

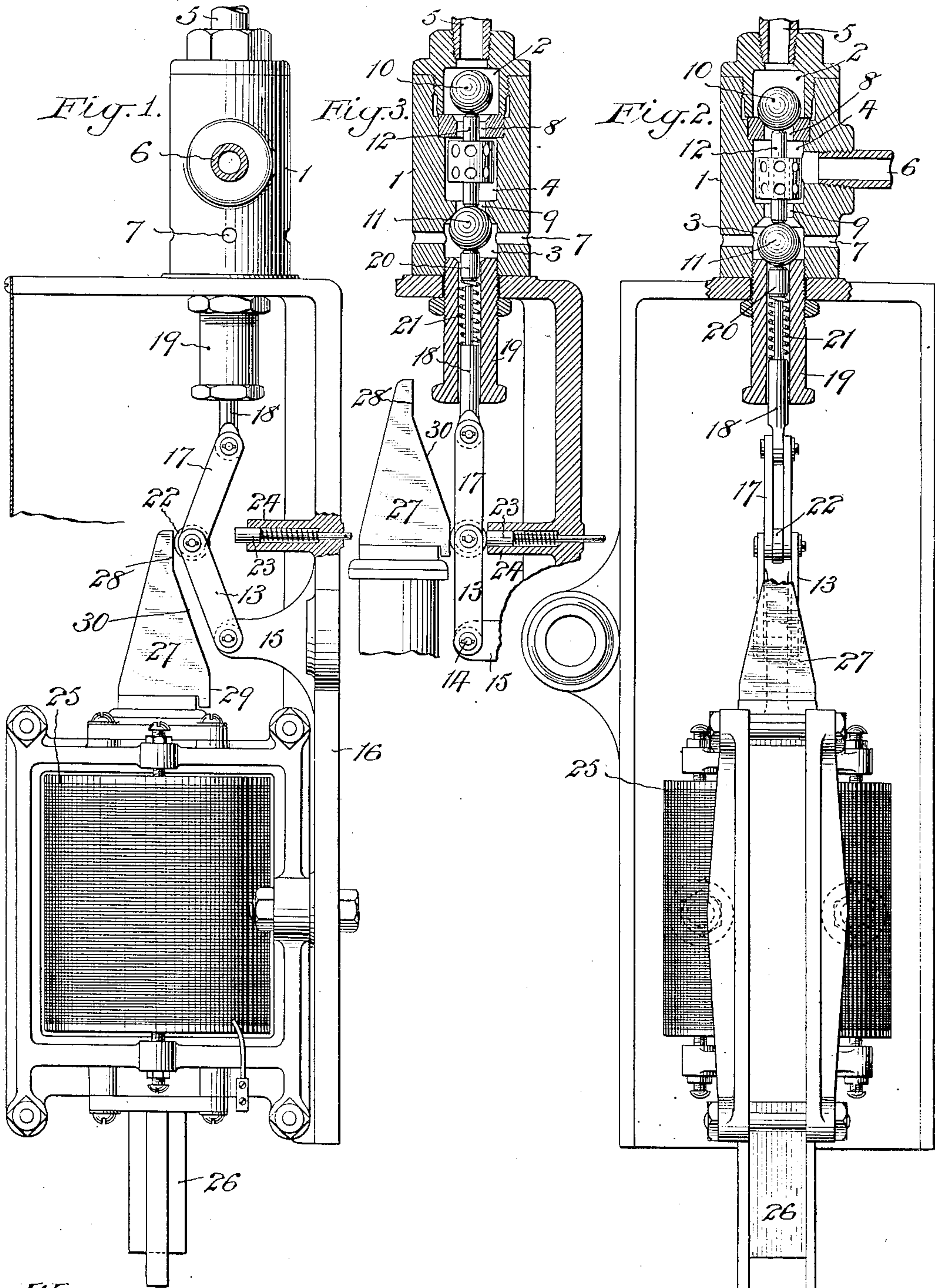
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ELECTRICALLY CONTROLLED VALVE OPERATING MECHANISM.

