

Nov. 28, 1933.

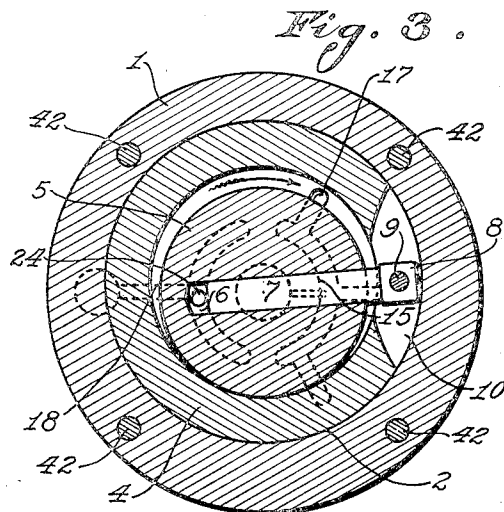
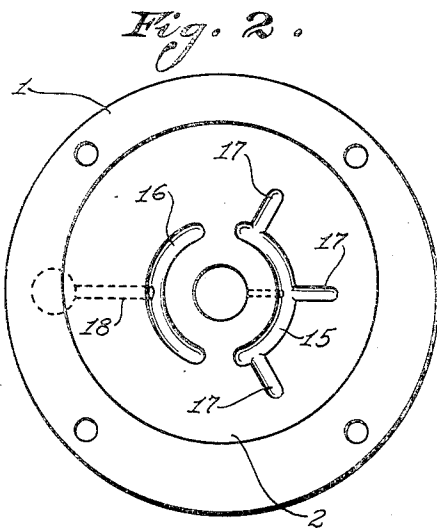
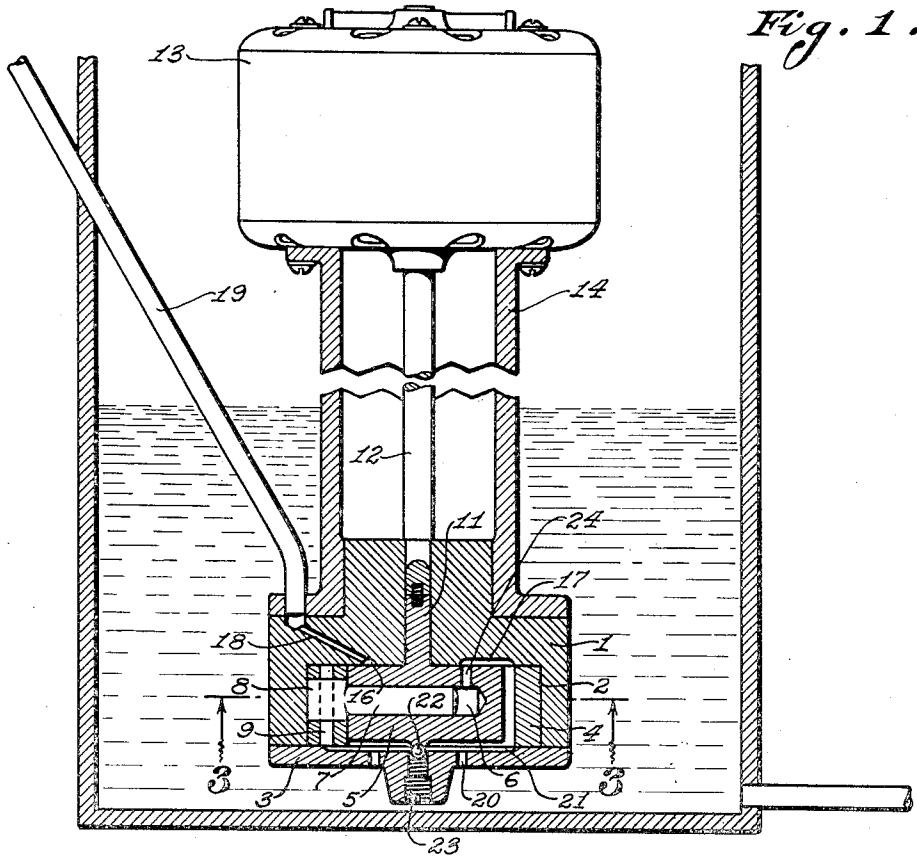
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1,936,614

PRESSURE PUMP

Filed Dec. 6, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 4.

