T. H. WURMB & R. BAUMANN.

ELECTRIC VALVE OPERATING DEVICE.

APPLICATION FILED AUG. 29, 1910.

1,022,914. Patented Apr. 9, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

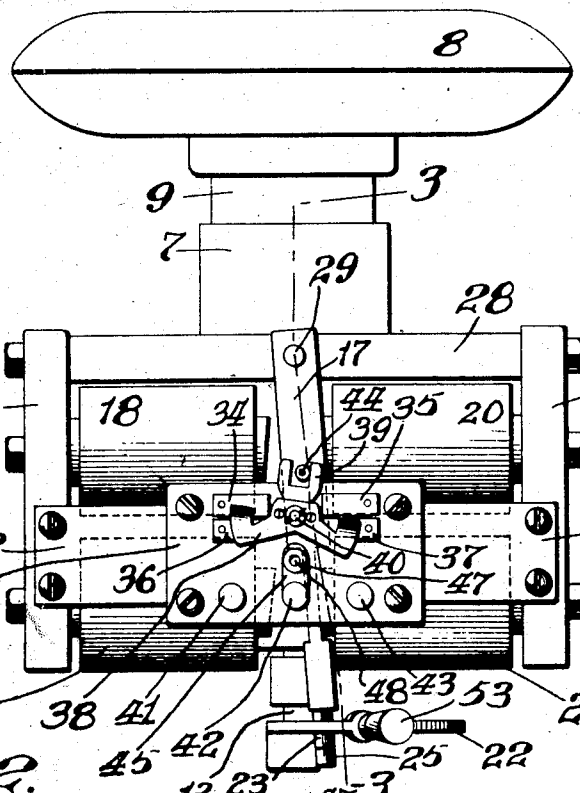
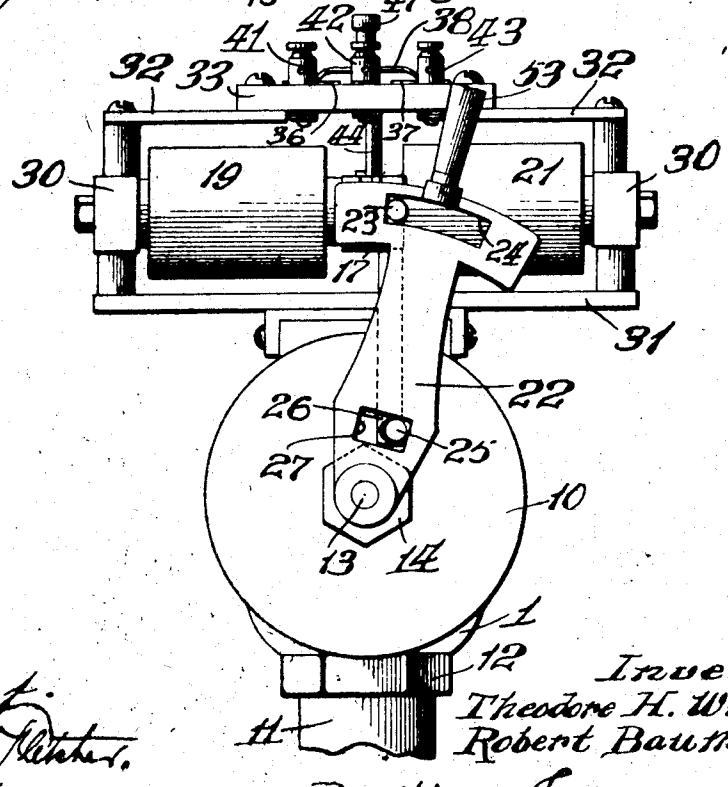


Fig. 2.