APPLICATION FILED DEC. 17, 1907.

925,673.

Patented June 22, 1909.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY WALTER ZOOK, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

ELECTRICALLY-CONTROLLED VALVE-OPERATING MECHANISM.

No. 925,673.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed December 17, 1907. Serial No. 406,833.

To all whom it may concern:

Be it known that I, HENRY WALTER ZOOK, a citizen of the United States, and resident of Easton, in the county of Northampton and State of Pennsylvania, have invented a new and useful Improvement in Electrically-Controlled Valve-Operating Mechanism, of which the following is a specification.

My invention relates to electrically controlled valve operating mechanism and has more particularly for its object to provide certain improvements in the construction, form, arrangement and operation of the several parts of an electrically controlled valve operating mechanism whereby variations in the current of the electro-magnet which controls the opening and closing of the valve will have no effect upon the valve and in which the core of the electro-magnet may be accelerated when the electro-magnet is energized, before the core is caused to operate the valve.

This invention is shown as applied to the automatic unloading valve of a fluid compressor, the valve being of the double ball and double ported type, and its operating mechanism being under the control of an electro-magnet utilized in connection with the alternating current motor of the compressor.

A practical embodiment of my invention is represented in the accompanying drawings in which—

Figure 1 is a view in side elevation, partly in section, of my improved valve operating mechanism, the parts being in the position which they assume when the electro-magnet is deenergized. Fig. 2 is a front view partly in section, and Fig. 3 is a detail section of the upper portion of the mechanism showing the parts in the position which they assume when the electro-magnet is energized.

The automatic valve herein shown is one suitable for use in connection with the unloading of a fluid compressor and comprises a valve casing 1 having an upper valve chamber 2, a lower valve chamber 3 and an intermediate chamber 4. A fluid pressure supply pipe 5 leads from a receiver or other source of fluid pressure supply to the valve chamber 2. A pipe 6 leads from the intermediate chamber 4 to the backs of the discharge valves of an air compressor, not shown herein. One or more ports 7 lead from the lower valve chamber 3 to external atmosphere. A port 8 opens communication be-

tween the upper valve chamber 2 and the intermediate chamber 4 and a port 9 opens communication between the lower valve chamber 3 and the intermediate chamber 4. A ball valve 10 is located within the valve chamber 2 and is arranged in position to open and close communication through the port 8 and a ball valve 11 is located in the chamber 3 in position to open and close communication through the port 9. A loosely sliding pin 12 is interposed between the ball valves 10 and 11 for imparting the movement of one valve to the other valve.

The valve operating mechanism comprises the following elements. The lower member 13 of a toggle lever is pivoted at 14 to a lug 15 on a suitable bracket 16 and the upper member 17 of the toggle lever is provided with a follower 18 which is fitted to slide in a hollow sleeve 19 forming a downward extension of the valve casing 1. A plunger 20 is also fitted to slide in the sleeve 19 and a spring 21 is interposed between the follower 18 and the said plunger for yieldingly connecting the follower and plunger. This yielding connection between the follower and plunger permits a slight movement of the follower without affecting the plunger and compensates for any wear in the joint of the toggle lever. The toggle joint between the members 13, 17, of the toggle lever is preferably provided with an antifriction roller 22. A spring-pressed dog 23 is mounted in a lateral lug 24 of the bracket 16 in position to break the joint of the toggle lever when the lever is released.