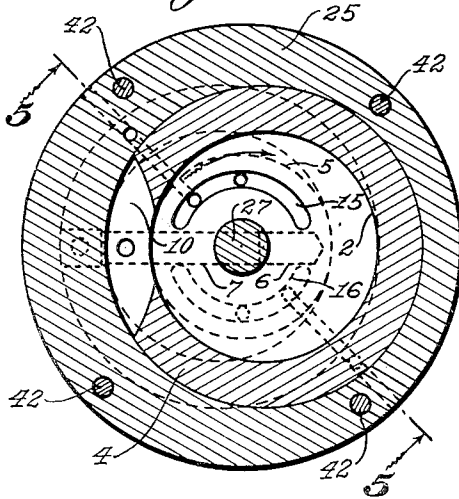


Fig. 6.

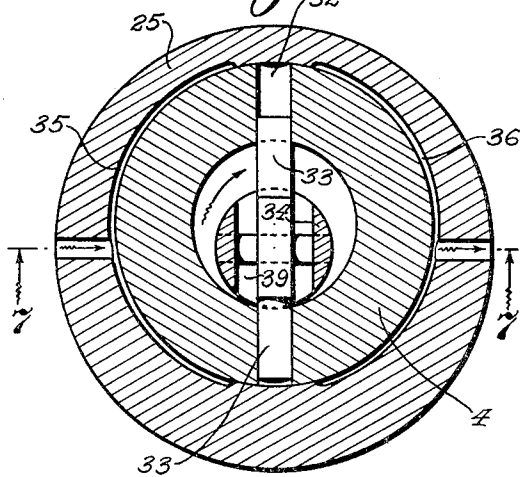


Fig. 5.

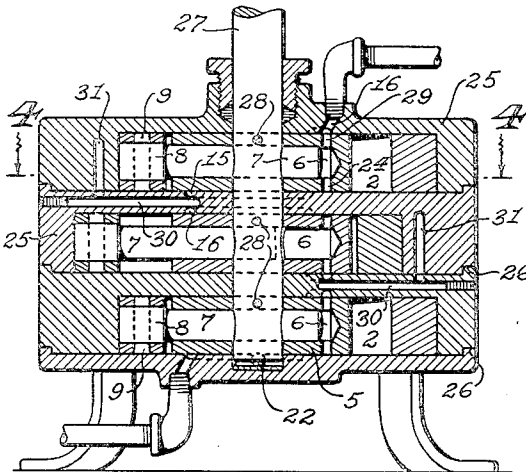


Fig. 7.

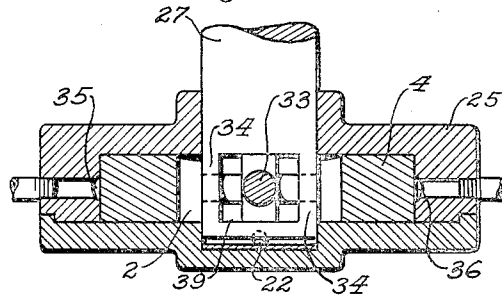


Fig. 9.

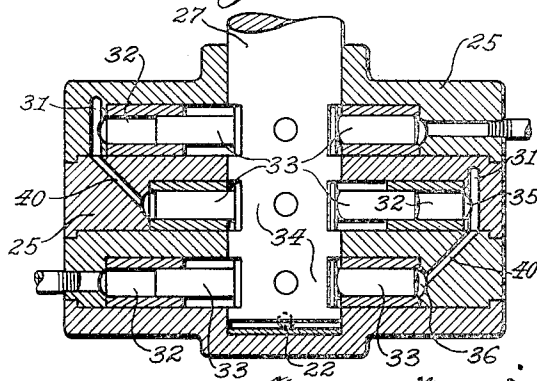
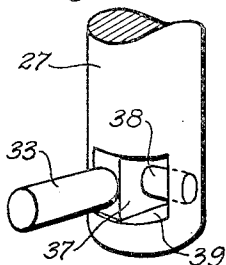


Fig. 8.



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UNITED STATES PATENT OFFICE

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PRESSURE PUMP

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Application December 6, 1929. Serial No. 412,022

4 Claims. (Cl. 103—160)

This invention relates to pumps. More particularly this invention is designed to provide a pump adapted to pump a constant quantity of fluid.

