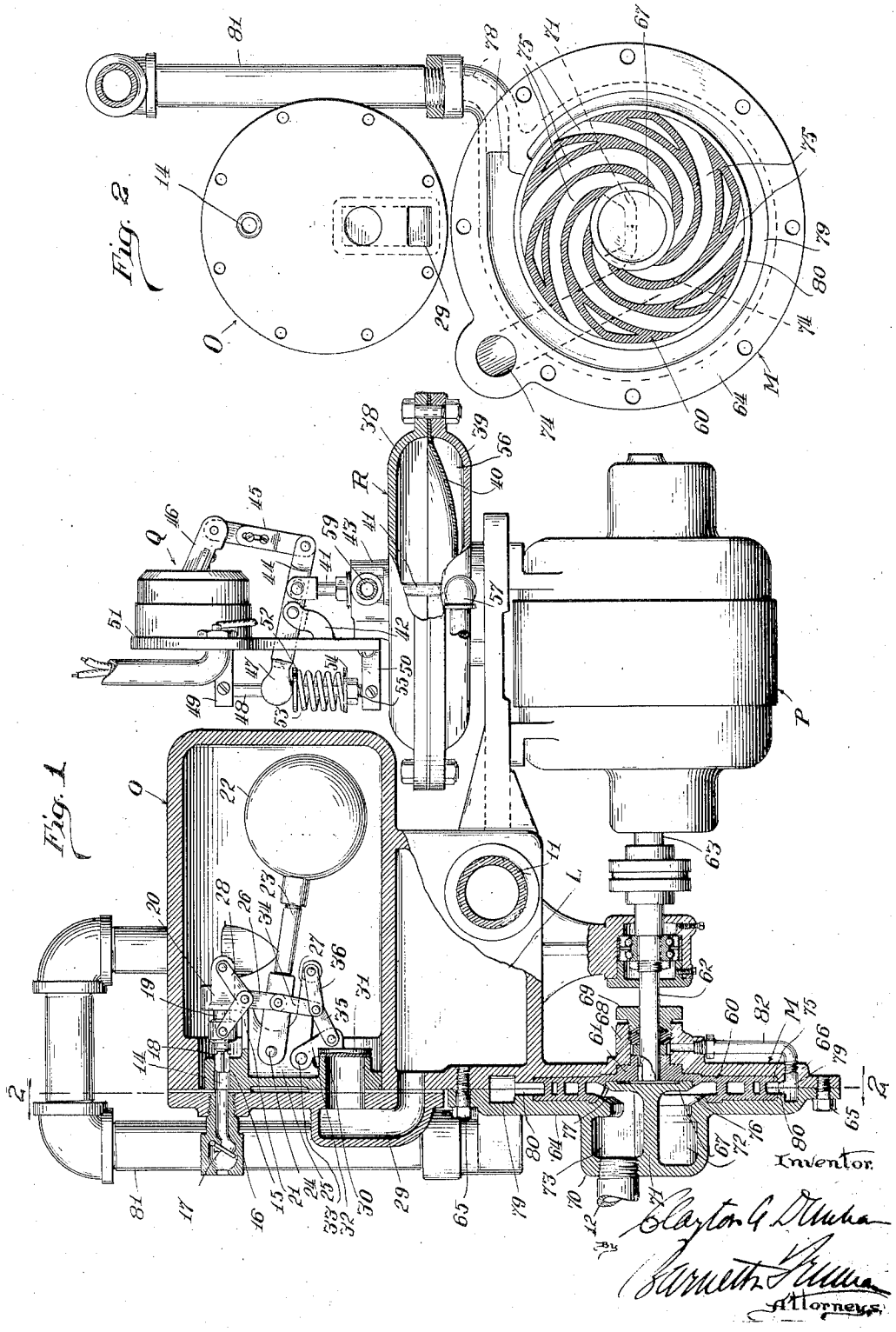
Aug. 13, 1929. C. A. DUNHAM 1,724,262

EXHAUSTING APPARATUS

Filed Nov. 13, 1924 2 Sheets-Sheet 1



Inventor.
Clayton A. Dunham
By Barnett & Fellows
Attorneys.

Aug. 13, 1929. C. A. DUNHAM 1,724,262

EXHAUSTING APPARATUS

Filed Nov. 13, 1924 2 Sheets-Sheet 2

Fig. 4.

