March 24, 1925. 1,530,858

J. W. SHAW

CONTROL VALVE

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Fig. 1.

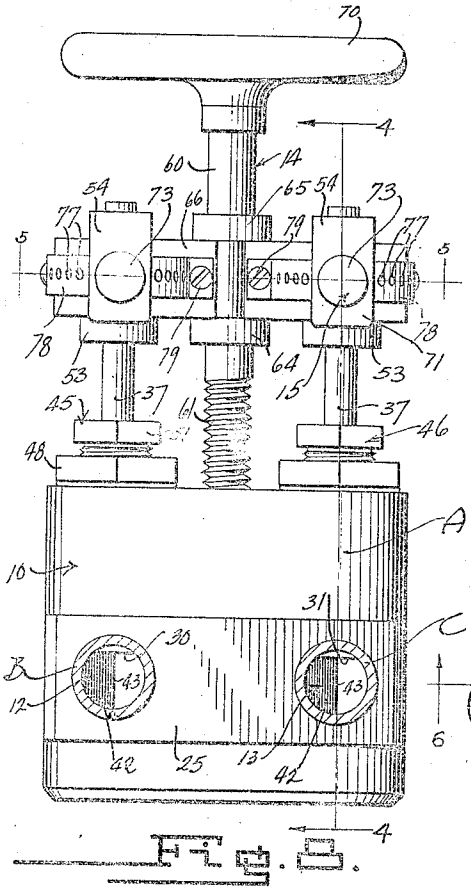


Fig. 2.

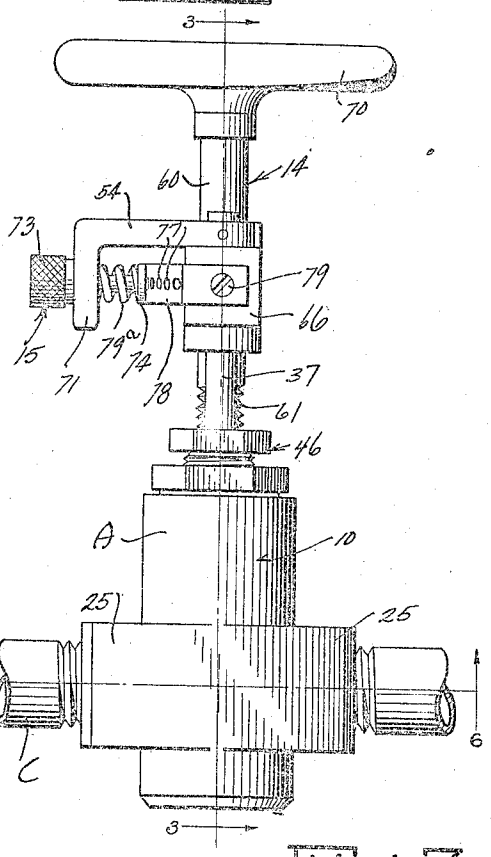
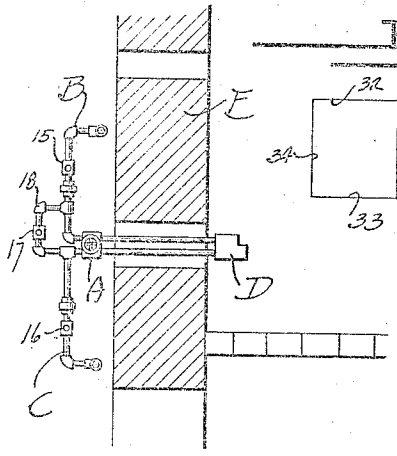


Fig. 3.



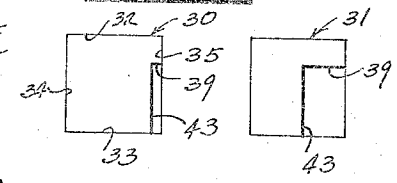
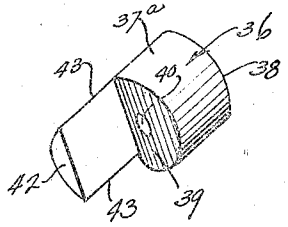


Fig. 7.



