Feb. 17, 1953 C. J. MEHLER 2,628,588

MICROMETER ADJUSTMENT DEVICE FOR VALVES

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Fig. 1.

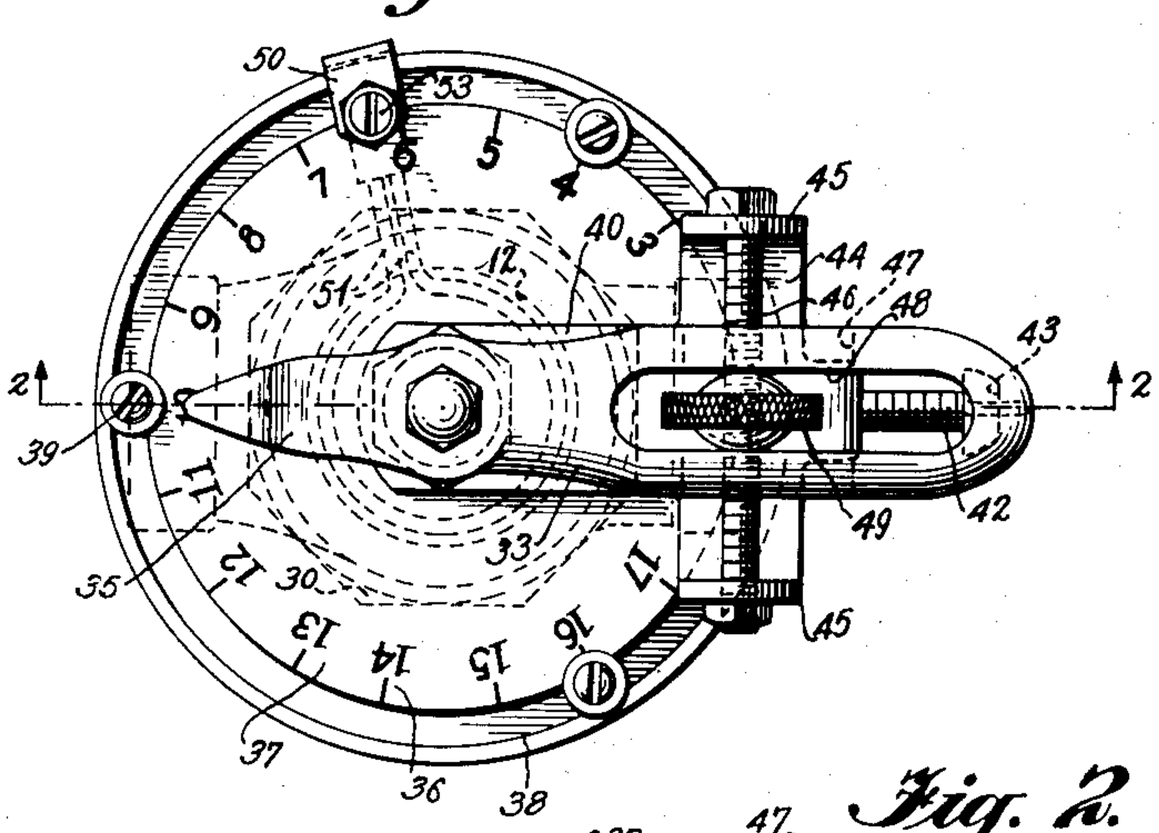


Fig. 2.

