

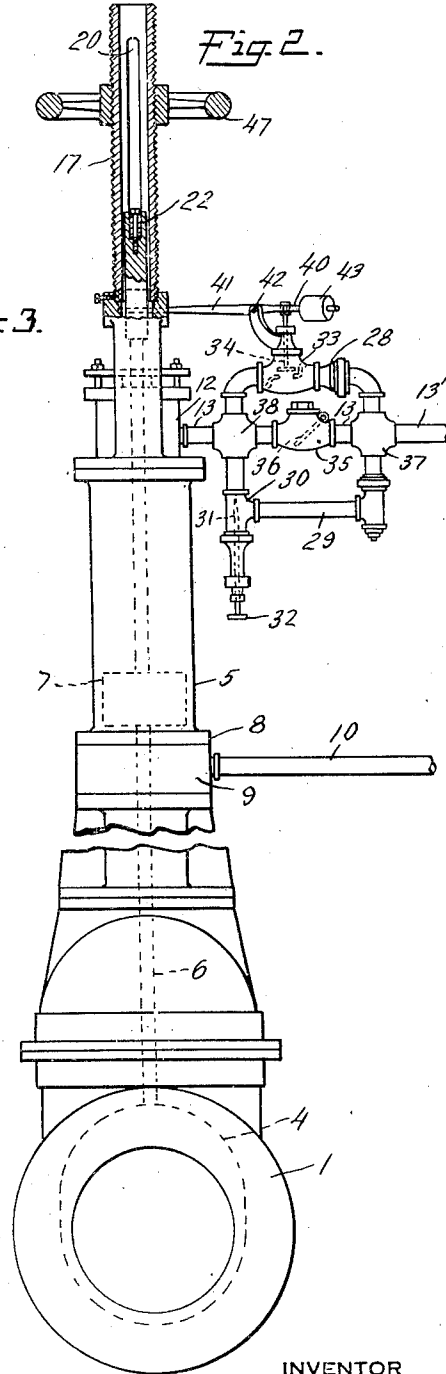
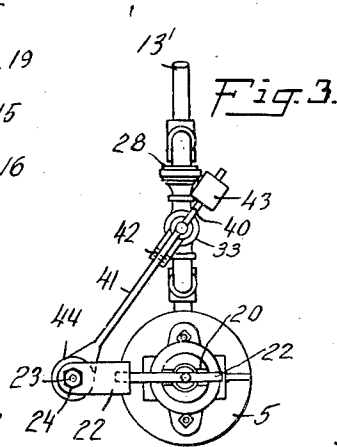
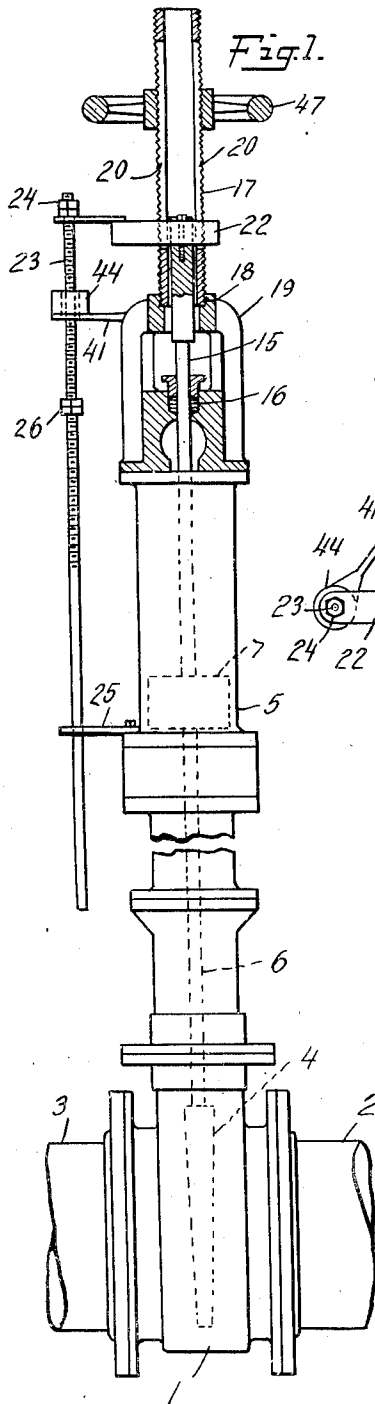
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OPERATING MECHANISM FOR VALVES

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OPERATING MECHANISM FOR VALVES

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This invention relates to valves and more particularly to pressure fluid operated valves in which the movement of the valve plate may be controlled to permit a rapid partial opening of the valve, a uniform slow opening, or both a rapid and slow opening in sequence in the order mentioned or in reverse order and after the valve is opened the desired extent, it is maintained open for a predetermined period and thereafter closed either rapidly or in the same sequence as it was opened.