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Fig. 3.

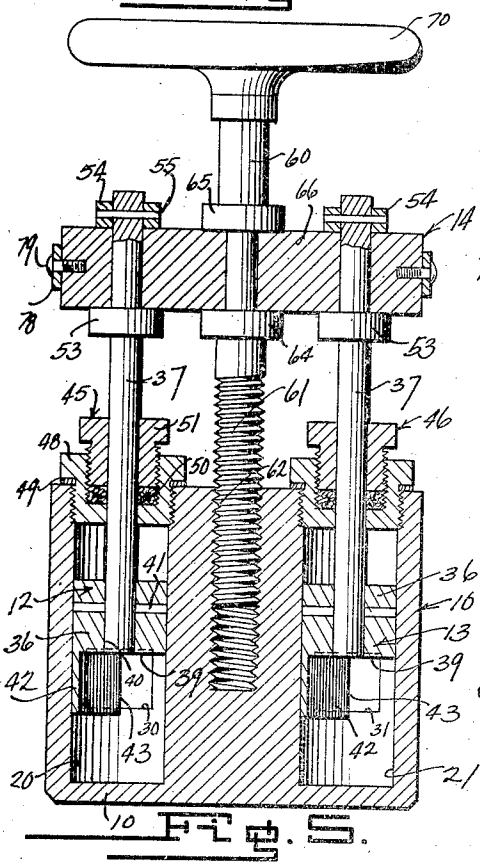


Fig. 4.

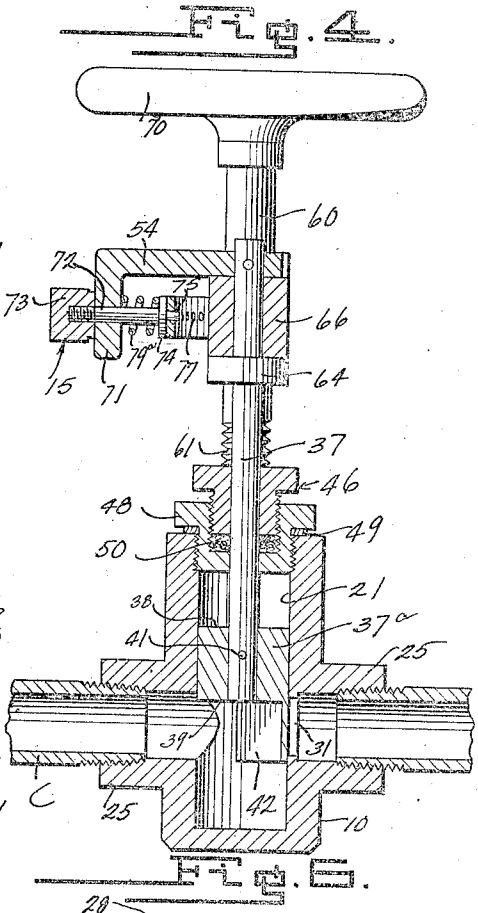


Fig. 5.

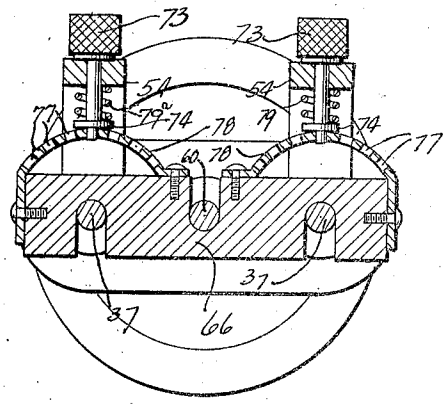
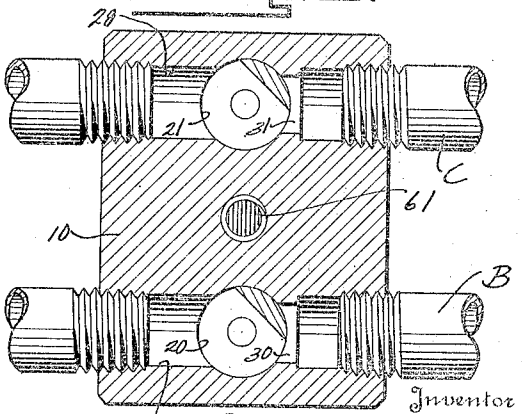


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN W. SHAW, OF BROOKLYN, NEW YORK.

