July 14, 1931. L. B. SCHUH ET AL 1,814,608

VALVES AND VALVE CONTROLLED MEANS FOR OPERATING GATES

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Fig. 4.

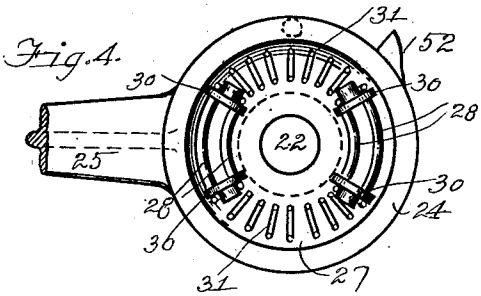
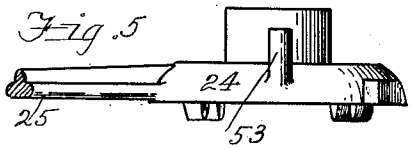


Fig. 5



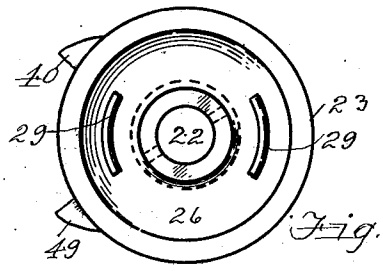


Fig. 6

Fig. 8.

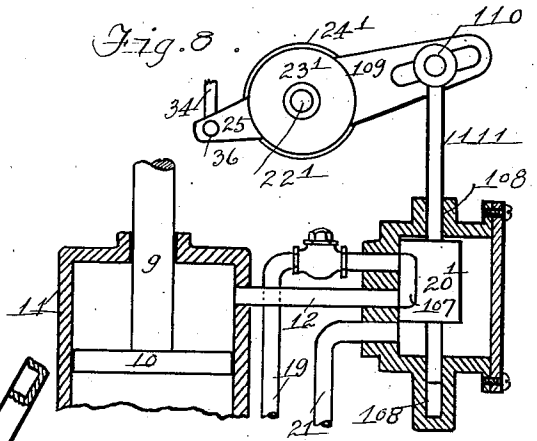
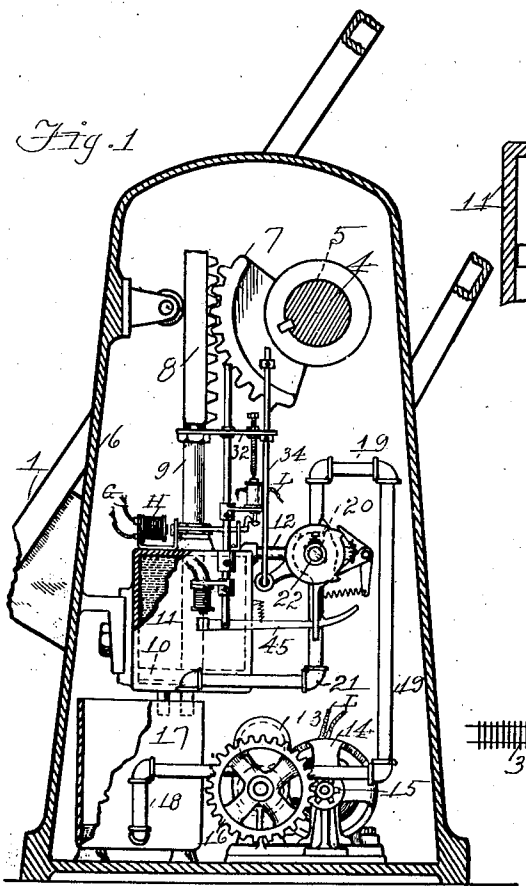


