July 12, 1927. 1,635,846

R. E. L. HOLMES

PUMP

Original Filed Feb. 11, 1925 2 Sheets-Sheet 1

Fig. 2.

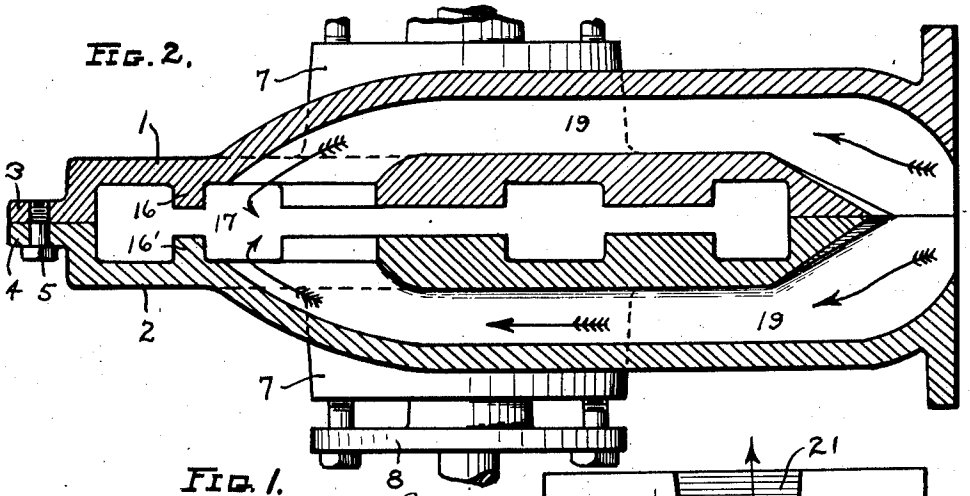
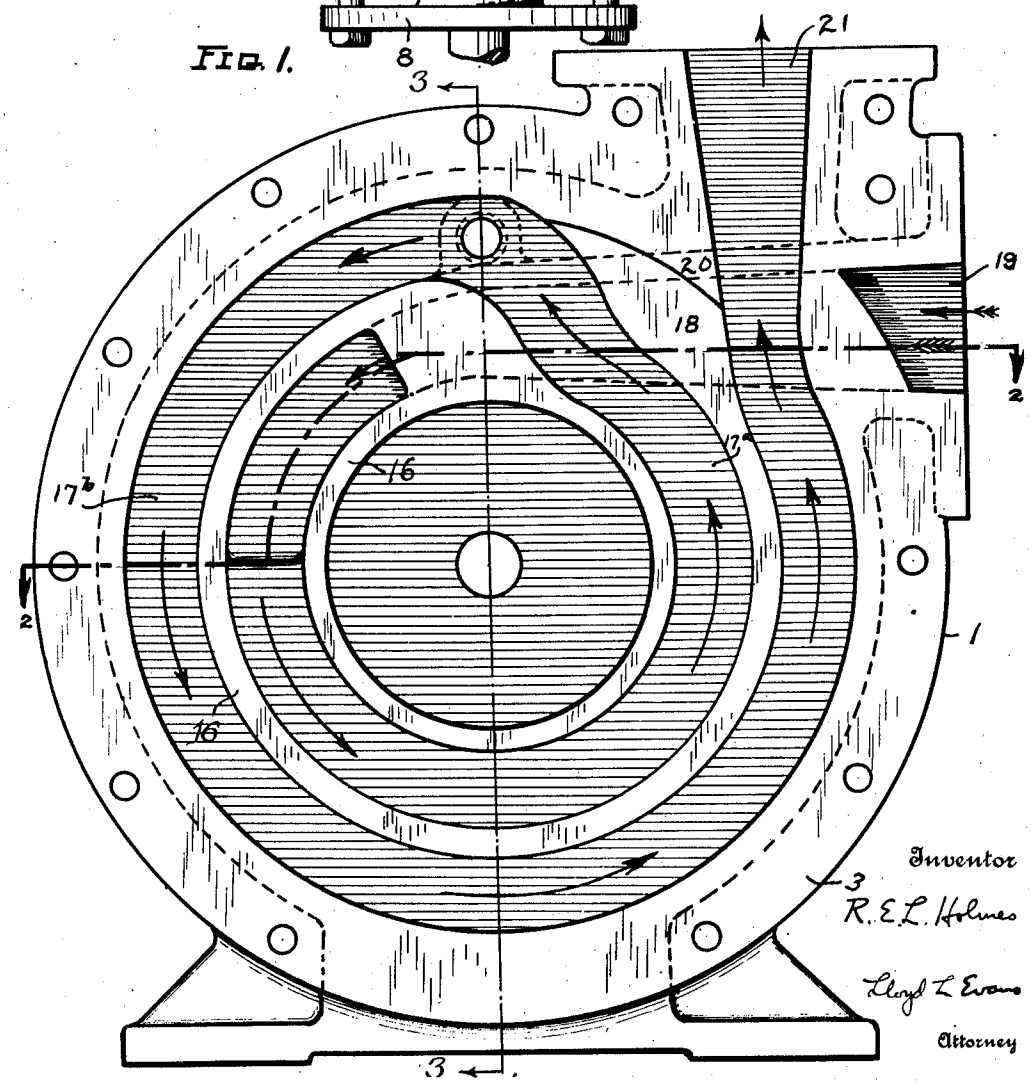


