

[72] Inventors **Gonzalo Vazquez**
Dorking Surrey, England;
John V. Salerni, Whittier, Calif.
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 [73] Assignee **Baker Oil Tools, Inc.**
City of Commerce, Calif.
a corporation of California

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Primary Examiner—Marvin A. Champion

Assistant Examiner—Ian A. Calvert

Attorney—Bernard Kriegel

[54] **DOWNHOLE DISASTER VALVE WITH DUMP UNIT**
19 Claims, 6 Drawing Figs.

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137/467; 166/184, 166/224

[51] Int. Cl..... **E21b 33/12;**

F16k 17/168

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131, 184, 224; 251/28, 62; 137/467, 625.66,

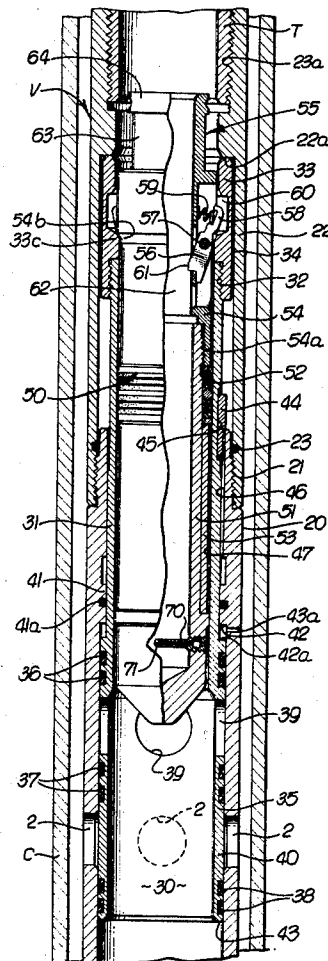
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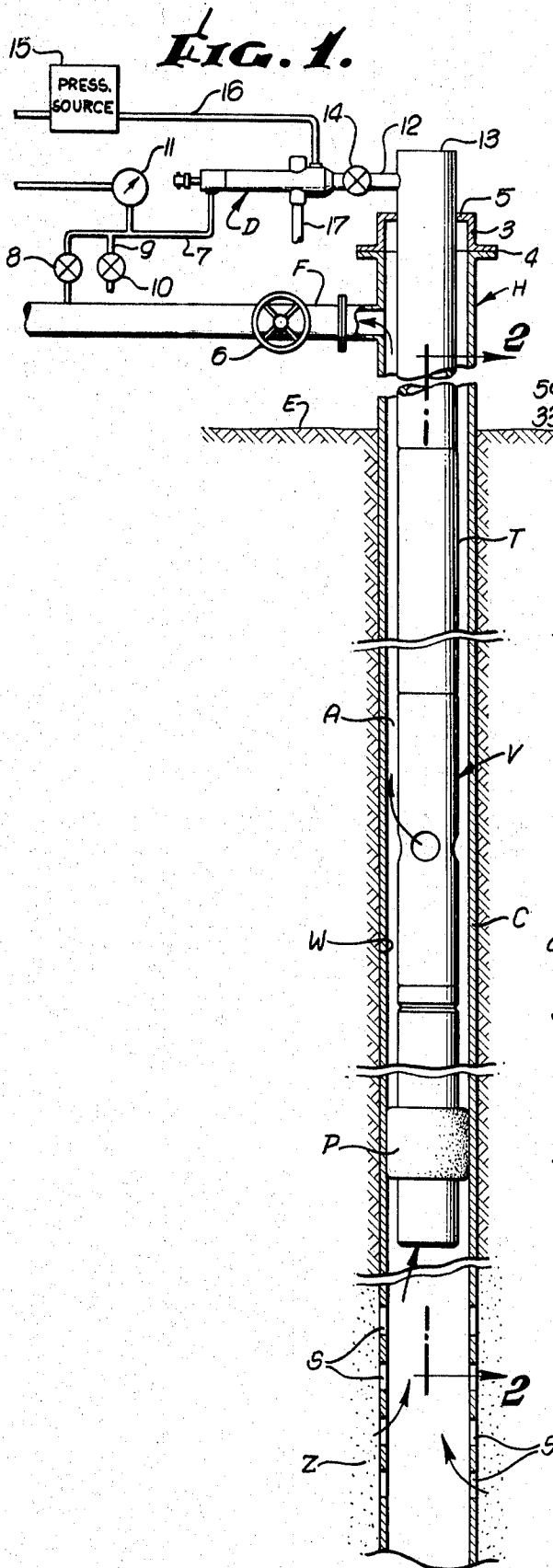
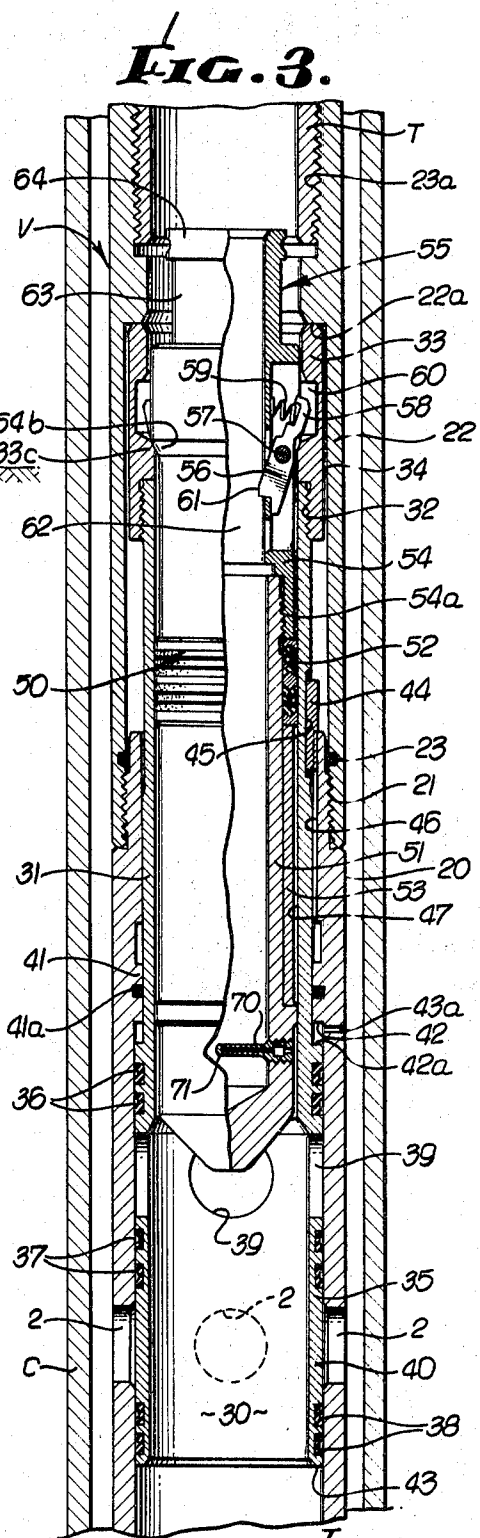
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ABSTRACT: Disaster valve apparatus for gas or oil wells in which a well pipe is disposed for conducting production fluid to the top of the well, the disaster valve being located below the top of the well in a control fluid tubing string above a packer sealingly engaged with the well pipe, the disaster valve having a valve sleeve provided with a central bore closed by a releasable plug, control fluid pressure in the control fluid tubing holding the valve open against the pressure of well fluid tending to close the valve. Such disaster valve apparatus including a dump unit located at the top of the well for venting the control fluid tubing if production fluid pressure in the flow line at the top of the well changes sufficiently to require that the disaster valve be closed.





