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PLANT FOR THE REMOTE CONTROL OF A GATE-VALVE BY MEANS OF A FLUID UNDER PRESSURE
Filed June 13, 1941

Serial No.
397,994

3 Sheets-Sheet 1

Fig. 1.

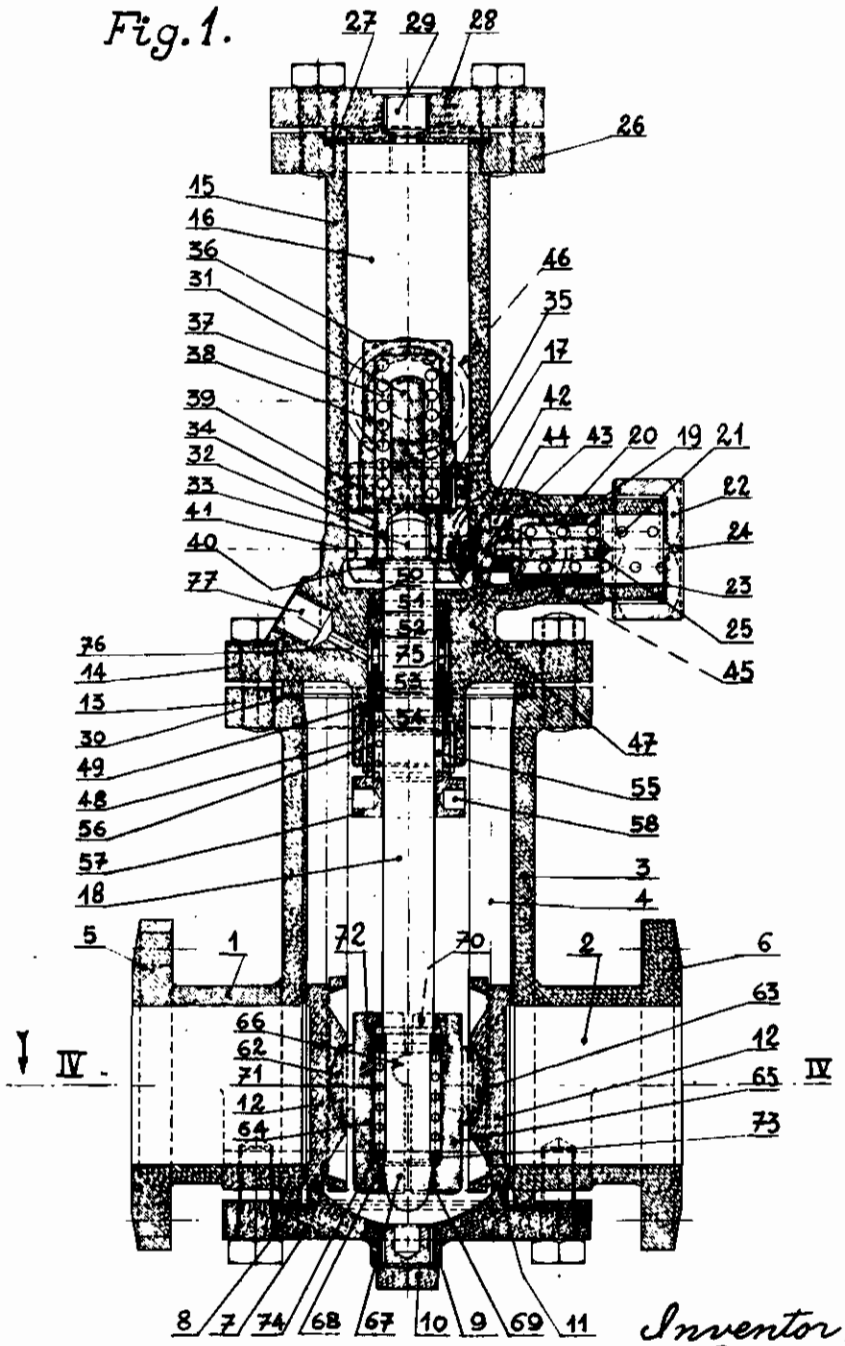

