

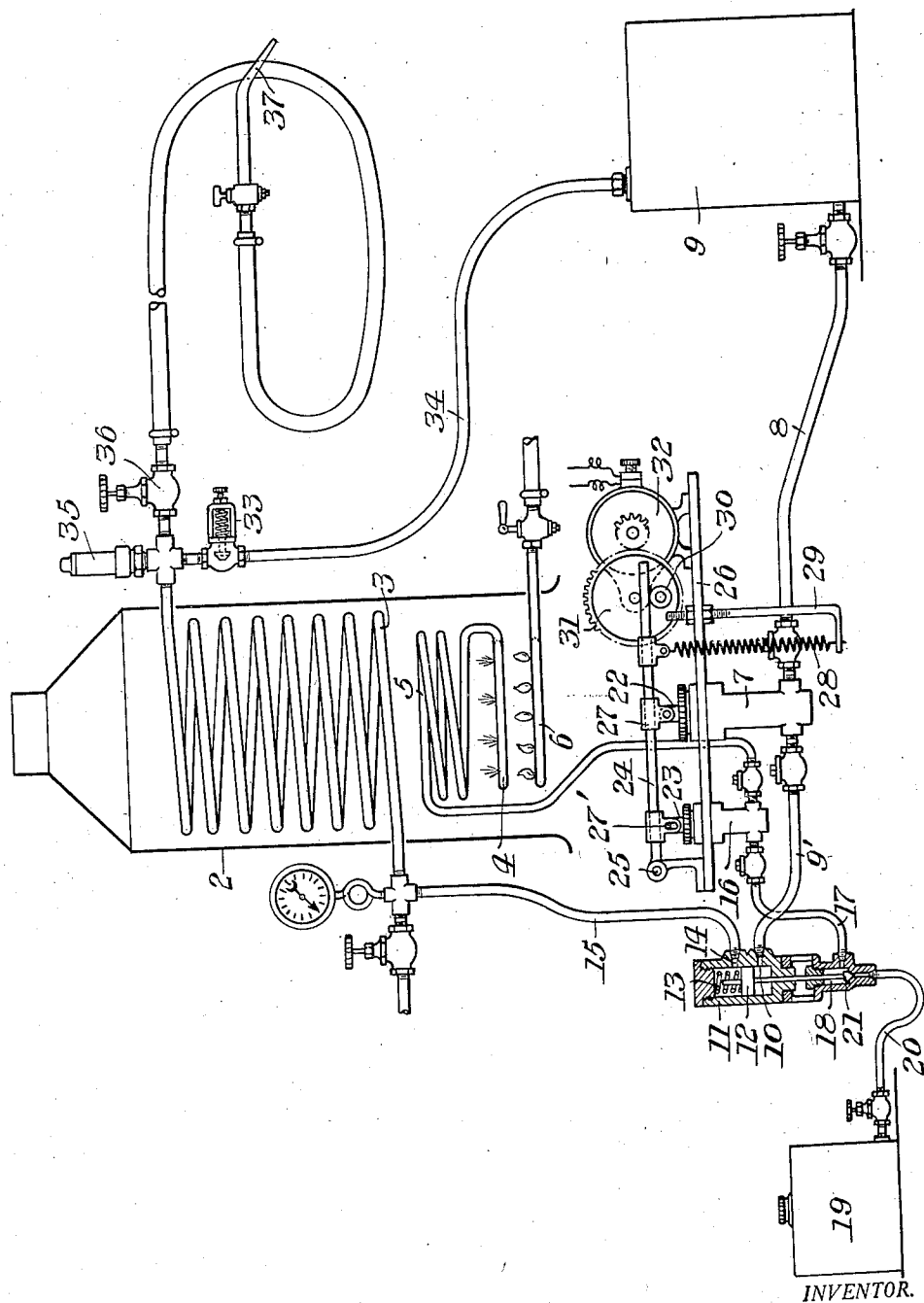
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F. W. OFELDT

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HEATING AND CLEANING APPARATUS

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INVENTOR.
Frank W. Ofeldt
Byrne, Lobbin & Parmelee
his attys.

UNITED STATES PATENT OFFICE

FRANK W. OFELDT, OF MCKEESPORT, PENNSYLVANIA

HEATING AND CLEANING APPARATUS

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The present invention relates broadly to the art of heat exchanging, and more particularly as applicable to the production of hot water under pressure for use in effecting the removal of foreign matter from an object to be cleaned.

In the accompanying drawing, there is shown, more or less diagrammatically, for purposes of illustration only, a preferred embodiment of the present invention, it being understood that the drawing does not define the limits thereof, as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the present invention or the scope of my broader claims.

The method performed by the apparatus described and claimed herein is described and claimed in my co-pending application, Serial No. 461,078, for Method and apparatus for distributing fluid.

