June 2, 1936. L. W. EGGLESTON 2,043,194

VALVE

Filed June 9, 1933

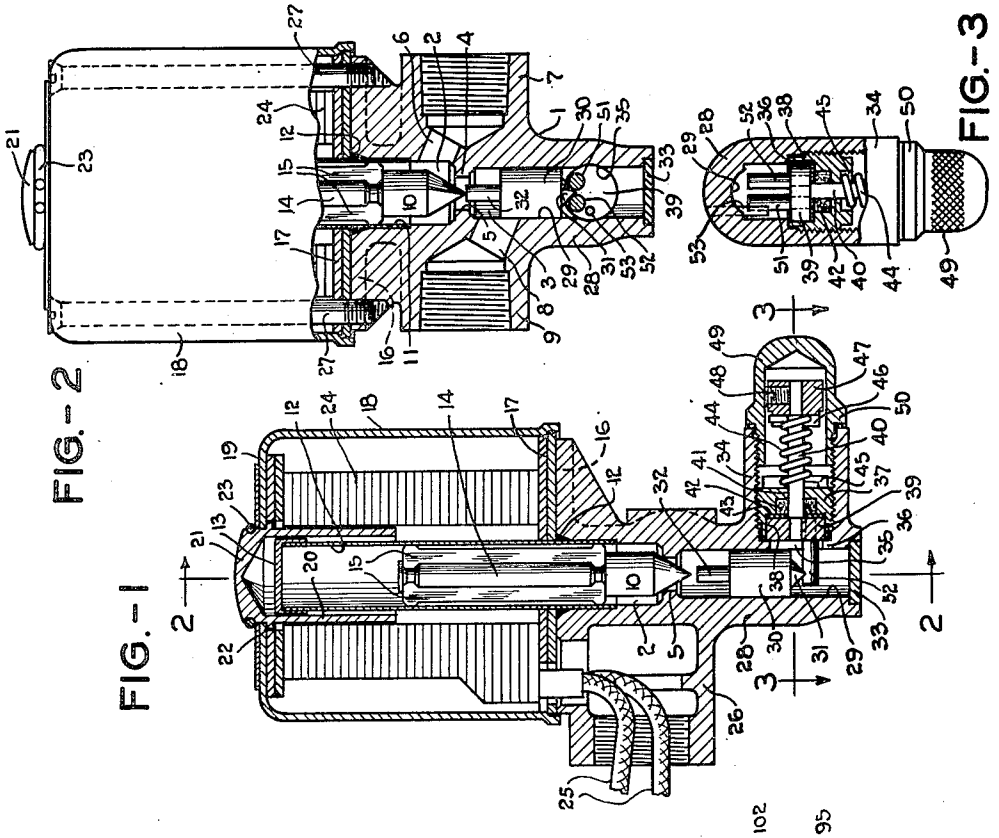


FIG.-2

FIG.-3

FIG.-1

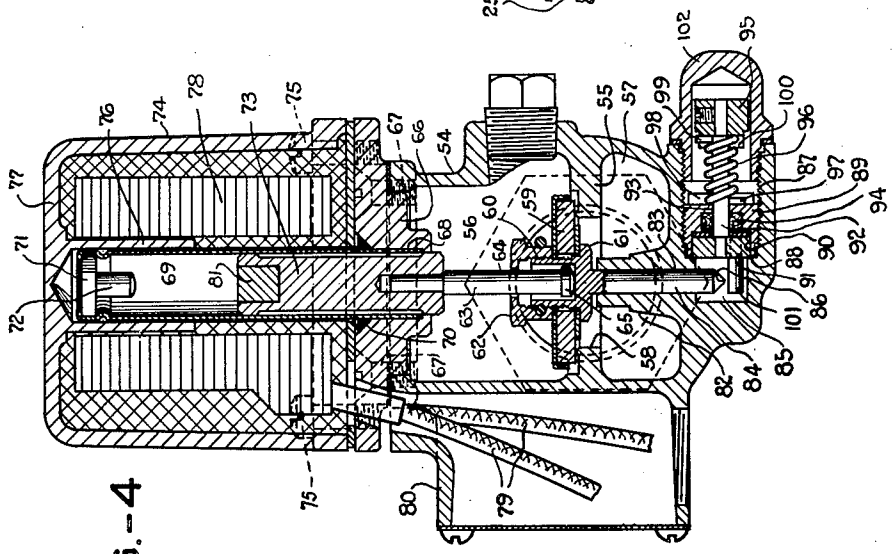


FIG.-4

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VALVE

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Application June 9, 1933, Serial No. 675,048

