Apr. 24, 1923. 1,452,859

B. WICHSER

VALVE OPERATING DEVICE

Filed Aug. 4, 1920

Fig. I

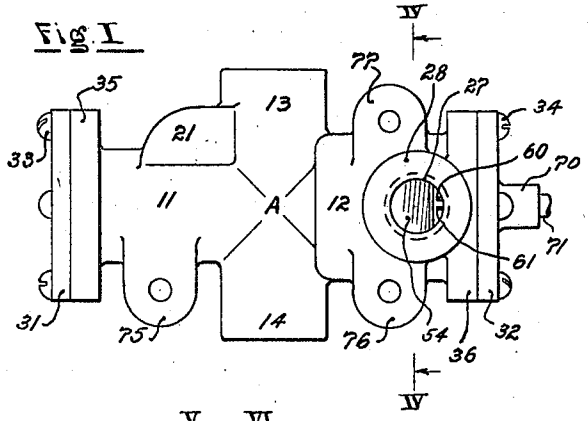
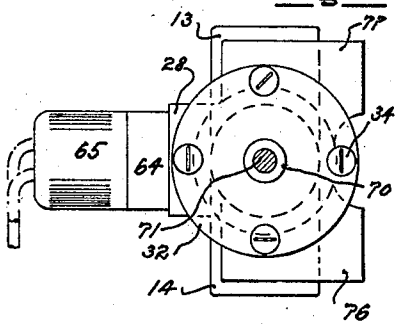


Fig. II



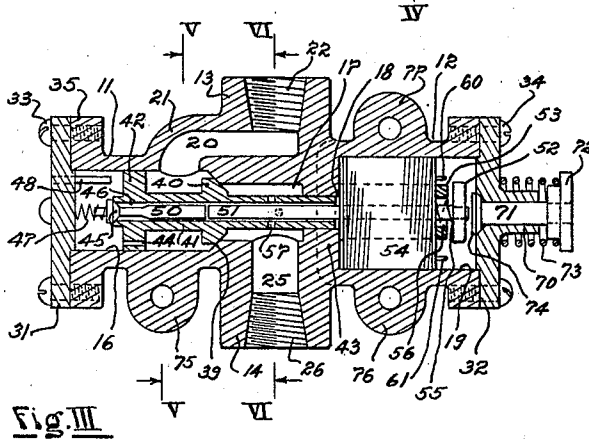


Fig. III

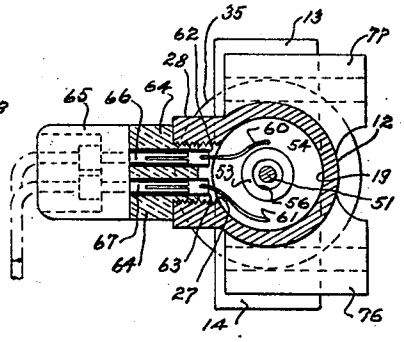


Fig. IV

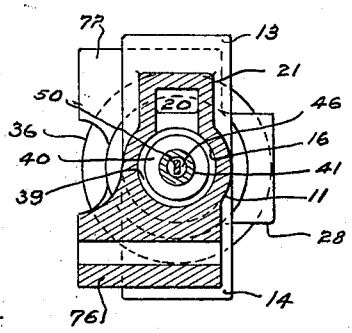


Fig. V

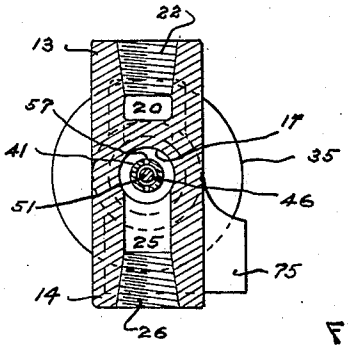


Fig. VI

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UNITED STATES PATENT OFFICE.

BERNHARD WICHSER, OF BROOKLYN, NEW YORK.

