Nov. 18. 1924 1,515,673

H. G. GEISSINGER

ELECTROMAGNETIC CONTROL OF MULTIPLE VALVES

Filed Dec. 24, 1920 2 Sheets-Sheet 1

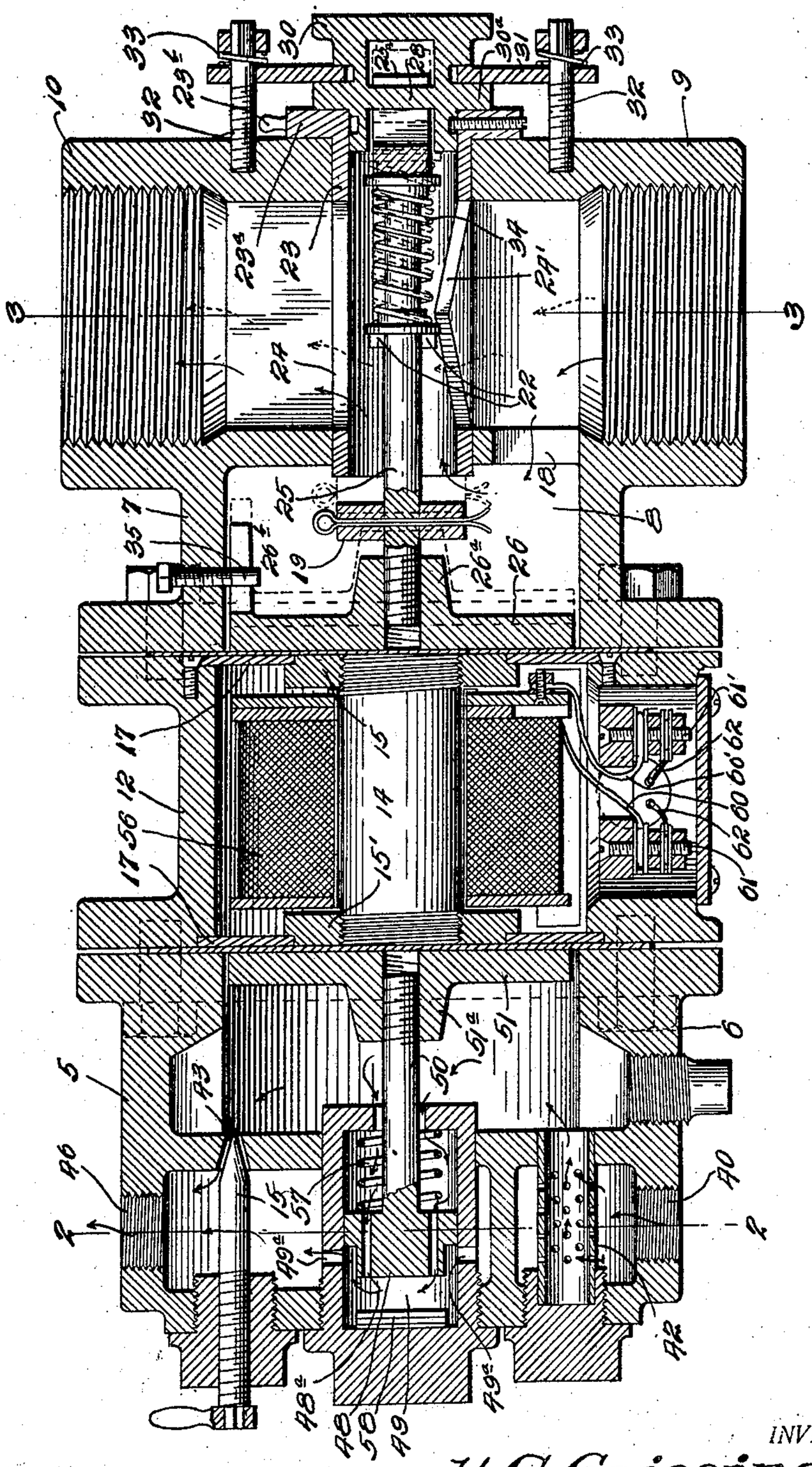


Fig. 1.

INVENTOR.
H. G. Geissinger
BY
Eugene C. Brown
ATTORNEY.

Witness

Nov. 18, 1924. 1,515,673

H. G. GEISSINGER

ELECTROMAGNETIC CONTROL OF MULTIPLE VALVES

Filed Dec. 24, 1920 2 Sheets-Sheet 2

Fig. 3.