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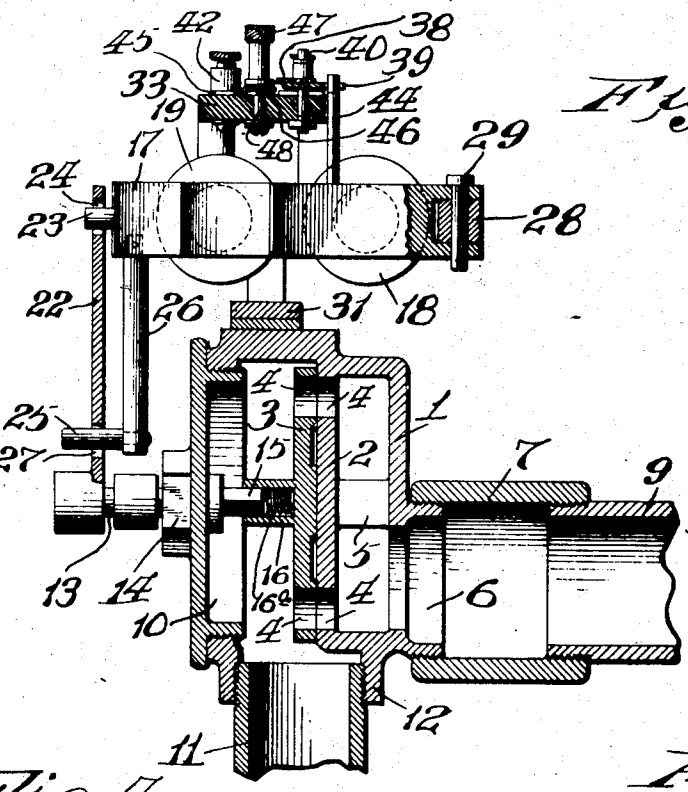


Fig. 3.

Fig. 4.

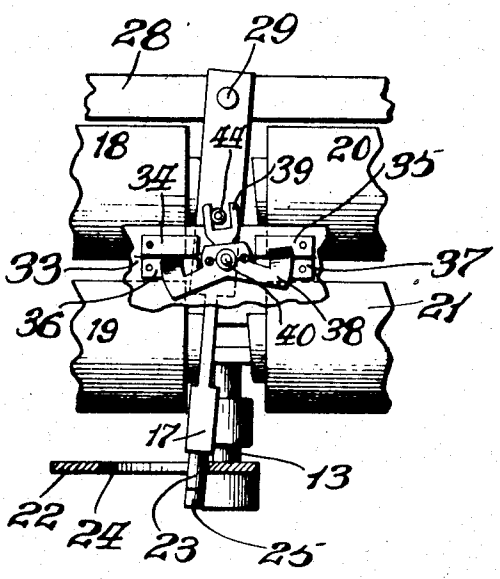
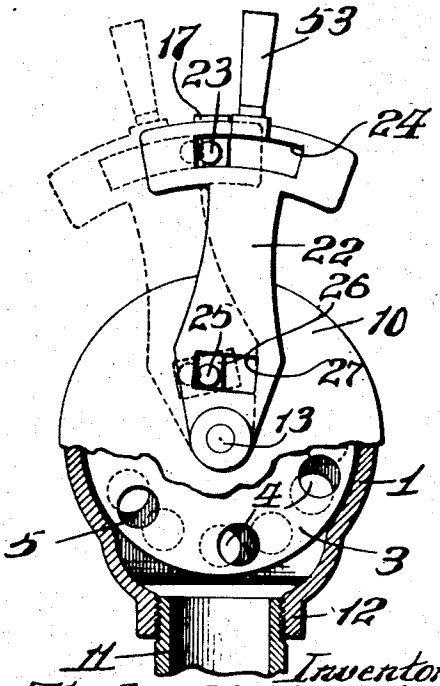


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

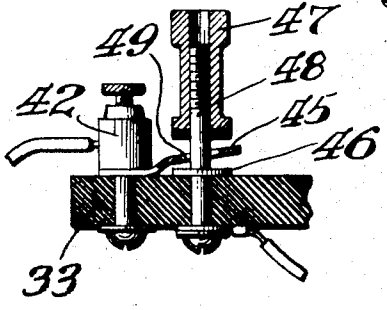


Fig. 7.

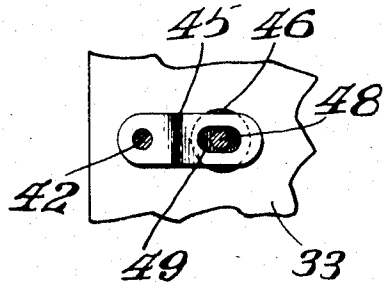
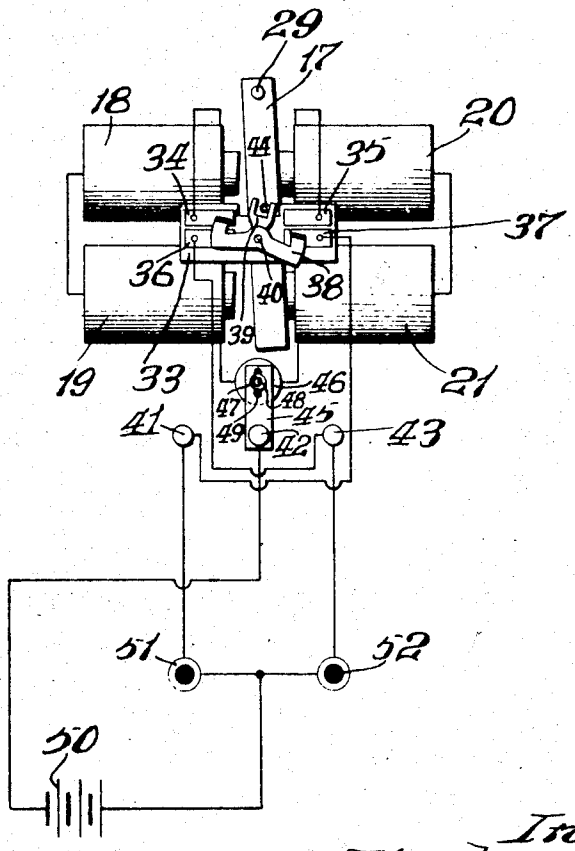