VALVE-OPERATING DEVICE.

Application filed August 4, 1920. Serial No. 401,247.

To all whom it may concern:

Be it known that I, BERNHARD WICHSER, a resident of the borough of Brooklyn and county of Kings, in the city and State of New York, have invented certain new and useful Improvements in Valve-Operating Devices, of which the following is a specification.

This invention relates generally to devices utilized for controlling the operation of a valve from a distant point, and it more particularly appertains to valves that are worked electrically.

An important object is to produce an improved valve of the character described that can be depended on to give an instantaneous response when called into action, irrespective of the distance at which the control thereof may be located, and promptly to resume its normal condition when it has filled the purpose intended.

Another object is the production of a valve of the class referred to, which shall be governed in its action largely by pressure of the flow of liquid controlled thereby while moving in any direction, and be relieved as much as is possible of the extraneous assistance to return it into any particular position.

A further object is to provide a valve of the nature set forth, the casing whereof shall have aligned apertures and bores, giving the required inlet and outlet for the fluid, the supply and discharge passages, and suitable chambers for the valve, its control, and operating mechanism, all practically extending diametrically in two general directions, the arrangement being such that the working parts can be removed from the casing without interfering with the control or either of the inlet and outlet connections.

Still another object is the provision of a valve of the type mentioned, which shall be equipped for actuation both by electrical and by mechanical means, so that it can be operated by either means at will, and controlled also from a point close at hand, if desired, instead of from a remote location.

An additional object is to supply a valve of the kind specified which shall be light and compact, efficient and reliable, easily mounted as well as conveniently operated and at the same time simple and comparatively inexpensive to manufacture.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists of the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated on the annexed drawing, wherein like parts are designated by the same reference characters throughout the several views.

In the said drawing:

Figure I is a front view of a valve, including the casing therefor, embodying the principles of the invention;

Fig. II is an end view of the same, looking from the right-hand side of Fig. I;

Fig. III is a central longitudinal section, with the parts vertically disposed as in Fig. I;

Fig. IV is a vertical transverse section on the line IV—IV of Fig. I, looking to the left in the direction pointed out by the arrows;

Fig. V is a similar section on the line V—V of Fig. III, but looking in the opposite direction, as the arrows indicate; and

Fig. VI is likewise a vertical cross-section, taken along the line VI—VI of Fig. III, and viewed from the right as the arrows point out.

Generally described, the invention comprises a casing of sufficient dimensions to enclose with the valve a control device for the same, and means for operating it electrically. The casing has the usual inlet and outlet, interconnected by internal supply and discharge passages that are adapted to be placed in communication one with the other through a chamber within which the valve is slidably mounted. An ante-chamber is also provided, the same being divided from the valve-chamber by a movable head pertaining to the valve. This valve-head is perforated to afford a by-pass that will permit the fluid admitted into the casing and reaching the valve-chamber to flow at the same time into the ante-chamber. The fluid is thus enabled to exert its pressure on both sides of the head and normally seats the valve, due to the larger area of the head within the ante-chamber producing a preponderance of pressure thereon over that exerted on the valve in its working chamber. Associated with the valve-head is a pilot-valve adapted to relieve this preponderance of pressure and consequently allow the main valve to be unseated, whenever desired, so

as to establish the communication between the internal passages, respectively connected with the inlet and outlet. The pilot-valve is urged to its seat by a resilient element and intended to function contemporaneously with the main valve, though preceding it in action, both during the seating and the unseating operations. The unseating of the pilot-valve is effected by means of impelling elements, arranged to come under the influence of an electro-magnet mounted in the casing, but operable exteriorly through suitable electrical connections. The impellers are automatically repelled upon the seating of the pilot-valve, the closing of which in the valve-head re-establishes the prior preponderance of pressure therein and re-seats also the main valve. In addition to being subject to the influence of the electro-magnet, these impelling elements are adapted for actuation by directly acting mechanical means, consisting of a plunger capable of being pressed manually into the casing and bearing against a resilient element through the agency of which it is automatically retracted.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in the one and same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, upon becoming conversant with the details thereof, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

As shown in the said drawing, the invention includes a cruciform casing A, having longitudinal runs 11 and 12, and transverse branches 13 and 14. The runs are preferably made of different diameters, while the branches may be equal in size or approximately.