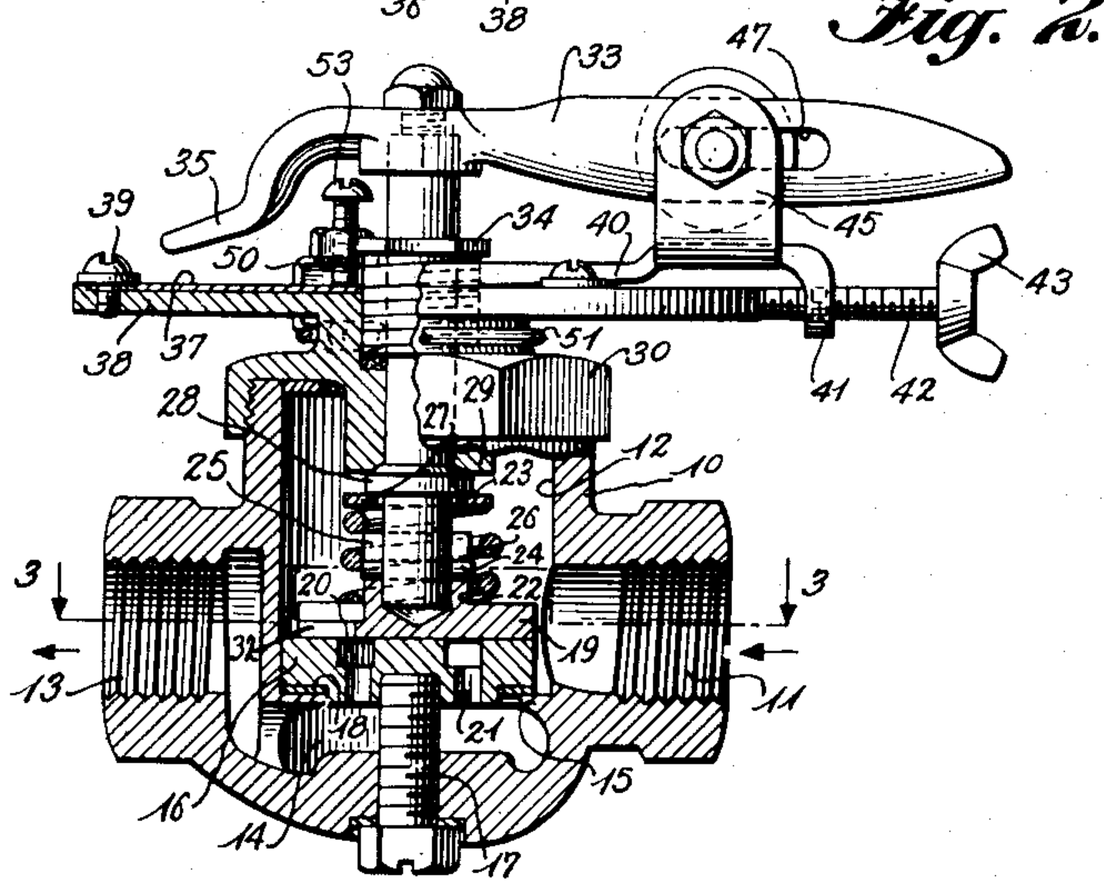
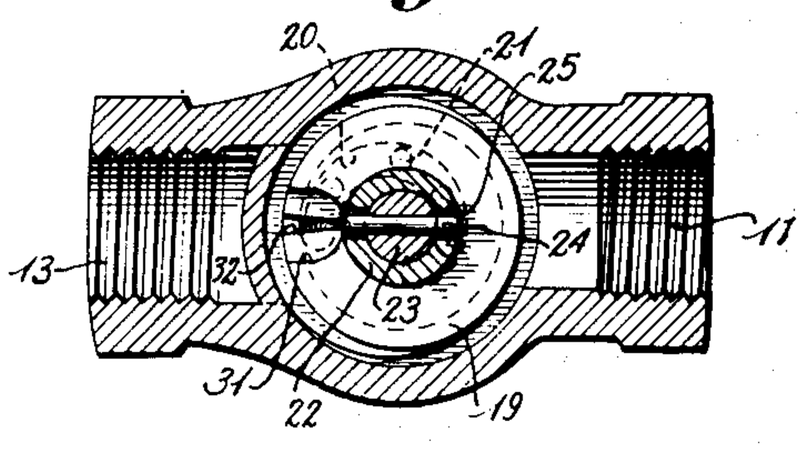


Fig. 3.



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MICROMETER ADJUSTMENT DEVICE FOR VALVES

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5 Claims. (Cl. 116—125)

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This invention relates to improvements in valves, being concerned more particularly with a valve characterized by features which render it of particular utility in installations wherein fine and accurate regulation of flow of a fluid is desired.

Heretofore, in an effort to obtain more or less fine and accurate regulation of flow, it has been the practice to design each valve of the so-called "precision" type with reference to the specific factors involved in the particular installation in which the valve is to be included; and as a result of the many different uses calling for "precision" valves and the widely different flow factors involved, the designing and manufacturing of each valve with reference to the specific characteristics of the particular installation have proved inefficient and costly.