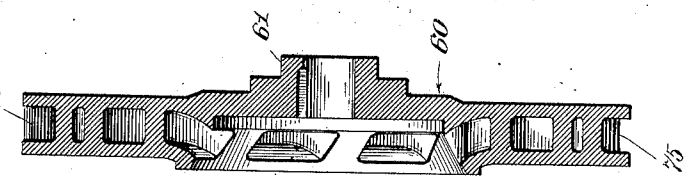
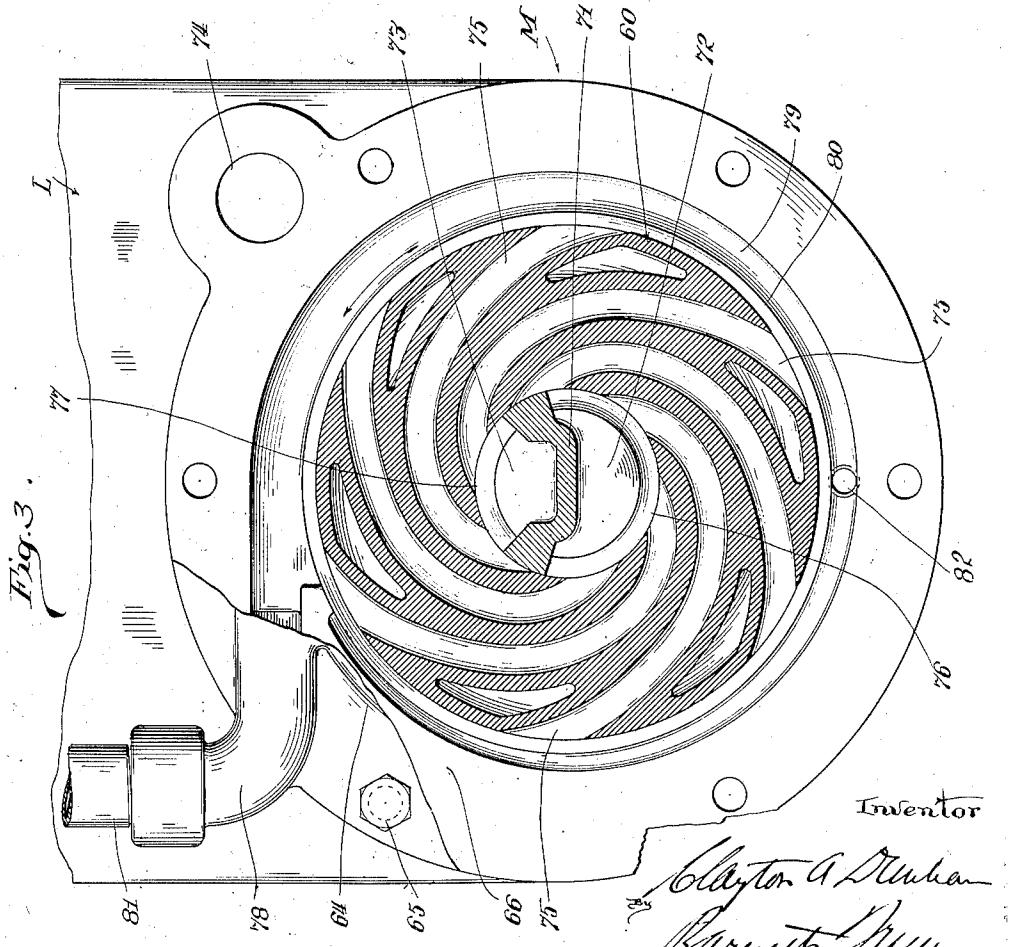


Fig. 3.



Inventor

Clayton A. Dunham

Barnett & Dunham

Attorneys.

Patented Aug. 13, 1929. 1,724,262

UNITED STATES PATENT OFFICE.

CLAYTON A. DUNHAM, OF GLENCOE, ILLINOIS, ASSIGNOR TO C. A. DUNHAM COMPANY, OF MARSHALLTOWN, IOWA, A CORPORATION OF IOWA.

EXHAUSTING APPARATUS.

Application filed November 13, 1924. Serial No. 749,808.

My invention relates to an apparatus for displacing fluids, such as gases, vapors or liquids or mixtures of the same, through the forced movement of water or other liquid, the invention being concerned more particularly with an apparatus for creating and maintaining a low pressure in a conduit or system of conduits or connected spaces by the evacuation of fluid therefrom; although the apparatus which I have in contemplation might be used for compressing fluids or producing, under other conditions the movement of the same from place to place.