One of the objects of this invention, therefore, is to provide a pump constructed so that when driven at a uniform speed the quantity of fluid pumped will be constant within fairly narrow limits.

Another object of this invention is to provide a pump which may be driven at a high speed without excessive vibration.

Another object is to provide a pump which may be constructed so as to pump the fluid in the successive stages so that a high fluid pressure may be developed thereby.

Another object is to provide a pump of simple construction which will be economical to manufacture and durable in service.

Further objects will appear from the following description taken in connection with the accompanying drawings; in which

Fig. 1 is a vertical section of a pump embodying this invention shown as submerged in a fluid tank.

Fig. 2 is a bottom view of the casing.

Fig. 3 is a section on line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 5 illustrating another embodiment of this invention.

Fig. 5 is a section on line 5—5 of Fig. 4, showing the plurality of pumping sections built up into a multi-stage pump.

Fig. 6 is a sectional view similar to Fig. 5 illustrating another embodiment of this invention.

Fig. 7 is a section on line 7—7 of Fig. 6.

Fig. 8 is a perspective detail of Figs. 6 and 7.

Fig. 9 is a view similar to Fig. 5 showing a multi-stage pump built up in sections in accordance with Figs. 6 and 7.

This application is a continuation in part of application, No. 230,714, filed November 3, 1927, as to their common subject-matter.

Referring now to the drawings and more particularly to Figs. 1, 2 and 3, 1 designates a casing which may be constructed of cast iron, brass or other suitable material and which is bored eccentrically to provide a compartment 2. The lower portion of the casing 1 is open and is designed to be closed by a cap 3. Mounted for rotation in the compartment 2 and so as to have a running fit in said compartment is a ring 4. Mounted within the ring 4 and so as to rotate concentrically with the casing 1, and therefore

eccentrically with respect to the compartment 2 and the ring 4, is a drum member 5. The member 5 provides a body which is bored transversely thereof to provide a cavity 6. The cavity 6 may be cylindrical so as to provide a pump cylinder adapted to cooperate with a plunger 7 to pump the fluid. The plunger 7 has a head 8 pivoted at 9 in a slot 10 in the ring 4.

The member 5 may be provided with a shank 11 having a bearing centrally in the casing 1 and adapted for connection to the shaft 12 of a motor 13. The motor may be mounted on a tubular bracket 14 connected with the casing 1. This bracket may be attached to suitable supports not shown so as to support the motor and the pump. The brackets 14, the casing 1, and the cap 3 may all be secured together by bolts 42 or other suitable fastenings.

The upper face of the compartment 2 in the casing 1 is provided with an intake port 15 in the form of a groove cut in said face of the cap, and an outlet port 16 similarly formed. The port 15 may have one or more grooves 17 extending radially upwardly therefrom. The port 16 is connected by a duct 18 with a discharge pipe 19.

The lower end of the casing 1 is closed by a cap 3 provided with a series of perforations 20 communicating with a depression 21 on the upper face of the cap. This permits the fluid to flow through the perforations 20 and into the compartment 2 when the pump is submerged as illustrated in Fig. 1. The cap 3 may also be provided with a suitable bearing 22 for the member 5. This bearing may be adjustable by means of a screw 23 or otherwise so as to adjust the position of the member 5 in the casing.

In the operation of this pump, the motor 13 drives the member 5 in rotation as indicated by the arrow in Fig. 3. The plunger 7 provides a connection between the members 5 and 4 so that when the former is driven, the latter will be carried with it.

Accordingly, these two members rotate together in the casing eccentrically with respect to one another. The eccentricity of these members causes the plunger 7 to reciprocate within the cavity 6 with each revolution. Examination of Fig. 3 will show that when the port 24 extending from the cavity 6 to communicate with the groove 15, arrives opposite said latter groove, the plunger is moving out of the cavity 6. As the compartment 4 is filled with fluid, this movement acts to draw a quantity of fluid into the cylinder. The port 24 then arrives at the end of the groove 15

and passes to the groove 16. At the same time the movement of the plunger changes so that instead of moving out of the cylinder it now begins to be forced into the cylinder. This operates to force the fluid out of the cylinder through the port 16 and the duct 18 to the discharge pipe 19. In this way the pump continues to operate discharging a definite quantity of fluid at each stroke.