CONTROL VALVE.

Application filed March 3, 1924. Serial No. 696,583.

To all whom it may concern:

Be it known that I, JOHN W. SHAW, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in a Control Valve, of which the following is a specification.

This invention relates to an improved control apparatus for regulating the quantity and ratio flow of various media.

The primary object of this invention is the provision of a novel regulating valve mechanism capable of being easily operated for accurately controlling the flow of fuel and an atomizing fluid to a burner, for the maintenance of an efficient ratio or mixture of the fuel and atomizing fluid independent of the demand of the burner unit, in order to maintain smokeless combustion; save fuel; eliminate furnace and unit repairs, and for enabling an expeditious adjustment to provide the proper ratio of the media controlled thereby.

At the present time in industries where oil is utilized as fuel, various burners are used, and in connection with the atomizing of this fuel by means of a fluid such as steam, air or gas, it is necessary to control the supply of fuel and atomizing fluid by means of separate control valves; one governing the atomizing fluid, and the other governing the oil supply. These fluids must be fed in proper ratio to the burner; the ratio of flow depending upon the individual characteristics of the burner. The ratio is at the best difficult to determine, and after the conventional control valves have been properly set to obtain the ratio, they cannot be disturbed if there is a demand for greater heat or less heat and maintain said ratio of media. In other words, with the conventional manner of regulating the flow of the media an increased or decreased quantity demand cannot be met without destroying the ratio of media being supplied to the burner. With the improved control apparatus herein described it is not necessary for the operator to pay continual attention, and experiment with adjusting of the valves in order to arrive at a correct ratio of the media whenever the demand on the unit fired is changed. The ratio of feed of the media is always constant and with a single operation the quantity supply of the media to the burner may be varied without changing the ratio.

A further and important object of this invention is the provision of a control apparatus of the above mentioned character which embodies a correct principle of port and valve design in order to accomplish a variable feed of several media always using the same ratio of media used.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views—

Figure 1 is a front elevation of the improved control unit showing cooperating details thereof.

Fig. 2 is a side elevation of the units illustrated in Figure 1.

Fig. 3 is a cross sectional view taken substantially on the line 3—3 of Figure 2 and showing cooperating valve features of the invention.

Fig. 4 is a transverse cross sectional view taken substantially on the line 4—4 of Figure 1.

Fig. 5 is a cross sectional view taken substantially on the line 5—5 of Figure 1.

Fig. 6 is a cross sectional view taken substantially on the line 6—6 of Figure 2.

Fig. 7 is a perspective view of a novel type of valve member used in pairs in each of the units for effecting the control or flow of media to the oil burner.

Fig. 8 is a fragmentary cross sectional view taken through a furnace showing the cooperating details of the oil burner apparatus with which the improved control unit is used, and

Fig. 9 is a diagrammatic representation of the manner in which the effective open area of the ports of the control unit may be maintained in order to operate at a predetermined ratio.

In the drawings, wherein for the purpose of illustration is shown only the preferred embodiment of the improved control unit, the letter A may generally designate the control valve unit which is adapted to be used in connection with pipe lines B

and C which respectively contain supplies of an atomizing fluid and oil for the proper supply of these media to an oil burner D; the parts A, B, C and D, of course, being used in connection with a furnace E.

The lines B and C contain their respective valves 15 and 16, and a clean out valve 17 is preferably positioned in a pipe connection 18 which extends from the line C to the line B. The control unit A is positioned so that the lines B and C enter it between the burner D and the connecting pipe 18.