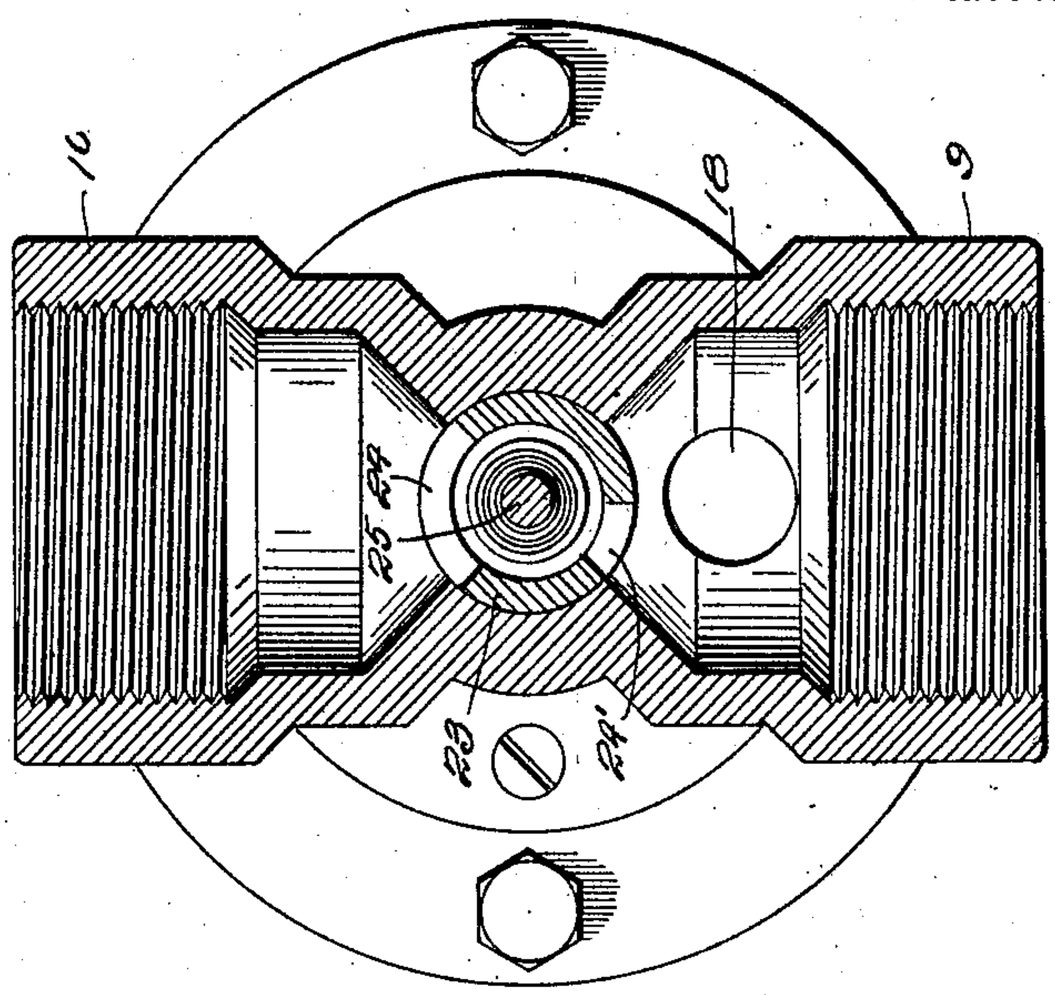
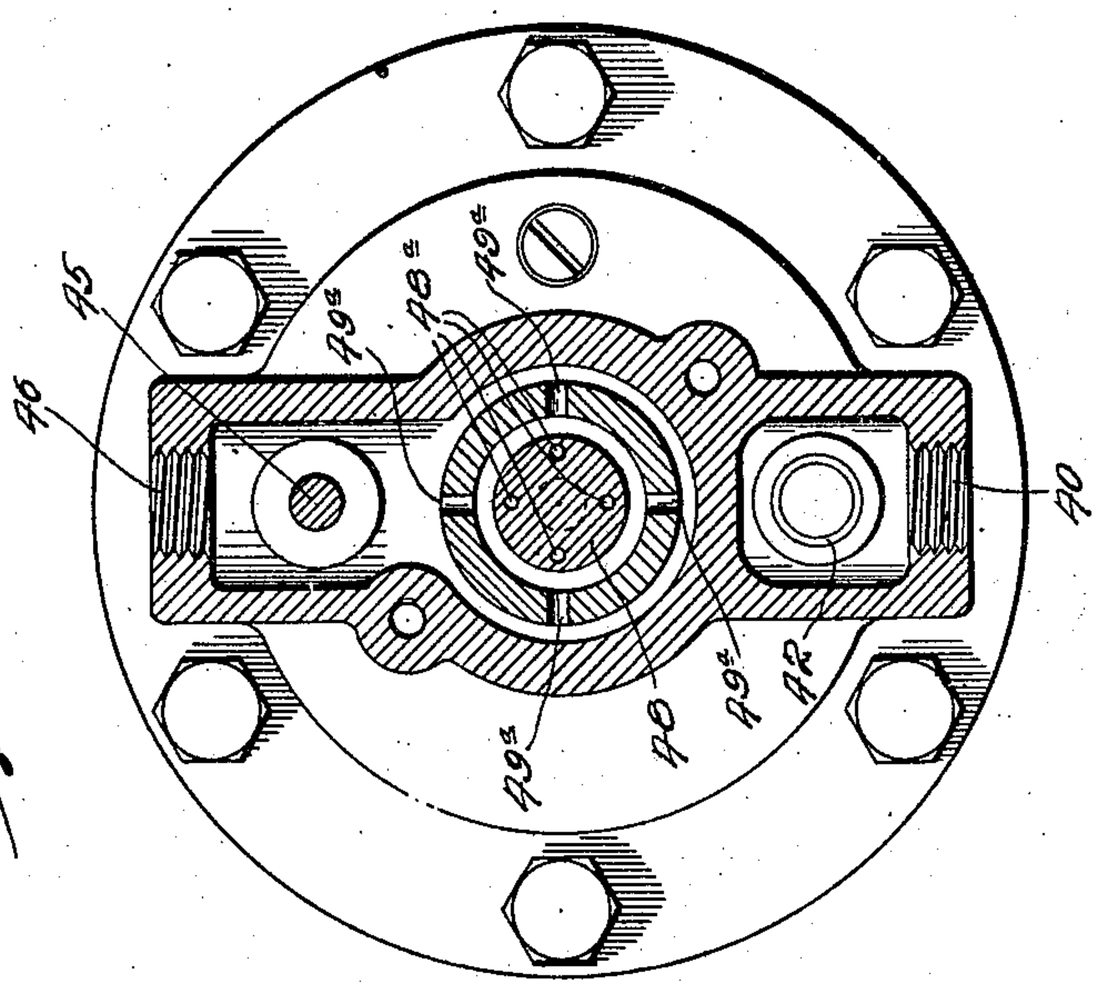


