

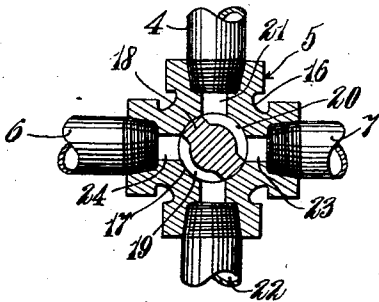
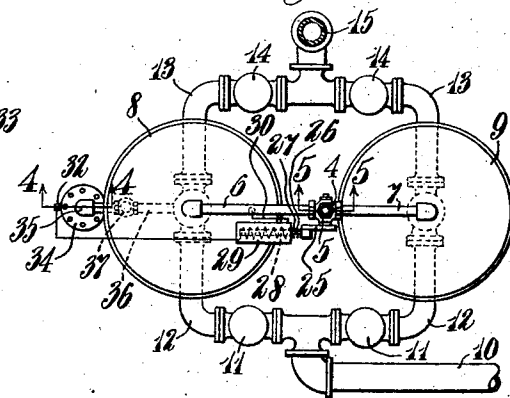
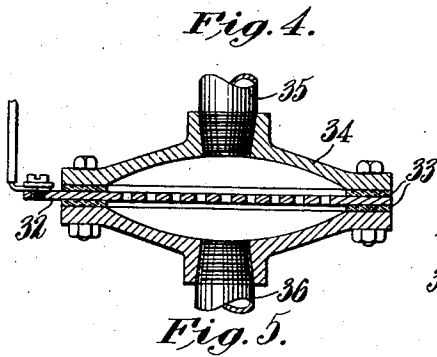
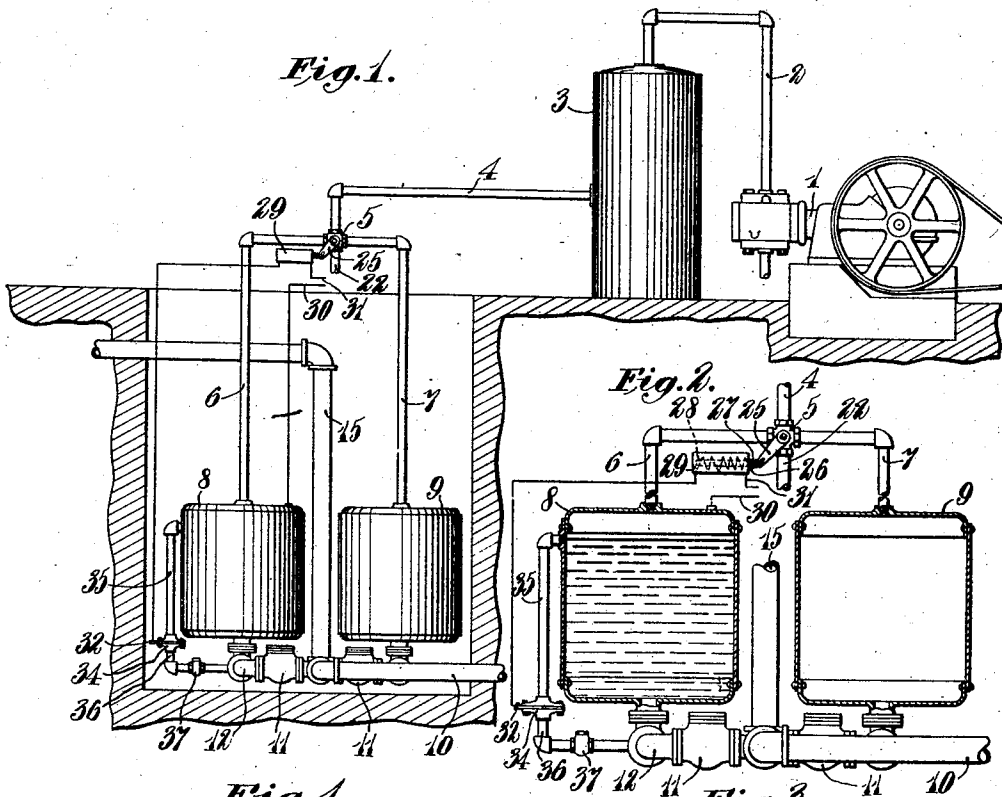
July 6, 1926.

