

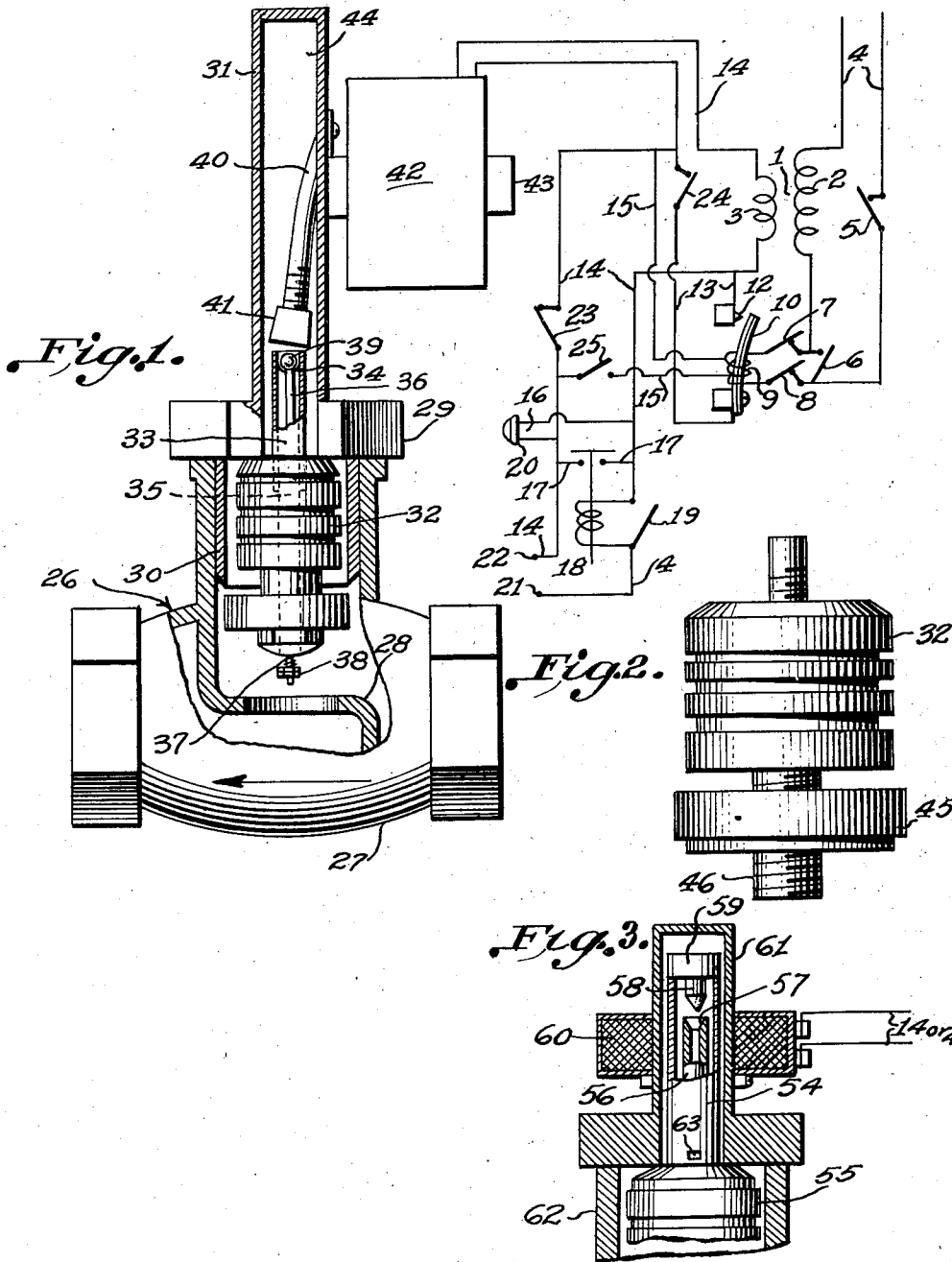
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E. E. LITTLEFIELD

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ELECTRICAL APPARATUS

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Inventor
EDGAR E. LITTLEFIELD
By Henry C. Stauffer
Attorney

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ELECTRICAL APPARATUS

Edgar E. Littlefield, Los Angeles, Calif.

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This invention relates to an electrical valve apparatus.

One of the objects is to provide an improved flushing system while an additional object is the provision of an improved valve for use with the same or for such other uses as may be found for it.