Fig. 2.



INVENTOR.
H. G. Geissinger,
BY
Eugene C. Brown
ATTORNEY

Witness

Patented Nov. 18, 1924. 1,515,673

UNITED STATES PATENT OFFICE.

HARRY G. GEISSINGER, OF DETROIT, MICHIGAN.

ELECTROMAGNETIC CONTROL OF MULTIPLE VALVES.

Application filed December 24, 1920. Serial No. 433,004.

To all whom it may concern:

Be it known that I, HARRY G. GEISSINGER, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Electromagnetic Controls of Multiple Valves, of which the following is a specification.

My invention relates to multiple valve structures under the control of a single electro-magnetic device. While it is especially adapted for two fluids, such as oil and air, supplied to a fuel oil burner, it is applicable to other uses.

The main purpose of my invention is to provide a multiple valve which practically eliminates the danger of turning on the oil supply without the corresponding air supply, or the gas without the air. A further object is to provide an electro-magnetic multiple valve actuating device in which the impelling force is immediately increased upon the valve which is momentarily checked by an extra resistance which may be due to various causes, such as interference from gritty, tarry or scaly matter in the oil, gas or air.

For the purpose of clearly explaining the nature of my invention I shall refer in the following description to the accompanying drawings, in which—Figure 1 is a longitudinal sectional view of an apparatus embodying my invention; Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1; and Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 1.

