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H. J. GRIGOLEIT

PRESSURE CONTROL SYSTEM

Original Filed July 2, 1923

2 Sheets-Sheet 1

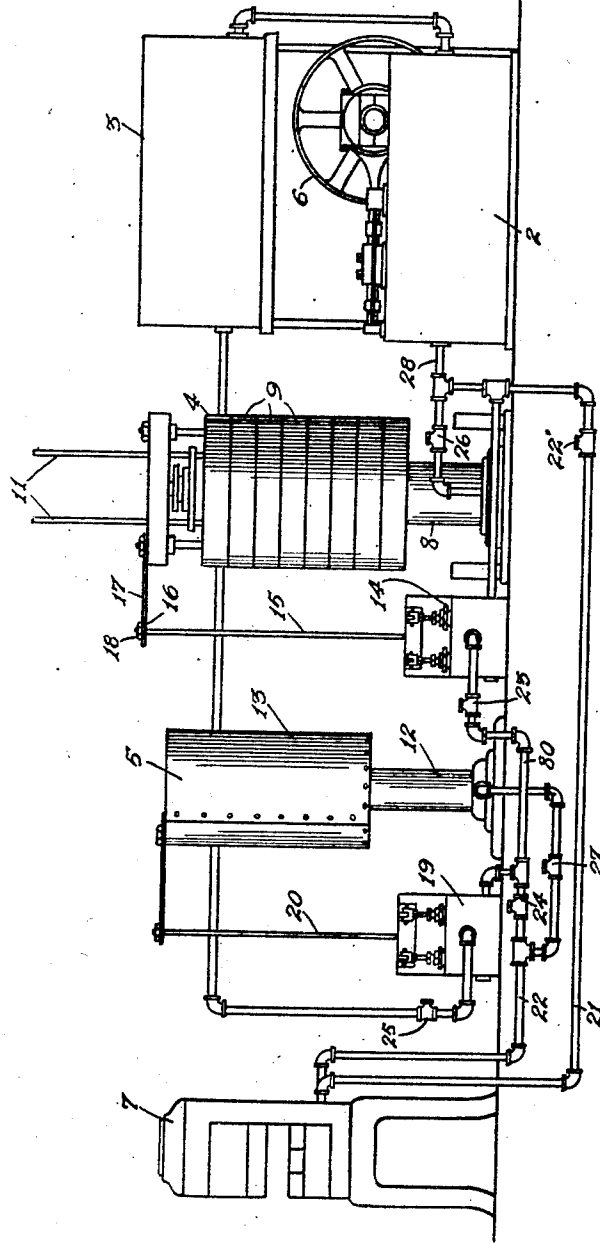


Fig. 1.

Inventor.
Henry J. Grigolet
By S. A. Yanchowski,
Attorney

Dec. 29, 1925.