Axially aligned or concentric bores 16, 17, 18 and 19 are provided in the said casing, centrally of the runs 11, 12 therein. These bores are conveniently produced from the opposite ends of the casing, in a diametral direction transverse to its said branches.

An internal passage 20 is formed in a boss 21, intervening between the forward run 11 and the upper branch 13. One end of this passage connects with an exteriorly directed opening 22, while the other end thereof leads into the bore 16. The opening 22 constitutes the inlet of the casing, and is internally threaded to receive the feed end of a supply-pipe (not shown).

Another passage 25 leads from the bore 17 to an opening 26, in the lower branch 14. The latter-named opening also is internally threaded to receive the end of a delivery pipe (not shown), which will conduct the fluid away from the casing. The bore 17 and passage 25 constitute practically one discharge for the fluid flowing through the casing, of which the opening 26 is the outlet.

From the bore 19, a third passage 27 leads out exteriorly of the casing, in a lateral direction. This passage runs through a boss 28, threaded to form a socket designed to receive a plug member of an electric device, hereinafter described.

The outer ends of the bores 16 and 19 are closed, respectively, by covers 31 and 32, which are held in place by screws 33 and 34, entered through suitably threaded openings provided in flanges 35 and 36, formed on the corresponding extremities of the longitudinal runs 11 and 12, and adapted to make tight joints therewith.

At the junction of the bores 16 and 17 is located a seat 39, with which coacts a valve 40, disposed intermediately upon a hollow stem 41. One extremity of the stem carries a head 42, similar to a piston, and having a working fit in the bore 16. The other extremity of the stem is slidably fitted in the bore 18 which is made in a dividing partition 43, between the bores 17 and 19. The valve 40, stem 41, and piston 42 may be conveniently made integral with one another, as shown, and therefore the latter-named element may properly be termed either a piston or a valve-head, according to the particular function thereof which it may be intended to single out. The said head, it will be observed, is of larger diameter than the valve 40, and serves to divide the bore 16 into two parts, the inner one of which forms a working chamber for the valve, while the other one constitutes an ante-chamber to the same.

A by-pass 44 is provided in the aforesaid valve-head or piston 42, through which the fluid entering the bore 16, from the internal supply passage 20, is allowed simultaneously to fill the valve-chamber and its ante-chamber, causing the fluid to exert its pressure on both sides of the said head or piston. But, by virtue of the larger area of the side of the piston that faces the ante-chamber, a preponderance of pressure thereon will keep the valve 40 normally closed.

A pilot or relay valve 45, having a seat in the outer end of the hollow valve-stem 41, serves to close the bore thereof, indicated by the reference numeral 46. This pilot valve is pressed against its seat by a helical spring 47, arranged to bear at the opposite ends thereof upon the outer face of the pilot-valve and the inner face of the cover 31, respectively. When unseated, the main valve 40 is also limited in its movement, together with the stem 41, by the head 42 coming into contact with a stop 48, which

may be in the nature of a pin driven into the cover 31, and projecting inwardly into the bore 16, to a predetermined extent.

A guide 50 extends inwardly a certain distance into the said bore 46, from the inner face of the pilot-valve 45. This guide is suitably flattened, as particularly indicated in Fig. V, that it may offer as little resistance as possible to the fluid entering the last-named bore, when the pilot-valve is unseated.

Coacting with the guide 50, is a rod 51, slightly spaced from the latter at the inner terminus thereof, and carrying a discoidal armature 52, at its outer extremity. As seen in Fig. III, approximately one-half of the rod 51 is loosely and slidably fitted in the bore of the hollow valve-stem 41, while its other half extends outwardly therefrom into the bore 19 of the casing.