Referring specifically to the unit A the same comprises a housing 10; valves 12 and 13; means 14 for connecting said valves for simultaneous adjustment for quantity regulation of the fuel and atomizing media; and means 15 for each of the valves 12 and 13 to enable said valves 12 and 13 to be independently adjusted for varying the ratio in which the fuel and atomizing media may be fed to the burner.

The housing 10 is constructed of metal in rectangular or other formation, providing a pair of vertically arranged chambers 20 and 21 therein wherein the valves 12 and 13 are respectively mounted for adjustment by the means 14 and 15, as will be subsequently described. These chambers 20 and 21 are of cylindrical formation and are arranged with their axes parallel. The housing is provided at opposite sides thereof with pipe connecting extensions 25, wherein are connected the sections of the pipes B and C. Transverse passageways 27 and 28 are arranged through the housing 10, in intersecting relation respectively with the valve chambers 20 and 21. The passageways 27 and 28 are of relatively great diameter, and these passageways are reduced at one side of the chambers 20 and 21 to provide shoulders wherein are positioned square or rectangularly formed ports 30 and 31 for the chambers 20 and 21 respectively. These ports 30 and 31 lie in the same horizontal plane and are of exactly the same length. While they have been shown as square, one or both may be rectangularly formed, and the upper and lower edges 32 and 33 respectively of each of these ports are parallel and horizontally positioned, with the side edges 34 and 35 parallel with each other and vertically positioned.

The valves 12 and 13 are of identical construction and each includes a novel valve head 36 and a stem 37. The valve head 36 for each valve construction 12 and 13 includes a cylindrical shaped body or piston portion 37^a having a top flat surface 38 and a lower flat surface 39 parallel with the surface 38; a passageway 40 being provided through this valve body 37^a for receiving an end of the valve stem 37 and to which it is connected by means of a cross pin 41, substantially as is illustrated in Figure 3 of the drawings. The valve head 36 for each valve construction furthermore consists of a segment 42 formed in a depending relation from the body 37^a so that the convex or arcuate outer surface of the segment lies flush with the circumference of the body portion 37^a. The side edges 43 of the segment 42 may be aptly characterized as cut off edges, as they cooperate in regulating the proper ratio of the media fed through the ports 30 and 31, and as will be subsequently mentioned.

The stems 37 of the valve constructions 12 and 13 extend upwardly through the chambers 20 and 21 in an axial relation in said chambers and extend in slidable relation through suitable glands 45 and 46 detachably provided in the upper ends of the chambers 20 and 21 respectively. These glands may each consist of a nut 48 adapted to be screw threaded in the top of a chamber for compressing a gasket 49 about the top of this chamber to prevent seepage of a fluid from the chamber. The valve stem 37 extends upwardly through the nut 48 and the nut is hollow to receive a packing material 50 disposed about the valve stem 37. The gland body 51 is in the form of a nut adapted to be threadably received in the nut 48 to compress the packing 50 about the stem 37 so that the stem 37 as it slides through the gland structure will have a fluid tight connection and the media will be prevented from flow or leakage, notwithstanding the fact that it may be under pressure. The valve stems 37 below their upper ends are each provided with a collar 53 integral therewith, and at the upper ends of each of said stems 37 a bracket member 54 may be detachably connected to each of said valve stems by means of a transverse pin 55.

Referring to the means 14 for the mounting of said valve constructions 12 and 13 by means of which they may be simultaneously moved longitudinally of the chambers in which they are disposed, this means 14 consists of a regulating stem 60 provided with a screw threaded end 61 adjustable within a tapped opening 62 in the body of the housing 10 between the chambers 20 and 21 of said housing; this screw threaded or tapped opening 62 being parallel with the chambers 20 and 21. The stem of the adjusting member 60 is provided with a pair of spaced collars 64 and 65 thereon between which is supported a connector bar or member 66. The portion of the stem 60 between the shoulders 64 and 65 is rotatably mounted or bears in a passageway provided through the connector bar 66 as a means of supporting the latter. The bar 66 adjacent its ends is provided with a pair of passageways through which the stems 37 of the valve structures 12 and 13 extend; the