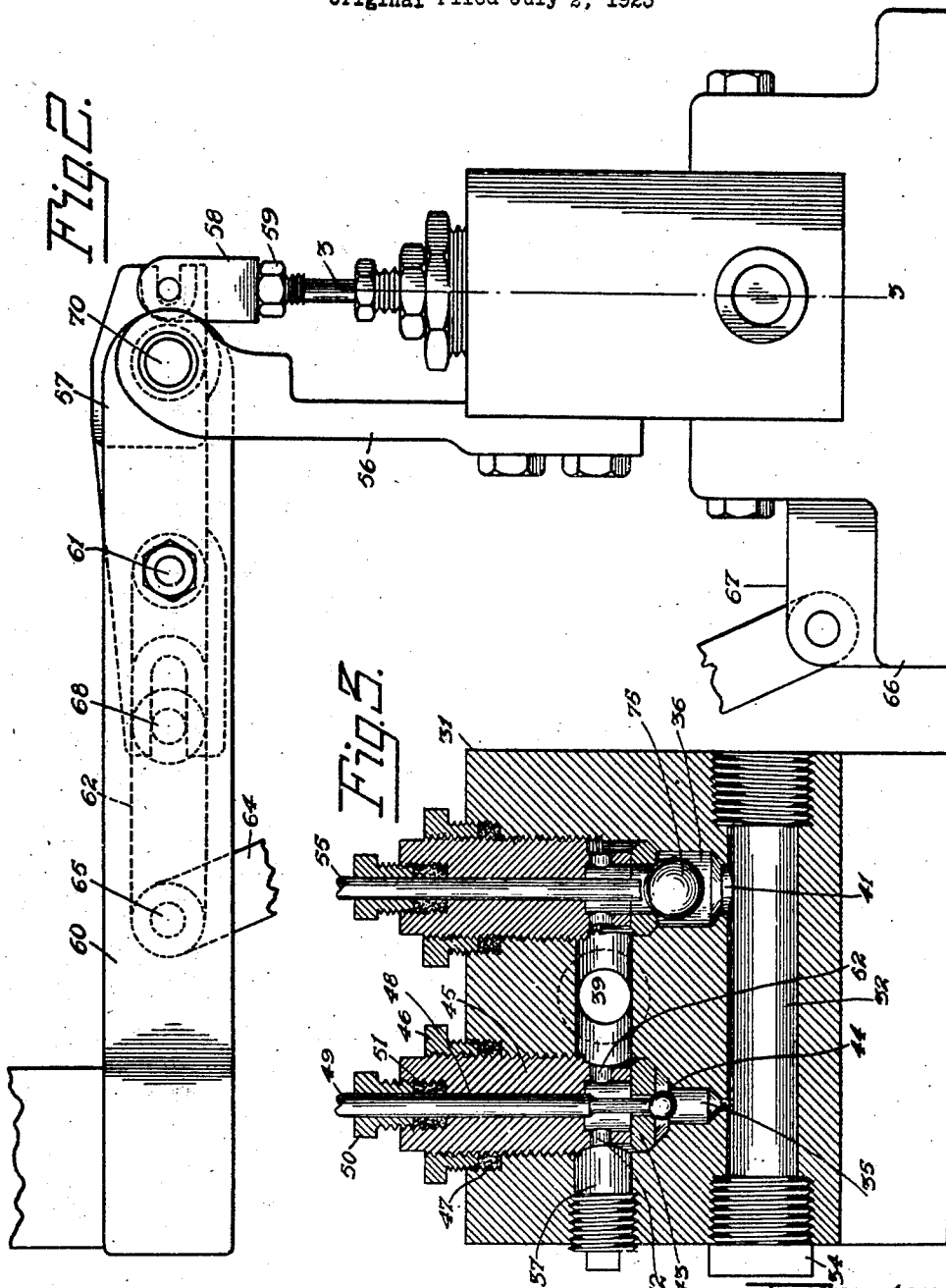
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PRESSURE CONTROL SYSTEM

Original Filed July 2, 1923

2 Sheets-Sheet 2



Inventor.
Henry J. Grigolet.
By H. A. Ganssner.
Attorney.

UNITED STATES PATENT OFFICE.

HENRY J. GRIGOLEIT, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PRESSURE-CONTROL SYSTEM.

Original application filed July 2, 1923, Serial No. 649,185. Divided and this application filed December 17, 1924. Serial No. 756,488.

To all whom it may concern:

Be it known that I, HENRY J. GRIGOLEIT, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pressure-Control Systems, of which the following is a specification.

My invention relates to pressure feed systems and has more particularly to do with systems in which fluid under a plurality of different pressures is fed to one or more presses or hydraulic devices for forming moulded objects.