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Fig. 2

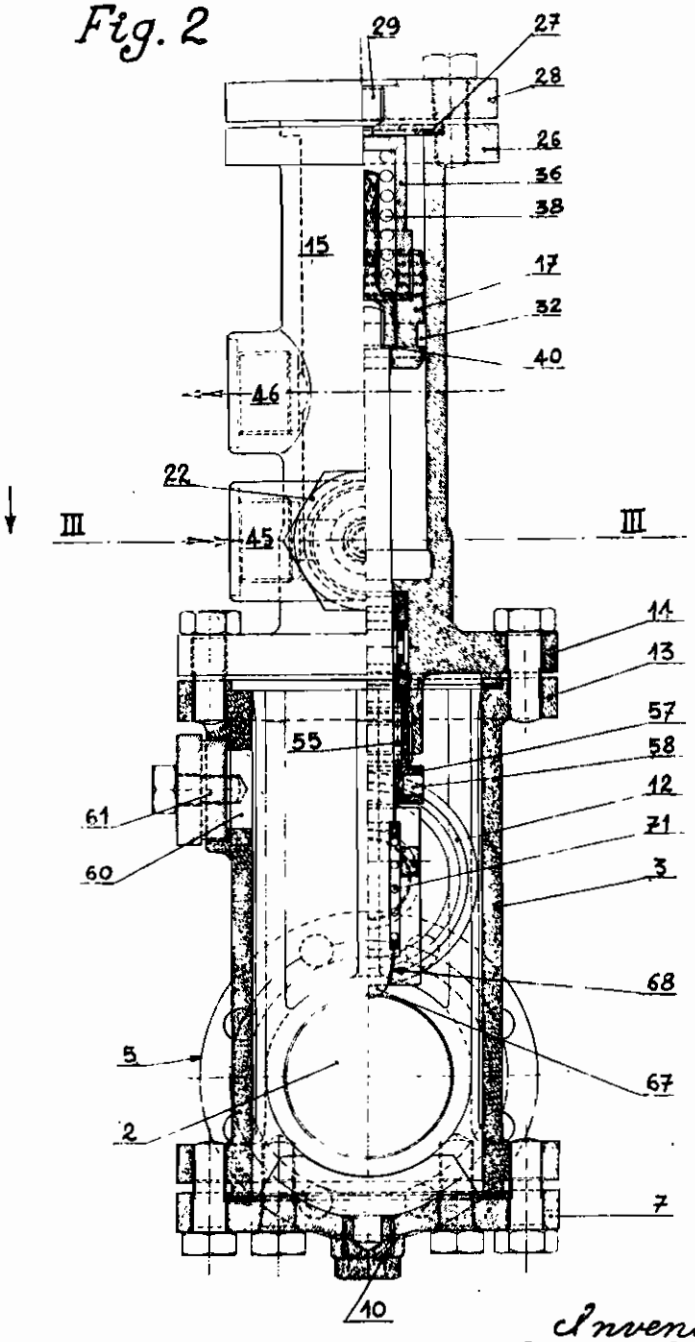

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Fig. 5

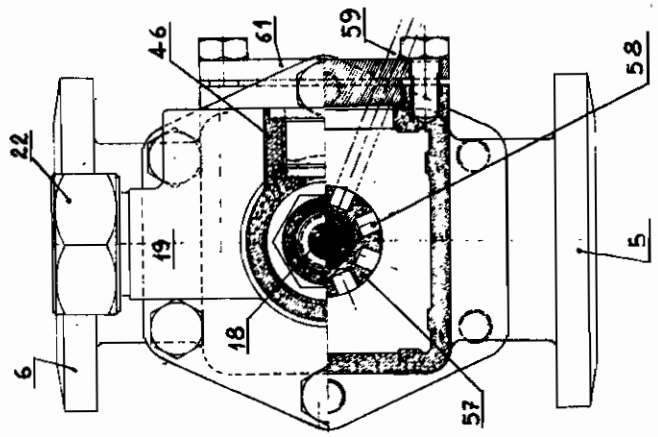


Fig. 4.

