C. DANTSIZEN.

FLUID PRESSURE DEVICE.

APPLICATION FILED JUNE 7, 1912.

1,158,029. Patented Oct. 26, 1915.

Fig. 2.

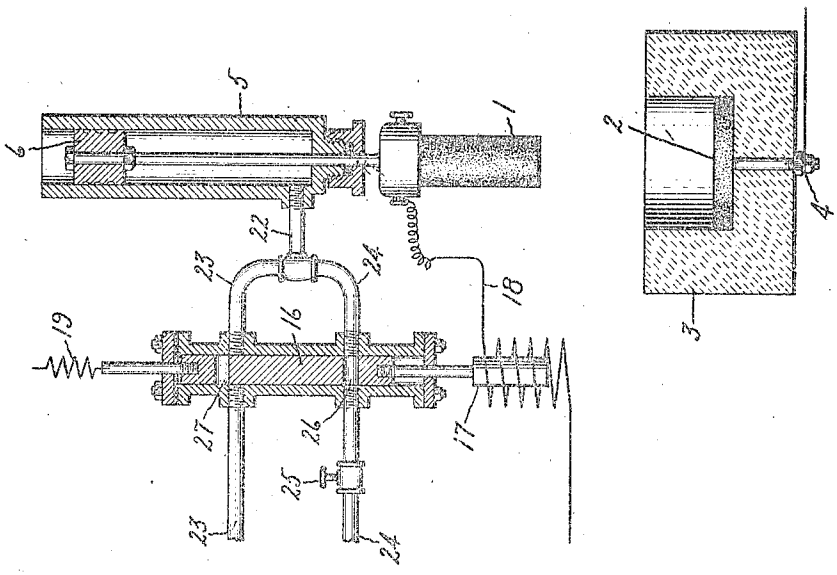
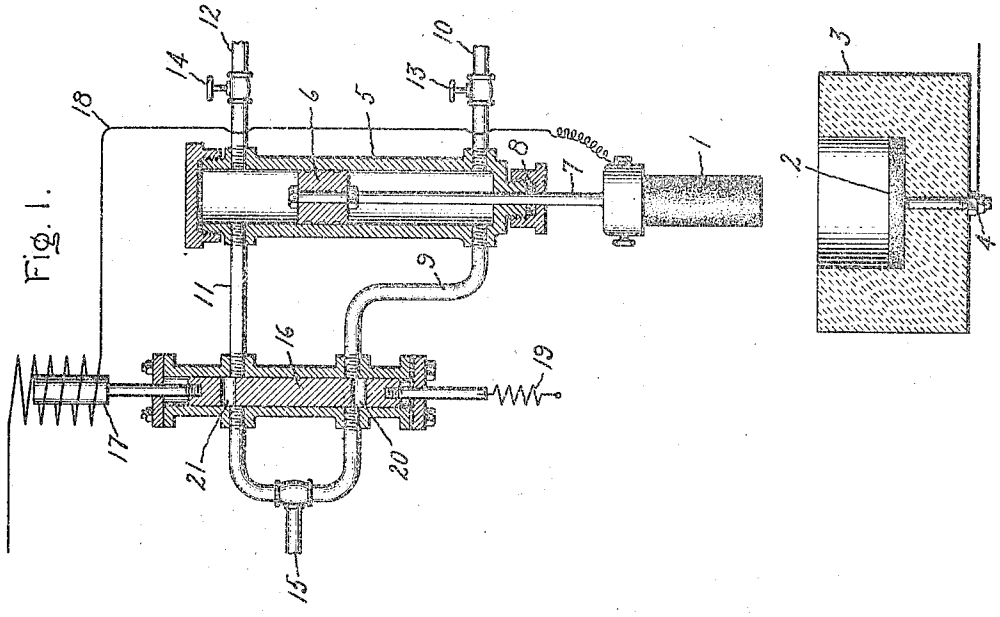


Fig. 1.



Witnesses:

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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE DEVICE.

1,158,029. Specification of Letters Patent. Patented Oct. 26, 1915.

Application filed June 7, 1912. Serial No. 702,152.

To all whom it may concern:

Be it known that I, CHRISTIAN DANTSIZEN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Fluid-Pressure Devices, of which the following is a specification.

The present invention relates to fluid pressure actuated devices, such as hydraulic or compressed air lifts or motors and its object is to provide a device which is free from jerkiness and the tendency to overshoot and which is, therefore, particularly applicable to the control of electrodes for electric furnaces.

In accordance with my invention, a cylinder having both intake and exhaust openings and supplied normally continuously with a fluid under pressure, is provided with valves whereby the relation between the rates of intake and exhaust may be varied so as to either accumulate or release pressure and thereby move the piston.

My invention will be more fully understood from the following description taken in connection with the accompanying drawing, in which—

Figure 1 illustrates somewhat diagrammatically an automatic arc furnace lift, and Fig. 2 illustrates a modification in which the fluid under pressure is admitted upon one side of the piston only.

The electrodes of industrial electric furnaces are frequently very large and heavy. As their control, especially in arc furnaces, is necessarily quite delicate, the regulation of suitable motive power for handling these electrodes without causing undue fluctuations of current becomes an important problem. In the case of hydraulic or similar apparatus, the usual methods of admitting and exhausting the fluid under pressure are inadequate. In my present device the fluid, for example, water, is passing through the cylinder unintermittently.