In moulding systems, a moulding compound is placed in moulds or dies which are placed in presses and then subjected to hydraulic pressure of different values to form the moulding compound into the desired shapes and objects. In hot moulding, it is customary to apply a relatively low pressure to close the halves of the mould and then, at a pre-determined time, a higher pressure is applied to further press or form the compound into the desired shape. At the desired time steam is applied to the mould to heat the compound, then subsequently the steam is disconnected from the mould, and in some instances a cooling fluid, such as water, is applied to the mould to cool the moulded compound. In cold moulding, the mould is not heated by steam.

In the prior art system, it was customary to provide one pump to force the fluid into a high pressure accumulator, and a second pump to force the fluid into the low pressure accumulator or tank. The pumps were of the necessary capacity to maintain the accumulators substantially filled when all of the presses in the system were in use. It is at once apparent that with such systems it was necessary to automatically connect the pumps to the accumulators when the pressure in the accumulators dropped and the automatically disconnect the pumps from the accumulators when the pressure in the same raised to the desired values. Disconnecting the high pressure pump from the high pressure accumulator and reconnecting the pump to the accumulator caused great strains to be thrown upon the high pressure pump which necessitated the continuous replacing and repairing of parts of the high pressure pump due to these sudden strains that were placed upon the same by the automatic mechanism

which connected and disconnected the pump from the accumulator.

An object of my invention resides in the novel valve construction which I employ to maintain the accumulators at the desired pressures while by-passing the fluid from one accumulator to the other and from the other accumulator to the reservoir tank, when the accumulators are filled. Now with pressures that run up to three or four thousand pounds per square inch, the force of the fluid very quickly cuts into the valve and valve seats of the prior valves so that the valves may become leaky. I have devised a valve which has substantially an infinite number of valve seats so that the extremely high pressures do not cut into my valve mechanism as was the case with the prior art valves.

A further feature of my invention resides in the provision of a double valve having different sized valve seats. I adjust my double valve mechanism so that the smaller valve opens first and then the larger valve, and in the case of the valve controlled by the high pressure accumulator, I adjust the smaller valve so that it is partly open at all times, by-passing part of the fluid to the low pressure tank. Even with this valve partly open and the fluid continuously surging through this opening, I am unable to find any noticeable wear or cutting on this valve after long usage. This may be due to the fact that the valve ball is kept continuously rotating as the fluid passes through.

A further feature of my invention is the provision of a plurality of cooperating control arms for my valve mechanism which permits a minute movement of the valve controlling plungers for large movements of the valve controlling rods, which rods are connected to the accumulator tanks.

The above features of my invention as well as others will be more fully pointed out and described in the ensuing specification and in the appended claims. This application is a division of my application S. N. 649,185, filed July 2, 1923.

For a more complete understanding of my invention, reference may be had to the accompanying drawings in which like reference characters in the different views denote like parts and in which;

Figure 1, diagrammatically represents my pressure feed system.

Figure 2, is a side elevation showing one of my valves and its control parts and,

Figure 3, is a sectional view along line 3—3 of Figure 2.

Referring first to Figure 1 which diagrammatically represents my pressure feed system, 2, represents the pressure pump which pumps the pressure from the supply tank 3 to the high pressure accumulator 4 and to the low pressure accumulator 5. The pulley wheel 6 of the pump 2 is driven by a motor not shown.

At 7, I diagrammatically represent one of the moulding presses. While I have only shown the high and low pressure supply pipes connected to this press, it is to be understood that the necessary steam, air and other connections are connected to the devices, so that they may perform their proper functions.

Referring to the accumulator 4, this comprises a pipe or reservoir 8 into which the fluid is pumped against the weights 9 which weights rise as the amount of fluid in the pipe 8 is increased. Guide rods 11 are provided for the accumulator 4 to direct its upward and downward movement. The accumulator 5 is substantially the same as the accumulator 4 and has a pipe tank 12, which after it is filled causes the weighted body portion 13 to rise.

At 14, I represent one of my double valve mechanisms which is more fully illustrated in Figures 2 and 3. The valve mechanism is controlled by a rod 15 which loosely fits through an orifice 16 in a plate 17 attached to the top of the accumulator 4.