The aforementioned armature is adapted to be acted upon by the outer end of a hollow core 53, pertaining to an electro magnet 54, mounted in the said bore 19. As shown, the rod 51 passes axially through the core, and the discoidal armature is ordinarily held away from the latter by a coil-spring 55, the inner end whereof is lodged in a recess 56, sunk into the said core. The outer free end of this spring bears against the armature and holds it passive until the electromagnet is energized. Then, the pull of the latter overbalances the power of the spring 55, and draws the armature up to the core, whereupon the rod 51 is caused to hit the guide stem 50, and lift the pilot-valve off its seat, overcoming the resistance of the resilient element 47. When this occurs, the fluid (for instance, compressed air) acting upon the outer face of the head 42, escapes from the ante-chamber, previously described, faster than it can be supplied thereto by the by-pass 44. The escaping air or fluid passes into the bore 46 of the hollow valve-stem 41, and thence flows out through openings, as 57, formed in the side walls of the latter. Contemporaneously, the incoming fluid supplied by the inlet 22 through the internal passage 20, pressing with greater force against the inner face of the head 42 than upon the outer face of the main valve 40, on account of the larger area of the former as compared with that of the latter, overcomes the pressure exerted on the valve, which is then moved away from the seat 39. The valve 40 having been unseated, the fluid becomes divided on both sides thereof, but the main current passes directly from the passage 20 and the inner end of the bore 16, into the discharge channel provided by the bore 17 and passage 25, and thence out through the outlet 26, to the pipe conducting it to the place where it is to be used. It is well to note that the fluid passing through the pilot-valve 45, the bore 46 of the hollow valve-stem 41, and the openings 57 in the side walls of the latter, is not wasted in the least, but flows from the latter-named openings into the same discharge channel as the main current being delivered therewith at the point of utilization.

At 60 and 61 are shown the ends of wires that constitute the winding for the electromagnet 54, previously mentioned. The said wire ends are anchored to metallic elements 62 and 63, such as are carried by one of the usual insulators pertaining to electric plugs composed of separable members, as 64 and 65. As shown, the member 64 is provided with external threads engaging the socket 28, before referred to herein. The member 65 has prongs 66 and 67, adapted to make contact with the said metallic elements, in the known manner. This, it will be noted, constitutes a detachable connection for the electrical control of the valve.

It is obvious that, although a separable connection of the type above described has been represented on the drawing in conjunction with the said control, any other appropriate current switching or interrupting appliance could be employed in lieu thereof with equal advantage. Furthermore, notwithstanding that the separable connection aforesaid has been shown as directed straight outward or forwardly of the casing, it is evident that it could equally as well point in any other direction. Apart from the location of the said connection relatively thereto, it is plain that the position of the casing itself admits also of change. Thus, despite the fact that it has been represented on the drawing as placed for operation with the inlet uppermost, it stands to reason that the valve would function just as efficiently, were the casing mounted in any other position.

From the cover 32 projects a boss 70 through which passes a spindle or plunger 71. The latter has attached to its outer extremity an operating button or collar 72, which may have a shoulder integrally formed therewith, as shown. This collar or button is urged outwardly by a helical spring 73, coiled around the said boss 70, and bearing by its opposite ends against the said cover and the said collar or button, respectively. A head 74, at the inner end of the spindle or plunger, retains it in place, that is, by precluding disassociation thereof from the boss 70. The head 74 also serves as a tightening means in preventing the fluid under pressure from seeking its way out along the bore in which the spindle or plunger is slidable. When the button 72 is pushed inwardly, the head 74 on the end of the plunger is moved thereby against the far end of the rod 51 or the discoidal armature 52, which then becomes actuated mechanically, instead of electrically, but with

the same result in either case. In other words, the mere sliding in of the plunger 71 causes the operation of the valve 40, in the identical manner hereinbefore described.

