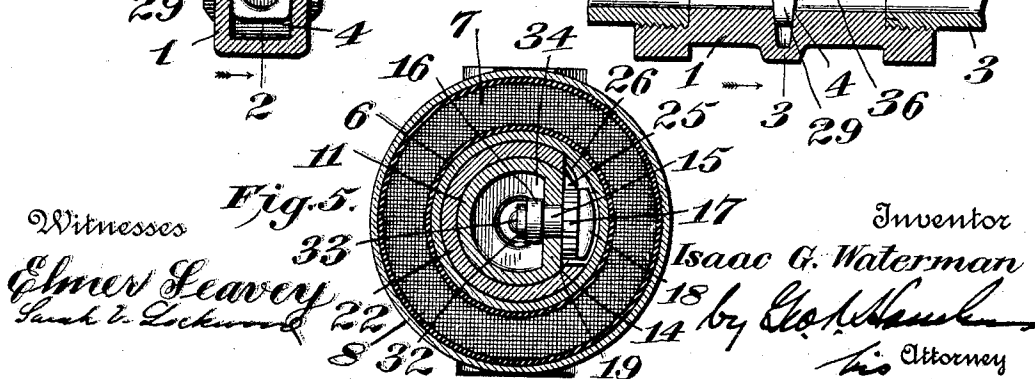
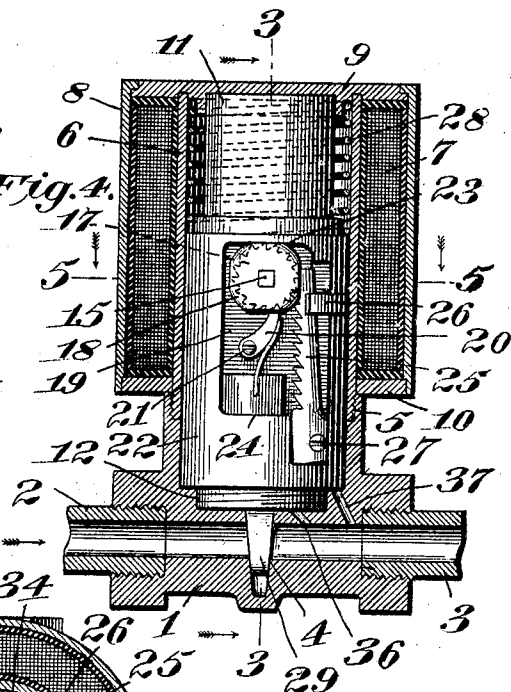
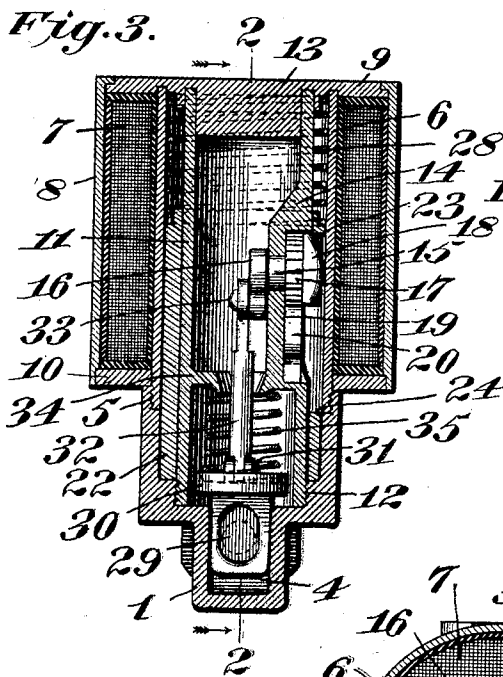
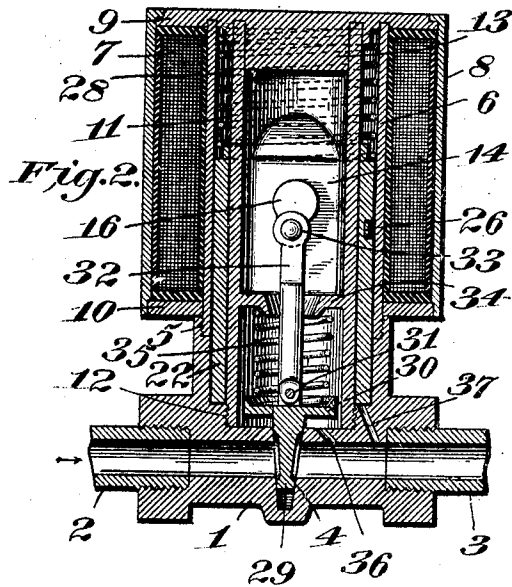
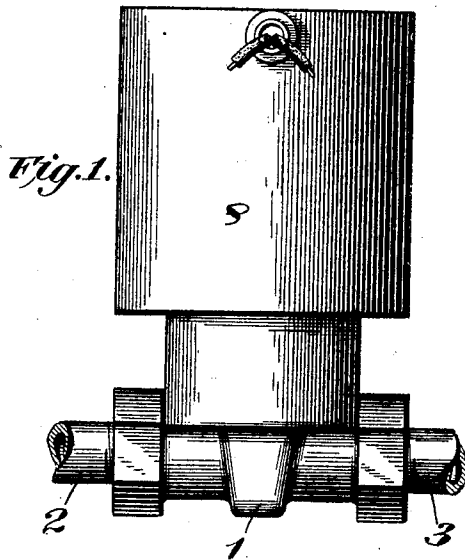


No. 802,959.