Fig. 8.



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UNITED STATES PATENT OFFICE.

THEODORE H. WURMB AND ROBERT BAUMANN, OF ST. LOUIS, MISSOURI, ASSIGNORS TO NATIONAL CLOCK & ELECTRIC MANUFACTURING CO., OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

ELECTRIC VALVE-OPERATING DEVICE.

1,022,914. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed August 29, 1910. Serial No. 579,460.

To all whom it may concern:

Be it known that we, THEODORE H. WURMB and ROBERT BAUMANN, citizens of the United States, and residents of St. Louis, Missouri, have invented certain new and useful Improvements in Electric Valve-Operating Devices, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to an improved electric valve-operating device, especially designed for use with our improved thermostatic circuit controller which forms the subject matter of a separate application; although our improved electric valve may, of course, be used with any of the thermal circuit controllers heretofore known.

The object of our invention is to provide an improved electric valve-operating device which can be readily controlled at a distance by a thermostatic circuit controller, for the purpose of automatically opening and closing the steam or hot water valves of radiators in heating systems and also for controlling shutters, registers or draft doors and dampers of furnaces.

In carrying out our present invention we preferably make use of a valve which is an improvement upon the disk valve heretofore patented by us under date of January 12, 1904, United States Patent No. 749,518.

Our invention consists in novel construction of parts, and in the combination of devices, hereinafter described and pointed out in the appended claims and illustrated by the accompanying drawings, in which:

Figure 1 is a top plan view of our improved valve-operating device, connected to one section of a steam or hot water radiator; Fig. 2 is a front elevation of same; Fig. 3 is a sectional side elevation taken on the line 3—3 of Fig. 1; Fig. 4 is a top plan view of a two-way valve, and adjacent parts in detail used in operating the device; Fig. 5 is a front sectional elevation of the valve and the means for operating same by hand, when desired; Fig. 6 is a detail section of the auxiliary switch, for manually operating the valve in case the automatic circuit-closing device should become disabled from any cause. Fig. 7 is a sectional plan-view of same. Fig. 8 is a diagrammatic-view, showing the electrical connections of our improved valve.

The valve consists of the cast body 1 which is cylindrical in form in the present instance, and the interior of which is divided by a vertical partition 2. The valve 3 is in the form of a rocking-disk, and is mounted within said casing in contact with said partition 2, which latter forms the seat for said valve. Both the valve and its seat are provided with a series of registering apertures 4 for the passage of the fluid when the valve is open. A central brace 5 extends from the center of said partition to the wall of the casing. At the back of said casing 1 is formed the outlet 6, which is shown as the usual threaded pipe-connection to which is attached the coupling 7, and the radiator 8 is connected to said coupling by the nipple 9. The front of the casing 1 is preferably closed by the screw-lid 10, which may readily be detached when it is necessary to gain access to the valve-chamber. The inlet-pipe 11 is threaded into a pipe-connection 12 at the bottom of the casing, so that the incoming fluid will be discharged into the casing in front of the valve 3. The front side of said partition should of course be faced and ground in order to form a suitable seat for said valve. The number of apertures 4 in said valve and its seat should be sufficient to provide a total area in excess of the sectional area of the inlet or outlet; in the present case six apertures in the valve are shown of the proper size for the work required of them.