INVENTORS.
GONZALO VÁZQUEZ
JOHN V. SALERNI
By Bernard Kriegel
 ATTORNEYS.

FIG. 2a.

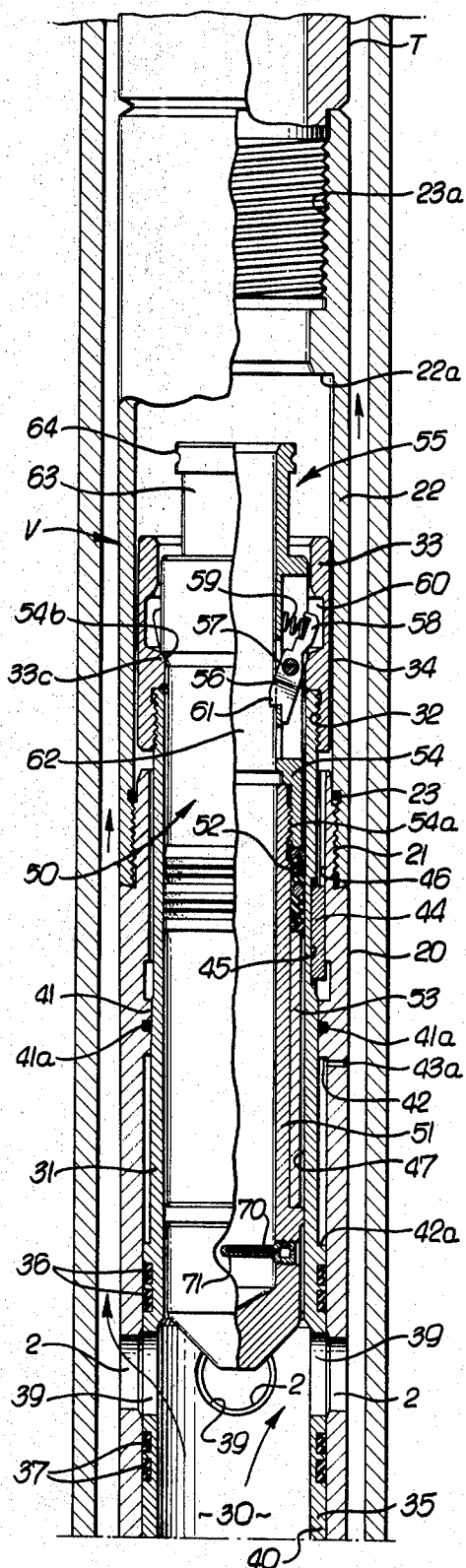
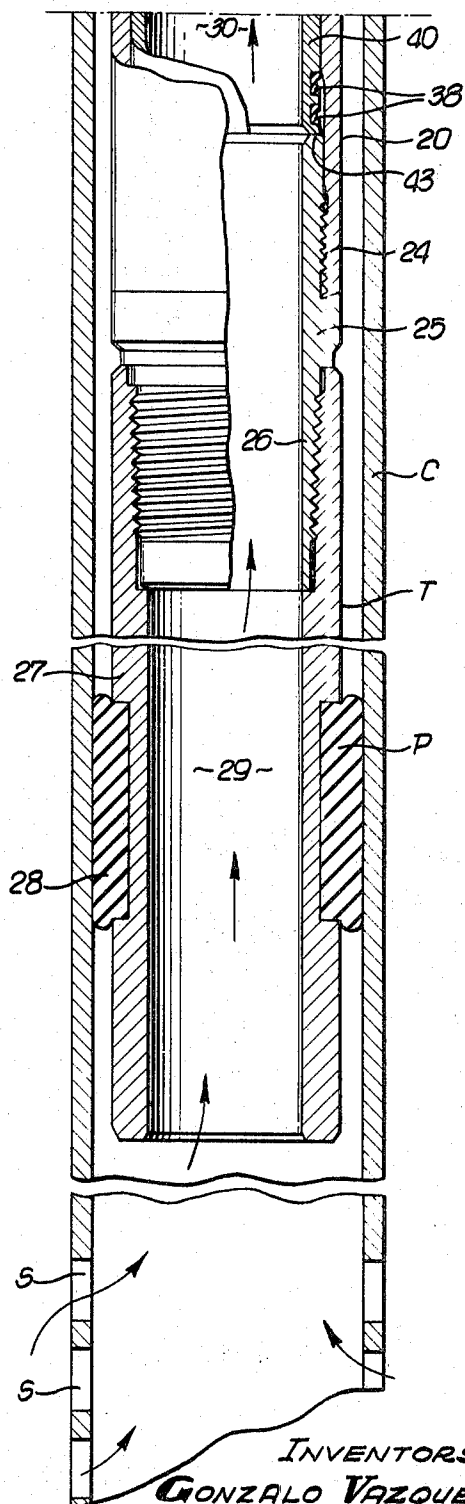