A nut or blocking device 18 is attached to the rod 15 so that when the accumulator reaches a pre-determined height, the valve rod 15 is operated to operate the mechanism of the valve 14. The valve 19 and its control rod 20 is substantially the same as valve 14 and its control rod.

Pipe 21 is the high pressure supply lead to different presses, only one of which is shown.

The pipe 22 is the low pressure supply line to the different presses.

22', 23, 24 and 25 represent ordinary check valves which permit the flow of fluid in one direction only.

26 and 27 represent leaky check valves which permit a free flow of fluid in one direction and a slow flow of fluid in the opposite direction. These check valves may be the regular check valves with a small hole drilled through the ball check.

The outlet pipe 28 from the pump 2 is connected through the leaky check valve 26 to the accumulator 4, to the valve 14, and through the check valve 22' to the supply line 21. The by-pass outlet of the valve 14 is connected through check valve 23 to the valve 19, also through a check valve 24 to

the supply line 22, and also through the leaky check valve 27 to the accumulator 5. The by-pass outlet of the valve 19 is connected back through a check valve 25 to the surge tank 3. Surge tank 3 is connected through pipe 30 to the pump 2.

Referring now more particularly to the valve mechanism as shown in Figs. 2 and 3, it comprises a block 31 through which extends laterally an orifice 32. In one end of the orifice is a plug 34, while the other end of the orifice is threaded to receive a pipe connection. Extending vertically into the block are the orifices 35 and 36. A second longitudinal orifice 37 is provided which intersects orifices 35 and 36. A plug 38 fits into one end of orifice 37. At right angles to orifice 37 is an orifice 39 which intersects orifice 37 and forms a by-pass for the fluid when the valves are open. It will be noted that the opening 40 extending from the orifice 35 into orifice 32 is smaller than the opening 41 which connects orifices 36 with orifice 32. Fitting into orifice 35 is a valve seat member 43 which is provided with an orifice that has a slightly chamfered opening for the valve ball 44. To hold the valve seat 43 in position a plug 45 is provided which has screw-threaded engagement with threads in the orifice 35. A packing ring 46 is provided which holds the packing 47 in position to prevent leakage between the plug 45 and the block 31. Extending vertically in the plug 45 is an orifice 48 through which extends the valve control rod 49. A packing ring 50 is provided to hold the packing 51 in place to prevent leakage between the rod 49 and the plug 45. The rod 49 contacts against the valve ball 44 and depresses the same when the valve is to be opened to permit a flow from orifice 32 through orifice 40 into by-pass opening 39. The plug 45 is provided with several radially extending orifices 52 that open into the orifice 37.

The construction of the larger valve mechanism at the right of Fig. 3 is substantially the same as the construction of the smaller valve mechanism at the left of Fig. 3.

Attached to the side of the block 31 is an arm 56. Pivotaly secured to the arm 56 is a valve controlling yoke 57 and pivotaly secured to the valve controlling yoke 57 is a pair of U-shaped dependent members 58, the one member connecting to valve rod 49, and the other member to valve rod 55. Valve rods 49 and 55 are threaded and have screw threaded engagement with U-shaped members 58. Lock nuts 59 are provided for maintaining the valve rods 49 and 55 in their adjusted positions.