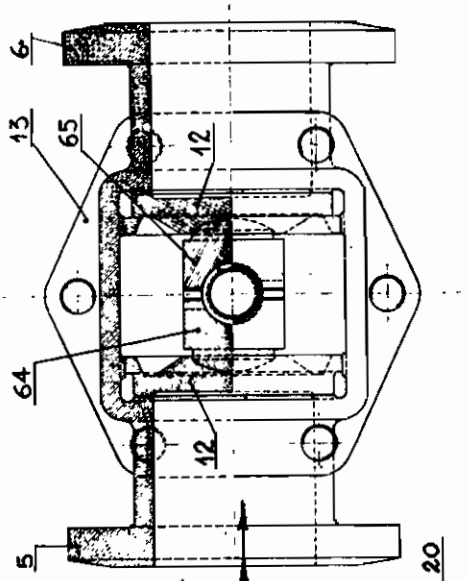
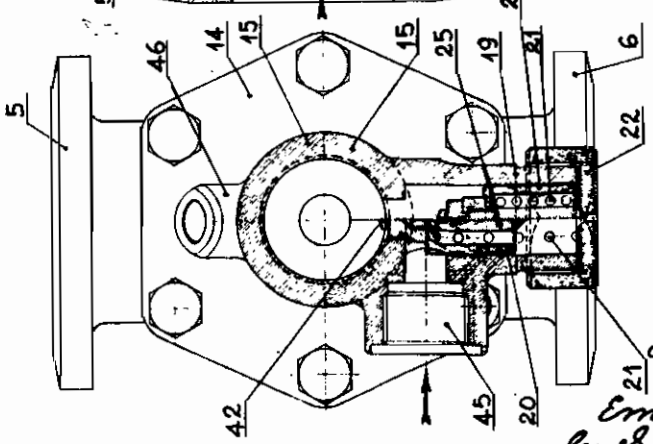


Fig. 3



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ALIEN PROPERTY CUSTODIAN

PLANT FOR THE REMOTE CONTROL OF A GATE-VALVE BY MEANS OF A FLUID UNDER PRESSURE

Emile Piquerez, Saint-Cloud, France; vested in the Alien Property Custodian

Application filed June 13, 1941

The present invention has for object a plant for the remote control of a gate-valve made in one piece, by means of a fluid under pressure.

The object of the present invention is a plant having a central station from which it is possible to control from a distance the opening of one or of a plurality of blow-off valves for the accelerated draining of tanks containing relatively important quantities of liquids, particularly inflammable liquids, and from which it is possible to effect the supervision of said plant, in particular for detecting therein the leakages which might occur of the liquid to be drained or of the fluid under pressure utilised for the acceleration.

The plant according to the invention is characterised by the fact that the action of the fluid under pressure is exerted on the draining only after it has caused the opening of the blow-off valve, and this in order to avoid any pressure liable to cause the bursting of the fluid-tight tanks to be drained. This arrangement allows in certain cases to interpose between the mechanism opening the gate-valve and the tank to be drained any known regulator allowing to reduce the importance of the pressure above said tank.

The plant is also characterised by the arrangement, within the gate-valve, of a double stuffing-box provided in communication with the central station in such a manner that the possible leakages of the two kinds of fluids can be immediately detected.

The blow-off valve of the plant according to the invention is characterised by the fact that:

The stuffing-box is interposed in the gate-valve between the inlet of the fluid under pressure and the draining passage for the liquid to be drained, so as to prevent the leakages of both kinds of fluids and is provided with a device for taking up the play operable from the exterior.

The stuffing-box has two fluid-tight zones separated by a central space provided with a nozzle for the connection of the pipe line detecting the leakages leading to the central station.

The closing slide of the gate-valve is controlled by a rod passing through the double stuffing-box and carrying, on the side opposed to the slide, a locking piston.

The bolt of the locking piston and the locking piston are movable by the pressure of the fluid under pressure.

The closing slide of the valve comprises two half-shells pivoted on each other, the pivotal centre being chosen in such a manner that the resultant of the pressure is exerted on the covers according to the axis of the outlet passage of the gate-valve.