Fig. 1.



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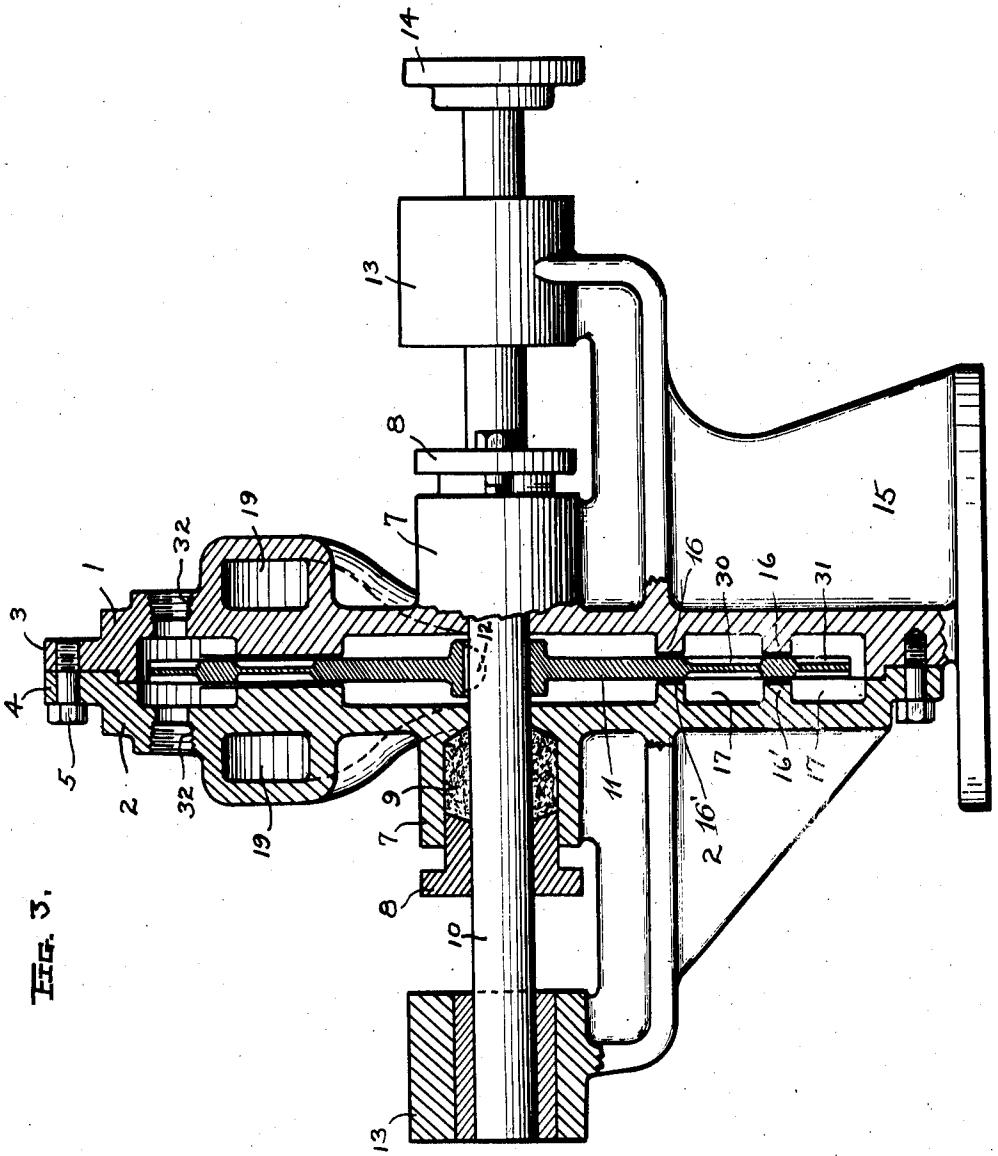