14 Claims. (Cl. 137—139)

My invention relates to new and useful improvements in valves, and more particularly to an automatically actuated valve having electrically energized means for operating the same. In valves of this type it is desirable to have some provision for opening the valve in case of failure of the automatic means or electric current. It is therefore one object of my invention to provide an automatically operated valve having means by which the valve may be moved to and held in open position.

Another object is to provide manual operation of the valve opening means.

Another object is to provide means for moving the manual means to inactive position upon resumption of automatic valve operation.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated two embodiments of my invention, in which drawing—

Figure 1 is a view in vertical central section of the automatic valve and manual operating means therefor embodying my invention;

Fig. 2 is a view partly in section on the line 2—2 of Figure 1, but showing the valve moved to open position by the manual means;

Fig. 3 is a detail view partly in section on the line 3—3 of Figure 1, and

Fig. 4 is a view in section similar to that of Figure 1, but showing the manual means applied to a different form of valve.

Referring to the drawing by characters of reference, 1 designates a valve casing or body having a passageway therethrough, comprising an inlet chamber 2 and an outlet chamber 3 separated by a substantially horizontal partition 4 through which there is a vertically extending valve port 5. The chamber 2 is provided with an inlet passage 6 which opens through an inlet sleeve or boss 7, preferably internally threaded for connection to a conduit, or the like. The outlet chamber 3 opens into an outlet passage 8 which opens through a sleeve member or boss 9, also preferably internally threaded for connection to a conduit, or the like. Within the chamber 2 there is a valve member 10 having a conical or tapered valve face controlling flow through the port 5 and adapted to seat on the partition 4 to close the port. The chamber 2 is preferably substantially cylindrical and opens upwardly through the top wall of the casing. The upper end of the chamber 2 is of slightly enlarged internal diameter to receive the lower end of a tubular guide member 11 which extends upwardly from the top wall of the casing. The tubular member 11 is secured and sealed in the casing by solder, or the like, as at 12, and is closed at its upper end by a cap member 13. Within the bore of the member 11 and longitudinally reciprocable therein there is an armature or core member 14 rigid with the valve member 10 which extends downward from the lower end thereof. The member 14 has flat side portions 15 extending longitudinally thereof to permit the free flow of fluid from and to the bore of member 11 above the armature 14 so as to avoid any dash-pot action or movement of the armature. The upper end of the casing is provided with a substantially horizontal supporting flange 16 which surrounds the tubular member 11. Supported on the flange 16 there is a circular, centrally apertured plate 17 through which the tubular member 11 projects and which serves to close the bottom end of a substantially cylindrical housing or cover member 18 having a top wall 19. Extending downward from the top wall 19 and into the housing 18 there is a sleeve 20 which surrounds the upper end portion of the tubular member 11 and which is closed at its upper end by a wall 21. The sleeve 20 extends upward through an aperture in the end wall 19 and has a rib or flange 22 abutting the under or inner face of the wall 19. The sleeve 20 is secured to the housing 18 by a resilient ring member 23 seating in a circumferential groove in the sleeve 20 and bearing against the top or outer face of the end wall 19. Within the housing 18 and surrounding the sleeve 20 and the tubular member 11 there is a solenoid coil 24 which rests on the plate member 17 and is provided with lead wires 25 connected to the terminals of the coil. The wires 25 extend downward through apertures in the plate member 17 into an outlet boss or fitting 26 carried by the casing 1 and preferably formed integral therewith. The housing 18 and coil 24 are secured to the casing 1 by screws 27 extending through the top wall 19 and the plate member 17 and screw-threaded into internally threaded apertures in the flange 16.