The single figure of the drawing comprises a diagrammatic layout, partly in section and partly in elevation, of a complete installation. In accordance with the invention, there may be provided a suitable casing 2 of any desired construction having operatively positioned therein a coil 3 for the fluid to be heated. Located in heat conducting relationship within the casing 2 below the coil 3 is a burner 4, herein illustrated as being of the liquid fuel type. Mounted above the burner 4 is a vaporizing coil 5 through which the oil passes on its way to the burner. A suitable pilot burner 6 is mounted in the casing below the burner 4 in such manner as to maintain the coils 5 in partially heated condition.

Located at any convenient point exteriorly of the casing, is a pump 7 having a connection 8 with a reservoir 9 or other source of water or cleaning fluid supply. The discharge connection 9' from the pump communicates through a port 10 with the interior of the casing 11 of a suitable flow control valve. With water flowing through the connection 9', the piston 12 in the casing 11 will be lifted against the action of the spring 13 to thereby uncover the outlet port 14. This port has a connection 15 to the coil 3.

Mounted adjacent the pump 7 is a second

pump 16 for the fuel oil, this pump having a supply connection 17 communicating with a chamber 18 in the casing 11. The chamber 18 receives a supply of fuel from a suitable reservoir 19 through a connection 20, the flow being controlled by a needle valve 21 connected to the piston 12. By reason of this construction, it will be apparent that with no fluid flowing through the connection 9', the spring 13 will be effective for seating the valve 21. With fluid flowing, the valve 21 will be held away from its seat, thereby permitting the passage of fuel oil to the pump 16. The pumps 7 and 16 are so located that the piston rods 22 and 23 thereof may be operatively connected to a single lever 24 having a pivotal mounting 25 on a support 26. The piston rod 22 preferably has a pivoted connection 27 with the lever 24, while the piston rod 23 is connected to this lever to provide a slight lost motion with respect thereto. This may be accomplished by means of the pin and slot 27'.

The lever 24 is normally urged in the full line position illustrated in the drawing by a tensile spring 28 connected at one end to the lever, and at its opposite end to an adjustable spring support 29. By suitable adjustment of the support, the tension of the spring may be varied. The lever 24 is moved in the opposite direction against the action of the spring 28 by means of a roller 30 eccentrically mounted on a gear 31 driven by a motor 32. With the construction described, starting the motor 32 will effect rotation of the gear 31 and thereby cause the roller 30 to lift the lever 24. The lever will be returned as the rotation of the gear 31 continues by the action of the spring 28. Since the downward stroke of the lever 24 is effective for expelling fluid from the pumps 7 and 16, it will be obvious that the maximum pressure of fluid in the system at any time, not having regard for temperature conditions, will be determined initially by the spring 28. When the pressure reaches such a point that the spring 28 is ineffective for moving the lever downwardly its complete distance, the roller 30 will only be effective on the lever during a portion of each rotation

of the gear 31. Ultimately there will be established a condition in which the lever 24 remains in substantially its uppermost position, whereby the movement imparted thereto by the roller 30, while effective for moving the piston rod 22, will not be effective for moving the piston rod 23 by reason of the lost motion connection 27' provided. This insures continued supply of cleaning fluid to the coils 3 after the pump 16 becomes ineffective for supplying further fuel oil to the burner 4. This constitutes a safety factor preventing excessive increase in temperature in the apparatus such as might result from the combined action of the pilot 6 and burner 4 with small water flows.

Any excess water supplied to the coil 3 by reason of the continued action of the pump 7 may escape from the coil past a suitable relief valve 33. This relief valve is preferably located in a connection 34 leading to the reservoir 9 or other source of supply. In the event of excessive pressure by reason of the heat supplied to the coils 3 sufficient to generate steam, such steam may escape through a safety valve 35 of any standard construction.

In actual practice, the pumps 7 and 16 are so constructed and proportioned that under given conditions of operation there will be sufficient fuel to the burner 4 to heat the amount of water or other cleaning fluid being handled, to the desired temperature. With the throttle valve 36 open, the cleaning fluid at high temperature is permitted to pass under pressure to a spray nozzle 37, by means of which it may be utilized for the purposes contemplated. With the throttle valve 36 wide open, the pumps 7 and 16 will be operating substantially up to their capacity. As this throttle is closed at the end of a cleaning operation, however, the pressure will gradually build up in the system so that the spring 28 becomes ineffective for imparting a full stroke to the lever 24, as hereinbefore described. At such times, the continued operation of the pump 7 after the cessation of operation of the pump 16 insures a flow of water past the relief valve 33 such that the boiler coil 3 is maintained full of cleaning fluid at a temperature below the boiling point at the pressure determined upon. This represents an idling condition during which the actual final temperature of the cleaning fluid is determined by the amount of heat supplied by the pilot 6.

The present construction provides a safety system in which the supply of fuel is made dependent upon the actual supply of fluid to be heated in such manner that excessive temperatures cannot be obtained.