FIG. 2b.



INVENTORS.
GONZALO VAZQUEZ
JOHN V. SALERNI
 By *Bernard Kriegel*
 ATTORNEY.

FIG. 4.

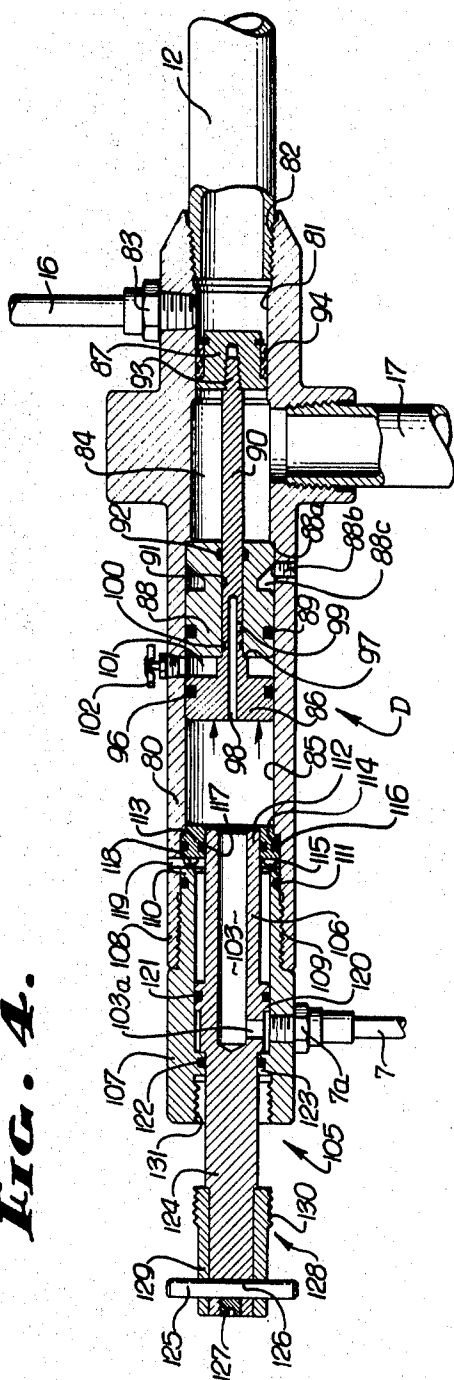
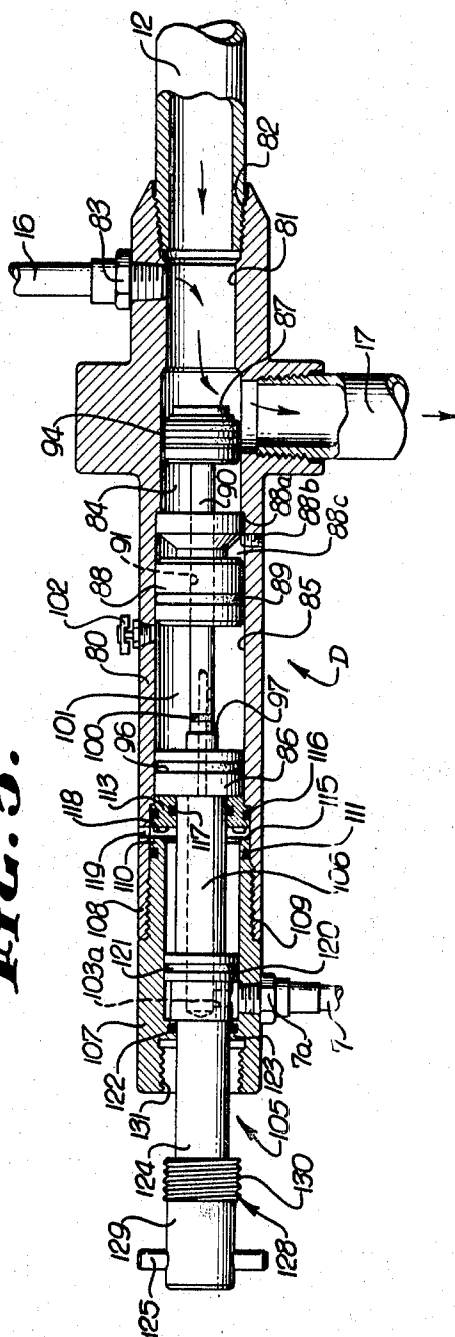


Fig. 5.



INVENTORS.
GONZALO VAZQUEZ
JOHN V. SALERNI
By Bernard Kriegel
ATTORNEY.

DOWNHOLE DISASTER VALVE WITH DUMP UNIT

In the production of certain oil and gas wells which naturally flow, it is sometimes desirable or necessary that the well be shut in, that is, be prevented from continuing to produce, in the event that some occurrence to the flow line or the collection tank would result in loss of producing fluid if the well were not shut in.