On the underside of the casing 1 there is an elongated hollow extension 28 having a substantially cylindrical bore 29 aligned with the port 5 and opening at its upper end into the chamber 3, which is also preferably cylindrical and of substantially the same diameter as the bore 29. The bore 29 serves as a guideway for a thrust member

or plunger 30 longitudinally reciprocable in the bore 29. The bottom end or underside of the member 30 is provided with a conical or downward tapered portion 31 forming a cam surface for cooperation with cam means to be described. The upper end of the member 30 terminates in a pin or post 32 of less cross-sectional area than the port 5 so as not to obstruct flow therethrough, and which is engageable with the pointed end of the conical valve face to lift the valve from its seat. The bottom end of the bore 29 is closed and sealed by a plug member 33. Projecting laterally from the extension 28 there is a hollow boss or sleeve member 34 which serves as a housing for a manual valve operating means. The bore of the member 34 opens into the bore 29 through an aperture 35 providing an annular outward facing shoulder 36. Within the sleeve member 34 there is a transverse partition 37 preferably in the form of a plug member screw-threaded into the bore of member 34 and having the marginal portion of its inner end face abutting the shoulder 36. Also in the inner end of the member 37 there is a substantially cylindrical recess 38 in which a supporting or head member 39 is fitted for free rotary movement. The diameter of the recess 38 is slightly larger than the aperture 35 so that the marginal edge portion of the inner end face of the member 39 abuts the shoulder 36 to prevent inward movement of the member 39. The member 39 is rigidly fixed on one end of an operating shaft 40 which extends through a bearing aperture 41 in the member 37 and which projects out of the sleeve member 34. Within the member 37 and concentric with but of less diameter than the recess 38 there is a packing material receiving recess 42 containing packing material to prevent leakage around the shaft 40. The packing material is held in position by a washer 43 which surrounds the shaft 40 and seats on the annular shoulder forming the end wall of the recess 38. Surrounding the shaft 40 there is a helical coil spring 44 having one end extending into a slot 45 formed in the outer end face of the member 37 so that this end of the spring is held against movement. The other end of the spring is secured to the shaft 40 and extends into a slot 46 formed in the inner face of a knob or hand grip member 47 rigidly fixed on the projecting end of the shaft by a set screw 48. The spring 44 also serves to urge the shaft 40 endwise to hold the head member 39 against the end wall of its recess 38 and thereby hold the packing 42 in position. The knob 47 is enclosed by a removable cap member 49 screw-threaded into the bore of the sleeve member 34 and preferably provided with an annular shoulder 50 to receive a packing washer for engagement with the end face of the sleeve member 34 to further seal the casing. Secured in the rotary supporting member 39 and projecting therefrom through the aperture 35 into the bore 29 there are laterally and circumferentially spaced pins 51, 52 which are substantially parallel and closely adjacent to each other and which serve as cam means for cooperation with the conical thrust member surface 31. The pins 51, 52 when in normal active position, as in Figs. 1 and 3, are substantially horizontal and serve to support the thrust member 30 with the conical portion 31 positioned between the pins and resting substantially equally on each of the same. A stop member 53, preferably a pin secured in the wall of the extension 28 and projecting into the bore 29, is engaged by the pin 51 to limit movement of the pins 51, 52 beyond their normally inactive position under the force of the spring 44.