H. C. JOHANSEN

1,591,318

PUMPING APPARATUS

Filed Jan. 13, 1922



Inventor:
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by
Trace L. [Signature]
Atty.

Patented July 6, 1926.

1,591,318

UNITED STATES PATENT OFFICE.

HARRY C. JOHANSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

PUMPING APPARATUS.

Application filed January 13, 1922. Serial No. 528,900.

My invention relates to devices for pumping by fluid pressure, and more particularly to pumping apparatus of the displacement type.

5 An object of my invention is to provide an improved pumping apparatus. Another object of my invention is to provide an improved displacement pumping apparatus. A further object of my invention is to provide an improved controlling mechanism for a displacement pumping apparatus. Other objects and advantages of my invention will hereinafter more fully appear.

10 In the accompanying drawings, I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

20 Fig. 1 is a side elevation of a displacement pumping system constructed according to the illustrative embodiment of my invention.

Fig. 2 is a view on a slightly larger scale in central vertical section through the displacement tanks forming a part of my pumping apparatus.

25 Fig. 3 is a plan view of the displacement pumping mechanism provided with the illustrative form of my invention.

Fig. 4 is a central vertical section on the line 4—4 of Fig. 3.

30 Fig. 5 is a central vertical section on the line 5—5 of Fig. 3, with the valve disclosed in a different position from that occupied in Figs. 2 and 3.

35 The form of my invention which I have selected for illustration and shall now describe as the illustrative embodiment thereof will be noted to be employed in a displacement pumping system comprising a compressor 1 supplying compressed air through a line 2 to a receiver 3, from which fluid is conducted by a pipe 4 to a valve mechanism generally designated 5 and thence alternately by pipes 6 and 7 to displacement tanks 8 and 9, in general of well known construction.

40 Liquid is conducted under suitable head from a suitable source by way of a pipe 10 through check valves 11 and branch pipes 12 to the bottoms of the displacement tanks 8 and 9 and is discharged from these tanks by branch pipes 13 through check valves 14 to a discharge pipe 15 when fluid pressure is admitted to the tanks, the operation being controlled by the valve mechanism 5. This mechanism 5 comprises a valve casing 16

having a bore 17 in which a valve 18 is rotatably disposed. This valve is cut away on its opposite sides to form grooves 19 and 20 which are adapted to connect a fluid pressure inlet connection 21 and an exhaust connection 22 alternately with passages 23 and 24 leading respectively to the pipes 7 and 6 and so to the tanks 9 and 8. It will be noted that by means of the valve 18 one of the tanks may be subjected to air pressure from the receiver 3 while the other is vented to the atmosphere. The valve 18 is provided with an operating lever 25 to which is connected a stem 26 which is surrounded by a spring 27 normally tending to hold the lever in a position to dispose the valve 18 in the position shown in Fig. 5. The stem 26 is provided with an armature 28 with which an electromagnet cooperates and this electromagnet is controlled by controlling means which will now be described.

It will be noted that one of the main wires 30 is grounded to the top of the tank 8 while the other 31 is connected to the solenoid and it will be noted that the opposite end of the solenoid winding is connected to a plate 32 of conducting material which is insulated by suitable gaskets 33 of insulating material from a chamber forming member 34 whose interior is connected by a pipe 35 with the tank 8 adjacent the top thereof and with a T which constitutes the junction between the pipes 12 and 13 and the tank 8 by way of a pipe 36. A check valve 37 permitting the flow downward through the pipes 35 and 36 is arranged between the casing 34 and the bottom of the tank 8.