The principal object of the present invention, therefore, is to overcome the above objections, this object contemplating a valve which may be designed and manufactured as a standard unit and which as so designed and manufactured, and without any dimensional changes in the parts thereof, or changes in dial calibration, is available for use in installations wherein widely different flow factors are involved and which in any such installation may be adjusted accurately and with facility to obtain large or minute flow variations, as desired.

A further object is to provide a valve of the "precision" type wherein provision is made for obtaining rapid changes in flow in any adjustment of the valve in the range in which fine adjustments are not called for.

A still further object is a valve which is highly accurate in operation and simple and inexpensive in design.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a top view of a valve embodying the features of the invention;

Figure 2 is a vertical section taken along line 2—2 of Figure 1; and

Figure 3 is a horizontal section taken along line 3—3 of Figure 2.

The features of the invention may be incorporated in valves of various types. The valve illustrated includes a body 10 formed with an inlet passage 11 (Figure 2) which communicates with the inlet chamber 12, the entrance portion of the inlet passage being threaded. The valve body is also formed with an outlet passage 13, threaded at its outer end, which communicates with an outlet chamber 14. At its bottom the inlet chamber is formed with an annular ledge 15 for supporting a stationary disc 16, the latter being secured in the bottom of the inlet chamber against the ledge by a threaded element 17. A sealing ring 18 is shown between the disc 16 and ledge 15 to insure a fluid-tight joint between these parts.

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The upper face of the disc 16 provides a seat for a rotatable element 19 and is formed with an arcuate channel 20, the latter being in eccentric relation with respect to the axis of rotation of the element 19 and being in communication with the outlet chamber 14 through ports 21.

The rotatable element 19 constitutes the movable element of the valve and its lower face cooperates with the upper face of the disc 16, the element 19 being formed with a tubular neck 22 for receiving the lower end of a spindle 23. The latter carries a cross-pin 24 at its lower end, the ends of the cross-pin being accommodated in diametrically-opposed, vertical slots 25 in the neck 22 to thereby hold the spindle and element 19 against relative angular movement.

The pin and slot connection described, however, permits removal of the end of the spindle 23 from the neck 22. It also permits a spring 26 which is arranged around the spindle to bias the element 19 against the disc 16, the spring 26 being under compression between the element 19 and a washer 27 which acts against an annular enlargement 28 on the spindle. The spring 26 in acting against the element 19 and washer 27 in the manner described also biases the top face of the annular enlargement 28 against a seat provided in the lower end of a sleeve extension 29 formed on the under side of a cap-piece 30, the latter having an internally threaded flange and screwing onto the upper end of the valve body which is externally threaded for this purpose.

As best shown in Figure 3, the rotatable element 19 is formed in its upper face with a peripheral depression 31 and the resultant thinner portion of the element 19 is formed with a radially-extending, V-shaped notch 32, the side walls of the notch converging in the direction of the axis of rotation of the element 19.

Fluid entering the valve through the inlet 11 passes into the inlet chamber 12. From the latter it passes through the notch 32 (assuming the element 19 is adjusted to permit this) into the arcuate channel 20. From the channel 20 the fluid enters the outlet chamber 14 through the ports 21 and then passes to the outlet 13. In this connection it will be noted that the path of movement of the notch 32 is concentric with respect

to the axis of rotation of the element 19 while the arcuate channel 20 in the upper face of the disc 16 is eccentric with relation to such axis. As shown, the channel 20 is so formed that when the element 19 is angularly adjusted to one limit of its range of movement the notch 32 is located in its entirety radially outwardly with respect to the channel while at the other limit of the range of movement of the element 19 the notch 32 extends entirely across the channel. The two limits referred to correspond to the fully closed and fully open positions, respectively, of the valve, it being understood that as the element 19 moves from the fully closed position to the fully open position, the extent to which the notch 32 overlies the channel 20 increases progressively, the rate of flow in any particular position depending, among other factors, upon the dimensions of the notch and the extent to which the latter is open.

A valve having the structural features described is far superior in action to a needle valve as better flow regulation can be obtained. The valve has the further advantage that it is self-cleaning in action, any foreign matter tending to accumulate being subjected to the shearing action of the seat and rotor orifices during adjusting movements of the rotor.