The operation of the valve above-described is as follows: Energization of the coil 24 by closing of the circuit through the lead wires 25 will cause the coil to attract the armature 14, lifting the same upwardly within the tubular member 11. Upward movement of the armature 14 will carry with it the valve member 10, raising the same from its seat and permitting flow through the passageway in the valve casing. Breaking of the coil circuit will permit the armature 14 to move downward under the force of gravity, seating the valve member 10 and closing the port 5. Should the valve fail to move automatically to open position, it may be manually opened as follows: The cap 49 is removed and the shaft 40 is manually rotated in a counter-clockwise direction by means of the knob 47. Rotation of the shaft 40 will wind up the spring 44, placing it under tension and will simultaneously rotate the pins 51, 52 respectively from the position of Fig. 1 toward the position of Fig. 2. As the pins move upward, the pin 52 will bear against the conical portion 31 to lift the thrust member and bring the thrust pin 32 into engagement with the valve member 10. Continued movement of the shaft 40 and pin 52 will now act through the thrust member to lift the valve member 10 from its seat. As the pin 52 starts to move substantially horizontally, the cylindrical surface of the pin 52 acting against the conical portion 31 will exert a cam action, lifting the valve member 10 still further until the pin 52 passes beyond the pointed end of the portion 31. The thrust member 30 will now drop slightly, coming to rest with the portion 31 between the pins 51 and 52, as in Fig. 2. It may be noted that the stop pin 53 due to its engagement by pin 52 serves to limit further rotation of shaft 40 and movement of cam pin 51 beyond the pointed end of conical surface 31. The valve member will now be held in open position by the thrust member 30 which seats on the elevated pins 51, 52. The shaft 40 and pins 51, 52 are held against return movement under the force of the spring 44 by engagement of pin 52 with the cam surface 31, the weight of the armature 14 and the valve and thrust members being sufficient to prevent upward movement of the valve member by pin 52. The position in which the valve is held by the manually operated means, as shown in Fig. 2, is not the full open position to which the valve is moved by the automatic means. If the coil 24 is now energized, the valve member 10 will be lifted further to full open position, decreasing the force opposing movement of the shaft 40 by the spring 44. This will release the manual means for return to the inactive position of Fig. 1 under the force of spring 44. As the valve member 10 is lifted automatically, the weight of the thrust member 30 alone will be insufficient to oppose the spring 34 so that it will be cammed upward slightly by engagement between the cylindrical surface of the pin 52 and the conical portion 31. As the member 30 is raised, the pin 52 will pass beneath the portion 31 and the supporting member 39 with its pins 51, 52 will be returned by the spring 34 to inactive position. As the pins 51, 52 are moved by spring force to inactive position, the thrust member 30 will move downward under force of gravity to again seat on the pins 51, 52, as in Fig. 1.

The form shown in Fig. 4 comprises a valve

casing 54 containing a substantially horizontal partition 55 which divides the casing internally into an inlet chamber 56 and an outlet chamber 57. Through the partition 55 there is a valve port 58 connecting the chambers and controlled by a valve member 59, preferably of the disc type, adapted to seat on the partition to close the port. Extending upward through an aperture in the valve disc there is a hollow screw member 60 providing a chamber and having an annular flange 61 engaging the underface of the valve disc. A cap nut 62 is screw-threaded on the upper projecting end of the screw 60 and engages the top face of the valve disc so that the valve disc is tightly clamped between the nut 62 and flange 61. The valve member is provided with an operating stem 63 which extends into the hollow screw through an aperture 64 in the end wall of the nut 62, the valve member being tiltable and rotatable on the stem so that it is universally supported. The stem 63 is provided with a head 65 positioned in the chamber in the screw 60 and engageable with the end wall of the nut 62 such that the valve stem can move upward relative to the valve member for a considerable distance before the head 65 engages the nut 62 and picks up the valve member 59. The valve casing is provided with a bonnet 66 secured to the casing by screws 67 and has an aperture 68 therethrough aligned with the port 58. A tubular member 69 is secured at its lower end in the aperture 68 by solder, or the like, as at 70. The upper end of the tubular member 69 is closed and sealed by a plug member 71 having a depending stop or abutment member 72 positioned in the bore of the member 69. Secured on the upper end of the stem 63 there is an armature and core member 73 of magnetic material and vertically reciprocable within the bore of the tubular member 69, which serves as a guide means for the armature. A housing 74 encloses the tubular member 69 and seats on the bonnet 66 to which it is secured by screws 75. The housing 74 has an internal sleeve 76 depending from the top or end wall 77 thereof and which receives the upper end portion of the tubular member 69. Within the housing 74 and surrounding the sleeve 76 and tubular member 69 there is a solenoid coil 78 having lead wires 79 which extend into an outlet box 80 carried by the casing 54. Positioned in a recess in the upper end of the armature 73 there is an insert 81 of resilient material cooperable with the abutment 72 to cushion and limit upward movement of the armature 73.