From the foregoing description, the mode of operation of my invention will be readily apparent. With the valve in the position indicated in Fig. 5, it will be noted that the tank 8 will be vented to the atmosphere while the tank 9 is being discharged and that liquid flows into the tank 8 from the supply line 10 as it is forced out of the tank 9 to the discharge line 15. As the liquid level rises in the tank 8, it will ultimately reach the upper end of the connection 35 and flowing therethrough will enter the chamber formed in the chamber forming member 34. As soon as the liquid enters and sufficiently fills the chamber 34, it will evidently constitute a means for closing the circuit between the casing 34 and piping of the tank 8 on the one hand and

the insulated plate 32 on the other, it being noted that the distance through which current must flow in the liquid to close the circuit is very small and so that the resistance offered by the liquid will be relatively small. As soon as the circuit is closed from wire 30 through the metal of tank 8, pipe 35, casing forming member 34, the liquid in the chamber in the member 34, the insulated plate 32 and the wire leading to the end of the solenoid back through the solenoid to the other main 31, the solenoid will be energized and move the armature 28 to shift the valve 18 to supply fluid pressure to the tank 8 while venting the tank 9. As soon as the liquid has been discharged from the tank 8 to a point below the member 32, the circuit will be broken, the magnet 29 will be de-energized and the spring 27 will return the valve 18 to its original position and the tank 9 will then be discharged while the tank 8 is refilling. It will be noted that the member 32 is perforated to permit liquid to flow therethrough and it will be further noted that if desired a pilot switch or relay can be employed to control the circuit through the solenoid 29 and accordingly that the current flow through the liquid may be very small. This device will evidently be very successful and well adapted for use in pumping acids, etc., as there are no moving parts whatever exposed to the liquid being pumped, the only limitation on its field of utility being that it must be used with liquids which will conduct electricity.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination with a plurality of electrically controlled pumping mechanisms, liquid circuit closing and opening means comprising a single circuit.

2. In combination with a fluid operated pumping mechanism, a single electrically controlled valve for controlling flow of fluid to and exhaust of fluid from said mechanism including a liquid circuit opening and closing means, said circuit having only stationary contact means engaged by the liquid being pumped.

3. In combination with a plurality of pumping mechanisms, controlling mechanism for said pump mechanisms including only a single circuit adapted to be closed by the liquid being pumped.

4. In a fluid pressure pumping system, a

pump, fluid pressure supply means therefor including valve mechanism adapted to control fluid to and exhaust fluid from said pump, and electro-magnetic controlling means operative to positively control both of said valve mechanism functions and including a circuit controlling said electro-magnetic means which is opened and closed by the liquid being pumped.

5. In a fluid pressure pumping system, a pump, fluid pressure supply means therefor including valve mechanism adapted to control fluid to and exhaust fluid from said pump, and electro-magnetic controlling means operative to positively effect both of said valve mechanism functions and including a circuit controlling said electro-magnetic means which is opened and closed by the liquid being pumped, said circuit having only contacts adapted to be operated by contact with said liquid.

6. In a plurality of displacement pumping systems, displacement tanks, means to alternately render the same operative including fluid pressure supply and discharge means therefor including a pumping fluid controlling valve, mechanical means for actuating said valve, liquid supply and discharge means therefor, means for controlling said controlling valve including an electric circuit adapted to be closed by the liquid being pumped, and a contact in said circuit, said contact closing the circuit and being submerged in the liquid until pumping opens said circuit.

7. In a displacement pumping system, a plurality of displacement tanks, pumping fluid supply and exhaust means therefor including a valve, a solenoid controlling said valve and current supply means for said solenoid including connections from a source of current to said solenoid and to one of said tanks, and a connection between said solenoid and a conductor element insulated from said latter tank, said conductor element being arranged to be submerged by the liquid being pumped when said latter tank is filled to initially close said circuit and remain submerged until said liquid is pumped.

8. In a displacement pumping system, a plurality of displacement tanks, pumping fluid supply and exhaust means therefor including a valve, a solenoid controlling said valve, current supply means for said solenoid including connections from a source of current to said solenoid and to said latter tank, a conductor element insulated from said latter tank, and a connection between said solenoid and said conductor element, said conductor element being arranged to be submerged by the liquid being pumped only after said latter tank is filled and then to remain submerged until said tank is empty.