From the drawings it will be noted that the smaller valve at the left of Fig. 3 is adjusted to be opened before the larger

valve is opened at the right of Figure 3. The smaller valve of valve 14 is adjusted so that it is always partially opened to permit a flow from the pump 2 to the accumulator 5, even though the main flow is into the accumulator 4. Pivotaly secured to the arm 56 is a pair of rearwardly extending arms 60. Pivotaly secured to the arms 60 at 61 is a rearwardly extending yoke 62. An arm 64 is provided that is pivotaly secured to arm 62 at 65, and to the base 66 at 67. Extending cross-wise of 62 is a pin 68 which is adapted to receive the forked end of the yoke 57. When the left end of the arms 60 (which are connected together at this point) are raised they turn about their pivot pin 70 and raise the right end of yoke 62 which is pivoted at 61 to the lever 60 and at 65 to the lever 64. The raising of the right end of the lever 62 naturally raises its pivot pin 68 which causes the free end of the yoke 57, to be raised, thereby causing it to be turned about its pivot point 70, causing the right end of the yoke 57 to be lowered, thus forcing the U-shaped members 58 downwardly, to which are attached the valve rods 49 and 55. The lowering of the valve rods 49 and 55 depresses the valve balls 44 and 75, the valve ball 44 first, to open the passage way from orifice 32 through to by-pass opening 39. When the righthand end lever 60 is lowered, it causes the yoke 62 to be lowered which lowers the right end of yoke 57, causing the raising of U-shaped pieces 58, thereby permitting the valve balls 44 and 75 to seat in their valve seats, cutting off the flow of liquid to the by-pass 39.

From the foregoing it is apparent that the valve balls 44 and 75 may be adjusted to operate in any desired sequence, and they may be made to open at any desired position of the lever arms 60, or they may be adjusted to remain partly open when the lever 60 is in its upper-most position.

Returning now to Figure 1 of the drawings, when the pump 2 is started in operation, it pumps fluid through the pipe 28 and the leaky check valve 26 into the water column 8 which causes the accumulator to be raised until the valve control rod 15, which it attached to the lever 60, is raised a sufficient amount to open the ball valves of valve 14. As above-mentioned, the high pressure feed line extends directly from the pipe 28, which is connected to the pump, through the check valve 22' to the presses. The left hand ball valve of valve 14 being partially opened, even though the accumulator 4 is not in its upper position, part of the fluid pumped by pump 2 extends through check valves 23 and 24 to the low pressure line 22, and through the leaky check valve 27 to the accumulator 5 to supply liquid to the accumulator 5. Although this valve is slightly opened, the back pressure in the high pressure feed line and into the accumu-

lator 4 is maintained at the desired amount. When the accumulator 4 has been raised to a certain position, the valve balls are opened an amount to permit a flow of the liquid through check valve 23 to the low pressure feed line 22 and to the accumulator 5, but these openings are such as to maintain a back pressure of the desired amount in the accumulator 4. As liquid is used from accumulator 4, it is lowered and valve 14 is caused to again force the liquid into accumulator 4. Assuming that liquid is not being taken from accumulator 4, and the liquid is being by-passed through valve 14 into accumulator 5, this accumulator is raised to a position where it opens its valve 19 to permit the by-passing of the liquid through check valve 25 to the surge tank, but valve 19 is not opened a sufficient amount to permit the lowering of the pressure between the valve 19 and 14 below the predetermined desired pressure.

From the above it is obvious that the pressure between the pump 2 and valve 14 is maintained at the predetermined high pressure point, and the pressure between valves 14 and 19 is maintained at the desired low pressure. The check valve 22' prevents a surge back from the pipe line 21 into the pipe line 28, and the check valve 24 prevents a surge back from pipe line 22 into the pipe 80. The leaky check valve 26 prevents the sudden dropping of accumulator 4 if a great number of presses are using from the pipe line 21 at the same time, while the leaky check valve 27 prevents the sudden dropping of accumulator 5 if a great number of presses are simultaneously using from pipe line 22.

From the foregoing it is thus obvious that as liquid is taken from pipe line 21, the pump and valve 14 will maintain the pressure in the pipe line 21 at substantially the predetermined value. The pump will also, in conjunction with the accumulator 5 and valve 19, maintain the pressure in pipe 22 at substantially the predetermined value. These valves will operate to automatically prevent the accumulators from dropping to their lower-most positions, when the presses are in use, and will by-pass the liquid from the pump 2 at the surge tank 3 if the normal use of the liquid through pipes 21 and 22 falls below the output of the pump 2.