Within the outlet chamber 57 there is a vertically extending boss or guide member 82 having a vertical guideway or bore 83 which receives a vertically reciprocable plunger or thrust member 84 carried by the valve member 59 and depending from the screw 60. The member 84 also serves as a guide means to maintain the valve member concentric with its seat. The bore 83 opens at its lower end into the inner end of a substantially cylindrical hollow chamber 85 in the bottom wall of the casing 54. The thrust member 84 extends downward into the chamber 85 and terminates at its lower end in a conical, downward tapered, end portion 86 which serves as a cam surface. The chamber 85 opens at one end through the side wall of the casing and has a portion of enlarged internal diameter which is internally screw-threaded, as at 87, and which terminates at its inner end in an outward facing shoulder 88. Threaded into the enlarged chamber portion there is a plug member 89 which serves as a partition to close and seal the portion of the chamber 85 which communicates with the bore 83. In the inner end of the member 89 there is a cylindrical recess 90 in which a supporting member 91 is fitted for rotation. The member 91 is fixed on one end of a shaft 92 which extends through and is journaled in an aperture 93 in the plug member 89. Within the member 89 there is a packing material receiving recess surrounding the shaft 92 and containing packing material 94 to seal the aperture 93 around the shaft. The shaft 92 projects out of the chamber 85 and has an operating knob 95 rigidly secured on its free outer end. The shaft 92 is surrounded by a helical coil spring 96 positioned between the member 89 and the knob 95. One end 97 of the spring extends into a slot 98 extending transversely across the outer end face of the member 89 such that the spring end 97 by engagement with the side wall of the slot is held against rotary movement. The other end 99 of the spring extends into a similar slot 100 formed in the inner face of the knob 95 and extending transversely thereacross so that the side wall of the slot 100 bears against the spring end 99 to place the spring under tension upon rotation of the shaft. Projecting from the inner end face of the supporting member 91 are laterally and circumferentially spaced pins 101 which are closely adjacent and substantially parallel to each other and which serve as a cam means for cooperation with the conical cam surface 86, and which are substantially similar to the pins 51 and 52 above-described. The chamber 85 is preferably closed by a cap member 102 which is screw-threaded into the chamber bore and encloses the outer end of the shaft and the knob 95. A stop member, not shown in Fig. 4, but identical with the stop member 53 of Fig. 3, is provided to cooperate with the cam pins 101 in the same manner as pins 51, 52 cooperate with member 53.

The operation of the manual valve operating means shown in Fig. 4 will, it is believed, be obvious from the foregoing description of the operation of the manual means disclosed in Figs. 1 to 3. The automatic operation of the valve of Fig. 4 differs from that of Fig. 1, and is as follows: When the coil 78 is energized, the armature 73 will move upwardly without imparting movement to the valve member 59 due to lost-motion between the valve member and the stem. However, when the armature has moved upwardly through substantially half its stroke, the stem head 65 will engage the nut 62 so that continued movement of the armature will carry the valve with it toward open position. The free travel of the armature results in a quick opening of the valve member when the lost-motion has been taken up, and further, due to the impact of the head 65 against the nut 62 overcomes any tendency of the valve member to stick to its seat. The opening movement of the valve member is limited by the stop 72, and the impact of the armature 73 thereagainst is cushioned by the resilient member 81. When the coil 78 is deenergized, the valve member 59 will seat by gravity to close the port 58. Due to the lost-motion connection, the armature 73 will continue to fall by gravity after the valve member is seated until the stem head 65 strikes the bottom of the recess in the hollow screw 60, which will impart a

hammer-like blow to the valve member insuring tight seating thereof to prevent leakage through the port 58.

What I claim and desire to secure by Letters Patent of the United States is:

1. A valve of the character described, comprising a casing having a passageway therethrough, a valve member in said casing and controlling flow through said passageway, said valve member having a stem, automatic means cooperable with said stem to move said valve member toward open position, a shaft journalled in and projecting through a wall of said casing, a rotatable member secured on said shaft within said casing and having an inactive position and being operable on rotation to move said valve member toward open position, and means operable to return said rotatable member to inactive position, said last-named means acting to return said rotatable member upon movement of said valve member by said automatic means.

2. A valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member having a stem and positioned in said casing and cooperable with said port to control flow through said passageway, said casing having a guideway opening into said passageway on the opposite side of said port from said valve member, a thrust member reciprocable in said guideway and cooperable with said valve member, electrically operated means cooperable with said stem to move said valve member toward open position, a manually operable rotatable member having an inactive position and operable on rotation to actuate said thrust member to move said valve member toward open position, and means operable to return said rotatable member to inactive position, said last-named means acting to return said rotatable member upon movement of said valve member by said electrically operated means.

