Nov. 20, 1956 W. D. BAILEY ET AL 2,771,094

SUCTION AND PRESSURE CONTROLLED VALVE SYSTEM

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Fig. 1.

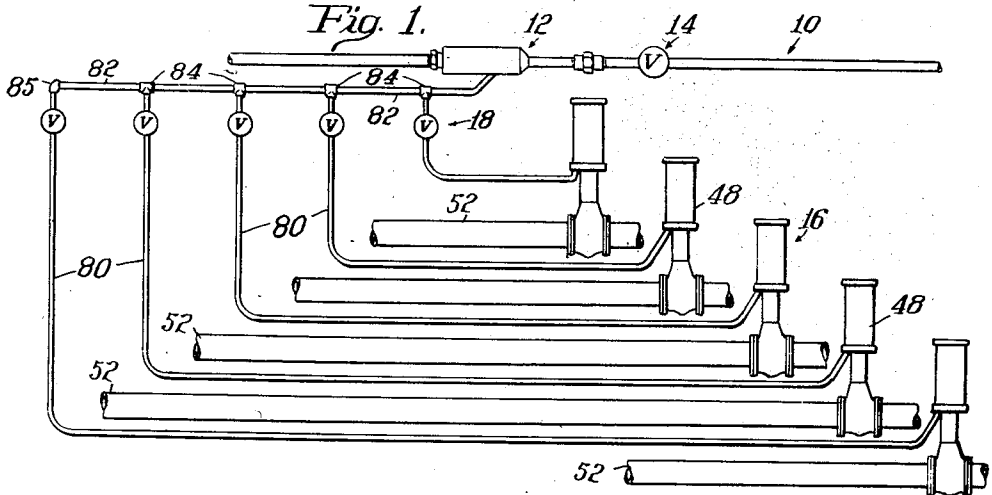


Fig. 2.

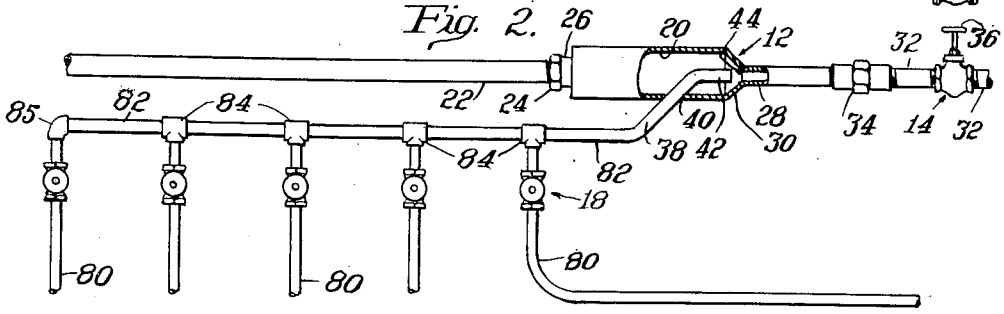


Fig. 3.

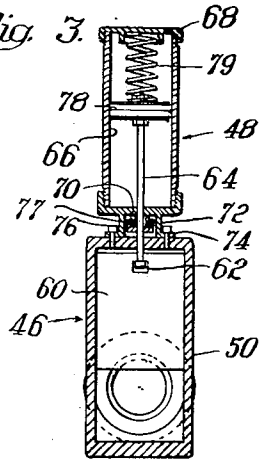
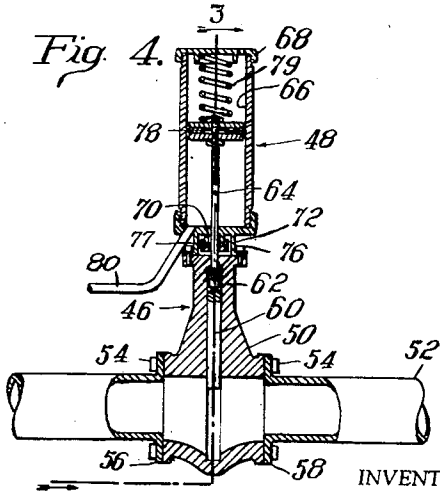


Fig. 4.



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SUCTION AND PRESSURE CONTROLLED VALVE SYSTEM

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The present invention relates to improvements in valve control systems, and more particularly to valve control systems wherein a plurality of valves are to be simultaneously operated in either opening or closing direction.

In valve control systems of the prior art, we are aware that pressure operated gate valves have been employed. In such arrangements, opening movement of the gate valve is usually effected by pressure acting on a piston or diaphragm to which the gate is connected for reciprocation therewith. The closing operation of the valve is usually effected by gravity coupled with the action of a spring bearing against the piston or diaphragm, upon release of the pressure.

One difficulty with such prior art arrangements is that positive opening and closing of the valve is not effected.

It is a primary object of the present invention to provide an improved valve control system wherein each valve is positively operated in both the opening and closing directions.

It is a further object of the present invention to provide an improved valve control system wherein opening movement of the valves to be simultaneously operated is effected by pressure and closing movement is primarily effected by vacuum, the same line being employed to subject the valve operator to both pressure and vacuum.