It is necessary to regulate the volumes of gas and air in gas-fired furnaces and the volumes of oil and air in oil-fired furnaces. In my multiple valve structure the volumetric regulation is produced by varying the lift of the magnetically operated valve and by the construction of the valve seat as hereinafter described. It has been the practice to by-pass certain amounts of oil and air or other atomizing medium around thermostatically controlled fuel systems. I have effected an appreciable reduction in the cost of the by-pass loops and valves formerly required by incorporating the by-passes in the valve structure.

My multiple valve structure comprises a casing 5 containing the oil chamber 6, a casing 7 containing the air chamber 8 and provided with tubular inlet 9 and outlet 10, the two casings being connected by the intermediate magnetic shell 12 constituting the yoke member of the actuating electro-magnet, the core 14 of which is provided with enlarged pole members 15, 15′ centrally held within the shell by means of non-magnetic rings 17. The air entering the inlet passage 9 passes through the port 18 into the air chamber and when the valve 19 is held in open position as indicated in Fig. 1, a free passage is provided through the open end of the axially adjustable cylindrical valve member 23 and through the lateral passage 24 therein to the outlet channel 10. The valve is carried by the stem 25 which is threaded at its inner end into the central boss of the armature 26 and at its outer end is provided with a slotted yoke portion 25^a which straddles pin 28 of the rotatable plug 30. By turning the plug in one direction or the other the stem is advanced or retracted within the boss 26^a to thereby adjust the maximum opening of the port 25 and the throw of the armature 26, the latter being guided by the pin 35 projecting through the slotted lug 26^b. The outer end of the tubular valve member 23 is provided with a flange 23^a which is frictionally held between the flange 30^a and the casing, and which may be rotated by the handle 23^b. The plug 30 is yieldingly held by a yoke 31 fitting at its inner edge in a groove in the plug and at opposite sides of its outer margin is supported by screw-pins 32 which carry coiled springs 33 to cushion the blows of the valve 19 against its seat upon the inner end of the tubular valve member 23. The valve 19 is normally held closed against its seat by the coiled spring 34 which surrounds the stem 25 and bears against the lugs 22 projecting from the inner wall of the valve member 23.

The slot 24 in the upper side of the tubular valve member 23 maintains an unobstructed passage into the outlet tube 10 at all times. The lower side of the valve member 23 is provided with a V-shaped slot 24′ which permits the by-pass opening direct from the inlet 9 through the tubular valve member to be varied by turning the valve member in one direction or the other by means of handle 23^b, thereby determining the minimum flow of air when the valve 19 is closed against its seat.

The oil passages at the opposite end of the device are likewise provided with a minimum flow by-pass. The oil entering the

inlet opening 40, passes through the strainer plug 42 into the oil chamber 6 and from thence through the minimum flow passage 43 determined by the adjustment of the screw plug 45, to the outlet passage 46.

The main valve-piston 48 reciprocates in the valve chamber 49 and is carried by the stem 50 which is threaded in the boss 51ª of the armature 51, the stroke of the piston, being determined by the adjustment of the stem 50 in the hub 51ª. When the valve 48 is moved to the open position, shown in Fig. 1, the ports 49ª, are uncovered, permitting the oil to flow from the oil chamber 6 through the opening around the stem 50 and through the passages 48ª in the piston valve 48 into chamber 49, and from thence through the ports 49ª to the outer port 46. As soon as the magnet coil 56 is deenergized the armature 51 will be retracted and the valve 48 forced to the left by the spring 57 until the valve strikes the washers 58, thus closing the ports 49ª, cutting off the flow of oil, except that which may flow through the minimum by-pass 43. The washers 58 being immersed in oil, entrap particles of oil between them as they are struck by the piston and crowded together, thereby serving as a cushioning stop. The terminals 60, 60′ of the magnet coils 56 are connected through the binding posts 61, 61′ with the leads 62 connected to the controlling thermostat which regulates the temperature of the furnace. The magnet coil 56 is energized or deenergized immediately upon any material variation in the temperature of the furnace and the armatures respond instantly to move the valves 19 and 48 which control the flow of air and oil respectively to the fuel oil burners. Inasmuch as both armatures are subjected to the pull of the same magnet, their movements will be controlled by the opposition or resistance which they encounter. It is evident therefore that the air disc valve 19 will meet with less resistance than the piston valve 48 which moves in the oil chamber 49 with a dash-pot effect, the armature 51 which moves in the oil chamber 6 and is connected to the stem 50 also serving as a dash-pot, and consequently the movement of the air controlling valve will precede slightly that of the oil controlling valve and such sequence is desirable in the control of fuel oil burners even though the interval be quite small.