Various well fluid pressure responsive valves have been provided in the past for accomplishing the shutting in of a well upon a change in pressure of the production fluid, but such valves have generally been so constructed as to be run into a well pipe on a tubing string and retrieved on the tubing string when various operations are to be performed in the well bore below the valve assembly, such as perforating, surveying or other operations requiring the running of a tool to a location lower than the valve. In other instances, a special string of tubing, including macaroni tubing, is run for conducting a control fluid to a subsurface location for controlling the valve, such macaroni string being difficult to run in combination with a conventional tubing string.

The present invention provides a simple sleeve valve construction adapted to be made up in a conventional tubing or pipe string with a packer, and to be run into the well in the tubing string. The normal central opening through the sleeve valve is substantially as large as the opening in the tubing string, thereby enabling performance of fluid injection or wire line operations in the well below the valve assembly. The valve is adapted to be conditioned for use by closing off the central passage through the valve sleeve by means of a closure plug. This plug is adapted to be run into the tubing string on a wire line for seating and anchoring coengagement with the valve sleeve, so as to close off the opening through the valve sleeve, whereby the valve sleeve is rendered responsive to the pressure of well fluid in the casing and responsive to the pressure of control fluid in the control tubing. Under these circumstances, a force applied to the valve sleeve by well fluid pressure in excess of the force applied to the valve sleeve by control pressure will effect closure of the valve, shutting the well in; but, if the force applied to the valve sleeve by the control fluid exceeds that applied by well fluid pressure, the valve will be held open to allow the continued flow of production fluid.

The invention also involves the provision of a unit at the top of the well, which is adapted to control the subsurface disaster valve. This unit is operable to maintain control fluid pressure on the control fluid in the control tubing in response to the maintenance of a production fluid pressure in the surface flow line of a predetermined magnitude, but if the flow line pressure changes, the control fluid is vented to atmosphere, thereby relieving the pressure of the control fluid required to hold the disaster valve sleeve in an open position.

More particularly, the surface or dump unit for venting the control fluid pressure includes an assemblage providing for ease of setting or conditioning to maintain the subsurface disaster valve open, and enabling testing to determine operability of the disaster valve, as well as enabling resetting of the dump unit following either testing of the disaster valve or operation of the latter responsive to a change in the pressure of fluid in the flow line.

Among the objects of the invention is the provision of a rugged disaster valve which is easy to install and operate, requiring only the removal of the plug or closure for the valve sleeve to permit the performance of downhole operations by wire line tools capable of passing through the valve sleeve, as well as the provision of a simple surface dump unit responsive to pressure differential to maintain the disaster valve open or to allow closure of the disaster valve by production fluid pressure.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed descrip-

tion is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIG. 1 is a view, partly in section and partly in elevation, showing a well equipped with a disaster valve and dump unit in accordance with the invention;

FIGS. 2a and 2b together constitute an enlarged vertical section through the subsurface valve, FIG. 2b being a downward continuation of FIG. 2a, and showing the valve open;

FIG. 3 is a view corresponding to FIG. 2a, but showing the valve closed;

FIG. 4 is a vertical section showing the dump unit in condition for holding the subsurface valve open; and

FIG. 5 is a view corresponding to FIG. 4, but showing the dump unit open to allow closure of the subsurface valve.

As seen in the drawings, and with particular reference to FIG. 1, the invention involves the provision of subsurface or disaster valve means V installed in a string of tubing T disposed in a well W in which a casing string C has been set. The casing C at a lower section has been provided with perforations or slots S through which gas or oil may flow from a producing zone Z of the subsurface earth formation traversed by or into which the well W extends. Below the valve V, the tubing string has a typical casing packer P which is adapted to be set in sealing engagement with the wall of the casing C above the casing perforations or slots S so as to confine the flow of production fluid to a path extending into the lower end of the tubing string T.

Above the packer P, the fluid entering the tubing T below the packer P may enter the annular space A, defined between the casing C and the tubing T, through valve ports 2 when the valve V is open, as will be hereinafter described. However, when the valve V is closed, the well is effectively shut in and flow of production fluid into the annulus A is prevented.

Above the surface of the earth, designated E, is suitable well head equipment H. This equipment illustratively includes a head 3 secured, as at 4, to the upper end of the casing C and having a sealing flange 5 disposed about the upper end of the tubing T to prevent the flow of well fluid therebetween. Below the head 3, a flow line F leads from the casing C and communicates with the tubing casing annulus A, so as to conduct production fluid from the well to a pipe line or tank farm, as is well-known. In the flow line F may be shutoff valve 6 to enable manual shutting in the well.

Interposed between the flow line F and the tubing T is a dump unit D which, in accordance with the invention, is responsive to well fluid pressure in the flow line F to allow the subsurface valve V to be closed by well fluid pressure when pressure in the flow line F varies. The dump unit D is connected by a conduit 7 to the flow line F, this conduit 7 having a shutoff valve 8 therein. Between the dump unit D and the shutoff valve 8 is a vent conduit 9 having a shutoff valve 10 for allowing venting of the conduit 7 and the adjacent end of the dump unit D for a purpose which will be hereinafter described. Between the dump unit D and the flow line F is a pressure gauge 11. The dump unit D is also connected by a control fluid conduit 12 to the tubing T below a head 13 closing the upper end of the tubing T. A further shutoff valve 14 may be provided in the control fluid conduit 12.

A pressure source 15 is provided and is connected by a conduit 16 to the dump unit D at the opposite end thereof from the conduit 7. This pressure source 15 may be a suitable tank containing a quantity of fluid pressurized by air or gas so as to apply the desired pressure to control fluid in the tubing T. The dump unit is adapted to vent the control fluid pressure to atmosphere via a vent outlet 17, when the pressure relationship of the production fluid in the flow line to the control fluid in the tubing T is such as to actuate the dump unit D, whereby the valve V in the tubing T will be caused to closed by production fluid pressure in the well.