Fig. 1



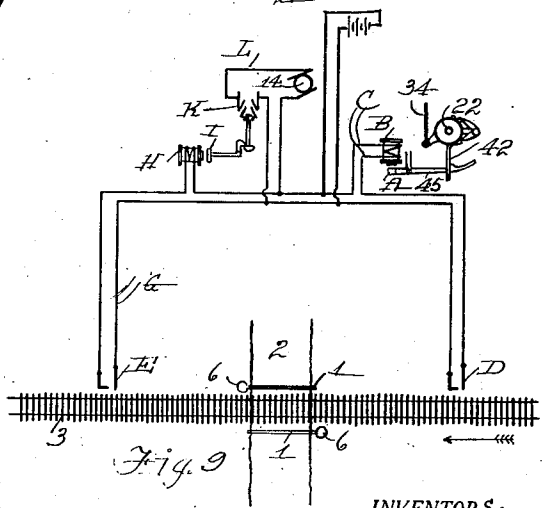


Fig. 9

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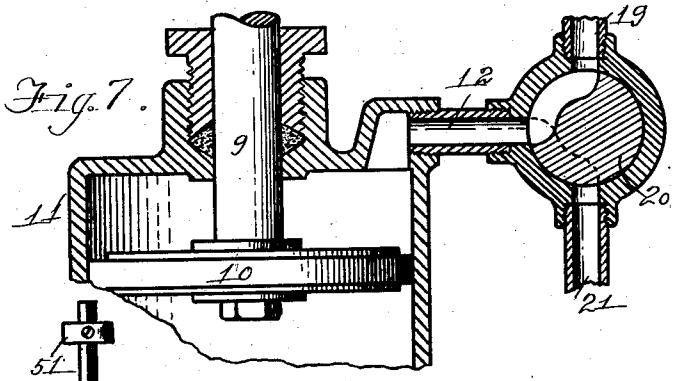
Witness:
G. E. Redding

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VALVE AND VALVE CONTROLLED MEANS FOR OPERATING GATES

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Fig. 7.



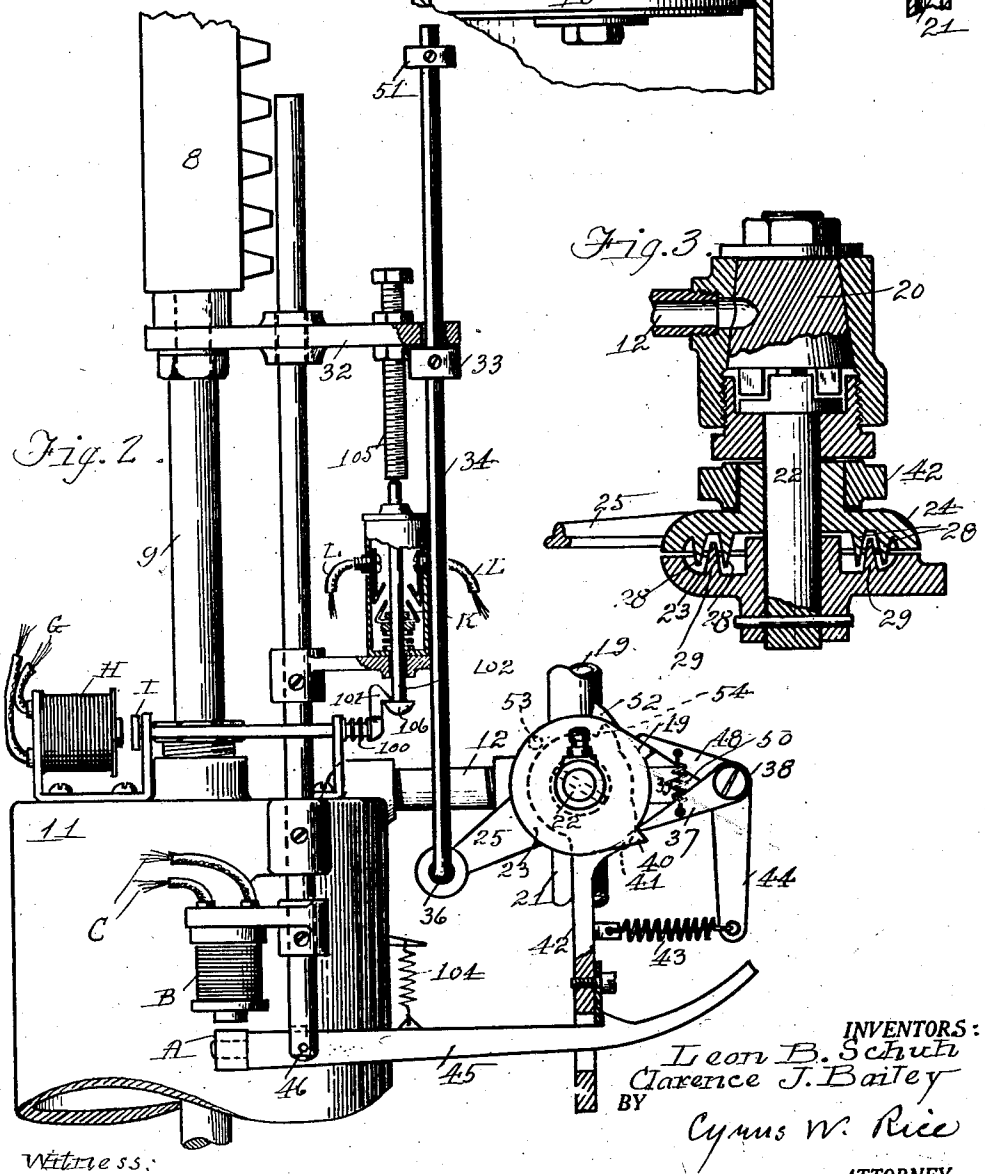


Fig. 3.

