said locking means when the pressure of the cleaning fluid rises above a predetermined point.

20. In a fluid heater cleaner, a movable blower element, means for moving the blower element, means for supplying a cleaning fluid under pressure to the blower element, means operating upon a predetermined decrease in the pressure of the cleaning fluid to lock the blower element against movement, means operating upon a predetermined increase in the pressure of the cleaning fluid to unlock said last mentioned means to thus allow movement of the blower element, and means for supplying a second cleaning substance to said blower element, the latter cleaning substance differing in properties from the cleaning fluid.

21. In a boiler cleaning system, a plurality of rotatable blower elements, an independent rotating means associated with each of said elements, an independent valve associated with each of said elements, a puff controller common to all of said elements, and an independent operating means associated with each of said elements to rotate the element, operate the valve, and actuate the puff controller.

22. In a boiler cleaning system, a plurality of blower units, each of said units comprising a rotatable blower element, a fitting in which said element is journalled, means to rotate the element, a valve to control the supply of cleaning fluid to said element, means to operate the valve, a puff controller common to all of said units, means to actuate the puff controller, and means interconnecting said last named means to all of said element rotating means and all of said valve operating means so as to permit the rotation of said elements one at a time and the simultaneous supply of cleaning fluid in a series of puffs to the element rotated.

23. In a boiler cleaning system, a plurality of rotatable blower elements, an independent rotating means associated with each of said elements, an independent valve associated with each of said elements to control the supply of cleaning fluid thereto, a puff controller common to all of said elements, and means so interconnecting the operations of said puff controller with the operation of all of said element rotating means and with the operation of all of said valves as to permit the rotation and supply of cleaning fluid in a series of puffs to said elements selectively.

24. In a boiler cleaning system, a plurality of movable blower elements, an independent valve associated with each of said elements, a puff controller common to all of said elements, an independent operating means associated with each of said elements to move the element and operate the valve thereof, and a control connection between the puff controller and the element moving means so arranged that during the intervals of cleaning fluid discharge from the blower elements the puff controller is operating.

25. In a boiler cleaning system, a plurality of rotatable blower elements, an independent valve associated with each of said elements, a puff controller common to all of said elements, an independent operating means associated with each of said elements to rotate the element and operate the valve thereof, and a control connection between the puff controller and the element moving means so arranged that during the intervals of cleaning fluid discharge from the blower elements the puff controller is operating.

26. In a fluid heater cleaner, a plurality of movable blower elements, a valve associated with each blower element for controlling the admission of cleaning fluid to the same, means associated with each element for moving the same, means so interconnecting each valve and the moving means of its respective blower element that each valve is opened during a portion of the movement of its respective blower element, means separate from the said valves for supplying cleaning fluid to said blower elements in a series of puffs, and a control connection between said last mentioned means and the element moving means so arranged that during the intervals of cleaning fluid discharge from the blower elements the said last mentioned means is operating.

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