FIG. 3.

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UNITED STATES PATENT OFFICE.

ROBERT E. L. HOLMES, OF DAVENPORT, IOWA, ASSIGNOR TO WESTCO-CHIPPEWA PUMP COMPANY, OF DAVENPORT, IOWA, A CORPORATION OF DELAWARE.

PUMP.

Application filed February 11, 1925, Serial No. 8,554. Renewed December 11, 1926.

This invention relates to pumps, and more particularly to a pump capable of use with pumping systems employing a vacuum return, such, for instance, as in heating systems.

The object of my invention is to provide a single unit mechanism that is capable of simultaneously pumping liquids and of creating a vacuum return for vapors, or for other uses.

A further object of my invention is to provide a single pumping unit of relatively inexpensive and simple construction that is capable of pumping liquids under relatively high pressures and of simultaneously developing a suction through a supplemental port opening directly into the passage of the pump, intermediate the intake and outlet ports, without materially impairing the pressure delivering capacities of the pump.

Pumping machinery has been suggested heretofore in which separate directly connected units were used for developing liquid pressure in the system and for exhausting fluid from the system particularly for use in connection with vacuum heating systems. Such apparatus has heretofore embodied two distinct operating units, although these units have at times been combined in a single housing, or have been directly connected to the same prime mover.

My invention differs from the above prior apparatus in that I provide a single unitary apparatus that acts simultaneous as a liquid pressure developing unit to force liquid through a system and that has a supplemental intake opening into the pressure stream of the pump that is adapted, when open, to exhaust vapors or fluids from the system.

An illustrative embodiment of my invention is shown in the accompanying drawings, in which

Figure 1 is a side elevation of one side of the pump casing with the rotor removed;

Fig. 2 is a cross-sectional view of the casing assembled without the rotor, taken substantially on the line 2—2 of Figure 1; and

Figure 3 is a vertical cross-sectional view of an assembled pump taken substantially through the axis of the rotor.

The embodiment of my invention that I have chosen to illustrate in the drawings comprises a pump casing formed by mated casing portions 1 and 2, that are connected by means of conventional outwardly extending flanges 3 and 4 that are held together by bolts 5. Each of the casing portions 1 and 2 has an outwardly extending tubular boss 7 that, together with a suitable packing gland 8 and packing material 9, constitutes a packing box that prevents leakage between the respective casing portions and a shaft 10, upon which a rotor 11 is secured for rotation therewith by a key 12. The shaft 10 is also supported in outboard bearings 13 and is provided with driving means, such, for instance, as the driving flange 14 from which the rotor 11 may be driven in conventional manner. The casing portion 1 has a pedestal 15 that serves to support the pump assembly.

Projecting inwardly from the members 1 and 2 of the casing are annular ribs or flanges 16, 16′ which form the walls of the passage 17. The flanges 16, 16′ form a continuous inner ring around which the first turn of the liquid passage is made.