One object of this invention is to provide such a valve structure that is simple in construction and efficient in operation. Another object is to provide such valve construction with positive mechanism for limiting the extent of opening and maintaining the valve in such open position, such mechanism being adjustable and operative to prevent undue opening or "creeping" of the valve plate.

This invention is particularly applicable to valves of the type used in gas generators, such as water gas sets which involve periodic air or other oxygen-containing gas blasting and steam introducing gas making cycles. In such sets it is customary to feed secondary air to the carburetor during the blasting cycle to burn the producer gas passing therethrough from the generator and thus efficiently heat the checkerwork of the carburetor. In beginning an air or other oxygen-containing gas blasting cycle, the amount of producer gas formed by the air or other oxygen-containing gas passed through the cold fuel bed is comparatively small so that a relatively small amount of oxygen-containing gas need be fed to the carburetor. As the fuel bed heats up, more and more producer gas is formed so that correspondingly greater amounts of oxygen-containing gas must be fed to the carburetor to burn the producer gas passed therethrough and efficiently heat the checkerwork therein. Finally, the fuel bed reaches a state of incandescence and a substantially constant amount of producer gas per unit of time is fed from the generator into the carburetor. During this period of the cycle a correspondingly constant amount of oxygen-containing gas should be fed to the carburetor. Accordingly, for satisfactory and efficient operation the oxygen-containing gas main leading into the carburetor should be equipped with valve or other controlling means permitting an initial rapid partial opening to permit the entry of oxygen-containing gas to burn the producer gas passed into the carburetor at the beginning

of the blasting cycle, then a gradually continuing opening movement to permit the feed of more and more oxygen-containing gas as more and more producer gas is passed into the carburetor and then the maintenance of a constant opening to permit the feed of a substantially constant amount of oxygen-containing gas into the carburetor during the interval that a substantially constant amount of producer gas is formed in the generator and fed into and through the carburetor, and then at the termination of the cycle permit prompt closure of the valve to prevent unnecessary feed of oxygen-containing gas into the carburetor.

My invention provides such a valve particularly in that a positive mechanism is utilized to maintain the valve plate in the desired open position. According to this invention, a hydraulic cylinder is utilized to move the valve plate from closed to open position and back, the plate being connected to one end of the piston rod of this cylinder and the other end of this rod passing into and adapted to move in a housing which has an adjustable stop thereon. The piston rod has an arm secured thereto and passing through a longitudinal slot in the housing, this arm having at its end extending from the housing a threaded rod which carries a nut member threadedly positioned thereon. The hydraulic cylinder has, of course, pressure fluid entry and discharge ports. One port according to this invention comprises a central pipe having a check valve preventing egress of pressure fluid and permitting entry of fluid to move the piston downwardly. Two parallel pipes are provided having their ends connected to the central pipe at points on opposite sides of the check valve. One of the parallel pipes is provided with a needle valve set to permit a slight leak of pressure fluid therethrough and the other of the pipes has a reciprocating valve which, in the beginning of operation, is in open position and is closed by an arm preferably having both ends weighted. One weighted end of the arm has the weight detachably secured, the arm being positioned so that the weight is arranged to be engaged by the aforementioned nut member and be lifted from the arm so that the other weighted end may function to close this reciprocable valve.

As the reciprocable valve is in open position in the beginning of the cycle of operation, the pressure fluid readily passes therethrough permitting a rapid initial opening of the valve. The piston of the hydraulic cylinder as it moves in

an upward direction, moves the threaded rod so that the nut thereon engages the weight on the arm connected to the reciprocable valve lifting it therefrom and permitting the other weighted end of the arm to close the valve. The only outlet then remaining for the pressure fluid is through the needle valve which permits a slow leak therethrough, and thus a gradual movement of the piston rod and valve plate results. The piston rod continues this gradual upward movement until the extension thereon contacts with the adjustable stop on the housing which positively prevents further movement of the rod and the valve is maintained in open position. When it is desired to close the valve promptly, pressure fluid is admitted through the check valve in the central pipe which moves the piston downwardly thus closing the valve.

Accordingly, my invention involves a valve automatically operated preferably by a fluid medium so that it is opened rapidly, gradually or both rapidly and gradually in sequence in any desired order and positively maintained open the desired extent.