It will be noted that the oil intake openings 20 in Figure 1 are near the center of rotation of the rotor 5 and that the passage 21 extends outwardly from the openings 20 to the space between the rotor 5 and the ring 4. As the entire pump is submerged these passages all become filled with the fluid. During the operation of the pump, while the rotor 5 and the ring 4 are revolving, the liquid in these passages and particularly that in the space between the members 5 and 4 is in rotation and, therefore, under the action of centrifugal force. This centrifugal action tends to force as much fluid as possible into this space so that the fluid therein is under pressure due to the centrifugal action. This pressure is continually acting to assist the suction of the plunger 7. It may be said, therefore, that this centrifugal action produces a sort of priming or supercharging effect which insures that the pump cavity 6 will always be supplied with fluid under an initial pressure.

In the embodiment of Figs. 4 and 5 a number of sections 25, each comprising a pump such as is described above has been combined to form a multi-stage pump. Each of these sections 25 is similar to the casing 1. The internal parts of each section are the same as those described above. The various sections are arranged to be mounted one upon the other and may be provided with flanges 26 to insure alignment of all the sections. A single shaft 27 may extend thru all of the members 5, being fixed to each member 5 by a pin 28. As the shaft 27 traverses to the position of the cavity 6 as shown in Fig. 5, the shaft itself may be bored so as to form part of that cavity and the plunger 7 may pass thru the same.

In order to provide a more uniform flow of fluid at the discharge the successive casings 25 may be reversed with respect to one another as indicated in Fig. 5 and shown in dotted lines in Fig. 4. Accordingly when one of the cylinders is drawing fluid the succeeding one will be discharging. Similarly when one is discharging the succeeding one will be drawing fluid. Therefore, the discharge of one section may be delivered directly to the cylinder of the next section. Accordingly, the ports 15 and 16 are arranged for that purpose as shown in Figs. 4 and 5. In this case, however, the intake port 15 is in the upper face of the next preceding section while the discharge port 16 is in the upper face of the compartment 2. The intake ports 24 may thus communicate directly with the discharge ports 29 of the next preceding section. The latter ports is in the body 5 opposite the port 24.

In order to provide some flexibility in the fluid column between successive sections of this pump, a duct 30 is provided communicating with the discharge port of one and the intake port of the succeeding section in each case. The port 30 further communicates with a vertically extending air chamber 31 which may be simply a drilled hole in the casing member. This arrangement provides for any difference in the extent of movement of the two plungers as one forces the fluid into the space being vacated by the other. In

this way the fluid passes successively thru each pump section and each section raises the pressure of the delivered fluid a corresponding amount. The air chamber 31 operates to compensate for differences in the phases of operation of the separate pumps. It will be obvious that if the delivery stroke of one pump should not coincide in time with the intake stroke of the succeeding pump a volume of fluid would be delivered by the first pump to the duct connecting the two pumps. If at this time the succeeding pump were not ready to receive this fluid the latter would be entrapped in the duct and an extremely high pressure might result if an incompressible fluid is being pumped.

In Figs. 6 to 9 inclusive, the cylinder and plunger parts have been reversed in their location. In other words, the cylinder cavity 32 is now placed in the ring 4 while the plunger 33 is mounted in the central member 34. In the arrangement shown, the ring 4 is provided with two cylinder cavities and the inner member is correspondingly provided with two plungers extending in opposite directions. This device works on the same principle as that previously described, the plunger and cylinders simply being interchanged. In this case the intake port 35 and the discharge port 36 may be cut in the circumferential surface of the compartment 2.

In this embodiment of this invention provision must be made for shifting of the plunger laterally of the member 34 to make allowance for the eccentricity of the inner and outer members. Accordingly, the plunger is provided with a guide block 37 arranged to slide on a pin 38 mounted transversely in the shaft 27. An opening 39 is provided in the shaft 27 to permit such lateral movement.

In Fig. 9 is shown the manner in which a plurality of sections may be assembled to form a multi-stage pump. In this case also the successive sections are reversed with respect to one another so that the discharge fluid of one section may provide the intake of the succeeding one. The discharge port 36 of one section is connected with the intake port 35 of the succeeding section by a duct 40. An air chamber 41 may be provided in the duct 40 as shown in Fig. 9.