shoulders 53 and 54 of these stems 37 bearing on opposite sides of the connector bar to insure an adjustable connection of the stems 37 upon the connector bar 14; but preventing longitudinal movement of these stems 37 with respect to the connector bar 66. The stem 60 upwardly thereon is provided with a hand wheel 70 by means of which the stem 60 may be rotated for feeding the same inwardly or outwardly of its screw threaded opening 62.

Means 15 for independent adjustment of each valve structure comprises the bracket 54 above mentioned, of L-shaped formation and providing a vertical depending flange 71 which slidably receives a latch plunger 72 therethrough; the plunger 72 at its outer end supporting a thumb nut 73, and at its inner end having a collar 74 rigid therewith and providing a reduced portion 75 inwardly of the collar 74 which is adapted to fit within any of a series of apertures 77 provided in a segmental piece 78 which is detachably secured as by screws 79 to the connector bar 66. A spring 79ª is compressed intermediate the collar 74 and the flange 71 and normally urges the plunger latch 72 to engage this piece 78. This construction 15 is, of course, provided for each of the valves 12 and 13, and it can readily be understood that by pulling outwardly upon the thumb piece 15 the end 75 will be withdrawn from an aperture 77 in the piece 78 and by swinging or oscillating the bracket 54 the valve head 36 will be angularly moved through a slight arc within its chamber 20 or 21 of the housing 10 for opening or closing the effective area of the port 30 or 31.

In operation, the cutter edges 43 of the segment 42 of both valves are provided for the purpose of adjustment across the area of the ports 30 and 31 upon regulation of said valves by the means 15. At this point it will be well to mention that in the burning of fuel oil there is always a greater percentage, by volume, of the atomizing medium than the fuel or oil, and very rarely if ever, is the ratio less than one part of fuel to one and one-half parts of the atomizing medium. All fuel burners have individual characteristics and the ratio demanded by the particular burner may vary anywhere from one to one and one-half, to as great a ratio as one to fourteen. Heretofore, in the control of the fuel and atomizing fluids, the ratio having been properly set, if it was desired to increase or decrease the load on the burner for the purpose of increasing or decreasing the intensity of the heat, the ratio was destroyed. There have been valves proposed for the controlling of these media by single operation, but these control units are inefficient in that when it is desired to vary the load or quantity of the atomized and oil fuel media, the ratio or proportion of feed of the same is destroyed, and it is necessary for the operator to reset the individual valves in order to arrive at the proper ratio to prevent improper combustion and other detrimental conditions.

With the improved unit A, however, the characteristic of the burner D is found, and the individual valve structures 12 and 13 are set by means of their individual means 15 so that an effective area of the ports 30 and 31 is exposed to permit the proper ratio of fuel and atomizing fluid to flow through these ports. The ratio of effective area of the ports 30 and 31 having been set, the valve structures 12 and 13 may be simultaneously adjusted by rotation of the stem 60 to increase or decrease the effective area of the ports; the ratio, however, always remaining the same and not being changed when the load upon the burner is varied. Exhaustive investigation and experiment has proven that the only type of port which will give satisfactory results is of polygonal formation, and more specifically rectangular or square as is illustrated in the drawings by ports 30 and 31. The segmental portions 42 of the valve heads 36 are used for lateral adjustment across said valve ports to expose the proper proportion of the ports 30 and 31, and it is to be noted that the lines or edges 43 of the segments 42 denote the shut-off of the ports for lateral regulation of said ports. The lower surfaces 39 of the valve bodies 37ª denote the shut-off lines for the ports 30 and 31 upon simultaneous adjustment of the valves by the means 14. These surfaces 39 are in the same plane and upon raising or lowering of the valve heads 36 by the means 14 the volume of the atomizing and fuel media may be varied without changing the proportion in which these media are fed to the burner D.