Besides reducing the heating effect to a minimum, the valve in question possesses numerous advantages including a simplified construction that in operation is quick acting and does not permit leakage of fluid when closed. Moreover, the valve seats without an objectionable hammer blow and does not stick under ordinary use.

Certain modifications will appear in the drawing.

Numerous objects and advantages of the improvements will become obvious upon consideration of the following description and the accompanying drawing.

Fig. 1 shows an improved electrical control system with one form of improved valve incorporated therein, the latter being shown partly in cross-sectional elevation.

In Fig. 2 is shown a modified form of valve element and piston which may be utilized in the valve combination.

In Fig. 3 is shown, partly in cross-sectional elevation, the upper part of a modified valve construction.

In the various views like numerals refer to like parts.

An arrow (Fig. 1) indicates direction of fluid flow.

Referring to Fig. 1, a step-down transformer 1, having primary and secondary windings 2 and 3, respectively, is connected with a suitable source of current, such as an ordinary alternating current service main, by means of circuit 4, having switch elements 5 and 6 therein and additional switch elements 7 and 8, which are normally closed, so that when element 6 is open and 5 closed, the load current flowing in circuit 4 supplies heat for the coil 9 encircling the movable contact arm 10 of a temperature responsive device, causing the former to move into contact with terminal 12, thus closing branch circuit 13 on the secondary side of the transformer. By closing the switch 6 and opening 7 and 8 the temperature responsive device may be made to respond to heat obtained from an extraneous source or to that obtained from the secondary side of the transformer.

Obviously, the primary winding 2 of the transformer is connected for energization by circuit 4.

On the secondary side of the transformer, and to secondary winding 3, is connected secondary circuit 14, having branches 13, previously referred to, 15, 16 and 17, the latter being controlled by means of a relay 18, preferably of the Telecode type, which, in turn, is controlled by the electrodes 21 and 22 together with the fluid at times interposed therebetween. In case it is desired to cut out relay 18, switch element 19, which is normally open under the circumstances, may be closed. Instead of the means indicated, or as additional means therefor, the valve operating circuit may be controlled by means of a push button 20, through branch circuit 16. Circuit interrupters 23 and 24, normally closed, provide means for opening their respective circuits when necessary or desirable.

When switch 25 is closed, as well as interrupter 6, and 7 or 8, or both, are opened, circuit 15 may be employed to heat the coil 9 of the temperature responsive device upon opening interrupter 23. In this way heat may be applied from the low tension side of the transformer, the voltage of which, at least for certain purposes, is preferably 18 to 24 volts. A transformer supplying from 50 to 150 watts has been found suitable for quite a number of purposes. The operation of the flushing system, as such, will be appreciated by reference to my prior United States Patent No. 1,709,083. The Telecode relay referred to is known by that name and is a product of the Benjamin Electric Mfg. Co. of Des Plaines, Ill., the same being made in accordance with the disclosure in Patent 1,272,432, dated July 16, 1918.

Included in circuit 14 is a valve 26 which is also shown and described in my Patent No. 1,862,937 and which has been found very satisfactory when incorporated in the above combination. The casing 27 is provided with a seat 28 and a bonnet 29 with a cylindrical extension 30 and an extension at the top in the form of a tubular member 31, closed at the top, said parts being formed of brass or other non-magnetizable material.

Arranged to co-operate with seat 28 is a piston valve 32 having a tubular extension 33, formed integral with the former or threaded therein, if desired, and having a seat 34 at its upper end, said parts being formed of non-magnetizable material of any suitable type. The tubular extension and piston provide a by-pass 35 within which a non-magnetizable valve stem 36 reciprocates and which is resiliently mounted at the lower end of the piston by means of the coiled spring 37 and lock nuts 38. At the upper end of

the stem is threaded a magnetizable valve member 39. Resting on the upper end of the tubular extension 33 is a lever device 40 formed of magnetizable material and having an adjustable head 41 threaded thereon. Valve 39 and lever arm 40 are preferably made of stainless iron or its equivalent. A coil 42, having core member 43, is adjustably mounted on the tubular extension 31, in position, when energized, to attract lever arm 40, when the piston valve is in seated position. In this drawing, however, the valve is shown in open position.

If we assume that the valve is closed or in seated position and that energy is applied to the coil 42, the arm 40 will be attracted to the core 43 thus unseating the by-pass valve 39 and opening the by-pass 35 permitting release of pressure from chamber 44 causing the piston valve to be unseated. Obviously, during the operation of the valve the lever arm 40 slides along the wall of the tubular extension 31 adjacent core 43.

