

J. B. STRUBLE & E. R. COE.
ELECTROMAGNETIC VALVE OPERATING MECHANISM.
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906,331.

Patented Dec. 8, 1908.

Fig.1.

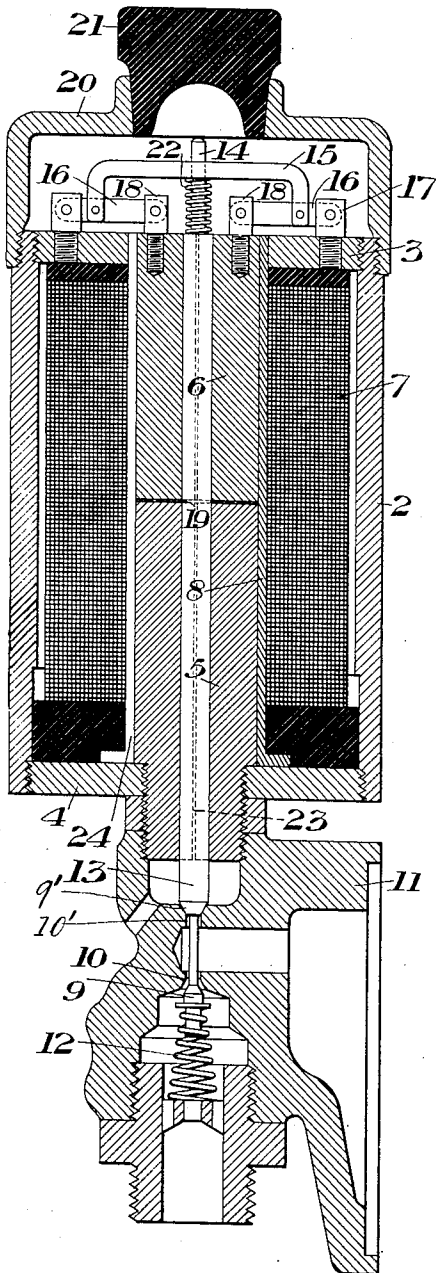
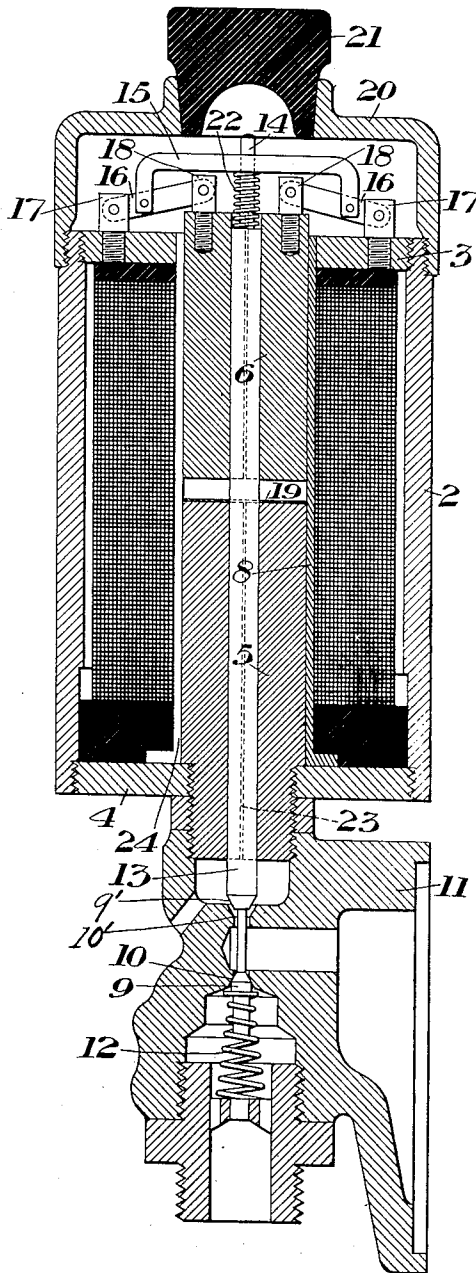


Fig.2.



WITNESSES

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UNITED STATES PATENT OFFICE.

JACOB BAKER STRUBLE AND ELMER R. COE, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS
TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPO-
RATION OF PENNSYLVANIA.

ELECTROMAGNETIC VALVE-OPERATING MECHANISM.

No. 906,331.

Specification of Letters Patent.

Patented Dec. 8, 1908.

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To all whom it may concern:

Be it known that we, JACOB B. STRUBLE and ELMER R. COE, both of Wilkinsburg, Allegheny county, Pennsylvania, have invented a new and useful Electromagnetic Valve-Operating Mechanism, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are longitudinal sections showing one form of our invention, Fig. 1 showing the magnet energized and the inlet valve opened and Fig. 2 showing the magnet deenergized and the inlet valve closed.