From the inner ring the flanges 16, 16′ extend around the pump casing in the direction of flow of the liquid to the outer wall of the casing where a shoulder 20 is formed of sufficient height to meet the corresponding shoulder on the other casing portion to provide means for deflecting liquid from the passage through the outlet port 21 of the pump.

The space between the flanges 16 of the two mated casing portions is only of sufficient size to permit unrestricted operation of the rotor therebetween without permitting any substantial flow of liquid transversely of the pressure developing passage between the casing and the rotor and without material frictional engagement between the flanges and the rotor. The side wall portions 16 and 16′ of the casing are thus arranged to cooperate with the corresponding face of the rotor to cooperatively define the channel or fluid raceway 17 between the casing and the rotor. The close operating fit between the face of the wall portions 16 and 16′ and the cooperating side face of the rotor thus prevents any substantial radial flow of liquid from the raceway 17 along the side face of the rotor. The shoulders 20 provide only operating clearance for the pump rotor and thereby constitute a deflect-

ing abutment that directs the flow of liquid from the pressure developing passage of the pump through the outlet port 21. The deflecting abutments 20 prevent substantial return flow of liquid from the outlet to the pressure developing passage. The liquid carried in the pockets of the rotor is, however, returned to the passage by the rotor.

In the form of my invention shown herein the passage 17 is formed with substantially two complete turns 17^a, 17^b between the inlet and outlet. The turns are concentric and provided with a crossover or connecting passage 18 between them.

It is to be understood, however, that a pump involving my invention may have a passage of greater or less length as desired.

The inlet 19 is disposed near the central portion of the pump casing and may be divided to permit the outlet to pass between the inlet passages. The inlet in each portion of the casing delivers liquid to one side of the rotor.

The pressure developing passage defined by the cooperation of the pump rotor and casing flanges extends in a circuitous passage through the pump. The first stage is provided by the first turn of the passage which connects with the outer or second stage of the pump through an intermediate portion. Both the inlet and outlet ports of the pump connect with the pressure developing passage of the pump and these ports may be tangential to the passage.

The pump rotor 11 is substantially of disc form having a series of suitable liquid-propelling pockets 30 formed therein in registered relation with the first stage of the pump, and adapted to engage liquid within the pressure developing passage defined by the rotor and the cooperating casing portions 16 and 16'. A second series of liquid-propelling pockets 31, that are formed in the peripheral portion of the rotor, are adapted to engage liquid within the outer or second stage of the pump.

The sides of the rotor have a close working fit with the flanges 16 and thereby prevent radial flow of liquid from the passage between the rotor and the flanges 16, or between the first and second stage of the pressure developing passage.

In a pump of the above type, I provide supplemental suction ports 32 that extend completely through the casing, one on each side of the rotor, and open directly into the pressure-developing passageway intermediate the main inlet and outlet ports thereof. Although I have shown this supplemental port in only one of several locations relative to the presser developing passage that have been found to be particularly useful for certain applications of the pump obviously other locations in the same pump or in other forms of the pumps come within the spirit and scope of my invention. It is also obvious that one or a plurality of supplemental ports may be used, and that the supplemental ports may be formed in the respective housings at different relative locations. The use of oppositely disposed supplemental ports opening laterally into the liquid stream give balanced rotor conditions and provide a pump having very useful properties.

The simultaneous operation of my pump as a pressure developing unit and as a suction producing unit, wherein the suction port opens directly in the pressure developing passage, may be accounted for by the high velocity of the liquid stream past the supplemental port. It may be that the portion of the tube of the passage connecting the first turn or stage of the pump with the second acts in the nature of a Pitot ejector and that sufficient water is not delivered from the first turn or stage 17^a to satisfy the suction developed by the rotor in the passage 17^b due to the higher relative speed of the rotor and consequently of the liquid in such passage.

The uses to which a unitary suction and pressure pump of comparatively high pressure and relatively high capacity may be put are manifold. Such a unit may be operated to propel liquid through a heating system having a vacuum return, or be used to charge water with chlorine or other purifying chemicals in municipal water systems, or for many other related uses.