Other advantages arise from the provision of a common operating lever for the separate pumps, which operating lever is positively actuated in one direction and yieldingly ac-

tuated in the opposite direction, whereby the maximum pressure created by the pumps themselves is limited by the yielding pressure exerted. Such a construction is particularly advantageous where a lost motion connection exists between the operating means and one of the pumps, whereby a differential action of the pumps is obtained.

Still other advantages arise from the provision of a boiler in the form of a coil 3 having a release valve insuring the escape of surplus cleaning fluid supplied by reason of the effective operation of the fluid pump 7 after the pump 16 has become inoperative.

I claim:

1. In an apparatus of the character described, a fluid container, heating means therefor, a fuel pump for supplying said heating means, a fluid pump for supplying said container, and common actuating means for said pumps, said actuating means being connected to said pumps to insure simultaneous operation of said pumps at certain pressures in the container and to permit operation of one pump at other pressures in the container while the other pump is stationary.

2. In an apparatus of the character described, a fluid container, heating means therefor, a fuel pump for supplying said heating means, a fluid pump for supplying said container, and common actuating means for said pumps, said actuating means being positively connected to one of said pumps and having a continuously effective lost motion connection with another of said pumps.

3. In an apparatus of the character described, a fluid container, a burner structure cooperating therewith, pump means supplying fluid to said container, pump means for supplying fuel to said burner structure, control means rendering said last-mentioned pump inoperative when the first-mentioned pump is supplying no fluid, and actuating means for said pumps, said actuating means having a continuously effective lost motion connection with one of said pumps.

4. In an apparatus of the character described, a fluid container, a main burner cooperating therewith, a pilot burner for the main burner, and means for supplying proportionate amounts of fluid to said container and fuel to said burner throughout the normal operation thereof, said means comprising pumps having a common operating arm and being constructed to produce a flow of fluid to said container after the flow of fuel to said main burner ceases.

5. In an apparatus of the character described, a fluid container, a burner structure cooperating therewith, pump means supplying fluid to said container, pump means supplying fuel to said burner structure, means for positively actuating both of said pump means throughout a portion of their respective cycles, and means under the control of the pres-

sure in the container for operating said pump means throughout the remainder of their cycles, such means being disposed to provide for operation of only one of said pump means under certain conditions.

6. In an apparatus of the character described, a fluid container, a burner cooperating therewith, a plurality of pumps of unequal stroke for supplying fluid and fuel respectively to the container and burner, and means for simultaneously positively actuating said pumps in one direction, and other means common to both pumps for yieldingly actuating them in the opposite direction.

7. In an apparatus of the character described, a fluid container, a burner structure cooperating therewith, a plurality of pumps for supplying fluid and fuel to said container and burner structure respectively, and common actuating means for all of said pumps, said actuating means having a continuously effective lost motion connection with one of said pumps permitting limited relative movement between said pumps.

8. In an apparatus of the character described, a fluid container, a burner structure, a plurality of pumps of unequal stroke supplying fluid to said container and fuel to said burner structure respectively, and operating means for said pumps imparting a stroke to each which becomes progressively shorter as the pressure in the container increases.

9. In an apparatus of the character described, a fluid container, a burner structure, a plurality of pumps of unequal stroke supplying fluid to said container and fuel to said burner structure respectively, and operating means for said pumps progressively decreasing the effectiveness thereof as the pressure in the container increases.

10. In an apparatus of the character described, a fluid container, a burner structure cooperating therewith, a plurality of pumps for supplying fluid to said container and fuel to said burner structure respectively, operating means for said pumps for producing a progressively decreasing effectiveness of said pumps as the pressure in the container increases, and a limited lost motion connection between one of said pumps and the operating means to insure stopping of one of the pumps during a period while the other pump remains in operation.

11. In an apparatus of the character described, a fluid container, a burner structure, a plurality of pumps supplying fluid to said container and fuel to said burner structure respectively, operating means for said pumps, and control means for said operating means rendering the same inoperative upon the production of predetermined pressure conditions in said container, such means providing for rendering one of such pumps inoperative before another.

12. In an apparatus of the character de-

scribed, a heat exchanger comprising a fluid container and a burner structure therefor, a fluid pump for delivering to the container, a fuel pump for delivering to the burner structure, a pivoted lever, said pumps being connected to said lever at different distances from its pivot, means for positively moving said lever in one direction to produce an intake cycle for said pumps, and other means producing a movement of said lever in the opposite direction for the expulsion cycle of both of said pumps.

13. In an apparatus of the character described, a heat exchanger comprising a fluid container and a burner structure therefor, a fluid pump for delivering to the container, a fuel pump for delivering to the burner structure, a pivoted lever having connections at different points in its length to said pumps, means for positively moving said lever in one direction to produce an intake cycle for said pumps, and other means producing a movement of said lever in the opposite direction for the expulsion cycle of said pumps, said last-mentioned means comprising a continuously acting device.

In testimony whereof I have hereunto set my hand.

FRANK W. OFELDT.

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