While I have only shown the accumulators 4 and 5, press 7, and pump 2 in diagrammatic form, these pieces of apparatus are well known in the art and their functions are well understood. The pressures maintained by accumulators 4 and 5 may be set at any desired points by the weights attached to these accumulators. By the length of the rods 15 and 20, the positions where these rods will operate valves 14 and 19, may be controlled.

My system is entirely automatic and no matter how many presses may be suddenly turned on or off, the valves will cause the accumulators to substantially maintain the pressures at the desired values. A sudden usage of a number of presses will cause the accumulators to drop a slight amount, still the pressures will be maintained at the desired values, and the pump will again restore the accumulators to their upper positions before the pressures drop below the desired predetermined amounts.

While I have illustrated only one form of my invention, I do not wish to be limited to the exact arrangement as shown, as various other arrangements may readily suggest themselves to those skilled in the art, and I, therefore, aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

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

1. A valve device of the character described including a plurality of valve units, mechanism for operating said valve units, means for simultaneously operating said mechanism, and different sized passages through said valve controlled by said different valve units.

2. A valve device of the character described including a plurality of valve units, mechanism for operating said valve units, means for simultaneously operating said mechanism, different sized orifices through said valve controlled by the different valve units, and means for adjusting the different valves so that they may operate in any desired predetermined sequence.

3. A valve device of the character described including a plurality of valve units controlling different sized passages through said valve, controlling mechanism for operating each valve unit, and means for simultaneously controlling the operation of the controlling mechanism.

4. A device of the character described including a valve having a plurality of individual valve units controlling a plurality of different sized passages through said device, control mechanism for operating each valve unit, and means for adjusting said control mechanism so that the valve units may operate in the desired sequence when the controlling mechanism is operated.

5. A pressure feed system of the character described provided with a valve consisting of two units, a supply inlet leading to said valve, different sized orifices connecting the supply inlet to the valves, an outlet, means for operating said valves whereby the smaller of the two operates to permit a passage from said inlet to said outlet prior to the opening of the other of said valves.

6. A valve mechanism of the character de-

scribed including an inlet and an outlet path, a plurality of valve units for said valve, different sized openings from said inlet path to said valve units, and means for operating said valve units to permit a flow from said inlet path to said outlet path.

7. A valve device of the character described including an inlet path and an outlet path, a plurality of valve units for said valve, different sized orifices connecting said inlet path to said outlet path, means for simultaneously operating said valve units, and means for adjusting said valve units so that they may operate in any desired sequence.

8. A valve unit of the character described including an inlet path and an outlet path, a plurality of valve units for said valve, different sized orifices connecting the inlet path to said valve units, control mechanism for said valve units, and means for simultaneously operating the valve controlling mechanism.

9. A device of the class described including a metallic block provided with an oblong opening, a by-pass opening in said block, a pair of valves secured in said block for controlling the passage of a substance through said oblong opening and said by-pass opening, means for controlling the operation of said valves, and adjustable means for regulating the time of operation of said valves relative to each other.

10. A device of the class described including a valve block having a supply opening and a by-pass opening, a pair of automatic valves secured in said valve block and interposed between said supply opening and said by-pass opening, said valves controlling the flow of liquid through said device, means including a plurality of control arms for translating a comparatively large movement to a comparatively small movement for controlling the opening and closing of said valves, and adjustable means for said valves for regulating the time of operation of said valves relative to each other so that said valves may operate simultaneously or non-simultaneously.

11. A device of the class described including a valve block having an inlet opening and an outlet opening, a pair of valves secured in said valve block for controlling the flow of a substance under pressure through said device via said inlet and outlet openings, one of said valves adapted to permit a greater flow of said substance than the other of said valves, and adjustable means for said valves for regulating the time of operation of said valves relative to each other.

