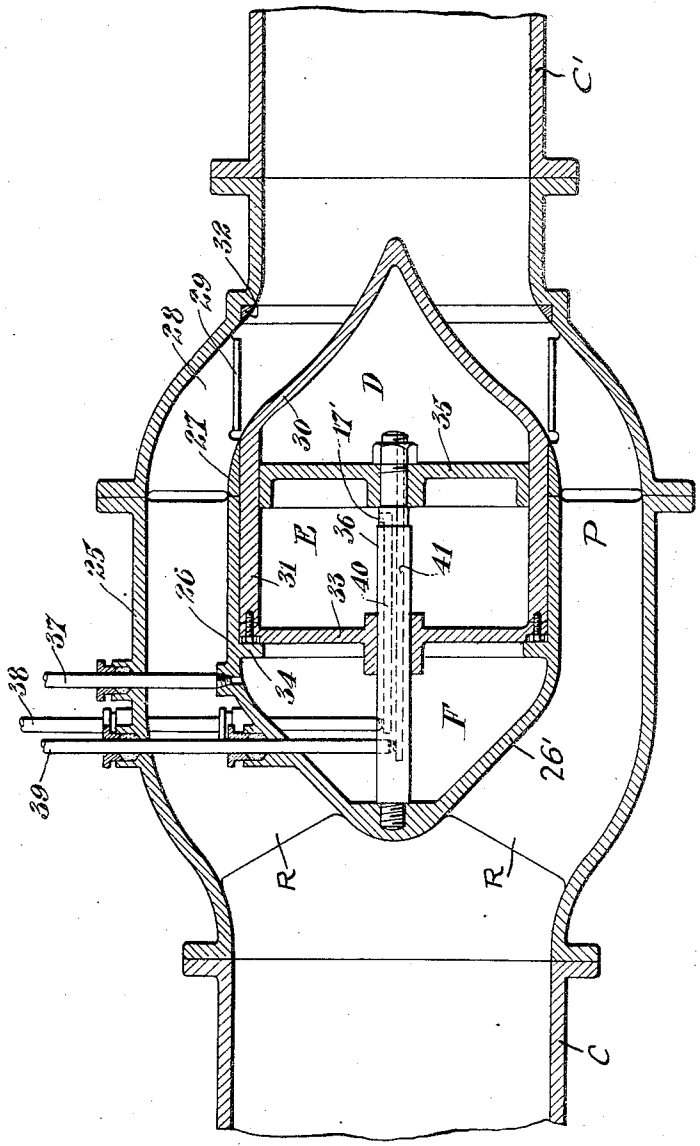
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VALVE

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VALVE

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This invention relates generally to valve mechanisms, and more particularly to a valve mechanism adapted for control of fluid in relatively large hydraulic pipe lines, and an object of my invention is to provide an improved arrangement of valve parts and operating means therefor, whereby fluid flow through the valve may be efficiently and positively controlled combined with other desirable operating and structural features such as will be more apparent to those skilled in this art.

More specific objects are to provide a clear passageway in that part of the valve where relatively high velocity flow is had, and to provide, also, means whereby an improved fluid pressure control of the valve may be had.

Other objects and advantages thereof will be seen from the following description of the accompanying drawing in which the figure is a longitudinal sectional view through the valve mechanism interposed between up and downstream pipes of a fluid conduit.

In the illustrative embodiment of my invention, I have shown a plunger type of valve mechanism comprising an outer casing 25 adapted to be secured through suitable flanges to an upstream pipe C and a downstream pipe C′, it being noted that the valve receives fluid from the upstream pipe and controls its discharge into the downstream pipe C′, this latter pipe being preferably of somewhat smaller diameter than the upstream pipe thereby creating a region of lower pressure in the downstream pipe adjacent the valve than in the upstream pipe. By this arrangement it is possible to obtain effective and relatively high operating pressure from the upstream pipe and discharge the operating fluid into the region of lower pressure in the downstream pipe, there being the further advantage that the plunger to be described is operating in this region of relatively low pressure. Said casing supports, through suitable ribs R, an interior casing or fixed valve element 26 spaced from the outer casing 25 to provide a relatively smooth annular fluid passageway P between the inner and outer casings. This inner casing has a conical head 26′. The forward part 27 is supported by ribs 28 having guiding surfaces 29 for the plunger valve 30 which is telescopically received within the inner casing 26. The nosepiece of the plunger and the rearwardly extending annular portion 31 are preferably integral and adapted to be moved forward for engagement with a seat 32 formed in the outer casing 25. To permit the valve to be of minimum diameter, as by having the plunger provided with the plain annular portion 31, and still allow an efficient, simple and economical means of fluid operation, there is provided a piston or partition 33 attached to and movable with the plunger 30. This attachment can be made by any suitable means, such as bolts or the like. Inward movement of the plunger is preferably limited by a suitable flange 34 carried on the inner casing 26. A stationary diaphragm 35 is secured to a fixed tubular member or rod 36 extending through a suitable substantially leak-proof opening in the piston 33, and is secured to the rear portion of the interior casing 26. The piston 33 and diaphragm 35 in cooperation with the plunger and inner valve casing 26 form the three tandem chambers D, E and F.