By modifying the construction of the piston valve 32 somewhat, as in Fig. 2, the part forming the valve head 45 may be adjustably threaded on to the stem part 46, thus permitting regulation of the fluid flow.

Fig. 3 illustrates a sectional view of a valve, shown partly cut away, similar to the type shown in Fig. 1 of my Patent 1,862,937, in which 54 is a tubular extension which may rest loosely on the upper end of a fluid operated piston valve 55. Within this tubular member is a tubular extension 56 of the piston valve 55 which extension may be formed integral therewith or as a separate piece threaded into the piston valve. The piston itself, of course, supplies the remainder of the by-pass. At the upper end of 56 is a seat 57 for a pilot valve 58 arranged to co-operate with a plug 59 resting on the upper end of 54, the latter, as well as 56, being formed of non-magnetizable material. Pilot valve 58 and plug 59 are preferably formed of stainless iron. The valve is shown in elevated position. A coil 60 is adjustably mounted on the extension 61 of the bonnet 62. An opening 63 in the side wall of 54 provides communication with the by-pass through the piston. When the main valve is closed the pilot valve 58 rests on its seat 57 while the plug 59 rests on the upper end of the tubular member 54, moving freely therewith. It will be understood that the bonnet 62 together with the extension 61 are formed of brass or other non-magnetizable material. In the seated position of the main valve the magnetizable parts 58 and 59 will occupy positions within the coil 60 in such way that a maximum magnetizing effect may be applied thereto. However, upon operation of the valve, these magnetizable parts move to a position designed to develop such reactance in the coil that overheating is prevented. Preferably, the magnetizable parts are moved, through the release of fluid, to a position without the energizing winding, if the arrangement is such as to permit it. Much less energy is required to hold the valve open than is required to open it. This fact is well known. This type of valve may, if desired, under certain conditions, be substituted for the one previously described. I have found it desirable, in certain instances, to employ an auxiliary or pilot valve the weight of which is less than that of the valve it controls. It is also desirable under certain conditions to have the auxiliary or pilot valve displace less fluid than the controlled valve.

While I have shown and described certain em-

bodiments of my invention, it will be understood that I am not limited to the details thereof, but cover all modifications that fall within the terms of the claims.

I claim:

1. A valve structure including a valve housing having a chamber open to line pressure when communication through the valve is interrupted; a fluid operated valve responsive to the pressure condition of said chamber; an auxiliary valve controlling the fluid operated valve; an armature for operating the auxiliary valve and a winding for energizing the armature; the armature normally occupying a position in substantially the densest portion of the field of the winding and, upon operation of the valve, assuming a position in a substantially less dense portion of the field.

2. A valve structure including a valve housing having a chamber open to line pressure when communication through the valve is interrupted; a fluid operated valve responsive to the pressure condition of said chamber; an auxiliary valve controlling the fluid operated valve; an armature for operating the auxiliary valve; and a winding surrounding the armature; the armature normally occupying a position in substantially the densest portion of the field of the winding and, upon operation of the valve, being moved to a position in a substantially less dense portion of the field by the fluid controlled by said valve.

3. A valve mechanism including a housing having a chamber open to line pressure when communication through the valve is interrupted, a magnetizing coil adjacent the chamber adapted to produce therein a relatively dense local magnetic field and a less dense field adjacent thereto, a fluid operated motor movable in the chamber operating to open and close the valve as conditions in the chamber vary, an auxiliary valve within the chamber mounted on and carried by the fluid operated motor controlling the pressure within the chamber, and magnetic means for operating the auxiliary valve also within the chamber and likewise carried by the fluid operated motor so as to be moved into the dense part of the magnetic field when the fluid operated motor has closed the valve and into the less dense part of the field when the motor has opened the valve.

4. A valve structure comprising a valve housing, a cylinder open to the line pressure when communication through the valve is interrupted, and an auxiliary nonmagnetic chamber communicating with the first mentioned chamber, a magnetizing coil adjacent the auxiliary chamber and adapted to produce therein a relatively dense local magnetic field and a less dense field adjacent the dense field, a piston movable in the cylinder for operating the valve to open and close the same as pressure conditions in the cylinder vary, an auxiliary valve within the cylinder mounted on and carried by the piston controlling the pressure within the cylinder, and magnetic means within the auxiliary nonmagnetic chamber for operating the auxiliary valve also mounted on and carried by the piston so as to be moved into the dense magnetic field when the piston has closed the main valve and into the less dense part of the field when the piston has opened the main valve.