Fig. 2.

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Patented July 14, 1931 1,814,608

UNITED STATES PATENT OFFICE

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VALVES AND VALVE-CONTROLLED MEANS FOR OPERATING GATES

Application filed March 10, 1926. Serial No. 93,618.

The present invention relates to valves and valve-controlled means for operating gates; and its object is, generally, to provide an improved valve and valve means for operating railway crossing gates; and to provide such means electrically operated and actuated by the approaching and passing trains; and further, to provide improved means for quickly operating such valves.

These and any other objects hereinafter appearing are attained by, and the invention finds preferable embodiment in, the structure or structures, means and mechanisms, hereinafter particularly described in the body of this specification and illustrated by the accompanying drawings, in which:—

Figure 1 is a sectional view of the hollow supporting column of the gate, taken on a vertical plane perpendicular to the axis of the gate's swinging movement, and showing operating mechanism contained in said column;

Figure 2 is a side elevation of portions of said operating mechanism;

Figure 3 is an axial sectional view of parts of a valve and means for quickly operating the same;

Figure 4 is an inner side view of one of said parts;

Figure 5 is an edgewise view of the same;

Figure 6 is an inner side view of another of said parts;

Figure 7 is an axial sectional view of the upper portion of a cylinder having a piston, and a transaxial sectional view of the valve controlling the same;

Figure 8 is a central longitudinal sectional view of a cylinder having a piston, and of a reciprocating valve structure, showing a portion of its operating mechanism; and

Figure 9 is a diagrammatic representation of electric circuits and instruments therein whereby such mechanisms may be operated.

In the embodiment of this invention chosen for illustration by the accompanying drawings and for detailed description in the body of this specification, a gate is shown to close the highway 2 adjacent the intersection thereof by the railway track 3. Each of the two members 1 of the gate is swingable vertically to its raised (open) position and to its closed (lowered) position, being carried by a rock shaft 4 journalled on a hollow supporting column 6 which contains gate-operating mechanism. The gate's shaft 4 carries a toothed segment 7 with which meshes the toothed rack portion 8 of a piston rod 9 whose piston head 10 is moved downwardly in the cylinder 11 to raise (open) the gate. The piston rod with its rack is thus moved by the pressure of a suitable fluid, as oil, forced into the cylinder on the upper surface of the piston head through a pipe 12 by means of a rotary pump indicated at 13 and operated by an electric motor indicated at 14, the gear 15 of whose shaft meshes with the gear 16 of the pump's shaft. The oil is drawn in such pumping operation from a tank 17 through a pipe 18 leading to the pump and is thence forced into the cylinder 11 through pipes 19 and 12 having a controlling rotary valve 20. When this valve (operated by means hereinafter explained) is turned to the position shown in solid lines in Figure 7, the oil may be pumped into the cylinder; but when the valve is turned to its other position indicated in dotted lines in said view, the oil is permitted to flow out of the cylinder, through the pipes 12 and 21 and back into the tank 17, such flow of the oil being brought about by gravitation which causes the gate to fall from its raised position (as it is in Figure 2) thus lifting the rack and piston head. The rotary valve 20 has means for quickly turning it to either its closed or its open position, such means and the operation thereof being illustrated particularly in Figures 2, 3, 4, 5 and 6. This valve has a rock shaft 22 coupled thereto (as shown in Figure 3) for turning it, said shaft being keyed to a disk 23. Turnably mounted on shaft 22 is a second disk 24 having an arm 25. These disks 23, 24 have circular recesses 26, 27 respectively in their adjacent sides, one disk (24) being provided with two pairs of arcuate parallel ribs 28, the other disk (23) having arcuate ribs 29 adapted to move (in the interrelative turning movements of the two disks) parallelly with and between the ribs 28 of the other disk. A pair of helical springs

31, arcuately disposed axially, are seated in said recesses and carry blocks 30 at their ends abutting, in the neutral position of the disks (illustrated in Figure 4) against the ends of all the ribs 28 and 29; but when these disks are turned in either direction about the shaft 22, these springs are compressed by the movement of the ends of the ribs 29 toward the ends of the ribs 28 at the opposite extremities of the respective springs.