A still further object of the present invention is to provide an improved valve control system wherein a source of pressure is employed to provide both pressure and vacuum for the operation of the plurality of valves and wherein the operation of a single valve in the pressure line selectively subjects the lines to the respective valves either to pressure or vacuum.

Another object of the present invention is to provide an improved valve control system wherein a plurality of valves each controlling flow through a separate pipe can simultaneously positively be operated in either opening or closing movement or if desired an preselected valve or valves or said plurality can be cut off from such simultaneous operation.

Various other objects and advantages will become apparent from the detailed description to follow.

The best form in which we have contemplated applying our invention is clearly illustrated in the accompanying drawings wherein:

Fig. 1 is a somewhat diagrammatic view of our entire valve control system;

Fig. 2 is an enlarged detail view, parts being broken away, showing the jet means, operating valve and cut-off valves;

Fig. 3 is a vertical transverse sectional view taken substantially along the plane of line 3—3 of Fig. 4; and

Fig. 4 is a vertical longitudinal view through one of the plurality of valves to be operated and its operating means.

Referring more particularly to the drawings wherein like numerals designate like parts throughout, it will be seen that our improved valve control system, designated generally by the numeral **10**, is comprised of jet means **12**, pressure control valve means **14**, a plurality of valves to be simultaneously operated, designated generally by the numeral **16**, and cut-off valves, designated generally by the numeral **18**.

Having particular reference to Fig. 2, the jet means **12** will first be described. The jet means **12** is comprised of a substantially cylindrical casing **20**, one end of which is coupled to and in communication with a pressure line **22** which in turn connects the casing with a source of pressure such as a pressure reservoir of a pump (not shown). The coupling **24** may be of any conventional nature such as a nut coupling a flange on the inlet **26** to the line **22** by threading of the nut **24** on the line **22**. The opposite end of the casing **20** is of reduced diameter and elongated at **28**. A conical-like portion **30** joins the larger diameter portion of the casing **20** with the reduced diameter portion **28**. The reduced diameter portion **28**, in turn, is coupled to the portion **32** of the pressure line **22** by a conventional union at **34**.

The jet means further includes an angulated conduit section **38** which extends through the casing at **40** and terminates at its inner end in an axially extending portion **42**. The open end of the conduit portion **42** is in juxtaposition to the opening at **44** into the reduced diameter portion **28**.

The pressure control valve means **14** is comprised of a globe-type valve having a manually operated handle **36**, the valve controlling the pressure flow through the pressure line portion **32**.

A description of one of the plurality of valves **16** to be operated will suffice inasmuch as the valves are all similar. Attention is directed to Figs. 3 and 4 wherein a valve **46** and its operating means **48** in the form of a separate self-contained unit, are disclosed therein. The valve casing **50** is connected in the pipe line **52** by the plurality of bolts **54** extending through the flanges **56** and **58** into the casing **50**. The pipe line **52** is one of a plurality of pipes of a system, as shown in Fig. 1. The valve **46** includes a gate **60** reciprocably mounted within the casing **50** to control the flow through the pipe line **52**. The gate has coupled to the upper end thereof the enlarged portion **62** of a rod **64** which extends upwardly and outwardly of the casing **50**, the enlarged portion being received in a complementary recess in the gate.

The operating unit means **48** for the valve **46** is comprised of a cylinder **66** having its upper end closed by the cover **68**. The lower end of the cylinder **66** is provided with a centrally apertured closure **70**. The cover **68** and closure **70** are both threaded on the ends of the cylinder **66**. The closure **70** has a depending cylindrical collar **72** terminating in a flange **74** integrally formed therewith. The flange **74** is apertured and bolts **76** are employed for securing the flange **74** to the upper end of the casing **50** so that the central aperture receives the rod **64** therethrough. A conventional form of stuffing box **77** encircles the rod **64** within the depending cylindrical collar **72** so as to prevent pressure leakage past the rod and through the closure **70**.

The upper end of the rod has a piston **78** secured thereto and a spring **79** is interposed between the upper face of the piston **78** and the cover **68** so as to normally urge the piston, rod and valve gate **60** downwardly to closed position. A conduit is connected with the lower end of the cylinder for subjecting the underside of the piston either to pressure or vacuum.

The operating means or unit **48** is attachable as shown to any valve having a suitable stem so that the system may thus be connected with a series of pipes having valves therein without disturbing the pipes or moving the valves.

Referring once again to Fig. 1, it will be seen that each valve operating means **48** has a conduit **80** extending therefrom and connected to a primary conduit **82** by the T-couplings at **84** or elbow at **85** and each of the secondary conduits **80** has a conventional cut-off

valve, as a globe valve, the group of valves being designated by the numeral 18.

In operation, when it is desired to simultaneously open all of the valves 16, the valve 14 is closed and all of the valves 18 are opened. Pressure from the line 22 passes into the jet means 12 and out the conduit section 38 of the primary conduit 82, into the secondary conduits 80 and from there into the cylinders of the individual operating means 48. The pressure beneath the pistons 78 forces the same upwardly in opposition to the spring 79, thereby opening the gates 60 and permitting flow through the pipes 52. When it is desired to effect simultaneous positive closing of the valves, the valve 14 is opened and the valves 18 are retained open. Fluid pressure will be exhausted out the line 32 and the venturi action between the conduit portion 42 and opening at 44 will put the primary conduit 82 under vacuum. In this fashion the cylinders will have a vacuum below the pistons positively drawing the same along with the plunger and gate valve downwardly to closed position.