Referring now to FIGS. 2a and 2b, the disaster valve means V will be seen to comprise an elongated tubular body 20 having a threaded connection at 21 with an upper sub 22, a seal 23 being provided at the threaded connection. The sub 22 is provided at its upper end 23a with internal threads for connection with the lower end of the tubing T. At its lower end, the body 20 is threadedly connected, as at 24, with a connector sub 25 having a threaded pin 26 for connection with the tubing T therebelow. Beneath the valve V, the packer P is shown (FIG. 2b) having a tubular body 27 provided with a resilient expansible packing element 28 sealing engageable in the well casing C, the packer body 27 having a flow passage 29 communicating with a central bore or passage 30 extending through the valve assembly V. Slips, or the like, (not shown) anchor the packer to the well casing, in a known manner.

The valve assembly V further includes an inner sleeve 31 reciprocally disposed in the body 20. Threadedly connected, as at 32, to the upper end of the valve sleeve 31 is a seating nipple 33 having an outer cylindrical wall 34 slidable in the body 20. At its lower end, the valve sleeve 31 has a cylindrical section 35 slidable in the body 20. This section 35 of the valve sleeve 31 has the upper seal ring means 36 providing an upper sliding seal between the valve sleeve 31 and the body 20. Spaced below the seal ring means 36 is intermediate seal ring means 37 providing a sliding seal with the body 20. Below the seal ring means 37 is lower seal ring means 38 providing a lower sliding seal with the body 20. Between the upper and intermediate seal ring means 36 and 37, the valve sleeve 31 is provided with side openings or ports 39 adapted, when the sleeve 31 is in a first or lower position, to communicate with the ports 2 in the valve body 20. Between the intermediate seal ring means 37 and the lower seal ring means 38, the valve sleeve 31 includes an unported section 40 which, when the valve sleeve is in an upper or second position (FIG. 3), is adapted to close the ports 2 in the valve body 20.

Above the port 2, the body 20 has an internal flange 41 carrying a seal ring 41a sealing against the valve sleeve 31. This flange provides a downwardly facing shoulder 42 opposed by an upwardly facing shoulder 42a formed about the valve sleeve 31, these shoulders being coengageable to limit upward movement of the valve sleeve 31, although upward movement can be limited by engagement of the upper end of the nipple 33 with a sub shoulder 22a. A vent port 43a is provided in the body 20 between the shoulders 42 and 42a to prevent entrapment of fluid. Downward movement of the valve sleeve 31 is limited by engagement of the lower end face 43 of the sleeve 31 with the upper end of the lower connector sub 25.

In order to assure alignment of the ports 39 in the valve sleeve 31 with the body ports 2, when the sleeve is in the lower position, a key 44 may be provided in a seat 45 in the valve sleeve 31, the key being longitudinally slidable in a keyway 46 in the body 20 of the valve assembly V.

Extending longitudinally through the valve sleeve 31 is a passage or bore 47 which communicates with the body passage 30, and which is of a size or diameter at least substantially equaling the diameter of the opening or passage through the tubing T. Accordingly, well tools may be run through the tubing T and through the passage or bore 47 of the subsurface valve V to perform various wire line operations below the valve assembly V, without requiring removal of the valve assembly from the well. In addition, the passage 47 causes no significant restriction in the path of fluid pumped through the tubing T, in the event that fluid treatment of the well below the valve V may be necessary or desired.

In order to close the bore 47 through the valve sleeve 31, a plug device, generally denoted 50, is adapted to be releasably latched in sealing engagement in the bore 47. This plug device 50 comprises, in the illustrative embodiment, a hollow body 51 having an annular seal ring assembly 52 disposed thereabout for sealing engagement within the bore 47 of the valve sleeve 31. The seal ring assembly is disposed between the upper end of a spacer sleeve 53 and the lower end of a body of a lock assembly 55, which body 54 is threaded, as at 54a, onto the upper end of the plug body 51.

The body 54 of the lock assembly 55 has a number of longitudinally extended laterally opening slots therethrough, in which locking dogs 56 are pivotally mounted on pins 57. These dogs 56 have upper ends 58 biased outwardly by springs 59 for interlocking engagement in an annular groove 60 in the seating nipple 33 of the valve sleeve 31. At their lower ends, the dogs 56 have inner cam portions 61 which project into the central bore 62 in the plug body 54. At its upper end, the body 54 of the latch or lock means 55 includes a hollow neck 63 projecting upwardly and having a flange 64 at its upper end. Thus, the plug assembly 50 is adapted to be run into the tubing T on a wire line (not shown) until its shoulder 54b engages a nipple shoulder 33c, the dogs 56 then automatically latching into the groove 60 of the nipple 33 of the valve sleeve 31, so as to effectively close off the passage or bore 47 through the valve sleeve 31. However, to remove the plug assembly 50, it is only necessary to run a retrieving tool of a well-known type into the tubing T to engage the neck 63 and the cam portions 61 of the latch dogs 56 to release the latter from the groove 60, allowing the plug 50 to be pulled from the valve sleeve 31 by the wire line.

At its lower end, the plug body 51 may be provided with an equalizer device 70 adapted to have its frangible part 71 broken off to establish communication between the portions of tubing T above and below the plug 50, thereby equalizing pressure and facilitating pulling of the plug 50 from the valve sleeve 31.