3. A valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member in said casing and cooperable with said port to control flow through said passageway, said valve member having a stem, automatic means cooperable with said stem to move said valve member toward open position, a rotatable member journalled within said casing on the opposite side of said port from said valve member and having an inactive position and being operable independent of said stem and on rotation to move said valve member toward open position, manual means projecting through a wall of said casing and operable to rotate said rotatable member, and means operable to return said rotatable member to inactive position, said last-named means acting to return said rotatable member upon movement of said valve member by said automatic means.

4. A valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member in said casing and cooperable with said port to control flow through said passageway, said casing having a guideway opening into said passageway on the opposite side of said port from said valve member, a thrust member reciprocable in said guideway and cooperable with said valve member, automatic means operable to move said valve member toward open position, a rotatable member having an inactive position and operable on rotation to actuate said valve member to move said valve member toward open position, a manually operable shaft for turning said rotatable member and journalled through a wall of said casing, and a coil spring concentric with said shaft and acting thereon to return said rotatable member to inactive position, said spring acting to return said rotatable member upon movement of said valve member by said automatic means.

5. A valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member in said casing and having a valve face cooperable with said port to control flow through said passageway, a stem extending from said valve member, automatic means cooperable with said stem to move said valve member toward open position, rotatable cam means having an inactive position and cooperable with said valve face to move said valve member toward and hold said valve member in open position, means to rotate said cam means, and a coil spring tensioned upon rotation of said cam means and operable to return said cam means to inactive position, said coil spring acting to return said cam means upon movement of said valve member by said automatic means.

6. A valve of the character described, comprising a casing having a passageway therethrough, a valve member in said casing and controlling flow through said passageway, automatic means operable to move said valve member toward open position, a thrust member operable to move said valve member toward open position, a rotatable shaft, normally inactive cam means carried by said shaft and operable on said thrust member upon rotation of said shaft, and a spring having one end fixed and having its other end acting on said shaft, said thrust member having means cooperating with said cam means to hold said shaft against rotation by said spring upon opening movement of said valve member by said cam means, said spring acting to move said cam means to inactive position upon movement of said valve member by said automatic means.

7. A valve of the character described, comprising a casing having a passageway therethrough, a valve member in said casing and controlling flow through said passageway, a stem on said valve member, electrically energized means cooperable with said stem to move said valve member toward open position, a thrust member operable to move said valve member toward open position, a rotatable shaft, normally inactive cam means carried by said shaft and operable on said thrust member upon rotation of said shaft, and a helical spring having one end fixed and having its other end acting on said shaft, said spring surrounding said shaft, said thrust member having means cooperating with said cam means to hold said shaft against rotation by said spring upon movement of said valve member by said cam means, said spring acting to move said cam means to inactive position upon movement of said valve member by said electrically energized means.

8. A valve of the character described, comprising a casing having an inlet and an outlet and containing a valve port, a valve member in said casing cooperable with said port, said casing having a guideway registering with said port and positioned on the opposite side of said port from said valve member, said casing having a chamber communicating with said guideway, a thrust member reciprocable in said guideway and projecting into said chamber, said thrust member cooperating with said valve member to move the same to open position, said chamber having a side opening, a shaft journalled in said opening,

cam means on said shaft and positioned in said chamber, said cam means coacting with said thrust member to move said valve member to open position, a helical coil spring surrounding and acting on said shaft to urge said cam means to inactive position, and automatic means for moving said valve means to open position and acting after operation of said valve means by said cam means to release said cam means for movement by said spring.

9. A valve of the character described, comprising a casing having an inlet and an outlet and containing a valve port, a valve member in said casing cooperable with said port, electromagnetic means mounted on said casing, an armature movable by said means and secured to said valve member to move said valve member to open position, said casing having a guideway registering with said port and positioned on the opposite side of said port from said valve member, said casing having a chamber communicating with said guideway, a thrust member reciprocable in said guideway and projecting into said chamber, said thrust member cooperating with said valve member to move the same to open position, said chamber having a side opening, a shaft journalled in said opening, cam means on said shaft and positioned in said chamber, said cam means coacting with said thrust member to move said valve member to open position, and a helical coil spring surrounding and acting on said shaft to urge said cam means to inactive position, said electromagnetic means acting upon energization after operation of said valve means by said cam means to release said cam means for movement by said spring.