One of the objects of the invention is to provide a novel device for displacing or compressing gases, vapors, liquids or mixtures thereof by causing bodies or "slugs" of liquid, water, for example, to be moved by centrifugal force through the ducts of a rotary impeller, which ducts are brought first into communication with the water supply and then with a port leading to the space to be evacuated. This principle of operation might, as suggested, be utilized not only in connection with an exhausting apparatus but also in the construction of an air compressor or other mechanism involving the displacement of a fluid.

With reference to the utilization of the invention in exhausting apparatus, another object is to provide novel means for separating the air from the water and air mixture discharged by the impeller and returning the water to the impeller.

A further object is to provide means whereby the exhausting apparatus may be operated to maintain, automatically a determinate pressure differential, for example, a determinate difference of pressure between the space being evacuated and a vessel under constant or variable pressures.

A further object is to so construct the exhausting apparatus that it will operate in conjunction with a system of conduits or connected spaces which are either above or below atmospheric pressure.

The invention consists of the new and improved constructions, arrangements and devices to be hereinafter described and claimed for carrying out the above stated objects and such other incidental objects as will be referred to in the following description of the preferred form of the invention illustrated in the accompanying drawings.

This application, so far as it is concerned specifically with an exhausting apparatus, is a continuation in part of my co-pending application Serial No. 704,142, filed April 4, 1924.

In the accompanying drawings:

Fig. 1 is a side elevation, with parts in section, of the exhausting apparatus.

Fig. 2 is a vertical sectional view, taken substantially on line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a similar view on a larger scale, taken in the plane of Fig. 2, but looking in the opposite direction.

Fig. 4 is a sectional view on a diametrical line of the impeller.

This exhausting apparatus is particularly adapted for use with a steam heating system of the type disclosed in my copending application 704,142, hereinabove referred to. In such a system, the pipe 11 leading into the tank L of the exhauster is connected with the drip pipe of the heating system, or a similar pipe leading into the boiler. This pipe 11 is positioned slightly below the normal water level in the boiler so that a continuous supply of water will be maintained in the tank L. The exhausting pump M is connected through pipe 12 with the return line of the heating system above the water level so that gases only are drawn into the exhauster through pipe 12. Preferably a check valve is positioned in pipe 12 opening toward the pump to prevent water being forced back through pipe 12 when the pump is idle.

P is an electric motor for driving the impeller of pump M.

Q is a circuit breaker of any desired type operated by the pressure actuated device R. This device consists of an upper casing member 38, a lower casing member 39, a flexible diaphragm 40 and a stem 41 secured to the diaphragm and extending through a stuffing box 43. A lever 44 is pivoted to a bracket 42 and is connected by link 45 to the arm 46 of switch Q, the other extremity of lever 44 being forked at 47 to straddle an adjusting stem 48 fixed between brackets 49 and 50 on the upright structure 51 carrying the switch Q. The forked end 47 of lever 44 bears on a washer 52 which latter is supported on a coiled spring 53 bearing on a washer 54 on stem 48, the lower end of which stem is threaded for an adjusting nut 55. The chamber 56 below the diaphragm

40 is connected by a pipe 57 to some point in the system under high pressure. The chamber 38 above the diaphragm is connected to the low pressure side of the system, for example, by pipe 59 extending to pipe 12. The diaphragm of the controller R is shown in a position indicating operation of the motor and pump.

The exhausting apparatus comprises a rotary impeller 60 formed with a hub 61 keyed to a shaft 62 connected with the armature shaft 63 of motor P. The impeller operates in a casing consisting of a front plate 64 secured by screws 65 to the tank L and a back plate 66 which is shown as a web depending from tank L and formed integrally therewith. Front and back plates are recessed for the impeller which fits snugly between the same with its hub 61 on one side close to a disc-like web 67 and on the other side close to a boss 68 through which boss and a gland 69 therein shaft 62 extends.

The front plate is formed with a boss 70 divided by web 71 to provide a water chamber 72 and an air chamber 73. The water chamber 72 is connected by a duct 74 with the supply tank L. The air chamber 73 is connected with pipe 12 which leads to the return main.

The impeller 60 is formed with a plurality of ducts 75 which extend from the central portion of the impeller to its periphery and are preferably curved in the direction opposite to the direction of rotation of the impeller as indicated in Fig. 3. The inlet end of each of the ducts 75 first passes over the port 76 of water chamber 72 and then over the port 77 of the air chamber 73.