The cylinder in which moves the bolt of the piston locking the gate-valve is provided with an outlet to the atmosphere which is obturated during the draining period by a valve rigid with the bolt.

A resilient device is interposed between the slide and the control rod in order to avoid jammings during the closing stroke.

Other advantages and characteristic features will become apparent from the following description given with reference to the accompanying drawings by way of example which relate to a plant for the draining of inflammable liquids and in which:

Fig. 1 is a vertical section of the gate-valve in closed position.

Fig. 2 is a view of the gate-valve, in open position, partly in elevation and partly in vertical section according to a plane at right angles to the plane of section according to Fig. 1.

Fig. 3 is a view in horizontal section according to line III—III of Fig. 2, partly in closed position, partly in open position.

Fig. 4 is a plan view of the lower part of the gate-valve, partly in horizontal section according to line IV—IV of Fig. 1.

Fig. 5 is a view in horizontal section, made partly through the nozzle for the outlet of the protecting fluid under pressure such as CO^2, partly through the plane of the device for taking up the play of the stuffing-box.

According to the embodiment chosen by way of example and which is provided for the draining of inflammable liquids, the lower part of the gate-valve is in the form of an inverted T the tubular horizontal branch 1 of which constitutes the draining passage 2 for the inflammable liquid and the tubular vertical branch 3 of which constitutes the bore 4 according to the axis of which moves the closing slide of the gate-valve. The horizontal branch 1 comprises flanges 5 and 6 respectively for connection to the inflammable liquid tank and the conduit for evacuating the liquid to be drained. The bore 4 which extends down to the bottom of the horizontal branch 1 is suitably obturated by means of a bottom 7 with interposition of a packing 8.

The bottom 7 is made in one piece with a cylindrical extension 9, the whole being internally threaded for receiving a maintenance plug 10.

The bottom 7 is also provided with a recess 11 the shape of which corresponds to that of the covers 12 closing the draining passage 2, so that said covers can suitably abut against said bottom when the gate-valve is in closed position.

At its upper part the vertical branch 3 comprises a flange 13 on which can be secured by a flange 14, with interposition of a packing 30, a tubular element 15 provided with a bore 16 in which can move a locking cylinder 17 connected to the rod 18 controlling the closing slide, as will be more fully described hereinafter.

This tubular element 15 comprises a horizontal branch 19 suitably bored to receive a bolt 20 subjected to the action of a spring 21 which takes a bearing on the internal surface of a plug 22 screwed at the end of the branch 19 with interposition of a fluid-tight washer 23.

An outlet to the atmosphere 24 is provided in the bottom of plug 22, said outlet 24 being closed, when the gate-valve is in service, by a valve 25 rigid with the bolt 20.

At its upper part the tubular element 15 has a flange 26 on which is secured, with interposition of a packing 27, a closing plate 28 provided with a tapping 29 for the connection of a conduit, not shown, leading to a multi-way distributor placed at the central control station.

The locking cylinder 17 is mounted on the control rod 18 with a damping device adapted to absorb the shocks which occur at the end of the opening stroke.

The damping device is thus constituted: a tailpiece 31 which terminates at its lower part in an internally threaded portion 32 screwed on the end, screw threaded for that purpose at 33, of the control rod 18. The internally threaded portion 32 which has a diameter larger than that of the tail-piece 31 is housed, with a certain amount of play, in a recess 34 provided within the locking cylinder 17. The recess 34 is followed at the upper part of the cylinder 17 by a tapping of larger diameter 35 in which is screwed a sheath 36.

The annular space 37 provided between the tail-piece 31 and the interior of the sheath 36 is used for receiving a damping spring 38 which, taking a bearing on the shoulder 39 of the tail-piece 31, reacts on the other hand, against the bottom of the sheath 36 rigid with the locking cylinder 17, the reaction of the spring 38 being limited by the clearance provided between the cylinder 17 and the control rod 18; said clearance being in its turn limited by a shoulder 40 provided within the cylinder 17 which abuts against the lower part of the internally threaded portion 32 of the tail-piece 31.