Apertured ears 75, 76 and 77 are provided on the casing, as a means wherewith to suspend it properly in operative position. The apertures in the ears, it is understood are intended to receive screws or similar fastening elements capable of holding the casing and its appurtenances in place on any suitable primary support.

In practice, the invention may be put to several uses, familiar to persons versed in the art to which it appertains. For example, it may be employed for blowing a whistle on a motor-propelled boat, wherein the power is derived from an internal combustion engine, and there is no steam available. In such a case, the casing containing the valve may be secured at any convenient place on the side planking or bulkheads of the boat. Preferably, it will be mounted so as to receive a supply of compressed air from a tank, charged by a pump driven by the boat-propelling motor, but in the absence of a tank, it could be connected directly to the pump. On the other hand, the electric circuit wires that are coupled up with the detachable plug members previously spoken of, can be led to some distant part of the boat and connected up with a push-button located at any point that may be found convenient for the helmsman.

While a certain preferred embodiment of this device has been shown and described, it will be understood that changes in the form, arrangements, proportions, sizes and details thereof may be made, without departing from the scope of the invention as defined by the appended claims.

Having described my invention what I desire to secure by Letters Patent and claim is:—

1. A device of the character described comprising in combination, a casing formed with aligned chambers and a compartment, one of the chambers and said compartment having their opposite outer ends open, a main valve intermediate of said chambers adapted to interrupt the flow of fluid therethru, a piston of larger area than said valve movable coincidentally therewith, means permitting the fluid to flow on both sides of said piston so that a preponderance of pressure on one side thereof will tend to keep the valve closed, the piston being provided with a passage of greater capacity than said means designed to establish a communication between the chambers, a pilot-valve arranged to follow movements of the piston serving to maintain said passage shut, an element for opening said pilot-valve to allow the fluid that has passed the means named to escape through the passage in the piston faster than what is supplied thereto, whereby the latter will act to move the main valve to produce a direct flow from one chamber to the other, an electromagnet lodged in said compartment, an armature also contained therein capable of controlling said element thru said magnet, and covers effecting fluid tight closures for the outer ends of one of the chambers and the compartment, while permitting removal of the operating parts of the device without disturbing said casing.

2. A device of the character described comprising in combination, a casing formed with aligned chambers and a compartment, one of the chambers and said compartment having their outer ends open, said chambers being adapted for communication with each other, a main valve controlling said communication, a piston of larger area than said valve operatively connected thereto, said piston being provided with a by-pass and a substantially central passage of greater capacity, said by-pass permitting the fluid to flow on opposite sides of the piston, the outer face of the latter admitting of a preponderance of fluid pressure thereon operating normally to close the valve, a pilot-valve resiliently seated in said passage, an element acting in opposition to said pilot-valve to open the passage so as to overcome said preponderance of pressure and thereby enable the main valve to become unseated, an electromagnet lodged against the inner end of said compartment, an oppositely located armature capable of actuating said element thru said magnet, removable covers closing the outer ends of one of the chambers and the compartment, and an offset stop intermediate one of said covers and the piston to limit the travel thereof.

3. A device of the character described comprising in combination, a casing having chambers with a valve seat intermediate thereof and including a compartment beyond the same, a main valve coacting with said seat, a hollow stem connected to said valve at one end, a piston at the other end of said stem adapted to move the valve, the inner face of said piston being larger than that of the valve but smaller than its outer face, a by-pass leading the fluid from one side of the piston to the other, a pilot-valve normally closing said hollow stem whereby a preponderance of fluid pressure is exerted upon said outer face of the piston which operates to keep the main valve seated while the pilot-valve remains closed, an element for opening the latter to transfer the pressure preponderance from the outer to the inner face of the piston thereby causing the main valve also to be opened so that the main body of the fluid will be led directly from one chamber to the other, and that part of the fluid which flows through the by-pass

will be returned to the main body by way of the hollow stem, an electromagnet lodged in said compartment, an armature also contained therein capable of controlling said element thru said magnet, and a hollow boss on said casing communicating with the compartment to accommodate the terminals of the electromagnet.