The front plate 64 of the pump casing is formed with a discharge port 78 and the impeller is arranged eccentrically in the casing so that a peripheral water outlet space 79 is provided which increases in width in the direction of the movement of the water toward the outlet 78, the outlet space 79 being connected with the recess in which the impeller works by a relatively narrow slit 80. The air and water mixture passes from outlet port 78 through a pipe 81 into the air eliminator tank O. 82 is a pipe extending from water space 79 to the stuffing box provided by boss 68 and gland 69 for the purpose of lubricating the bearing of the shaft 62.

By the term "fluid" as used in the claims I intend to include air or other gases, vapors, liquids or mixtures thereof.

I have shown the pump as supplied with hurling water from the drip pipe or boiler and as drawing air only into the hurling circuit from the return main. It would be possible to constuct the apparatus so that both water and air would be drawn into the pump in which case the water could be used in part as hurling water and the excess expelled to the boiler or elsewhere. This latter arrangement but with different forms of exhausting means (pump and hurling circuit) is shown in my copending applications Serial No. 518,386, filed November 28, 1921, patented June 5, 1928, #1,672 309 and Serial No. 669,363 filed October 18, 1923.

I claim:

1. A device for displacing fluid comprising, in combination, a pair of casing members recessed to provide a central space, one being formed with a peripheral outlet and with separate chambers to receive a hurling liquid and the displaced fluid, respectively, and having ports opening into said central space, and the other being provided with a stuffing box, a rotary impeller in said space formed with ducts extending from its center to its periphery, the inner ends of which are adapted to pass over said ports in alternation, a shaft extending through said stuffing box, means for imparting rotation to said shaft, and a lubricating pipe extending from the space in which the impeller is located and into the stuffing box.

2. In combination with a conduit to be evacuated and a liquid supply conduit, an exhausting apparatus comprising a rotary impeller having ducts extending from its center to its periphery, an axial structure having ports with which said conduit to be evacuated and said liquid supply pipe are respectively connected and over which the inner ends of the impeller ducts pass alternately as the impeller rotates, a vessel to receive liquid and entrained gas discharged by the impeller and provided with a float controlled vent for gas, and means for returning liquid from the vessel to the exhausting device.

3. In combination with a conduit to be evacuated and a liquid supply conduit, an exhausting apparatus comprising a rotary impeller having ducts extending from its center to its periphery, an axial structure having ports with which said conduit to be evacuated and said liquid supply pipe are respectively connected and over which the inner ends of the impeller ducts pass alternately as the impeller rotates, a vessel interposed between the liquid supply conduit and the liquid port of the exhausting device, a vessel to receive liquid and entrained gas discharged by the impeller which vessel is provided with a vent for gas and with a passage leading to the first named vessel, valves for said vent and passage, and a float in the second mentioned vessel which operates to seat and unseat said valves alternately, unseating one when the other is seated.

4. In mechanism for creating a vacuum by movement of a liquid, the combination of an exhausting apparatus having a liquid impeller, a gas eliminating vessel adapted

to receive a gas and liquid mixture from the impeller, said vessel having a gas vent, a vessel for supplying liquid to the impeller connected so as to receive liquid from the eliminating vessel, valves to control the vent and the connection between the eliminating and supply vessels, and a float in the eliminating vessel which operates to seat one of said valves and unseat the other.

5. In mechanism for creating a vacuum by movement of a liquid, the combination of an exhausting apparatus having a liquid impeller, a gas eliminating vessel adapted to receive a gas and liquid mixture from the impeller, said vessel having a gas vent, a vessel for supplying liquid to the impeller connected so as to receive liquid from the eliminating vessel, valves to control the vent and the connection between the eliminating and supply vessels, a float in the eliminating vessel which operates to seat one of said valves and unseat the other, and an outwardly opening check valve in said vent.

6. In mechanism for creating a vacuum by movement of a liquid, the combination of an exhausting apparatus having a rotary liquid impeller, a gas eliminating vessel adapted to receive a gas and liquid mixture from the impeller, said vessel having a gas vent, a vessel for supplying liquid to the impeller connected so as to receive liquid from the eliminating vessel, valves to control the vent and the connection between the eliminating and supply vessels, a float in the eliminating vessel which operates to seat one of said valves and unseat the other, and an outwardly opening check valve in said vent.

CLAYTON A. DUNHAM.