The cylinder 17 is of course provided with packing-rings ensuring fluid-tightness within the bore 16, it is also provided with an annular groove 41 in which can engage, when the gate-valve is in closed position, under the action of the spring 21, the head 42 of the bolt 20.

Between the head 42 and the main body of the bolt is provided a portion 43 of smaller diameter than that of said body in order to provide, in locking position, a free annular space 44 opposite which is located the nozzle 45 through which is admitted the protecting fluid under pressure, said nozzle 45 being connected to the horizontal branch 19.

Slightly higher up the tubular element 15 is provided with a nozzle 46 through which the protecting fluid is directed towards the liquid to be drained when, after having been unlocked, the locking cylinder 17 has been moved to the upper part of the tubular element 15.

The tubular element 15 presents, directly above its flange portion 14, a solid portion 47 and downwardly from said flange, a cylindrical extension 48.

A hole 49 bored in said lower part extends to a shoulder 50 of the solid portion 47.

Said bore 49 is used to house a double stuffing-box having, in the order from top to bottom: a first packing 51, a bracing ring 52, a second packing 53 and a clamping ring 54 which receives the pressure of a spring 55 adjustable at will by the more or less accentuated screwing of the nut 56 in a tapping of the extension 48. Said nut comprises a flange 57 in which are perforated a certain number of radial holes 58 which can receive the end of a tightening rod 59 which can be inserted in an opening 60 provided in the tubular branch 3 after having removed a plug 61 removably mounted in a fluid-tight manner on said branch 3.

The bracing ring 52 is I-shaped so as to provide, between both packings 51 and 53, an annular space 75 which, through the medium of a conduit 76 and a connecting tapping 77 can be put in communication with a device for supervising the leakages placed at the central control station within sight of the superintendent.

The covers 12 are centered on spherical projections 62 and 63 of two shells 64 and 65, the centre common to both these spherical projections being located on the intersection of both axes of the gate-valve.

The two shells 64 and 65 are pivoted on each other, the pivotal centre 66 being located on the vertical axis of the gate-valve slightly above the plane passing through the horizontal axis of the gate-valve.

The distance between the horizontal axis and the pivotal centre 66 is so chosen that when the end of conical shape 67 of rod 18 exerts a thrust on corresponding cones 68 and 69, respectively provided on the shells 64 and 65, the resultant of said thrust is exerted on either side, according to the horizontal axis so that the closing surfaces of the covers are correctly applied against their respective seats on the gate-valve.

Said thrust, which is useful for ensuring fluid-tightness, constitutes an inconvenience when it is desired, after the opening period of the gate-valve, to bring back the covers 12 to their closed position. If said thrust could not be relieved, jammings between the covers and the bore 4, might be produced and, in any case, the friction would be important.

For avoiding this inconvenience, the thrust transmitted to the rod 18, is only directly exerted on the conical parts 69 and 69 of the shells 64 and 65 when the covers 12 and 13 have abutted against the recess 11 of the bottom 7 of the gate-valve, that is to say, in their practically closed position.

As long as the contact between said covers and the bottom 7 is not obtained, the thrust of the rod 18 is transmitted through the medium of a resilient device.

The rod 18 presents, within the two shells 64 and 65, a shoulder 70 against which abuts, under the action of a spring 71, a washer 72. The spring 71 reacts, on the other hand, against a washer 73, which in closed position, presses against a shoulder 74 common to both shells.

Assuming that, in the central station, there is a supply of protection gas under pressure, for

instance CO^2, connected to a multi-way distributor controlled by the superintendent, and that one of the ways of the distributor can be connected to the nozzle **45** admitting the fluid under pressure to the gate-valve, whereas the other way which is connected to a connection in engagement with the tapping **29**, remains closed, the operation of the plant, if it is necessary to rapidly drain an inflammable liquid contained in a tank to which the flange **5** of the gate-valve is connected, is as follows:

The superintendent of the station puts the distributor in the position in which the CO^2 gas can reach the nozzle **45** of the gate-valve, the admission takes place in the free annular space **44**, the pressure pushes back the bolt **20** and disengages its head **42** from the annular groove **41**.