The electric controlling means for the valve operating mechanism comprises the following. An electro-magnet of the solenoid type is denoted by 25 and is suitably supported on the bracket 16. The core of the solenoid is denoted by 26 and it is provided with a cam block 27 having upper and lower vertical faces 28, 29, and an intermediate inclined face 30 arranged to control the movements of the toggle lever as follows. When the electro-magnet 25 is deenergized, the roller 22 at the joint of the toggle lever will engage the upper vertical face 28 of the cam block 27 at a short distance from the inclined face 30. When the electro-magnet 25 is energized, the core will be permitted to accelerate before the roller 22 begins to ride up on the inclined face 30 of the cam block. The upward movement of the core 26 is sufficient to raise the cam block to a point where

the roller 22 will engage the lower vertical face 29 of the said cam block at a short distance from the end of the inclined face 30, thus holding the toggle lever straightened and permitting a slight movement in the core without affecting the said toggle lever.

As the toggle lever is straightened, it will slide the follower 18 upwardly within the sleeve 19 and thereby cause the plunger 20 through the connecting spring 21, to raise the ball valve 11 into position to close the port 9 and through the connecting pin 12 raise the ball valve 10 away from the port 8.

When this device is used in connection with the unloading system of a fluid compressor, the parts are normally in the position shown in Figs. 1 and 2 of the drawings when the magnet is deenergized; the backs of the discharge valves being open to atmosphere through the pipe 6, chamber 4, port 9, chamber 3 and port 7; and the fluid pressure supply being cut off by the closure of the port 8 by the valve 10. The discharge valves will remain unloaded until the motor for the compressor has reached a predetermined speed when the electro-magnet 25 will be energized. The energization of the electro-magnet 25 will cause the valve 11 to close the port 9 and the valve 10 to open the port 8, thereby throwing the load on to the backs of the discharge valves and closing communication between the backs of the valves and atmosphere.

When the electro-magnet 25 is deenergized, the core and its cam block will descend, thus permitting the spring pressed dog 23 to break the joint of the toggle lever. This will permit the ball valves to drop under the influence of weight and pressure.

It will be seen that the electrically controlled valve operating mechanism as hereinabove described is one in which the variations in the current will not affect the movements of the valve and one in which the valve operating mechanism may be very easily controlled with a minimum loss of energy.

What I claim is:

1. A valve, its operating mechanism including a toggle lever and an electro-magnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve.

2. A valve, its operating mechanism including a plunger, a follower, an interposed compensating spring and a toggle lever connected to the follower, and an electro-magnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve, through the follower, spring and plunger.

3. A valve, its operating mechanism in-

cluding a toggle lever, and an electro-magnet of the solenoid type having its core provided with a cam block so engaged with the toggle lever that the core will be permitted to accelerate when the electro-magnet is energized, before the toggle lever is moved to operate the valve.

4. A valve, its operating mechanism including a toggle lever, and an electro-magnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve, the connection between the cam block and toggle lever being such that the core may reciprocate a limited amount without affecting the toggle lever.

5. A valve, its operating mechanism including a toggle lever, and an electro-magnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve, and a spring-pressed device separate from the toggle lever, for breaking the toggle lever joint when released by the core.

6. A valve, its operating mechanism including a toggle lever, and an electro-magnet of the solenoid type having its core provided with a cam block having an inclined face arranged to engage the toggle lever for controlling its movement and thereby the movement of the valve.

7. A valve, its operating mechanism including a toggle lever, and an electro-magnet of the solenoid type having its core provided with a cam block having vertical faces and an intermediate inclined face arranged to engage the toggle lever for controlling its movements and thereby the movement of the valve, the engagement of one vertical face with the toggle lever permitting an acceleration of the core when the electro-magnet is energized, before the toggle lever is moved and the other vertical face permitting a limited reciprocation of the core without affecting the toggle lever.

8. In combination, a double ball valve, a connecting pin between the balls of the valve and a valve operating mechanism including a plunger engaging one of the balls, a follower, a compensating spring interposed between the plunger and follower, a toggle lever connected to the follower and an electro-magnet of the solenoid type having its core provided with a cam block arranged to control the movement of the toggle lever and thereby the valve.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this thirteenth day of December 1907.

HENRY WALTER ZOOK.

Witnesses:

CHAS. B. BRUNNER,
JOHN BRUNNER.