PATENTED OCT. 24, 1905.

I. G. WATERMAN.
ELECTROMAGNETIC VALVE.
APPLICATION FILED FEB. 8, 1904.



Witnesses

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ISAAC G. WATERMAN, OF SANTA BARBARA, CALIFORNIA.

ELECTROMAGNETIC VALVE.

No. 802,959.

Specification of Letters Patent.

Patented Oct. 24, 1905.

Application filed February 8, 1904. Serial No. 192,504.

To all whom it may concern:

Be it known that I, ISAAC G. WATERMAN, a citizen of the United States, residing at Santa Barbara, county of Santa Barbara, and State of California, have invented certain new and useful Improvements in Electromagnetic Valves, of which the following is a specification.

My invention relates to electromagnetic valves.

The object of the present invention is to provide an improved and novel gate-valve opened and closed electromagnetically, which will be of compact and simple construction, employ but a single electromagnet, and which will not leak.

Another object of this invention is the provision of an improved sliding gate-valve opened and closed by an armature on alternate energizations of a single electromagnet, improved means being provided for operating the valve and provision being made to supplement the electromagnetic closing action and insure perfect seating of the gate-valve.

In the present invention I employ certain features which are set forth and claimed in a series of applications which I have filed heretofore, and other features are set forth and claimed in an application for an electromagnetic valve, Serial No. 192,503, and in this present application I make no claim to these features *per se*, but only in their novel association with the gate-valve and the operating mechanism thereof.

The invention is set forth fully hereinafter and the novel features thereof distinguished from the elements and construction of my earlier filed applications and the application Serial No. 192,503.

The improvements embodied in the present invention are recited in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation; Fig. 2, a vertical section on line 2 2 of Fig. 3; Fig. 3, a vertical section on line 3 3 of Fig. 4; Fig. 4, a vertical section similar to Fig. 2, but showing certain parts in full lines; and Fig. 5, a section on line 5 5 of Fig. 4.

The valve casing or shell 1 has the entry and exit pipes 2 and 3 connected thereto and is provided with a gate-valve seat 4, extending transversely of the port through the valve-casing and whose sides taper downwardly, as more clearly shown in Figs. 2 and 4, so that the

valve will be wedged in its seat when closed. Surmounting the valve-casing and connected thereto by screw-threads 5 is a tubular shell 6, surrounded by a wire solenoid 7, having a suitable outer casing 8 and heads 9 and 10. Within the tube or shell 6 is a guide tube or shell 11, connected to the valve-casing by screw-threads 12 and at its upper end surrounding a central boss 13 on the head 9. This guide-tube has a solid portion 14, in which is journaled a crank-shaft 15, bearing on its inner end a crank 16 and on its outer end a ratchet-wheel 17 and a square nut 18. The ratchet-wheel lies in a cut-out portion 19 in the solid part 14, and lying in said cut-out portion is a spring-pressed dog 20, engaging with the ratchet-wheel and preventing backward turning thereof, said dog being pivoted to the solid portion 14 at 21. Slidable on the tube 11 is a tubular armature 22, having shoulders 23 and 24, respectively, adapted to engage the sides of the nut 18 at the limits of the play of the armature to adjust or rectify the position of the crank-shaft 15 if the valve has not been properly opened or closed. A pawl 25, pressed by a spring 26, is pivoted to the armature at 27 and provided with teeth adapted to engage the ratchet-wheel 17 when the armature is drawn into the solenoid 7; but said pawl rides idly on the ratchet-wheel on the return of the armature to the position indicated in the drawings, this return movement or projection of the armature being accomplished by a coil-spring 28, interposed between the head 9 and the upper end of the armature.

The numeral 29 represents a gate-valve which has its faces converging or tapered downwardly, so that it will properly fit the seat 4, and it has a circular head 30, to which at 31 is pivoted a valve-stem 32, journaled to the crank 16 at 33. A web or partition 34 extends transversely of the tube 11, and the stem 32 passes through an opening in said web. Interposed between the web 34 and the head 30 is a coil-spring 35, whose expansion assists in seating the valve 29 to wedge it properly in its seat 4, thereby supplementing the closing action of the solenoid and armature and insuring proper closing of the valve. When the valve is opened, this coil-spring is placed under further compression. Ducts 36 and 37 are provided to drain any water from the interior and exterior of the tube 11.