It sometimes happens that one valve or the other meets with an increased resistance by reason of a particle of gritty, tarry or scaly matter so that the armature connected with that valve is momentarily held back while the other armature moves on to closed position. This closure of the gap in the magnetic circuit at one of the armatures reduces the magnetic reluctance of the magnetic circuit to such an extent that the total magnetic flux is greatly augmented and this results in an increased pull upon the retarded armature which frequently amounts to 2.75 times the pull which was exerted upon the other armature. The advantage of my multiple control of the valves which regulate the flow of the two fluids leading to the fuel burners whereby the valves are caused to operate in sequence as above described, and whereby a very largely increased pull is exerted upon the valve which is momentarily checked or restrained by encountering a particle of some foreign substance, will be especially appreciated by those who are familiar with the operation and control of the fuel supply valves previously in use. It will also be evident that these features provide a multiplied factor of safety. The springs which retract the armatures and throw the valves into closed position may be made quite strong since I have provided the spring mounted yoke 31 and the disks 58 to absorb or cushion the hammer-blows of the moving parts of the respective valves.

I have described in detail the particular construction illustrated in the accompanying drawings for the purpose of disclosing an embodiment of my invention but it will be evident to engineers that various changes and modifications may be made without departing in any manner from my invention.

I claim:—

1. A fluid controlling valve structure, comprising a plurality of valves, each controlling a separate fluid channel, and an electro-magnet having separate armatures connected to said valves, said armatures being in series relation in the magnetic circuit.

2. A fluid controlling valve structure, comprising a plurality of valves, each controlling a separate fluid channel, an electro-magnet having separate armatures at opposite ends of the magnet and connected to said valves, and means for independently adjusting the connecting means between the armatures and the valves to vary the lift or stroke of the valves.

3. A duplex electrically actuated valve, comprising separated valve casings each provided with a valve controlling the main passage therethrough, an electro-magnet interposed between said casings and sealed therefrom by non-magnetic septums, and armatures at opposite ends of the magnet operatively connected respectively with said valves.

4. A duplex electrically actuated valve, comprising separated valve casings each provided with a valve controlling the main passage therethrough and a regulable by-pass for conducting fluid around said valve, an electro-magnet interposed between said casings and sealed therefrom by non-mag-

netic septums, and armatures at opposite ends of the magnet operatively connected respectively with said valves.

5. A fluid controlling valve structure, comprising a casing have a main fluid passage, a valve reciprocable to open or close said passage, an electro-magnet having an armature operatively connected with the stem of said valve to move the valve in one direction, a spring operating to move the valve in the opposite direction, a by-pass channel, and a rotatable cut-off member having means for external manipulation to regulate the size of the opening of said channel, the inner end of said rotatable member constituting the seat for said valve.

6. A fluid controlling valve structure, comprising a casing having inlet and outlet openings for the flow of a liquid, said casing having a passage connecting said openings and embodying a cylinder, the latter having a passage connecting with said inlet opening and being provided with a port connecting the cylinder with the outlet opening, a piston reciprocable in said cylinder to open or close said port and provided with a passage for the flow of the liquid therethrough, and an electro-magnet having an armature operatively connected to said piston.

7. An electrically controlled fluid valve having inlet and outlet openings, a cylinder having a passage communicating with said inlet opening and a port communicating with said outlet opening, a piston reciprocable in said cylinder to open and close said port, an electro-magnet operatively connected to said piston, said piston being provided with restricted passages through which the liquid must flow, said restricted passages serving to create a difference of pressure in the liquid upon opposite sides of the piston when said port is uncovered, said difference of pressure tending to close the valve when the magnet is deenergized.

8. A fluid controlling valve structure, comprising a casing having inlet and outlet openings for the flow of a liquid, said casing having a passage connecting said openings and embodying a chamber and a cylinder, the latter having a passage connecting with the chamber and being provided with a port connecting the cylinder with the outlet opening, a piston reciprocable in said cylinder to open or close said port and provided with a passage for the flow of the liquid therethrough, and an electro-magnet having an armature operatively connected to said piston, said armature being located in said chamber, whereby the movement of the piston is checked by the dash-pot action of the liquid in the chamber upon the armature.

In testimony whereof I affix my signature.

HARRY G. GEISSINGER.