10. A valve of the character described, comprising a casing having an inlet and an outlet and containing a valve port, a valve member in said casing and cooperable with said port, means urging said valve member toward closed position, said casing having a chamber, a thrust member cooperable with said valve member to open the same against the force of said means and extending into said chamber, a rotatable shaft extending through a wall of said casing and into said chamber, cam means on said shaft within said chamber and operable on said thrust member to open said valve member, said cam means comprising a pair of spaced projecting portions, said thrust member being engaged and moved by one of said portions into seating position on both of said portions whereby said thrust member holds said cam means in valve opening position, and a spring returning said cam means to inactive position.

11. A valve of the character described, comprising a hollow casing having a passageway therethrough, a valve member in said casing controlling flow through said passageway, a thrust member cooperable with said valve member, said casing having a chamber receiving said thrust member, cam means in said chamber cooperable with said thrust member to move said valve member to open position, said chamber having an open side, a hollow extension on said casing registering with said open side, a plug member in said extension and closing said open side, said plug member having an aperture therethrough and a packing material receiving recess concentric therewith, packing material in said recess, a shaft extending through said aperture into said chamber, a head member on said shaft within said chamber and closing said recess, said cam means comprising spaced pins projecting from said head member and operable to move and position said thrust member between and seating on said pins, a head on said shaft external of said extension for rotating said shaft, and a coil spring positioned between and secured to said head and said plug member and operable to rotate said shaft, said thrust member acting by seating engagement on said pins to hold said shaft against rotation by said spring.

12. A valve of the character described, comprising a casing having a passageway therethrough, a valve member in said casing controlling flow through said passageway, a thrust member for moving said valve member to open position, the wall of said casing having an opening, a plug member closing said opening and having a cylindrical recess opening into said casing, a rotatable head member in said recess, cam means on said head member and operable to actuate said thrust member, the other end face of said plug member having a diametral slot, a shaft extending through said plug member and secured to said head member, a head sleeved on said shaft external of said casing and having a diametral slot facing said first-named slot, and a helical coil spring loose on and surrounding said shaft, said head being rigidly fixed on said shaft in position to maintain the ends of said spring positioned in said slots whereby said spring will be tensioned upon rotation of said shaft and can act to rotate said shaft.

13. In a valve of the character described, a casing having an inlet and an outlet, a partition in said casing having a valve port, a pair of cup-shaped members in telescoping engagement and defining a chamber, a valve member controlling flow through said port and clamped between said members, one of said members having an aperture through the end wall thereof, a valve stem extending through said aperture, and a lateral flange on said stem cooperable with said end wall, said flange being loosely positioned in and freely movable longitudinally of said chamber whereby said stem will be in motion prior to operation of said valve member by said stem.

14. In a device of the character described, a casing having an inlet and an outlet and having a valve port therewithin, a reciprocal valve member controlling flow through said valve port, a pair of cup-shaped members cooperating to provide a chamber and clamping said valve member therebetween, one of said cup-shaped members having an aperture in a wall thereof, means for operating said reciprocal valve member, and a connecting rod operatively connecting said operating means and said valve member, said connecting rod extending through the aperture in said wall and having an enlarged portion within said chamber for engagement with said wall, said enlarged portion being loosely disposed in and freely movable longitudinally of said chamber whereby said connecting rod will be in motion prior to engagement of the enlarged portion with said one wall to move said reciprocal valve member.

LEWIS W. EGGLESTON.

DISCLAIMER

2,043,194.—*Lewis W. Eggleston*, Detroit, Mich. VALVE. Patent dated June 2, 1936. Disclaimer filed February 24, 1937, by the assignee, *Detroit Lubricator Company;* the patentee joining.

Hereby enters this disclaimer to claims 6 and 7 in said specification.

[*Official Gazette March 30, 1937.*]