The pressure of the CO^2 gas pushes back the bolt **20** in antagonism to the action of the spring **21** until the needle of the valve **25** closes the outlet **24**, in this position the passage which connects the annular space **44** to the bore **16** is already open and the pressure is exerted under the locking piston **17** which, through the medium of its shoulder **40**, displaces the control rod **18** upwardly.

During said upward movement of the operating rod **18**, the lower cone **67** of of said rod is separated from the cones **68** and **69** of the shells **64** and **65** thus relieving the covers **12** of the thrust which pressed them against their seats, or practically, against the bore **4** and thereby the closing slide can effect its opening stroke without appreciable friction. It is to be noted that the beginning of the upward movement of the rod takes place without shock on the slide owing to the interposition of the spring **71**.

At its upper part the pressure has been transmitted from the locking position **17** to the rod **18** and when the latter reaches the end of its upward stroke, that is to say against the closing plate **28**, the shock on the sheath **36** is damped by the damping spring **38**.

In this high position of the rod **18** the draining passage **2** of the gate-valve is open and the fluid under pressure used for accelerating the draining can freely issue through the nozzle **46** which is then located below the locking piston **17**.

The nozzle **46** being connected by a conduit, not shown, to the tank for the liquid to be drained, the pressure will be exerted on said liquid which will flow through the draining passage **2** towards the place where it is to flow away.

It will be noted that the pressure of the fluid accelerating the draining can only be exerted when the blow-off valve is open and that the tank for the liquid to be drained is thus subjected to no dangerous pressure. Furthermore, the pressure may be adjusted between the nozzle **46** and the tank, by means of any regulating device suitably arranged on the conduit connecting these two points.

Assuming it is advisable to reclose the gate-valve, the superintendent closes the passage leading to the nozzle **45** and establishes the communication with the way of the distributor which is connected to the tapping **29**. The pressure acts on the locking cylinder **36—17** which transmits the thrust to the rod **18** through the medium of the shock absorber **38**, when the rod **18** reaches its closed position the bolt **20** pushed back under the action of the spring **31** plays its part automatically, and the gate-valve is again locked in its closed position.

During its downward movement the rod **18** transmits the thrust on both shells **64** and **65** through the medium of the spring **71** and of the shoulder **74**, leaving a certain clearance between the lower cone **67** and the conical surfaces **88** and **69**; the covers freely sliding in the bore **4**. As soon as the covers **12** abut against the bottom **7**, the spring **71** can no longer act and the thrust on the shells is directly transmitted by the conical parts.

The thrust exerted by the cone **67** on the shells **64** and **65** causes the latter to pivot about their common center **66** and the resultant of said thrust on each of these two shells tends to press the covers **12** against their seats, the pressure being sultably directed on either side according to the horizontal axis of the draining passage **2**.

The leakages which might occur through the double stuffing-box **51—53**, respectively in CO^2 and in inflammable liquid, are immediately pointed out to the superintendent of the central station which is connected to the intermediate annular space **75** of the stuffing-box by the conduit connecting said station to the tapping **77**.

If such leakages occur, the double stuffing-box must be put in suitable condition. For that purpose, it suffices to remove the plug **61** and by using the opening **60** (Fig. 2), by means of the tool **59** (Fig. 5) to tighten the nut **50**.

It is to be understood that the embodiment illustrated only by way of example has been described simply as an indication and not in a limiting sense, and that all modifications might be made therein without changing the nature of the invention.

Thus, for instance, the plant might be equipped for simultaneously opening a plurality of gate-valves connected to one and the same tank, or for simultaneously draining a plurality of tanks, provided however that the pressure is only exerted on the tank or tanks after the opening of said gate-valve or gate-valves.

The plant can also be applied in numerous cases to the treatment of hydrocarbons in particular for the recovery of secondary products. The various controls might also be obtained hydraulically instead of pneumatically.

EMILE PIQUEREZ.