Hereinafter, we shall designate the part 3 as the valve-disk. Said valve-disk is rocked in use by means of a short horizontal shaft 13 which is passed through a stuffing-box 14 carried by the screw-lid 10, and the inner end of said shaft is provided with a squared-portion 15 which fits into a similarly-shaped recess of the boss 16 on the front of said valve-disk. (See Fig. 3). A suitable coiled spring 16 presses said valve-disk to its seat, or any other known means the equivalent of

said spring may be used for such purpose. A rocking-movement is imparted to the shaft 13 by the armature 17 which vibrates between the opposite cores of two pairs of electro-magnets 18, 19, and 20, 21. In this connection we desire to point out that we have discovered a novel and efficient means of applying the power of said electro-magnets to the shaft 13, whereby electro-magnets of comparatively small size and power are enabled to move and control much larger and heavier valves, shutters, registers, dampers and the like, than they could were our improved means not employed.

One of the important elements of our improved means for rocking the valve, shutter, damper or like divice, is what we term our "two-in-one" rocker-arm or rock-lever 22, the lower end of which is fixed upon the outer free end of said rock-shaft 13. The peculiarity about this lever 22 is the fact that it performs the functions of a "long" lever in starting the load from a state of rest, the power being applied to said lever at a comparatively great distance from its fulcrum-point; thereby enabling the load or weight to be moved with greater ease than it would be if the power were applied to the lever at a point nearer its fulcrum; and then, after the load has been started, power is applied to said lever at a point much nearer its fulcrum, thereby accelerating the movement of the load and quickly carrying the same to its destination. It will thus be seen that our "two-in-one" rock-lever 22 renders the electro-magnets much more efficient than they would be if a common lever were used in place of our said lever to apply the power of the electro-magnets to the work, such as rocking the valve-disk 3 by means of its shaft 13; and this is especially so because the attractive-power of an electro-magnet is comparatively weak when the armature is located at its maximum distance from the magnet-poles (as in starting the load), and it is at just that point that our said "two-in-one" lever acts as a "long" lever in applying the power of the electro-magnets, thereby starting the load more promptly and powerfully. Likewise, after the load has been thus started, and the armature has approached the poles of the electro-magnet, the increased attractive-power of the electro-magnet is then applied to the load (such as the valve-disk 3) by means of a "short" lever, thereby accelerating the load and quickly carrying it to its destination. Another very important element of our improved means for rocking the valve-disk is the device for applying the force of the armature to the "two-in-one" lever 22, in changing it from a "long" lever to a "short" one. Said transforming-device, in its simplest form, consists (as shown) of a short pin 23 projecting from the free end of the armature 17 into a slot 24 formed in the rock-lever 22 near the upper end of same, and another pin 25 carried by an arm 26 which depends from the said armature, said last-mentioned pin projecting into another slot 27 formed in said lever at a point much nearer the fulcrum of said lever than is said slot 24.

Referring again to the armature 17, the same is pivoted at its rear end to a horizontal brass-bar 28 by means of a pin 29, and said brass bar is supported by rearward-extensions of the yokes 30 of said electro-magnets; said yokes being supported by a suitable frame 31 which rests on top of the valve-casing 1. Mounted in a plane above the electro-magnets, upon a suitable frame 32 is the insulating-base 33 of a two-way switch which will now be described in detail. The function of said switch is to automatically cut out one pair of said electro-magnets, and instantly cut in the opposite pair, whenever the circuit is closed on either pair of said magnets by the action of the distant thermostatic circuit-controller (not shown), said switch being operated by its connection with the armature 17 of said electro-magnets, as will presently be described. Said switch consists of the said insulating-base 33; the four terminal-plates 34, 35, 36, and 37, all fixed upon said base but insulated from each other; the rocking switch-lever 38 having the integral forked-arm 39 and mounted upon the vertical pivot 40 so that the outer ends of said switch-lever (which are flexible) may yieldingly ride upon and contact with said terminal-plates; and the binding-posts 41, 42 and 43. Said forked-arm 39 of said switch-lever is engaged by a vertical insulated-pin 44 which projects upwardly from the armature 17 so that its insulated upper end is located between the forks of said forked-arm.

An auxiliary-switch, to be operated by hand, is provided for the purpose of closing and opening the circuit on the electro-magnets in case the automatic circuit-controlling device should get out of order, and this auxiliary-switch consists of the flexible metallic-strip 45 one end of which is fixed to the binding-post 42 and the free end of which is adapted to be forced into contact with a metallic-washer 46 by the nut 47 on the threaded-post 48, which latter is mounted in the insulating-base 33 at a point closely-adjacent said binding-post 42. Said flexible-strip 45 is provided with an oblong hole 49 through which passes said post 48 in order that said parts may not come in contact with each other. (See Fig. 6). The metallic-strip 45 of said auxiliary-switch is normally held in contact with said washer 46 by said nut 47. The electrical parts

above-described are connected in circuit with a battery or other common source of electricity 50, as shown in the diagrammatic-view, Fig. 8, in which the two contact-points of the distant thermostatic circuit-controller are indicated (for convenience) by the two push-buttons 51 and 52. The rock-lever 22 is provided with a handle 53 at its upper end.