Assuming now that the gate is closed (lowered): If the pump be operated to raise the gate, the arm 32 (see Figure 2) carried by the piston rod 9 will, in said rod's descending movement, strike an adjustable stop 33 on the vertical rod 34 and move said rod down with it. This rod 34, being pivotally connected at 36 to the arm 25 of the disk 24 will turn said disk about the shaft 22. The detent 37, pivotally mounted at 38 on a stationary part 39 of the structure, engaging the ratchet tooth 40 of disk 23, holds this disk from turning with the turning movement of disk 24, so that the springs 31 are compressed by the downward movement of the rod 34. This compression continues and increases until the detent 37 is released from said tooth. This detent is thus released by the cam 41 of an arm 42, swingable on the shaft 22, said cam raising the extremity of said detent from the tooth 40 by the turning movement of said arm, under the action of a spring 43, toward the stationary leg 44 of the structure, such turning movement of arm 42 occurring instantly it is released from its held engagement by the catch lever 45 fulcrumed at 46. This catch lever has an armature A attracted against the pressure of a spring 104, to release the catch lever, by an electric magnet B energized through the electric circuit C by means hereinafter explained. When the released arm 42 is pressed by spring 43 toward the right hand side of Figure 2, said arm's cam 41 having released the detent 37, the disk 23 is pressed rotatably by the springs 31 to a position in which it is held against reverse movement by a second detent 48 engaging said disk's second ratchet tooth 49 and being pivotally mounted at 38 and spring-pressed at 50 toward the detent 37. The valve 20 being thus suddenly turned to open position, the oil is pumped into the cylinder 11 on the upper surface of the piston head to raise the gate to its open position. The springs 31 are again compressed so that the valve 20 may suddenly turn to its other position to permit the oil to flow out of the cylinder (the pump's operation being stopped), by the rising movement of the piston rod 9, in the lowering of the gate, the arm 32 in such movement striking the adjustable stop 51 on the rod 34 and thus swinging the arm 25 upwardly to compress the springs 31. In this movement, the disk 23 is held by its tooth 49 and the detent 48 from turning with the disk 24, until the cam 52 of this disk raises the extremity of detent 48 from tooth 49, so that the springs 31 may expand and suddenly turn the valve to the position in which the weight of the descending gate forces the oil out of the cylinder. In this movement of disk 24, its lug 53 strikes the lug 54 of the arm 42 and swings said arm, against the pressure of its spring 43, into its held engagement with the catch lever 45 as shown in Figure 2.

The motor 14 is operated and stopped and the mechanisms of this organization are actuated and operated through electric circuits and instruments therein controlled by trains approaching and passing the highway 2.

In the diagrammatic representation in Figure 9, electric circuits are closed and opened by trains moving on the track 3. The circuit closers and openers, or "switches," in these circuits, operated by the trains, are located such a distance from the gate that the opening and closing of the gate may be properly timed, and these switches are positioned at the side of the railway track 3 and at such distance therefrom that they may be operated by a projecting part of a passing locomotive.

Referring now to Figure 9: A train moving in the direction of the arrow, first meets and momentarily closes switch D thereby closing circuit C and energizing its magnet B which now attracts the armature A, releases the arm 42 and permits the springs 31 to expand and suddenly turn the valve 20 to the position wherein the oil in cylinder 11 is forced therefrom by the falling movement of the gate. The gate being thus closed for the passing train, is opened by the train meeting and momentarily closing the switch E in electric circuit G containing an electric magnet H which, being thus energized, attracts the armature I against the pressure of a spring 100, and thus releases the catch 101, carried by this slidably mounted armature, from the slidable member 102 of the electric switch K and closes said switch and the electric circuit L containing the motor 14, so that this motor, now operating, pumps oil into the cylinder 11 to raise the gate to its open position.

When the gate is raised, the descending movement of the piston rod 9 causes the adjustment screw 105 carried thereby to contact the upper end of switch member 102 and pushes the same downward and into held engagement by its catch 106 with the catch 101, thus opening switch K and stopping the motor.