Angular adjustments of the element 19 to regulate the flow of fluid through the valve is controlled by a handle 33. The latter is secured to the upper end of the spindle 23, there being a packing nut 34 carried by the cap-piece 30 to prevent the escape of fluid from the inlet chamber 12 through the opening provided in the cap-piece for the spindle. A radial extension 35 of the handle 33 provides a pointer, the latter traversing a scale 36 on a dial 37. The latter, as illustrated, is in the form of a disc and is arranged in a shallow depression in a disc-like support 38 formed on the cap-piece 30, the dial 37 being held in the depression by screws 39.

It will be apparent that the handle 33 may be grasped and manipulated to adjust the element 19 as desired, the dial 37 cooperating with the pointer 35 to indicate the rate of flow. Such adjustments as are made by manipulating the handle 33 are more or less rough adjustments. In accordance with the invention, therefore, means are provided whereby fine, or micrometric, adjustments of the element 19 may be made. The said means include an arm 40, the inner end of which is formed with an opening for accommodating the body portion of the packing nut 34 and being pivotally mounted thereon. At its outer end, the arm 40 is formed with a down-turned end 41 which is located in the same plane as the disc-like support 38 and which carries a threaded locking screw 42. The inner end of the locking screw is engageable with the peripheral edge of the support 38 while the outer end carries a wing nut 43.

Adjacent its outer end the arm 40 is formed with lateral extensions 44 which terminate in up-turned ends 45. The latter carry a micrometric stationary screw 46 which passes through elongated slots 47 in the opposite down-turned sides of the handle 33, the top wall of the handle being slotted longitudinally as indicated at 48 to accommodate an adjusting nut 49 on the micrometric screw. The nut 49 may, as shown, have a central, knurled wheel-like portion to facilitate its adjustment while the sides are more or less spherical for engagement with the side walls of the slot 48.

In operating the valve, rough adjustments are made merely by grasping the handle 33 and turning it to the extent desired, as indicated by the pointer 35, the screw 42 being disengaged from the periphery of the support 38 at such times. After such rough adjustments have meen made, the screw 42 is tightened to engage the periphery of the support 38 and thereby lock the arm 40 against angular movement. When this has been done, any further adjustment of the element 19 can only be made by turning the nut 49, turning of the nut in one direction effecting fine increments of adjustments of the element 19 in a closing direction and turning of the nut in the opposite direction effecting similar increments of adjustment of the element in the opening direction. The elongated slots 47 in the down-turned sides of the handle 33, and the spherical sides of the nut 49 permit angular movement of the handle, relative to the arm 40, in response to turning movements of the nut.

The valve described has the advantage that the parts thereof, including the dial, may be standardized with respect to widely different flow factors. In other words, the same valve may be employed in installations in which the average rate of flow range is large and may be employed to equal advantage in other installations in which the average rate of flow range is small. In either case fine and accurate adjustments of flow can be made throughout the entire range selected. In order to facilitate universal use of the valve in the manner described, an adjustable stop 50 may be, and preferably is, employed. The stop 50, as best shown in Figure 1, is carried by the outer ends of arms 51, which are integral with and extend radially with respect to a ring 52. The latter fits somewhat loosely around the neck portion of the cap-piece 30 and is free to turn relatively thereto. The stop 50, which is in the form of a pointer, overlies the peripheral edge of the dial 37 and carries a set-screw 53 for locking the stop in any desired position around the dial.

In the use of the valve the stop 50 may be adjusted so that it occupies a position over the dial corresponding to the maximum rate of flow desired in the particular installation in which the valve is to be employed. The stop by engagement with the pointer 35 will thus insure against any accidental adjustment of the valve to positions corresponding to greater rates of flow. Both rough and micrometric adjustments of the valve may be made, in the manner described, within the range between the closed position and the fully open position corresponding to that at which the stop 50 is set.

From the foregoing, it will be apparent that the micrometric adjustment provided renders the valve, within limits, substantially universal in use as a "precision" device. It will be understood, of course, that the features of the invention are not limited to the specific type of valve illustrated, that shown being intended by way of example only.