When the plug means 50 is in place in the bore 47 of the valve sleeve 31, the position of the valve sleeve in the valve body 20 is determined by pressure acting across the entire cross-sectional area of the sleeve 31 above the plug 50 in the tubing T and below the plug 50 entering the tubing T through the packer body passage 29. The present valve sleeve 31 has equal upper and lower end areas, so that if the pressure in the tubing T above the valve assembly is less than the well pressure, the valve sleeve 31 will be shifted to its upper position (FIG. 3), at which the ports 2 are closed by the section 40 of the valve sleeve, but if the control fluid pressure in the tubing T above the valve assembly exceeds the well pressure below the valve assembly, then the valve sleeve 31 will be held in its lower position (FIGS. 2a and 2b), at which the port 2 in the body and ports 39 in the sleeve are in communication. Under the latter circumstances fluid from the subsurface earth zone Z may flow upwardly through the valve assembly into the annulus A and thence to the flow line F.

In order to apply fluid under pressure to the top of the valve sleeve 31 when the plug 50 is in place, the tubing T may be filled with a suitable liquid, such as kerosene. Thereafter, air or gas may be applied to the liquid in the tubing T from the source through the dump unit D.

Referring to FIGS. 4 and 5, it will be seen that the illustrative dump unit D comprises an elongated tubular body 80 having a bore 81 adjacent one end, the control fluid conduit 12 being connected to the body 80 as by a threaded joint 82, so as to communicate with the bore 81. The conduit 16 leads from the pressure source 15 to the bore 81, being connected to the body 80 by a connector 83. Spaced inwardly in the body 80 from the bore 81 is a vent chamber 84 with which the vent conduit 17 communicates. On the opposite side of the vent chamber 84 from the bore 81 is a bore 85. A piston 86 is reciprocable in the bore 85 and a piston 87 is reciprocable in the bore 81. The piston 86 is reciprocally supported by a member 88 providing a wall between the bore 85 and the vent chamber 84, the member 88 having a ring seal 89 engageable in the bore 85, and the piston 86 having a rod 90 shiftably disposed in a bore 91 in the wall member 88, a ring seal 92 also being provided between the rod 90 and the wall member 88. This rod 90 has one end 93 connected to the piston 87 which has a ring seal 94 engageable in the bore 81. The wall member 88 is held in the bore 85 against the shoulder 88a therein by means of a pin or setscrew 88b extending into an annular groove 88c in the outer periphery of the wall member 88. The rod 90 provides a shoulder 97 adapted to abut with the wall member 88 so that the pistons 86 and 87 are movable

in one direction as a unit, together with the rod 90, to a limited extent at which the piston 87 is in the bore 81, but the piston 86 and piston 87 may move in the other direction relative to the wall member 88 for purposes of dumping control pressure.

The piston 86 and rod 90 have a central passage 98 leading from the bore 85 and a lateral port 99 communicating with the passage 98, a seal ring 100 being provided on the rod 90 to form a seal in the bore 91 of the wall member 88, when the piston 86 is positioned as seen in FIG. 4 relative to the wall member 88. However, movement of the piston 86 away from the member 88 will open the port 99 into an annular space 101 defined between the wall member 88 and the piston 86, the body 80 having a vent valve 102 for selectively venting the annular space 101.

A passage 103 leads from the conduit 7 to the bore 85 of the dump unit. Therefore, the piston 86 in the bore 85 is subjected to the pressure of fluid derived from the flow line F; while the piston 87 in the bore 81 is subjected to control fluid pressure from the source 15. In the illustrative embodiment, the pistons 86 and 87 provide a differential assembly, the piston 86 being larger than the piston 87. If the force derived from production fluid pressure admitted to the bore 85 from conduit 7 and acting on the piston assembly 86 to move the latter, together with the rod 90 and the piston 87, to the right exceeds the force derived from control pressure admitted to the bore 81 and acting on the piston 87 to move the latter, together with the rod 90 and the piston 86, to the left, then the dump unit will, as seen in FIG. 4, maintain the control fluid pressure in the conduit 12 leading from the control tubing. Thus, such control fluid pressure will be imposed on the hydrostatic column in the control tubing T. This control pressure from the source 15 previously referred to is, therefore, selected to provide a total pressure capable of holding the subsurface disaster valve sleeve 31 in its lower position against counterpressure of the production fluid tending to move the valve sleeve 31 to the upper position, at which the valve means V is closed.

When flow line pressure applied to the bore 85 of the dump unit D, via the conduit 7, drops to a value such that control fluid pressure in bore 81 can force the piston 87 to the left, to the position shown in FIG. 5, then control fluid pressure is vented to atmosphere through vent conduit 17. Thus, the pressure of production fluid in the well casing C below the valve V will act on the valve sleeve 31 to force the same upwardly to the position shown in FIG. 3, whereby the well may be shut in. The dump valve releases the control pressure very quickly, since a short travel of the piston 87 and its rod 90 to the left shifts the port 99 into the annular space 101, equalizing the pressure on both sides of the piston 86 by flow through the passage 98 and port 99. The pressure force on the piston 86 opposing movement of the piston 87 to the left is thus reduced to a very great extent, allowing the pressure in the bore 81 to rapidly shift the piston 87 fully to the left, as seen in FIG. 5.

Included in the dump unit D are means 105 for resetting the well flow control system following venting of the control pressure system and closure of the valve V. This resetting means including This resetting means includes a bar or rod 106, which is reciprocally disposed in an end cap 107 connected to the end 108 of the dump unit body by threads 109. The inner cylindrical end 110 of the cap 107 has a ring seal 111 engaged in the body 80 of the dump unit. At its inner end 112, the bar 106 extends through an annular insert 113 which shoulders at 114 in the counterbore 115 into which the cap 107 is threaded. This insert 113 has an outer ring seal 116 sealingly engaged in the counterbore 115, and an inner ring seal 117 sealingly engaged with the bar 106. Between the seal insert 113 and the inner end 110 of the cap 107 is a gap 118, and the body 80 has a port 119 communicating the gap 118 to atmosphere.