Further objects and advantages of this invention will appear from the following detailed description taken in connection with the accompanying drawing in which

Fig. 1 is a fragmentary side elevation partly in section of a valve, illustrating a preferred embodiment of this invention;

Fig. 2 is a fragmentary front elevation corresponding to Fig. 1; and

Fig. 3 is a plan view corresponding to Fig. 2.

In the drawing, 1 indicates the valve casing of a valve of the type which may be used in the pipe leading into a carburetor of a water gas set. The casing is secured to pipes or mains 2, 3, and has a reciprocable valve plate 4 which, when in its upward position, permits passage of material from one pipe 2 through the valve casing 1 into the other pipe 3 and when in its lowered position, closes the passage between pipes 2 and 3 through the valve casing 1. Suitably secured to the valve casing 1 is a hydraulic or other pressure fluid operating cylinder 5 having the usual piston rod 6 secured to and passing through the piston 7. Cylinder 5 has at its lower end 8 a port 9 communicating with a pipe 10 which, during one cycle, functions to conduct the pressure fluid into the cylinder 5 to raise the piston 7 and during a subsequent cycle as the piston 7 is lowered, functions to conduct the pressure fluid out of the cylinder. Port 12 at the upper end of cylinder 5 communicates with a central pipe 13 similarly functioning to conduct pressure fluid from the cylinder 5 as the piston 7 is raised and to permit entry of pressure fluid into the cylinder to lower the piston 7. One end of the piston rod 6 passes through the casing 1 and is keyed or otherwise secured to the valve plate 4. The other end 15 of the piston rod passes through the fluid-tight joint formed by the packing and gland 16, into a housing 17 secured to the top of the hydraulic cylinder 5 as by the threaded nut member 18 in threaded engagement with threads on the exterior of the housing 17. The threaded nut member 18 is supported by standards 19 extending from the cylinder 5.

As indicated above, and as shown in Figs. 1 and 2, the housing 17 has a threaded exterior. It is also provided with two diametrically positioned longitudinal slots 20. The end 15 of the piston rod 6 has pinned or otherwise secured

thereto an arm 22 the ends of which extend through the slots 20, and the arm 22 is thus guided by the walls of the slots in its reciprocatory movement. A threaded rod 23 is secured by nuts 24 to the arm 22 and is guided in its vertical up-and-down movement by a bracket arm 25 bolted or otherwise secured to the housing of hydraulic cylinder 5. A nut member 26 is adjustably positioned on the rod 23, the function of which will be hereinafter explained.

Pipe 13 has preferably connected thereto through suitable joints, parallel pipes or conduits 28, 29, pipe 28 being positioned above pipe 13 and pipe 29 below pipe 13. Positioned in the T 30 connecting the pipe 13 with pipe 29 is a needle valve 31 of well known type which may be set by the hand wheel 32 so as to regulate the flow of material from pipe 13 into and through pipe 29.

The valve fitting 33 connected at both ends to pipe 13 through pipe 28 and suitable fittings has therein a reciprocating valve 34 of well known type. Pipe 13 is provided with a valve fitting 35 having a check valve 36 therein which is positioned so as to permit flow of fluid through pipe 13 into the hydraulic cylinder and prevent egress of fluid through pipe 13. It will be noted that both pipes 28 and 29 are connected to pipe 13 through 4-way fittings 37, 38 at points on both sides of check valve 36 so that pressure fluid from the hydraulic cylinder 5 can flow either through 4-way fitting 38, valve fitting 33, pipe 28, into 4-way fitting 37 and out through pipe 13' or through 4-way fitting 38, needle valve 31, pipe 29, into 4-way fitting 37 and out through pipe 13'.

Arm 40 of the reciprocating valve 34 has pinned or otherwise secured thereto a weighted arm 41 which is pivoted in bracket 42 bolted or otherwise secured to the casing of the valve 34. One end of arm 41 is preferably weighted by adjustable weight 43 suitably mounted thereon. In lieu of weight 43 a spring may be used. The other end of arm 41 is bifurcated, the arms of the bifurcation detachably supporting a weight 44. The weighted arm 41 is mounted at substantially a 45° angle with a projection of the pipe 28, the arms of the bifurcation being positioned so that the aforementioned threaded rod 23 passes therebetween. These bifurcations are of such dimensions as to permit the passage of the nut 26 therethrough so that the nut 26 when the rod 23 is moved engages the weight 44 and removes it from the supporting arms of the weighted lever 41.

An adjustable stop wheel 47 is threadedly mounted on the housing 17 the function of which will be more fully explained hereinafter.