In Fig. 1 the regulation of an arc furnace by means of a lift which may be operated either with hydraulic, steam or air pressure is illustrated. The elements of the electric furnace are indicated simply as a carbon electrode 1, movable with respect to a conductive base plate 2 supported in a suitable container 3, contact being made to the plate 2 by a rod 4 passing through the lower wall of the furnace. The lift which for the sake of convenience will be referred to as hydraulicly operated, comprises a cylinder 5 containing a piston 6 connected to the electrode 1 by piston rod 7, sliding through a stuffing box as usual. On the lower side of the cylinder 6 are provided an intake pipe 9 and an exhaust pipe 10; on the upper side of the cylinder an intake 11 and exhaust pipe 12. The exhaust pipes are provided with shut off valves 13, 14 which if desired can be omitted. The intake pipes 9 and 11 receive water under pressure from a common pipe 15 and the flow of water in pipes 9 and 11 is controlled by a slide valve 16, common to both pipes. The movements of this slide valve are controlled by an electromagnet 17 which is electrically connected in series with the arc by conductor 18 as clearly shown. The pull of the electromagnet is opposed by the spring 19. In the position shown in the drawing, the openings 20 and 21 into the pipes 9 and 11, respectively, are about equal. The pressure upon both sides of the cylinder 6 will therefore be about equal, as the water is being exhausted from pipe 10 and 12 at a rate equal to its flow into the cylinder. The electrode, therefore, will slowly fall by reason of its own weight until electrical contact is made with the plate 2, or with any charge resting upon this plate. The solenoid 17 will be energized, thereby raising its core and moving the slide valve 16 so as to reduce the size of the opening 21 and enlarge the size of the opening 20. This operation will increase the flow of water into the lower part of the cylinder below the piston 6 and decrease its flow into the space above the piston. As the exhaust openings remain the same the effect of this will be to raise the electrode and strike an arc. The apparatus can be so adjusted that when the arc is of desired length, the pull of solenoid 17 will just equal the pull of the spring 19 when the pressures upon both sides of the piston 6 are properly proportioned, and thus the electrode will be held stationary. As the arc lengthens either by wearing away of the electrode or by the fusion or removal of the material in the furnace, the current decreases and the pull of the solenoid is weakened allowing the slide valve to descend and decreasing the flow of water in the pipe 9 and increasing the same in the pipe 11 until the increase of pressure

in the upper part of the cylinder causes the electrode to descend. Because of the continuous flow of water through the cylinder, these movements will take place promptly and almost imperceptibly without jerkiness so as to maintain the arc very steady the desired length.

In the modification illustrated in Fig. 2, pressure is exerted upon the lower side of the piston only, its descent being caused by gravity only. In this case the cylinder 5 is provided with a single pipe 22, receiving water under pressure from pipe 23 which is in communication with exhaust pipe 24. The exhaust pipe may be provided if desired with a cut off valve 25. Pipes 23 and 24 are provided in this case similar to the modification already described with a slide valve 16 operated as before by a magnet 17 working against a spring 19.

To start the furnace in operation the valve 25 is opened allowing the piston 6 to descend by gravity, the water being exhausted through the pipe 24. When the electrode makes contact with the plate 2 the magnet 17 is energized, and operates the slide valve to decrease the size of the opening 26 and present the passage 27 to the inflow of water in the pipe 23. This movement will continue until the admission of water from pipe 23 takes place at a greater rate than its exhaust through pipe 24, causing the accumulation of pressure in the cylinder 5 and raising the piston with its attached electrode. When the arc has reached the desired length, or when the current in the case of a resistance furnace has reached its proper value, the pull of the solenoid 17 is overcome by that of the spring 19 to such an extent as to decrease the intake of water and increase the exhaust to a point where equilibrium is established and the electrode is held stationary. During normal operation of the furnace water is constantly flowing through the ports in both the regulating valves so as to permit a smooth and instant regulation when the size of the ports is changed by a movement of the valve. When it is desired to shut down the furnace it is only necessary to close the valve 25 in the exhaust pipe 24 so that the accumulation of water in the cylinder 5 will raise the electrode until the arc breaks.

While I have described the operation of my improved fluid actuating device with reference to the control of an electric furnace, it will of course be understood that it is not limited in its application to this particular use. It is also obvious that fluids under pressure other than water can be used.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The combination of a cylinder, a piston therein arranged to be urged in a given direction, a conduit for delivering a fluid under pressure to a chamber of said cylinder to urge said piston in the opposite direction, a conduit for discharging said fluid, and means for varying at will the ratio of delivery of said fluid with respect to the discharge thereby varying the position of the piston in said cylinder.

2. The combination of a cylinder, a piston movably mounted therein, a conduit for delivering a fluid under pressure to a chamber on one side of said piston, a conduit for discharging said fluid from said chamber, and means for varying the rate of delivery of said fluid while simultaneously varying the discharge of said fluid.

3. The combination of a cylinder, a piston movable therein, a conduit for supplying said cylinder with a fluid under pressure, a second conduit for discharging said fluid, a valve having a port communicating with said supply conduit, and another port communicating with said discharge conduit, said ports being so arranged with respect to said conduits that a widening of one port correspondingly contracts with the other port, and means for operating said valve.

4. A fluid pressure device comprising the combination of a cylinder operable in a vertical position, a piston fitted therein, descending in said cylinder by gravity, a conduit communicating with said cylinder below said piston, supply and exhaust pipes communicating with said conduit, a slide valve having openings spaced to register with the openings through said pipes that a displacement of said valve in either direction widens the passage to one pipe and correspondingly closes the passage to the other pipe and means for moving said valve.

In witness whereof, I have hereunto set my hand this 6th day of June, 1912.

CHRISTIAN DANTSIZEN.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.