On sending a temporary electrical current

through the solenoid, assuming that the valve is closed, the armature is drawn into the solenoid and the pawl 25 turns the ratchet-wheel 17, which operation turns the crank-shaft one-half of a complete revolution, thereby opening the valve. The shoulder 24 engages the nut 18 and insures readjustment of the crank-shaft to proper position if not properly turned. Immediately the temporary energization of the solenoid ceases the spring 28 snaps the armature back to the position shown in the drawings, the pawl 25 meanwhile riding idly on the ratchet-wheel 17 and the dog 20 preventing backward turning of the ratchet-wheel. The shoulder 23 engages the nut 18, and if the crank-shaft has not been previously properly adjusted said shoulder adjusts the crank-shaft. The valve remains open until another temporary energization is given the solenoid, whereupon the armature is drawn into the solenoid again and the crank-shaft turned another half-revolution, which forces the gate-valve into its seat 4, this closing action being supplemented by the spring 35, which takes up all lost motion and insures a perfect seating of the gate-valve. Immediately the current ceases the armature returns to the position shown in the drawings. Thus alternate electrical energizations of the single solenoid alternately open and close the gate-valve.

In the present application I lay no claim to the general arrangement of the armature and the solenoid, as the general construction thereof is disclosed in my prior applications, Serial Nos. 164,888, 171,215, 172,489, 188,784, 188,785, 188,786, and 188,787; nor do I lay claim in this application to the manner of operating the ratchet-wheel by a pawl on the armature and a dog to prevent backward turning, as this general construction exists in my prior applications, Serial Nos. 164,888, 172,489, 171,215, 188,782, 188,783, 188,784, 188,785, 188,786, and 188,787, and no claim *per se* is laid herein to the means for adjusting the position of the valve-operating member by the use of the shoulders on the armature and the nut on the valve-operating member, as this construction is disclosed in substance in my applications Serial Nos. 188,784, 188,785, 188,786, and 188,787; nor do I lay any claim herein to the broad idea of operating the valve by a crank-shaft, as the same is shown and claimed in my application Serial No. 192,503; but the present invention I consider to reside in the association of these mechanisms with the gate-valve, the supplemental closing-spring, and the operation of the gate-valve by the crank devices and connections, as such association and the operation of a gate-valve in this manner, particularly the operation of a gate-valve by a single electromagnet, is, so far as I am aware, novel.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electromagnetic valve, the combination with a valve-seat, of a valve for said seat, an electromagnet, an armature controlled by said electromagnet, means for alternately opening and closing the valve from the armature upon alternate energizations of the electromagnet, and independent means for supplementing the action of the armature in closing the valve.

2. In an electromagnetic valve, the combination with a valve-seat, of a valve for said seat, an electromagnet, an armature controlled by said electromagnet, means for alternately opening and closing the valve from the armature upon alternate energizations of the electromagnet, and a spring for supplementing the action of the armature in closing the valve.

3. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted to fit said seat, a spring cooperating with the gate-valve to assist in seating said gate-valve, an electromagnet, an armature controlled by said electromagnet, and means for alternately opening and closing the gate-valve from the armature on alternate energizations of the electromagnet.

4. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted to fit said seat, an electromagnet, an armature controlled by the electromagnet, a rotary crank-shaft turned step by step in the same direction by the armature, and a connection between the crank of said shaft and the gate-valve.

5. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted to fit said seat, an electromagnet, an armature controlled by the electromagnet, a rotary crank-shaft turned step by step in the same direction by the armature, a connection between the crank of said shaft and the gate-valve, and a spring for assisting in closing the gate-valve.

6. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted to fit said seat, a solenoid, a sliding armature controlled by the solenoid, a spring for projecting the armature, a rotary crank-shaft, a ratchet-wheel on the crank-shaft, a pawl carried by the armature for turning the ratchet-wheel, said armature being adapted to turn the crank-shaft step by step in the same direction, means for preventing backward rotation of the ratchet-wheel, and a stem pivotally connecting the crank of the crank-shaft with the gate-valve.

7. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted for movement in said seat, an electromagnet, an armature controlled by the electromagnet, an operative connection be-

tween the armature and the gate-valve for alternately opening and closing the gate-valve on alternate electrical energizations of the electromagnet.

5 8. In an electromagnetic valve, the combination with a gate-valve seat, of a sliding gate-valve adapted to move in said seat, a solenoid, an armature slidable in the solenoid, a spring for projecting the armature from the solenoid, and an operative connection between the
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armature and the gate-valve, whereby when the armature is attracted by the solenoid it opens or closes the valve according to its former position.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

ISAAC G. WATERMAN.

Witnesses:

WALLACE R. SEAVEY,

ELMER SEAVEY.