In commencing operation we may assume that the needle valve 31 is positioned to permit a slight leak therethrough; valve 33 is open; check valve 36 prevents egress of fluid therethrough and valve plate 4 is in closed or lowered position. The nut 26 is adjusted on the threaded rod 23 so as to initiate the desired gradual opening of the valve plate 4 at the desired point of the cycle and the stop wheel 47 is positioned on the housing 17 so as to limit the opening of the valve to the desired extent and to aid in retaining the valve open in the desired open position. Accordingly, valve 33 being open the pressure fluid enters pipe 10 lifting the piston, the pressure fluid above the piston leaving through valve 33, pipe 28, 4-way fitting 37 and pipe 13' and thus a ready passage of fluid

through cylinder 5 is possible so that a rapid opening of the valve 4 results. As the piston rod 6 is raised, rod 23 through arm 22 is lifted and nut 26 in the course of the upward movement of rod 23 passes through the bifurcations of lever arm 41 and engages weight 44, removing it from this lever arm, so that weight 43 operates to move the valve rod 34 to close the valve 33. At this point in the cycle of operation, the egress of fluid through valve fittings 33 and 35 is prevented so that the only passage for the pressure fluid is through the needle valve 31 which, as above indicated, is set to permit a slow leak of fluid therethrough. In view of this slow escape of fluid through needle valve 31, a corresponding slow movement of the piston rod and gradual opening of the valve 4 is permitted. As the valve is gradually opened the piston rod is elevated until the arm 22 engages the adjustable stop 47 which is set so as to permit opening of the valve the desired extent and which prevents further movement of the piston rod and valve. The valve 4 is thus positively maintained in open position and further opening of the valve is prevented. The hydraulic cylinder, piston rod, stop 47 and connecting mechanism are made sufficiently rugged to withstand the pressure arising during operation.

To close valve 4 the pressure fluid is admitted through pipe 13 and as the check valve 36 opens to permit the entry of fluid there is no obstruction to the flow of fluid and the piston 7 is lowered to promptly close the valve. Of course if a gradual closing or gradual and rapid closing in sequence of the valve is desired, this may be accomplished by placing a valve in line 13 and utilizing a needle and reciprocating valve arrangement as described in connection with the opening of the valve.

By changing the position of nut 26 on rod 23, the extent of initial rapid opening of the valve may be determined and by suitably positioning the positive stop 47, the extent of gradual opening is determined so that flow of material through the valve casing while the valve is being opened and maintained open may be varied as desired. Also, the stop 47 is a positive medium for limiting further movement of the valve plate 4 and in practice it has been found that with my invention "creeping" of valve plates is eliminated.

While I have described this invention in connection with water gas generating sets, it will be understood that it has many applications and the invention is not to be limited to the supplying of air or other oxygen-containing gas to carburetors, or to the disclosure herein, but only by the scope of the appended claims.

I claim:

1. In combination, a valve casing, a reciprocable valve plate for opening and closing the valve opening in said casing, a hydraulic cylinder positioned on said casing having its piston rod connected to said plate and a housing on said hydraulic cylinder having a threaded exterior being provided with longitudinal slots and arranged to permit movement of said piston rod therein, an arm connected to said piston rod moving in said slots and a threaded member on said housing arranged to contact with said arm to limit the upward movement of said piston rod.

2. In combination, a valve casing, a reciprocable valve plate for opening and closing the valve opening in said casing, a hydraulic cylinder positioned on said casing having its piston rod connected to said plate, pipes connected to said cylinder for the admission and discharge of pressure fluid into and from said cylinder, a conduit communicably connected to one of said pipes, a valve in said conduit, a weighted arm connected to the valve in said conduit, a housing on said hydraulic cylinder arranged to permit movement of said piston rod therein, a stop on said housing, said piston rod in its upward movement first engaging and removing the weight on said arm to permit closure of said valve in said conduit and then engaging the stop on said housing for limiting the upward movement thereof.

3. In combination, a valve casing, a reciprocable valve plate for opening and closing the valve opening in said casing, a hydraulic cylinder positioned on said casing having its piston rod connected to said plate and arranged to move it from its closed to open position and back, and a housing having longitudinal slots in the wall thereof, said housing being positioned above said hydraulic cylinder, said piston rod extending into said housing, an arm fastened to said piston rod and extending through the slots in said housing, a threaded rod having a nut adjustably positioned thereon secured to said arm, a stop adjustably positioned on said housing, a fluid discharge pipe connected to one port of said hydraulic cylinder and having a check valve therein, two branch pipes each connected to the fluid discharge pipe, a needle valve in one of said branch pipes, a valve in the other of said branch pipes, said latter valve being operated by an arm connected to a pivoted lever having both ends weighted, the weight on one of said ends being arranged to be removed by the nut on said threaded rod.

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