4. A device of the character described comprising in combination, a casing having intercommunicating chambers of different diameters and including an enlarged compartment, a main valve seated between said chambers, a laterally perforated tubular stem extending from one chamber into the other and carrying said valve intermediate thereof, a piston also carried by said stem at the outer end of the same, means permitting part of the fluid to reach both sides of the piston, a pilot-valve normally keeping closed the piston end of the stem, the opposite areas of the main valve and of both faces of the piston being made of progressively increasing size to establish a preponderance of fluid pressure first on the outer face of the piston tending to urge the main valve to its seat when the pilot-valve is shut, an element operable through the inner end of the tubular stem to open the pilot-valve to shift the pressure preponderance from the outer to the inner face of the piston whereby the first named valve becomes unseated to let pass the main current of the fluid while said part thereof that reached the outer face of the piston is allowed to escape past the pilot-valve through the tubular stem and its lateral perforations to join the main current, an electromagnet lodged in said compartment, an armature also contained therein capable of controlling said element thru said magnet, a hollow boss on the side of said casing communicating with the compartment, a socket affording an anchorage for the terminals of the electromagnet entered into the interior of said boss, and a detachable wire connection arranged to engage said socket and make contact with said terminals.

5. A device of the character described comprising in combination, a casing provided with a plurality of bores constituting chambers therein, a main valve having its seat between adjoining chambers, a piston connected with said valve at a distance therefrom and fitted for reciprocation in an outer chamber, a by-pass permitting the fluid to flow on both sides of said piston, the opposite faces of the latter and of the valve being made progressively diminishing in their respective areas so as to obtain a preponderance of fluid pressure first on the piston's outer face and subsequently on the inner face thereof to close and open the valve respectively, a pilot-valve controlling a passage through the piston and main valve enabling transference of said pressure preponderance, an electro-magnet located in an outer chamber remote from that containing the piston, and an operative connection effecting the opening of said pilot-valve from said magnet, said connection including a rod disposed substantially axially of said casing and operating thru the magnet and the main valve against an end part of the pilot valve within the passage controlled thereby.

6. A device of the character described comprising in combination, a casing formed with interconnected chambers separated by a valve seat, a main valve movable to and from the same, an actuating piston for said valve having inner and outer areas progressively larger than the latter, means enabling the fluid to reach both sides of said piston to establish a preponderance of pressure on either side thereof to open or shut the valve, a pilot-valve normally closing a passage in the piston adapted to throw the pressure preponderance from one to the other of its sides, an electro-magnet mounted in opposed relation to said pilot-valve, an element acted upon by said magnet serving to dislodge the pilot-valve from its seat, and manually operated means independent of of said element capable of moving the same to unseat the pilot-valve irrespective of the magnet, said means moving in the same direction as the element when unseating the pilot valve but being automatically restored to its initial position in the opposite direction.

7. A device of the character described comprising in combination, a casing having chambers in substantial alignment, a main valve seated between adjacent chambers, a piston capable of actuating said valve, the area of the latter being smaller in progressive ratio than the piston's inner and outer faces, means allowing the fluid to pass on both sides of said piston to produce a preponderance of pressure on either face thereof to close or open the valve, a spring seated pilot-valve controlling the flow of fluid through a passage designed to shift the pressure preponderance from one face to the other of the piston to reverse the main valve's position, an electro-magnet situated oppositely to said pilot-valve, a spring opposed armature energized by said magnet, a loose connection operable by said armature to unseat the pilot-valve, a spring retracted spindle adapted upon manual operation to move said connection independently of the magnet, and means at the inner end of said spindle effecting a tight joint therefor when retracted by its spring.

BERNHARD WICHSER.