I claim as my invention:

1. Actuating means for precisely controlling the opening of a valve wherein the movable member of the valve is rotatable in the valve housing, said actuating means comprising a spindle, a lever secured intermediate its ends to said spindle for turning said spindle, one end of said lever being formed to provide a pointer, a support for the actuating means carrying a graduated dial which is traversed by said pointer, an arm mounted on said support to be adjustable angu-

larly about the axis of rotation of said spindle, means, including a micrometer element, for adjustably connecting said lever and arm, said lever and arm being movable as a unit to effect rough adjustment of said spindle, and means for locking said arm against angular movement relative to said support so that thereafter said lever may be adjusted by said micrometer element angularly relative to said arm to effect fine adjustment of said spindle.

2. Actuating means for precisely controlling the opening of a valve wherein the movable member of the valve is rotatable in the valve housing, said actuating means comprising a spindle, a lever secured intermediate its ends to said spindle for turning said spindle, one end of said lever being formed to provide a pointer, a support for the actuating means carrying a graduated dial which is traversed by said pointer, an arm mounted on said support to be adjustable angularly about the axis of rotation of said spindle, means, including a micrometer element, for adjustably connecting said lever and arm, said lever and arm being movable as a unit to effect rough adjustment of said spindle, and means carried by said arm and engageable with the periphery of said support for locking said arm against angular movement relative to said support so that thereafter said lever may be adjusted by said micrometer element angularly relative to said arm to effect fine adjustment of said spindle.

3. Actuating means for precisely controlling the opening of a valve wherein the movable member of the valve is rotatable, said means including a spindle, a lever secured intermediate its ends to said spindle for turning said spindle, an arm pivotally mounted at its inner end and angularly adjustable about the same axis as said spindle, one end of said lever being formed to provide a pointer and the opposite end a handle, a dial which is traversed by said pointer, a fixed support for said dial, the outer end of said arm having spaced-apart projections between which said handle extends, a transversely-extending screw mounted between said projections and connecting said handle to said arm so that they may both be moved together, and means for locking said arm to said support so that said lever may be adjusted relative to said arm by said screw and in so doing adjust in fine increments the angular position of said spindle, said last mentioned means being releasable so that said lever, arm and screw may be moved as a unit to effect rough adjustments of said spindle.

4. Actuating means for precisely controlling the opening of a valve wherein the movable member of the valve is rotatable, said means including a spindle, a lever secured intermediate its ends to said spindle for turning said spindle, an arm pivotally mounted at its inner end on said spindle, and angularly adjustable about the same axis as said spindle, one end of said lever being formed to provide a pointer and the opposite end a handle,

a dial which is traversed by said pointer, a fixed support for said dial, the outer end of said arm having spaced-apart projections between which said handle extends, a transversely-extending screw mounted between said projections and connecting said handle to said arm, said screw being adjustable to vary in fine increments the angular relation between said lever and said arm and in so doing adjust in fine increments the angular position of said spindle, and a locking element carried by said arm and engageable with said support to lock said arm against movement so that said lever may be adjusted only by said screw, said locking element being releasable so that said lever, arm and screw may be moved as a unit to effect rough adjustments of said spindle.

5. Actuating means for precisely controlling the opening of a valve wherein the movable member of the valve is rotatable, said means including a spindle, a lever secured intermediate its ends to said spindle for turning said spindle, an arm pivotally mounted at its inner end on said spindle and angularly adjustable about the same axis as said spindle, one end of said lever being formed to provide a pointer and the opposite end a handle, said handle having a top wall formed with an opening and sides formed with opposed openings, a dial which is traversed by said pointer, a fixed support for said dial, the outer end of said arm having spaced-apart projections between which said handle extends, a transversely-extending screw mounted between said projections and extending through the opposed openings in said handle, a nut carried by said screw for connecting the latter to said handle, said nut extending through said first mentioned opening so that it may be turned to vary in fine increments the angular relation between said lever and said arm and in so doing adjust in fine increments the angular position of said spindle, and a locking element carried by said arm and engageable with said support to lock said arm against movement so that said lever may be adjusted only by said nut, said locking element being releasable so that said lever, arm, screw and nut may be moved as a unit to effect rough adjustments of said spindle.

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