5. A valve structure comprising a housing provided with a cylinder which is open to line pressure when communication through the valve is

interrupted, and an auxiliary nonmagnetic cylinder approximately in line with the first mentioned cylinder; a piston in said cylinder for operating the valve in accordance with the pressure conditions in the cylinder; a magnetizing coil adjacent the auxiliary nonmagnetic cylinder for producing a relatively dense magnetic field within the auxiliary cylinder and a less dense field adjacent the dense field; a magnetizable auxiliary valve within the cylinder mounted on and movable with the piston for controlling the pressure in the cylinder; and an elongated magnetizable armature of a diameter substantially less than the diameter of the auxiliary nonmagnetizable cylinder, mounted on and carried by the piston, and projecting into the nonmagnetic cylinder and into the field of the magnetizing coil adjacent the same, for operating the magnetizable auxiliary valve, substantially as described.

6. A valve structure comprising a housing provided with a cylinder which is open to line pressure when communication through the valve is interrupted, and an auxiliary nonmagnetic cylinder approximately in line with the first mentioned cylinder; a piston in said cylinder for operating the valve in accordance with the pressure conditions in the cylinder; a magnetizing coil adjacent the auxiliary nonmagnetic cylinder for producing a relatively dense magnetic field within the auxiliary cylinder and a less dense field adjacent the dense field; a magnetizable auxiliary valve within the cylinder mounted on and movable with the piston for controlling the pressure in the cylinder; and an elongated magnetizable armature having a pointed end, the armature being of a diameter substantially less than the internal diameter of the auxiliary nonmagnetic cylinder, resting on the magnetizable auxiliary valve, and tiltable within the cylinder under the influence of the magnetizing coil, the armature actuate the magnetic auxiliary valve, and also mounted on the piston so as to be moved thereby into and out of the dense field of the magnetizing coil, substantially as described.

7. A valve mechanism including a housing having therein a pressure chamber; a tiltable armature within the chamber; an auxiliary valve controlled by said armature; a closure responsive to the pressure conditions in said chamber and controlled by the auxiliary valve, the auxiliary valve being supported by the closure; and electrical controlling means without the chamber adapted to inductively control the armature.

8. A valve structure including a casing having a chamber open to line pressure when the valve is closed; a closure responsive to the pressure con-

ditions of said chamber, the closure having a by-pass with a valve seat at one end thereof; a controlling auxiliary valve the weight of which is supported by said seat; a tiltable armature controlling the auxiliary valve, the armature being supported by the closure; and electrical means without the chamber to inductively control said armature.

9. A valve structure including a casing having a pressure chamber with a seat arranged to support the weight of a closure; a closure within said chamber the weight of which is supported by said seat, said closure having a by-pass; an auxiliary valve; a tiltable armature controlling the auxiliary valve, the armature being carried by the the closure; and electrical means without said chamber adapted to inductively control the armature.

10. A valve structure including a valve housing having a chamber open to line pressure when communication through the valve is interrupted; a fluid operated valve responsive to the pressure condition of said chamber; an auxiliary valve controlling the fluid operated valve; an armature for operating the auxiliary valve; and a winding surrounding the armature; the armature normally occupying a position in the densest portion of the field of the winding and upon operation of the valve assuming a position in a substantially less dense portion of the field.

11. A valve structure including a valve housing having a chamber open to line pressure when communication through the valve is interrupted; a fluid operated valve responsive to the pressure condition of the chamber; an auxiliary valve controlling the fluid operated valve; an armature for operating the auxiliary valve; and a winding surrounding the armature; the armature normally occupying a position in substantially the densest portion of the field of the winding and, upon operation of the valve, being moved to a position in a substantially less dense portion of the field by the fluid controlled by said valve.

12. An electrically controlled valve combination including, a pressure chamber; an elongated auxiliary chamber in communication with the pressure chamber; a fluid operated valve responsive to the pressure conditions in the pressure chamber; a piston in the pressure chamber for operating the valve; a controlling pilot valve, and tiltable electrically controlled operating means therefor within said auxiliary chamber; and electrical means operative to inductively control said tiltable means from without said auxiliary chamber.

EDGAR E. LITTLEFIELD.