Our invention has relation to an improved electromagnetic device for the operation of valves, and has been particularly designed to provide means of this character for the control of electropneumatic signals and switches, but may be used for various other purposes. The invention is designed to provide means of this character more particularly adapted for operation by alternating current, means being provided whereby the movable plunger or core of the magnet may have a stroke considerably greater than that of the stem which operates the valve. This is a desirable feature, for the reason that solenoid magnets operated by alternating current have the characteristic of a longer stroke and a lesser pull than solenoid magnets operated by direct current. By means of our invention, we provide for the operation of the device at a much lower wattage and with very much less heating effect.

Our invention will be best understood by reference to the accompanying drawing, in which we have shown the preferred form of our invention, and which will now be described, it being premised, however, that various changes may be made in the details of construction and arrangement by those skilled in the art without departing from the spirit and scope of our invention as defined by the appended claims.

In these drawings, the numeral 2 designates an inclosing casing which may consist of a section of soft iron pipe into the ends of which are screwed the iron disks 3 and 4, which, with the core 5 screwed or otherwise secured in the disk 4 and the movable plunger 6, complete the magnetic circuit of the device.

7 designates the coil of the magnet which is wound about a tube 8, serving as a form therefor, and which is preferably of brass and which surrounds the core 5 and the plunger 6.

9 and 9' designate two oppositely seating valves which control respectively an inlet port 10 and an exhaust port 10'. It will be understood, however, that we do not limit ourselves to any particular form or arrangement of valves.

12 is the usual spring which acts upon the valves in opposition to the magnet, that is to say, in a direction to seat the valve 9 and to unseat the valve 9'. These valves are both carried on a rod or stem 13 which is extended loosely upward through the core 5 of the magnet and through the plunger 6. The upper end of the stem has a reduced portion 14, which is guided through an aperture in a yoke 15. The ends of this yoke are pivotally connected to the intermediate portions of links 16. One end of each link is pivoted to a screw stud 17, secured in the disk 3, and the other end of the stem is pivoted to a stud 18, secured in the plunger 6. Sufficient looseness is provided at the link pivots to permit of the movement of the core 6.

The plunger 6 is prevented from making iron to iron contact with the core 5 by means of an interposed washer 19, of non-magnetic material.

20 is a cap preferably of brass which is screwed upon the upper end of the casing 2, and which has an opening in its top normally closed by a plug 21 preferably of hard rubber. This cap and plug effectively protect the moving parts of the device from dirt and water.

The operation of the device will be readily understood. When the coil is energized, the plunger 6 will be drawn down into contact with the washer 19, thereby forcing the valve 9 away from its seat against the action of the spring 12, thereby opening the port 10 as shown in Fig. 1. When the coil is deenergized, the valve 9 is closed by the action of the spring 12, and the parts assume the positions shown in Fig. 2.

It will be seen that the valve stem is actuated by the plunger through the medium of the links 16 and the yoke 15, and that these parts may be so arranged as to give

the plunger a stroke several times as great as that of the valve stem. Inasmuch as alternating current magnets have the characteristic of a long stroke with a lesser pull, this renders the device an advantageous one for use with alternating current, since much less wattage is necessary to its operation, and the heating effect is, of course, greatly reduced.

10 The guiding of the upper end of the guide stem in the yoke 15 holds said stem in a vertical position and prevents side friction between the plunger and the surrounding brass cap or tube. A spring 22 is interposed

15 between the upper end of the stem and the under side of the yoke 15. This spring permits movement of the yoke 15 after the valve 9' has become seated, and allows the plunger 6 to come to a seat against the washer 19.

20 This is necessary in order to prevent the vibration of the plunger, which is accomplished by permitting it to rest against the solid stop. Without the spring 22, it would be impracticable to close the exhaust valve

25 at the exact time that the plunger comes to rest against its support. Furthermore, any vibration which occurs in the plunger is by means of this spring prevented from being communicated to the valve seat, thereby

30 avoiding injurious pounding upon and destruction of the latter.

To cheapen the construction, the plunger 6 and core 5 may be made of solid iron instead of laminations. The losses due to eddy

35 currents will be somewhat greater, but at a comparatively low frequency, this loss is not serious and may be reduced by making a radial saw-cut 23 in the core and plunger, as indicated in dotted lines in the drawing.

40 The surrounding brass cap or tube may also

be formed with a slot at 24 for the purpose of preventing induced currents. The air gap between the core and plunger is at the position of maximum magnetic field, being at the center of the winding.

While we have shown and described our improved magnet as arranged for the operation of an air valve, it will be readily understood that it may be used for various other purposes.

We claim:

1. In an electro-magnetic device, a solenoid coil, a plunger actuated by said coil, a member extending through the plunger, links connected to the plunger, a yoke connected to said links, and a spring forming the actuating connection between the member and the yoke; substantially as described.

2. In an electromagnet, a solenoid coil, a plunger actuated by said coil, a member extending through the plunger, links connected to the plunger, and a yoke connected to said links and to said member, substantially as described.

3. In an electromagnet, a solenoid coil, a core therefor, a plunger within the core, a washer of non-magnetic material between the core and plunger, an actuated member extending loosely through the core and plunger, and a motion-reducing connection between the plunger and said member, said connection including a spring, substantially as described.

In testimony whereof, we have hereunto set our hands.

JACOB BAKER STRUBLE.
ELMER R. COE.

Witnesses:

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