9. In a displacement pumping system, a displacement tank, pumping fluid supply means and exhaust means therefor including a valve, a solenoid controlling said valve, current supply means for said solenoid including connections from a source of current to said solenoid and to said tank, a conductor element insulated from said tank, and a connection between said solenoid and said conductor element, said conductor element being mounted in a bypass communicating with the top and bottom of said tank and positioned adjacent the bottom thereof whereby when liquid closes the circuit between said tank and said conductor element said circuit will remain closed until the tank is empty.

10. In a displacement pumping system, a displacement tank, pumping fluid supply means, exhaust means therefor including a valve, a solenoid controlling said valve, current supply means for said solenoid including connections from a source of current to said solenoid and to said tank, a conductor element insulated from said tank, a connection between said solenoid and said conductor element, said conductor element being mounted in a bypass communicating with the top and bottom of said tank and positioned adjacent the bottom thereof whereby when liquid closes the circuit between said tank and said conductor element said circuit will remain closed until the tank is empty, and a check valve opening toward the bottom of said tank in said bypass.

11. In a displacement pumping system, a displacement pump including a tank, liquid supply and discharge connections for said tank, a chamber of conducting material having insulatedly supported therein a conductor member, said casing communicating with said tank adjacent the top and bottom thereof, and means for controlling the supply and discharge of pumping fluid to said tank controlled by the admission of pumping fluid to said chamber.

12. In a displacement pumping system, a plurality of displacement pumping tanks, supply and discharge connections for the liquid to be pumped, supply and exhaust connections for a pumping fluid, valve mechanism operative to positively control the connection of said supply and exhaust connections to said tanks, and electromagnetic means controlled by the liquid level in only one of said tanks for controlling the position of said valve.

13. The combination comprising an electrically controlled pumping mechanism hav-

ing a plurality of substantially similar pumping elements, and means controlled by a single element in contact with the liquid being pumped for causing continued alternate operation of said elements.

14. The combination comprising an electrically controlled pumping mechanism having a plurality of substantially similar pumping elements, and means for alternately rendering the same operative including a single controlling electrical circuit and liquid circuit closing means.

15. In a displacement pumping system, a plurality of alternately operable displacement pumping tanks, and electrical means including contacts engaged by the liquid being pumped connected to only one of said tanks and adapted to control the pumping of the fluid in the remainder of said tanks.

16. In a displacement pumping system, a plurality of alternately operable displacement pumping tanks actuated by pressure fluid, and electrical means connected to only one of said tanks adapted to control independently of said pressure fluid the pumping of the liquid in the other tanks in their proper order.

17. In combination with an electrically controlled pumping mechanism having a liquid container, liquid circuit closing means comprising a single circuit and having a contact adapted to be submerged in the liquid being pumped only after said container is filled and then remain submerged until said tank is empty, said contact upon being submerged permitting said mechanism to pump said fluid, and mechanical means for stopping further pumping action when said contact becomes unsubmerged.

18. In a combination with an electrically controlled pressure fluid operated pumping mechanism having a plurality of alternately operable pumping elements, and means controlled independently of said pressure fluid by an element in contact with the liquid being pumped causing continued operation of said elements, said electrical control including only a single circuit.

19. In combination with an electrically controlled pumping mechanism having a liquid container, liquid circuit closing means having a contact adapted to be submerged in the liquid being pumped, and means permitting overflow from the top of said tank to effect said submergence.

In testimony whereof I affix my signature.

HARRY C. JOHANSEN.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,591,318, granted July 6, 1926, upon the application of Harry C. Johansen, of Chicago, Illinois, for an improvement in "Pumping Apparatus," an error appears in the printed specification requiring correction as follows: Page 2, lines 87 and 88, claim 6, strike out "In a plurality of displacement pumping systems" and insert *In a displacement pumping system, a plurality of*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of August, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.