The diagrammatic representation in Figure 9 shows the ports 30 and 31 with their horizontal and vertical side edges and the lines denoted 43 designate the shut-off edges of the segmental portions 42 of the valves, whereas the lines 39 denote the surfaces 39 of the valve heads 36. While the lines 43 may respectively differ in positioning across the ports 30 and 31, the shut-off lines 39 always are elevated or lowered together, and it is very apparent that the volumn flow of the media may be varied, without in the slightest degree varying the ratio in which these media are supplied.

The fact that the valve heads always travel in the same plane to simultaneously open the ports 30 and 31 enables the proper ratio of the media to be fed to the burner and prevent premature explosion or smoky combustion. The ports are of identically

the same size and the shut-off edges of the valve heads are of identical formation for both valve constructions.

Various changes in the shape, size, and arrangement of parts may be made to the form of the invention herein shown and described, without departing from the spirit of this invention or the scope of the claims.

I claim:

1. As an article of manufacture a valve comprising a cylindrical shaped body portion, and a segmental portion rigid with the body portion extending outwardly from an end thereof with the arcuate face of said segmental portion flush with the arcuate circumference of the body portion.

2. As an article of manufacture a valve head comprising a cylindrical shaped body portion having a flat lower surface and having a segmental portion depending from the flat surface of said body portion, said segmental portion providing side edges of straight line formation disposed at right angles to the plane of the flat surface of said body portion.

3. In a regulator of the class described the combination of a housing providing a pair of chambers therein and having ports communicating laterally therethrough, valves slidable in each of said chambers including depending segmental portions, means for independently moving said valves so that the segmental portions may be moved independently across their respective ports for regulating the effective open area of said ports with respect to each other in a determined ratio, and means for moving said valves longitudinally in their chambers for opening or closing said ports without destroying the ratio of effective opening of said ports.

4. In a regulator of the class described the combination of a housing providing a pair of parallel chambers vertically disposed therein, and having ports of square formation communicating laterally through said chambers, valves each including a cylindrical portion provided with a lower horizontally disposed surface, and each of said valves including a depending segmental portion providing a vertical side edge, means movably mounting said valves so that they may be independently adjusted in their chambers so that the segmental portions thereof may have their straight edges moved across said respective ports for opening or closing the ports and whereby a desired ratio of effective opening of the ports may be obtained, and means for moving said valves simultaneously in their chambers so that the body portions of said valves may move upwardly or downwardly across the ports to open or close the ports without destroying the ratio of effective opening thereof.

5. As an article of manufacture a valve structure consisting of a housing providing a chamber therein having a polygonal shaped port therethrough, and a valve rotatably and longitudinally slidable in said chamber providing a valve head of cylindrical formation adapted to snugly fit for sliding relation in said chamber and providing a segmental portion rigid with said cylindrical portion and extending outwardly therefrom at an end thereof so that it may control the opening of said port by rotational movement of the valve in said chamber.

6. In combination a housing having a port therein, and a valve rotatable and reciprocable in the housing including a body portion and a depending segmental shaped portion, the former of which is adapted to operate across the port and the latter of which is adapted to operate across the port in transverse direction to the body portion to regulate the effective area of said port.

7. A valve structure consisting of a housing providing a chamber therein having a port laterally therethrough, a valve rotatably and slidably mounted in said chamber providing a valve head with means to control the area of the port both by rotary movement of the valve in said chamber and longitudinal sliding movement therein, a rod connected with the valve and extending from said housing, an adjusting member carried by said housing, a support carried by said adjusting member within which said adjusting member is rotatably mounted so that the support will move with the adjusting member as the same is adjusted in said housing, means rotatably supporting the valve rod on said supporting member, means carried by the supporting member providing a plurality of openings therein, means carried by the rod extending outwardly therefrom adjacent said supporting member, a plunger member carried by said last mentioned means including a spring adapted to force the plunger member into any of the openings of said means whereby to hold the valve in a desired adjusted relation with respect to said port.

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