The valve which controls the admission of oil to the cylinder 11 to raise the gate to open position may be of the rotary form hereinbefore described; or it may be a valve of other forms, such as the reciprocating valve 20^1 illustrated in Figure 8. This valve when raised to the position seen in said view, ad-

mits oil from the pump 13 through the pipe 19 into the valve's passage 107 and thence through pipe 12 into the cylinder 11 and on the upper surface of the piston head 10 to raise the gate. When however this valve is lowered, the falling movement of the gate forces the oil reversely through the pipe 12, passage 107 and thence through the pipe 21 and into the tank 17. This valve is suddenly slid in bearings 108 in its casing to one or the other of its said positions by mechanism similar to that employed and hereinbefore described for suddenly turning the rotary valve 20, viz.: The rod 34 is moved by the arm 32 of piston rod 9, so that the disk 24^1 is turned by said rod, pivotally connected at 36 to the arm 25 of said disk, to compress the springs 31 held in recesses in said disk and in disk 23^1 having an arm 109 turnably connected at 110 to the stem 111 of the valve 20^1. These disks 23^1 and 24^1 turning interrelatively about an axis 22^1 are held to compress the springs 31 contained in their recesses and are released to allow said springs to expand, by means identical with those employed for the same purpose in the construction hereinbefore explained and illustrated in Figures 2, 3, 4, 5 and 6, including the swingable arm 42, magnet B and the catch lever 45 for engaging and releasing said arm 42.

Our Patent No. 1,602,949 dated October 12, 1926, discloses certain features set forth and claimed in this application.

The invention being intended to be pointed out in the claims, is not to be limited to or by details of construction of any particular embodiment thereof illustrated by the drawings or hereinbefore described.

We claim:

1. In combination with a valve; quick-operating mechanism therefor which comprises a pair of disks carrying the opposite ends respectively of a spring and having an interrelatively turning movement in either direction to adjust the spring and a contrary movement under the pressure of the spring to move the valve in either direction, the disks having means for holding them in spring-adjusting relation; a swingably-mounted arm having a cam adapted to release said means in the swinging of the arm in one direction, the arm having also a projection engaged by a lug carried by one of the disks for swinging the arm in the opposite direction by the movement of said disk to spring-adjusting position; means for swinging the arm in the first-mentioned direction; means for releasably holding the arm against the operation of the last-mentioned means.

2. In combination with a valve; quick-operating mechanism therefor which comprises a pair of disks carrying the opposite ends respectively of a spring and having an interrelatively turning movement in either direction to adjust the spring and a contrary movement under the pressure of the spring to move the valve in either direction, the disks having means for holding them in spring-adjusting relation; a swingably mounted arm having a cam adapted to release said means in the swinging of the arm in one direction, the arm having also a projection engaged by a lug carried by one of the disks for swinging the arm in the opposite direction by the movement of said disk to spring-adjusting position; means for swinging the arm in the first-mentioned direction; electrically-controlled means for releasably holding the arm against the operation of the last-mentioned means.

3. In combination with a reciprocating valve, quick-operating mechanism therefor, comprising: a pair of disks carrying the opposite ends respectively of a spring and having an interrelatively turning movement in either direction to adjust the spring and a contrary movement under the pressure of the spring to move the valve in either direction, the disks having means for holding them in spring adjusting relation and one of the disks having an arm connected to the valve's stem for moving the valve; a swingably mounted arm having a cam adapted to release said means, in the swinging of the arm in one direction, the arm having also a projection engaged by a lug carried by one of the disks for swinging the arm in the opposite direction by the movement of said disk to spring-adjusting position; means for swinging the arm in the first-mentioned direction; means for releasably holding the arm against the operation of the last-mentioned means.

4. In combination with a movable element: quick-operating mechanism therefor which comprises a pair of disks carrying the opposite ends respectively of a spring and having an interrelatively turning movement in either direction to adjust the spring and a contrary movement under the pressure of the spring to move said element in either direction, the disks having releasable means for holding them in spring adjusting position; a movable member having means adapted to release the first-mentioned means in said member's movement in one direction, said member being movable in the opposite direction by the movement of one of the disks to its spring-adjusting position; means for moving said member in its first-mentioned direction; means for releasably holding said member against the operation of the last-mentioned means.

5. In combination with a movable element: quick-operating mechanism therefor which comprises a pair of disks disposed side by side on a connecting pivot and having in their adjacent sides registering recesses extending circularly about said pivot; a coiled spring seated in the recesses, the disks carrying the opposite ends respectively of

the spring and having an inter-relatively turning movement about the pivot in either direction to adjust the spring and a contrary movement under the pressure of the spring to move said element in either direction, the disks having releasable means for holding them in spring-adjusting position; a movable member having means adapted to release the first-mentioned means in said member's movement in one direction, said member being movable in the opposite direction by the movement of one of the disks to its spring-adjusting position; means for moving said member in its first-mentioned direction; means for releasably holding said member against the operation of the last-mentioned means.

In testimony whereof we have hereunto set our hands at Minneapolis, Minnesota, this 18th day of January, 1926.

LEON B. SCHUH.
CLARENCE J. BAILEY.