12. A device of the class described including a valve block provided with an inlet and an outlet opening, said openings being connected by a pair of openings, a pair of

valves secured in said valve block and adapted to engage said pair of openings for controlling the flow of a substance under pressure through said device, said pair of openings and said valves arranged so that the volume of flow of said substance through one of said valves is less than the volume of flow through the other of said valves, and means for automatically operating said valves.

13. A device of the class described including a valve block provided with an inlet and an outlet opening, internal ducts for interconnecting said openings, a pair of valves secured in said valve block and positioned in said internal ducts for controlling the flow of a substance under pressure through said device, one of said ducts and one of said valves adapted to permit a greater volume of flow of said substance through said device than the said other duct and said other valve, and means for regulating the operation of said valves relative to each other so that said substance may be flowing through one or both of said valves.

14. A device of the class described including a valve block provided with an inlet and an outlet opening interconnected by internal ducts, valves secured in said valve block and associated with said openings and said internal ducts for controlling the flow of a substance under pressure through said device, an individual rod supported in each of said valves, said rods controlling the opening and closing of their respective valves, individual means for adjusting said rods so that said valves may be opened simultaneously or at different intervals relative to each other, and a plurality of control arms for translating a comparatively large movement to a comparatively small movement to operate said rods.

15. In a device of the class described including a valve block having openings therein, a combination of valves secured in said valve block and in association with said openings for controlling the passage of a substance under pressure through said device, members for controlling the opening and closing of said valves, and adjustable means for adjusting said members to permit said valves to open and close at the same time or to permit said valves to open and close at different times relative to each other.

16. In a device of the class described including a valve block provided with openings, automatic valves secured in said valve block and in association with said openings for controlling the flow of a substance under

pressure through said device, each one of said valves having a valve seat and a ball member for engaging said valve seat to prevent the flow of said substance through the valve, an individual member positioned in each of said valves in operative position with the ball member thereat, and adapted to move said ball member out of engagement with its associated valve seat to open said valve, and adjustable means for each of said last members for adjusting the same so that said valves may be opened simultaneously or at different times relative to each other, said members maintaining said valves open.

17. A device of the class described including a valve block provided with openings, valves secured in said valve block and in operative position with said openings for controlling the flow of a substance under pressure through said device, said valves and said openings arranged so that said substance may flow through said device in different volumes, a valve seat and a ball member associated therewith for each of said valves, a rectilinearly movable member for each of said valves adapted to move said ball member away from its associated valve seat to open the valve, and adjustable means for each of said last members for adjusting the same relative to said ball members so that the said valves may be controlled to permit said substance to flow through one or more of said valves at the same time.

18. A valve device of the character described including a plurality of valve units having different size passages, and mechanism including a plurality of control arms for translating a comparatively large movement to a comparatively small movement for operating the valves of said valve units.

19. A valve device of the character described including a plurality of valve units controlling different size passages, and controlling mechanism including a plurality of arms for translating a comparatively large movement to a comparatively small movement for operating the valve mechanism of said valve units.

20. A device of the character described including a plurality of valve units, means for operating said valve units in a desired sequence, and a plurality of control arms for translating a comparatively large movement to a comparatively small movement to operate said means.

Signed by me at Chicago, in the county of Cook, and State of Illinois, this 15th day of December, 1924.

HENRY J. GRIGOLEIT.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,567,136, granted December 29, 1925, upon the application of Henry J. Grigoleit, of Chicago, Illinois, for an improvement in "Pressure-Control Systems," an error appears in the printed specification requiring correction as follows: Page 1, in the heading, lines 3 and 4, after residence of patentee, strike out "assignor to Kellogg Switchboard and Supply Company, of Chicago, Illinois, a Corporation of Illinois."; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of February, A. D. 1926.

[SEAL.]

WM. A. KINNAN,
Acting Commissioner of Patents.