There are thus formed closing chambers D and F and an opening chamber E. Fluid flow to or from either one of these chambers may be had by pipes 37, 38 and 39, the last two having communication with chambers D and E through passages 40 and 41 formed in the rod 36. The passage 41 extends entirely through the rod, while the passage 40 communicates with the chamber E through the radial port 17′. Closing movement of the plunger as it nears its seat is gradually retarded due to port 17′ communicating with an annular groove in the rod 36 whereby the hub of piston 33 will override this annular groove thereby gradually throttling fluid discharge into port 17′. Under certain conditions, the pressure in chamber D might be sufficient to effect closure of the valve, but under other conditions, a total closing force greater than that produced by pres-

sure in chamber D may be necessary, in which case, pressure may be supplied through pipe 37 to chamber F.

Any suitable valve mechanism may be used for controlling the operating fluid to the various operating chambers and the pipes leading to these operating chambers can be provided with a suitable four-way valve, or other type, depending upon the operating conditions, such as possibly receiving the actuating fluid from the upstream pipe, or from an external source, and of either exhausting the discharge pressure to atmosphere, or to the region of low pressure in the downstream pipe.

Thus it is seen that my improved arrangement not only provides a clear passageway adjacent the outlet whereby the velocity of flow may be relatively high, but also the nose piece is made to form an operating chamber so that relatively simple fluid operating control may be used. In order that the plunger nose may be provided with a fluid chamber which serves the function of an operating or pressure chamber it is necessary that the nose be closed or otherwise arranged to prevent any substantial uncontrolled communication between the nose chamber and the downstream pipe. Such an arrangement permits control of the relative pressures in all of the chambers.

I claim:

1. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all of said chambers.

2. A fluid receiving and controlling valve, including a valve body having an inlet and an outlet of smaller diameter than the inlet whereby a higher pressure exists in the inlet than at the outlet during flow of fluid therethrough, said valve being arranged to be connected to a fluid conveying conduit and to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger adapted for cooperation with said seat, a fixed valve element, within said body, having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, means whereby fluid pressure may be supplied from the inlet side of said valve mechanism to all of said chambers as required in accordance with opening or closing of the valve, and means whereby during valve operation fluid pressure may be discharged from at least one of said chambers to the outlet side of said valve mechanism where the lower pressure exists.

3. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger having a closed nose and adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling fluid from the exterior of said valve mechanism in at least two of the chambers thereof.

4. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger adapted for cooperation with said seat, a fixed valve element, within said body, having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within

said plunger, said valve member, plunger, piston, and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all of said chambers, said pressure controlling means including control passages connectable with said conduit and extending across said annular waterway from the exterior of said valve mechanism to the tandem chambers therein.

5. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger having a closed nose and adapted for cooperation with said seat, a fixed valve element, within said body, having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for supplying fluid from the conduit to a plurality of said chambers and for positively effecting discharge of fluid from the other of said chambers.

6. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger having a closed nose and adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all three chambers, including means for supplying fluid from the upstream side of the fluid conveying conduit to two of said tandem chambers one of which is in the upstream end of the valve mechanism and the other of which is in the downstream nose portion of the plunger and for discharging fluid from the intermediate chamber to a point of lower pressure than exists in the upstream side of the plunger.

7. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger thereby providing a chamber in the nose of the plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers, one of which is said nose chamber, adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all of said chambers, said pressure controlling means including means for supplying fluid from the upstream pipe simultaneously to both the nose chamber and upstream chamber and discharging fluid from the intermediate chamber to the downstream pipe.

8. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger having a closed nose and adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all three chambers, including means for throttling the flow of fluid relative to one of the chambers by motion of the plunger automatically when it approaches its closing position.

9. A fluid receiving and controlling valve, including a valve body arranged to be connected to a fluid conveying conduit, said valve being arranged to receive flowing fluid

at one end and to control its discharge from the opposite end, a valve seat arranged in said body, a movable plunger having a closed nose and adapted for cooperation with said seat, a fixed valve element within said body and having a conical head at one end and adapted to telescopically receive said movable plunger at its opposite end, said valve element providing an annular waterway within said body, a piston movable with said plunger, a fixed tubular member within said valve element, a fixed diaphragm carried by the end of said tubular member and arranged to fit within said plunger, said fixed tubular member being disposed co-axially of the plunger and extending through said piston so as to permit rotation of said plunger in case of any tendency therefor, said valve member, plunger, piston and diaphragm providing three tandem pressure chambers adapted to receive pressure fluid from said conduit, and means for controlling the relative pressures in all of said chambers.

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