It will be understood that any of the valves 16 can be cut-off from operation with the others by operation of the valves 18. Furthermore, by closing selected ones of the valves 18 when their respective valves 16 are either open or closed will retain the latter valves in that relationship while the other valves are positively simultaneously operated as above.

From the foregoing it will be seen that we have provided an improved valve control system that is susceptible of use in many environments such as in water treating plants, refineries, oil and gas lines of various processes, etc.

We claim:

1. A valve control system comprising a plurality of valves each controlling an individual pipe line, individual operating means for each valve comprising a self-contained unit detachably secured to the valve, each unit being responsive to pressure for opening its respective valve and responsive to vacuum for closing its respective valve, a pressure control line entirely separate from and independent of said individual pipe lines and said units, jet means in said control line, valve means in said control line, and conduit means connecting said jet means with said operating units, said valve means being operable to subject said conduit means and operating units selectively to vacuum and pressure whereby simultaneous operation of the plurality of valves in both opening and closing direction can be positively effected.

2. A valve control system comprising a plurality of valves each controlling an individual pipe line, individual operating means carried by each of said valves and comprising a self-contained unit detachably secured to the valve, each unit being responsive to pressure for opening its respective valve and responsive to vacuum for closing its respective valve, a pressure control line entirely separate from and independent of said individual pipe lines and said units, jet means in said control line, a valve in said control line adjacent the outlet end of said jet means, a primary conduit extending from said jet means, and a plurality of secondary conduits connecting said primary conduit with each of said operating means, closure of said valve in the control line directing pressure from the inlet end of said jet means to said primary and secondary conduits to simultaneously positively effect opening of said plurality of valves, and opening of said valve in the control line discharging pressure from said jet means and sujecting said primary and secondary conduits to vacuum to simultaneously positively effect closing of said plurality of valves.

3. A valve control system comprising a plurality of valves each controlling an individual pipe line, individual operating means carried by each of said valves and comprising a self-contained unit detachably secured to the valve, each unit being responsive to pressure for opening its respective valve and responsive to vacuum for closing its respective valve, a pressure control line, jet means in said control line, a valve in said control line adjacent the outlet end of said jet means, a primary conduit extending from said jet means, and a plurality of secondary conduits connecting said primary conduit with each of said operating means, closure of said valve in the control line directing pressure from the inlet end of said jet means to said primary and secondary conduits to simultaneously positively effect opening of said plurality of valves, and opening of said valve in the control line discharging pressure from said jet means and subjecting said primary and secondary conduits to vacuum to simultaneously positively effect closing of said plurality of valves, and wherein each of said secondary conduits is provided with a manually operable valve for selectively closing off communication between said primary conduit and said operating means.

4. A valve control system comprising a plurality of valves each controlling an individual pipe line, individual operating means carried by each of said valves and comprising a self-contained unit detachable secured to the valve, each unit being responsive to pressure for opening its respective valve and responsive to vacuum for closing its respective valve, a pressure control line entirely separate from and independent of said individual pipe lines and said units, jet means in said control line, a valve in said control line, adjacent the outlet end of said jet means, a primary conduit extending from said jet means, and a plurality of secondary conduits connecting said primary conduit with each of said operating means, closure of said valve in the control line directing pressure from the inlet end of said jet means to said primary and secondary conduits to simultaneously positively effect opening of said plurality of valves, and opening of said valve in the control line discharging pressure from said jet means and subjecting said primary and secondary conduits to vacuum to simultaneously positively effect closing of said plurality of valves, each of said operating means including a cylinder having a piston reciprocably mounted therein with a plunger connecting the piston with the valve to be operated, a spring abutting said piston and normally urging said valve to be operated to closed position, and one of said secondary conduits being in communication with said cylinder on the side of said piston remote from said spring.

5. A system of the character described comprising the combination with at least two pipe lines each having a control valve therein including a casing and movable shut-off element, of an operating means for each shut-off element including a cylinder secured to the valve casing, a piston in the cylinder and a rod coupling the piston with the adjacent shut-off element, a fluid pressure line separate from and independent of the pipe lines, an elongated casing interposed in the pressure line and having one end tapered toward an outlet, said pressure line having one side leading into the end of the casing remote from the outlet and having another side connected with and leading from said casing outlet, a primary conduit having an end portion extended into said casing and terminating in an open end in close coaxial relation with and directed toward said casing outlet wherey passage of pressure fluid through the casing and said outlet will effect a reduction of pressure in said primary conduit, means for closing said pressure line on the side thereof adjacent to the casing outlet, whereby the pressure fluid will be caused to flow into the primary conduit, a secondary conduit leading from the primary conduit into each piston cylinder on one side of the piston therein, and a shut-off valve in each secondary conduit.

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