The operation is as follows: The length of the slots 24 and 27 in said rock-lever is so proportioned that when the armature 17 is pulled by one magnet the pin 23 will start the lever and the valve-disk, giving them considerable momentum, and then the other pin 25 will "pick up" the load and move it to destination, fully opening or closing the valve. Referring again to the diagrammatic-view, Fig. 8, by pressing the push-button 51 the valve will be turned "off," and by pressing the push-button 52 the valve will be turned "on." When push-button 51 is pressed the current flows from the battery 50 to and through said button; to binding-post 41; to terminal-plate 37; switch-lever 38; switch-plate 34; electro-magnet coils 18 and 19; washer 46; strip 45; binding-post 42, and thence back to the said battery, thus energizing said electro-magnet coils and pulling the armature 17 to the poles of said coils, and said armature carrying the said rock-lever with it sets the valve in a "closed" position, turning off the steam or hot-water from the radiator 8 or doing any other common work. Said movement of said armature also turns the switch-lever 38 from out of contact with the plates 35 and 36 into contact with plates 34 and 37, thereby opening (and leaving open) the said circuit that had been previously closed, as described, by the push-button 51. A reverse movement of the parts takes place if the push-button 52 is pressed, the said switch-lever 38 changing the circuits and bridging the switch-plates which are in circuit with the opposite push-button, which is of course open at the time. The route of the current from the battery 50 and other connections, when the push-button 52 is pressed, and when the switch-lever 38 is in a reverse position from that in which it is shown in Fig. 8, may be readily traced, and need not be described in detail. The switch-plate 38 is shown in its reversed position in Fig. 4, which is, as already intimated, the position it assumes after the push-button 51 has been pressed, and before the said push-button 52 has been pressed. The auxiliary-switch (shown more clearly in Fig. 6) is of course closed during the operation above described, but if, from any cause the thermostatic circuit-controller should become inoperative and fail to close or open the circuits on the electro-magnets, then the auxiliary-switch is used to open the circuits (to save the batteries, &c.) and the valve may be opened or closed by hand, the operator grasping the handle 53.

What we claim is:

1. An electric valve-operating device, comprising the combination with an electro-magnet and its armature, of a device to be moved, an electric circuit in which said electro-magnet is included, a lever for applying the power of said electro-magnet and its armature to said device to be moved, and means for automatically changing the point on said lever at which the power is applied thereto for the movement of said device.

2. An electric valve-operating device, comprising the combination of an electro-magnet, its armature, a device arranged to be moved by the action of said armature, a rock-lever applied to said device, and means for automatically changing the point on said rock-lever at which the power of said magnet is applied thereto.

3. An electric valve-operating device, comprising an electro-magnet, its armature, a valve having a rock-shaft, the rock-lever arranged with two points at which power may be applied to it, one of said points being located a greater distance from the fulcrum than is the other, and a device connected with said armature, for applying the power first at the point on said rock-lever which is farther from the fulcrum and then changing the point of application of power to a point nearer the fulcrum of said rock-lever.

4. An electric valve-operating device, comprising an electro-magnet, its armature, a valve having a rock-shaft, a rock-lever fixed on said rock-shaft and having slots at different distances from the fulcrum-point, a pin projecting from said armature into one of said slots, an arm depending from said armature and a pin carried by said arm and projecting into the other of said slots.

5. The combination with a pivoted armature and electro-magnets for operating the armature in different directions, of a device, to be actuated, having a lever, two separate and distinct means carried by said armature for engagement with said lever at different points relative the fulcrum of the lever, and means automatically operated by said armature for establishing a circuit to energize one of the magnets and breaking a circuit to deënergize the opposite magnet.

6. The combination with a pivoted armature and electro-magnets for operating the armature in different directions, of a device, to be actuated, having a lever, two separate and distinct means carried by said armature for engagement with said lever at different

points relative the fulcrum of the lever, means automatically operated by said armature for establishing a circuit to energize one of the magnets and breaking a circuit to deënergize the opposite magnet, which means serves to automatically reverse the current to deënergize the energized magnet and energize the deënergized magnet.

In testimony whereof, we have signed our names to this specification, in presence of two subscribing witnesses.

THEODORE H. WURMB.
ROBERT BAUMANN.

Witnesses:
E. L. WALLACE,
N. G. BUTLER.