Intermediate its ends, the bar 106 has a sealing flange 120 provided with a ring seal 121 sealingly engaged within the cap 107 at one side of the flow line or production fluid pressure inlet fitting 7a, which connects the conduit 7 to the dump unit. At the other side of the fitting 7a, a ring seal 122 is provided in

an internal flange 123 in the cap 107. Between the ring seals 121 and 122, the bar has a radial port 103a for establishing communication between the conduit 7 and the passage 103 in the bar 106, whereby flow line or production fluid pressure is admitted to the bore 85 between the seal ring insert 113 and the piston 86.

The bar 106 has its outer end 124 projecting outwardly from the cap 107 to enable actuation or reciprocation of the bar. A handle 125 in the form of a diametrically extended pin disposed in a hole 126 in the bar end 124 is provided for facilitating a manual reciprocation of the bar 106. This handle 125 is held in place by suitable means, such as a socket headed setscrew 127, threaded into the extremity of the bar end 124.

Releasable latch means 128 are provided for holding the bar in an inward position when desired. This latch means includes an annular latch body 129 disposed on the end 124 of the bar 106 and keyed in place by means of the handle pin 125. The latch body 129 has an external thread 130 thereon engageable in an internal thread 131 in the adjacent end of the cap 107. Thus, the latch means 128 are engageable and releasable responsive to rotation of the handle 125 and bar 106.

It will now be understood that, when the piston 86, the piston rod 90, and the piston 87 of the dump unit D are moved to the left, as seen in FIG. 5, to vent control pressure through the vent 17, the bar or rod 106 may be moved axially to the right to reset the piston 95 and the piston 87 to the positions shown in FIG. 4. At this time, the latch means 128 may be engaged by threading the latch body 129 into internal thread 131 to hold the piston 87 in the bore 81 so as to prevent venting of the control fluid pressure. With the piston so held control fluid pressure may be applied in the tubing T to open the disaster valve V. After production of the well is established through the valve v, pressure of the production fluid will be applied through the conduit 7, port 103a, and passage 103 to the bore 85 to maintain the pistons 86 and 87 in the position of FIG. 4, and, thereafter, the latch means 128 may be released by unthreading the body 129 from the bore 131 to allow for subsequent venting of the control tubing responsive to a drop in the pressure of production fluid in the flow line.

In the installation of the system in a well head and flow line assembly, the latch means 128 may be initially engaged to hold the piston 87 in a nondumping position until control fluid pressure opens the subsurface valve V and production fluid pressure is present in the flow line conduit 7. The pressure in the flow line may be a function of a choke in the the line F downstream from the conduit 7, and, in any event, the pressure will be indicated on the gauge 11. When such pressure is known, the required control pressure may also be determined and established so as to effect opening of the vent 17 at a desired low point in the production fluid or flow line pressure.

Thereupon, the latch means 128 may be released and the rod or bar 106 retracted. To test the balance and operability of the system, the shutoff valve 8 in the conduit 7 may be closed, and the vent valve 10 may be opened to bleed off pressure from the bore 85 of the dump unit. As such pressure bleeds off, the dump unit will open the vent 17, allowing the subsurface disaster valve to close.

Thereafter, the rod 106 is employed to reset the dump unit, as previously described, the shutoff valve 8 opened, and the vent valve 10 closed; whereupon the control tubing T may be repressured to reopen the valve V, and well production resumed. Thereafter, a drop in the pressure of production fluid in the flow line F to a predetermined value will result in the automatic closure of the subsurface valve V.

We claim:

1. In a disaster valve system for a well having a production well pipe communicating with a producing earth zone, a packer in said well pipe, a control fluid tubing in said well pipe, a flow line for conducting production fluid from said well pipe, a source of control fluid pressure for pressurizing said control fluid tubing, dump means connected to said flow line and to said source to dump the control fluid in response to a change in the relationship between the pressure of production

fluid in said flow line and the pressure from said source: a subsurface valve assembly having a body provided with a production fluid outlet communicating with said well pipe above said packer, an inlet communicating with said well pipe below said packer, a valve sleeve having a central passage therethrough and shiftable in said body between a first position allowing communication between said outlet and said inlet and a second position closing off communication between said outlet and said inlet, and closure means releasably engageable in said central passage of said valve sleeve to close said central passage, said closure means being responsive to pressure in said well pipe below said packer and pressure in said tubing for shifting said sleeve valve.

2. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tube string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including apart opening laterally in said body above said packer.

3. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tubing string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including a port opening laterally in said body above said packer, said valve sleeve being oppositely axially shiftable in said body passage responsive to pressure of control fluid in said tubing string and pressure of well production fluid in said body passage when said closure means is in said central passage of said valve sleeve.

4. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tubing string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including a port opening laterally in said body above said packer, said valve sleeve being oppositely axially shiftable in said body passage responsive to pressure of control fluid in said tubing string and pressure of well production fluid in said body passage when said closure means is in said central passage of said valve sleeve, said valve sleeve having equal oppositely facing cross-sectional areas exposed to fluid in said body passage when said closure means is removed from said central passage of said valve sleeve.

5. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tubing string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including a port opening laterally in said body above said packer, said valve sleeve being oppositely axially shiftable in said body passage responsive to pressure of control fluid in said tubing string and pressure of well production fluid in said body passage when said closure means including a plug sealingly engageable in said valve sleeve, and said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve.

6. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tubing string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including a port opening laterally in said body above said packer, said valve sleeve being oppositely axially shiftable in said body passage responsive to pressure of control fluid in said tubing string and pressure of well production fluid in said body passage when said closure means is in said central passage of said valve sleeve, said closure means including a plug sealingly engageable in said valve sleeve, and said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve, said plug having means for enabling running said plug on a wire line tool

into said valve sleeve and removing said plug from said valve sleeve by a wire line tool.