The inexpensive nature of the pump construction and its relatively high pressure delivering qualities render it particularly adaptable to heating system installations requiring suction means for maintaining proper circulation of the heating medium. I have found that a pump of the above specified character is capable of developing a differential pressure, such for example, 150 pounds or more per square inch, and that the pressure is not perceptibly reduced by opening the supplemental suction ports in the sides of the pump casing.

Although I have described only one preferred embodiment of my invention, it is obvious that many modifications in the application of the principles may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

This application is a continuation in part of my application Serial No. 720,253, filed June 16, 1924.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from

my invention as defined in the appended claims.

What I claim is:

1. A rotary pump comprising a rotor having a primary and a secondary series of liquid propelling pockets, and a casing for said rotor adapted to enclose the same and define therewith a pressure developing chamber within which said primary series of propelling pockets operate and a second chamber within which the secondary series of propelling pockets operate, a connecting passage between the first and second chambers, and a supplemental port opening directly into said connection passage.

2. A rotary pump comprising a rotor, and a casing enclosing the rotor having a suitable inlet and outlet port, said casing and rotor being adapted to define therebetween a curved passage extending between the inlet and outlet ports, said ports being substantially tangential with respect to said passage, a restriction between the inlet and outlet ports adapted to prevent the flow of a material quantity of liquid from the outlet to the inlet end of said passage, said rotor having a multiplicity of pockets therein adapted to engage and propel liquid along said passage, the side wall of the casing and the face of the rotor that co-operate therewith to define the passage being disposed sufficiently close to each other to prevent a substantial radial flow of liquid from the passage along the face of the rotor while permitting a free running fit of the rotor in the casing, said casing having a supplemental port opening directly into one side of said passage.

3. A rotary pump comprising a rotor, and a casing enclosing the rotor having an inlet and outlet port and a curved passage extending therebetween, said rotor having a multiplicity of liquid propelling pockets therein adapted to engage and propel liquid along the passage, the faces of the rotor and the walls of the casing cooperating therewith to form said passage being sufficiently close to each other to prevent the flow of a material quantity of liquid transversely from the passage along the face of the rotor, the rotor having a free running fit within the casing, said casing also having a supplemental port opening into said passage between the outlet and the inlet ports therefor.

4. A rotary pump comprising a rotor, and a casing enclosing the rotor having an inlet and outlet port and a curved passage extending therebetween, said rotor having a multiplicity of liquid propelling pockets therein adapted to engage liquid in the passage, the faces of the rotor and the walls of the casing cooperating therewith to form said passage being sufficiently close to each other to prevent the flow of a material quantity of liquid transversely from the passage along the side face of the rotor, said casing having portions adjacent the outlet that deflect liquid from the passage to the outlet to thereby prevent the return flow of a material quantity of liquid from the outlet end of the passage, said casing also having a supplemental port opening laterally into said passage between the outlet and the inlet ports therefor.

5. A rotary pump comprising a rotor, and a casing for the rotor defining a curved liquid passage leading from a suitable inlet to a suitable outlet, said casing having portions adjacent the outlet that deflect liquid from the passage to the outlet to thereby prevent the return flow of a material quantity of liquid from the outlet end of the passage, said passage having two portions in which pressure is developed upon actuation of the rotor, and a supplemental port adjacent the beginning of the second pressure developing passage.

6. A rotary pump comprising a rotor, a casing for the rotor defining a curved liquid passage leading from a suitable inlet to a suitable outlet, said casing having portions adjacent the outlet that deflect liquid from the passage to the outlet to thereby prevent the return flow of a material quantity of liquid from the outlet end of the passage, said passage having a plurality of portions in which pressure is developed upon actuation of the rotor, a connecting passage between adjacent pressure developing portions of the passage and a supplementary port located intermediate adjacent pressure developing portions of the passage.

In testimony whereof, I hereunto affix my signature.

ROBERT E. L. HOLMES.