While these pumps are shown as operating in a vertical position, they can, of course, be constructed to operate in a horizontal position with obvious modifications.

While in the multi-stage pumps illustrated in the drawings the pump sections are shown as arranged in series so as to increase the pressure of the fluid delivered, they can be obviously arranged in parallel, just as well, so as to increase the volume of discharge without increasing the pressure delivered. This can be done simply by an appropriate rearrangement of intake and discharge ports. Any combination of series-parallel arrangement may also be used.

It will be seen that this invention provides a pump of simple construction which may be adapted to a variety of purposes. It is particularly useful where it is desired to pump a constant quantity of fluid, for instance, where used in connection with an oil burner for pumping oil to the burner. Since the cylinder capacity and the movement of the plunger is constant, the quantity of fluid discharged in any given time will be constant so long as the speed is uniform.

The construction of this pump is such that it can be manufactured by shop operations of

the simplest kind. Its parts are few and easily assembled. Accordingly, the pump is cheap to manufacture.

It will be noted that both the ring 4 and inner member 5 or 34 rotate on their own axes. Accordingly, there is no tendency for these parts to set up vibration. The endwise movement of the plunger is zero so that there is no tendency to set up vibration by such a movement. The only unbalanced movement is the sidewise shifting of the plunger 33 in the embodiments of Figs. 6 to 9 inclusive or the rocking movement of the plunger 7 on its pivot 9 in the embodiments of Figs. 1 to 5 inclusive. This rocking movement compensates for the eccentricity of the two rotating members, the angular velocity relatively to one another varying slightly during each revolution. Accordingly, this pump may be made to run with practically no vibration and consequently a high speed of rotation may be employed.

If a pump is submerged as indicated in Fig. 1, no leakage of fluid can take place. This is a great advantage of such an installation as described in the above application where the pump is used to pump oil to a burner.

The arrangement of this pump for multi-stage operation is a very convenient one and such that any number of stages may be combined so that a very considerable pressure may be built up.

While this pump has been described as a unitary device, it will be understood that certain features or sub-combinations thereof may be useful by themselves without reference to other features or sub-combinations. It is understood that such individual features and sub-combinations are contemplated by this invention and is within the scope of the appended claims. It is further obvious that various changes may be made, within the scope of the appended claims, in the details of construction without departing from the spirit of this invention; it is, therefore, to be understood, that this invention is not limited to the specific details shown and/or described.

Having thus described the invention, what is claimed is:

1. In a pump of the character described, a casing having a chamber, members mounted for rotation in said chamber eccentrically with respect to each other, a fluid inlet to said casing, a fluid duct extending from said inlet outwardly

to communicate with the space between said members whereby said space may be filled with fluid, one of said members having a cavity, and a plunger connected with the other member adapted to cooperate with said cavity to pump the fluid, and a fluid inlet to said cavity adapted to communicate with said space between said members.

2. In a pump of the character described, a casing having a chamber, members mounted for rotation in said chamber one within the other and eccentrically with respect to each other, a fluid inlet to said casing, a fluid duct extending from said inlet outwardly to communicate with the space between said members whereby said space may be filled with fluid, one of said members having a cavity, and a plunger connected with the other member adapted to cooperate with said cavity to pump the fluid, and a fluid inlet to said cavity adapted to communicate with said space between said members.

3. A pump, comprising, a casing providing a plurality of compartments each having intake and discharge ports, fluid connections between said compartments, an air chamber in each connection, a member mounted for rotation in each compartment and having a circumferential surface thereof providing a journal with said casing, a drum mounted for rotation in each compartment eccentrically with respect to said member, said drum having a cavity, and a rigid plunger movably secured to said member adapted to be positively reciprocated in said cavity by eccentric movement of said member and drum to pump the fluid and providing a circumferentially rigid driving connection between said member and said drum.

4. A pump, comprising, a casing providing a plurality of compartments each having intake and discharge ports, fluid connections between said compartments, air chambers in said connections, a member mounted for rotation in each compartment and having a circumferential surface thereof providing a journal with said casing, a drum mounted for rotation in each compartment eccentrically with respect to said member, said drum having a cavity, and a laterally rigid plunger pivoted to said member and extending into said cavity to cooperate therewith in pumping the fluid.

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