7. In a disaster valve system as defined in claim 1, said control fluid conduit comprising a tubing string having said packer therein below said subsurface valve assembly, said body being a tubular member having a passage therethrough including said inlet, said body being in said tubing string, and said outlet including a port opening laterally in said body above said packer, said valve sleeve being oppositely axially shiftable in said body passage responsive to pressure of control fluid in said tubing string and pressure of well production fluid in said body passage when said closure means is in said central passage of said valve sleeve, said closure means including a plug sealingly engageable in said valve sleeve, said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve, said plug having means for enabling running said plug from said valve sleeve by a wire line tool, and said latch means including means for releasing the same responsive to engagement of said plug by the wire line removing tool.

8. In a disaster valve system as defined in claim 1, said closure means including a plug sealingly engageable in said valve sleeve, and said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve.

9. a disaster valve system as defined in claim 1, said closure means including a plug sealingly engageable in said valve sleeve, and said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve, said plug having means for enabling running said plug on a wire line tool into said valve sleeve and removing said plug from said valve sleeve by a wire line tool.

10. In a disaster valve system as defined in claim 1, said closure means including a plug sealingly engageable in said valve sleeve, and said plug and said valve sleeve having releasable latch means for releasably retaining said plug in said valve sleeve, said plug having means for enabling running said plug on a wire line tool into said valve sleeve and removing said plug from said valve sleeve by a wire line tool, and said latch means including means for releasing the same responsive to engagement of said plug by the wire line removing tool.

11. In a disaster valve system as defined in claim 1, said outlet in said body including a laterally opening port said, valve sleeve having a first section provided with a port and an unported second section, said port in said body and said port in said ported section of said valve sleeve being in adjacent relation when said valve sleeve is in said first position, and said unported section of said valve sleeve and said port in said body being in adjacent relation when said valve sleeve is in said second position.

12. In a disaster valve system as defined in claim 1, said outlet in said body including a laterally opening port, said valve sleeve having a first section provided with a port and an unported second section, said port in said body and said port in ported section of said valve sleeve being adjacent relation when said valve sleeve is in said first position, and said unported section of said valve sleeve and said port in said body being in adjacent relation when said valve sleeve is in said second position, said body and said valve sleeve having longitudinally extended key and keyway means interengaged to align said port in said body and said port in said valve sleeve.

13. In a disaster valve system as defined in claim 1, said dump means comprising a body having a bore communicating with said control fluid pressure source and with said flow line, said body also having a vent, and piston means in said bore responsive to the pressure of fluid in said flow line and to the pressure of said control fluid for opening said vent in response to a change in the relationship between said flow line pressure and said control fluid pressure.

14. In a disaster valve system as defined in claim 1, said dump means comprising a body having a bore communicating with said control fluid pressure source and with said flow line, said body also having a vent, and piston means in said bore

responsive to the pressure of fluid in said flow line and to the pressure of said control fluid for opening said vent in response to a change in the relationship between said flow line pressure and said control fluid pressure, said dump unit also including vent means for shifting said piston means to a position closing said vent.

15. In a disaster valve system for a well having a production well pipe communicating with a producing earth zone, a packer in said well pipe, a control fluid tubing in said well pipe, a flow line for conducting production fluid from said well pipe, a source of control fluid pressure for pressurizing said control fluid tubing, subsurface valve means having an outlet communicating with said well pipe above said packer and an inlet communicating with said well pipe above said packer and inlet communicating with said well pipe below said packer, said valve means including a valve member movable between a first position closing said valve means and a second position at which said valve means is open responsive to change in the relationship of pressure at said inlet and pressure in said control fluid tubing: dump means responsive to the pressure of production fluid in said flow line and to the pressure of said control fluid pressure source for dumping said control fluid tubing in response to a change in the pressure of the production fluid in the flow line, said dump means comprising a body having a vent outlet, piston means in said body exposed to the pressure of fluid in said flow line and to the pressure of said source and movable to one position for closing said vent outlet when the force on said piston means derived from said flow line exceeds the force on said piston means derived from said source, said piston means being movable to another position to open said vent outlet when the force on said piston derived from said flow line, said dump means including reset means for moving said piston means to and holding said piston means in said one position to allow initiation of flow of production fluid through said flow line, said reset means having a passage therein for communicating said flow line with said body.

16. In disaster valve system for a well having a production well pipe communicating with a producing earth zone, a packer in said well pipe, a control fluid tubing in said well pipe, a flow line for conducting production fluid from said well pipe, a source of control fluid pressure for pressurizing said control fluid tubing, subsurface valve means having an outlet communicating with said well pipe above said packer and an inlet communicating with said well pipe below said packer, said valve means including a valve member movable between a first position closing said valve means and a second position at which said valve means is open responsive to change in the relationship of pressure at said inlet and pressure in said control fluid tubing: dump means responsive to the pressure of production fluid in said flow line and to the pressure of said control fluid pressure source for dumping said control fluid tubing in response to a change in the pressure of the production fluid in the flow line, said dump means comprising a body having a vent outlet, piston means in said body exposed to the pressure of fluid in said flow line and to the pressure of said source and movable to one position for closing said vent outlet when the force on said piston means from said flow line exceeds the force on said piston means derived from said source, said piston means being movable to another position to open

said vent outlet when the force on said piston means derived from said source exceeds the force on said piston derived from said flow line, said system also including means for venting the fluid pressure derived from the flow line to test close said subsurface valve means:

17. In a disaster valve system for a well having a production well pipe communicating with a producing earth zone, a packer in said well pipe, a control fluid tubing in said well pipe, a flow line for conducting production fluid from said well pipe, a source of control fluid pressure for pressurizing said control fluid tubing, subsurface valve means having an outlet communicating with said well pipe above said packer and an inlet communicating with said well pipe below said packer, said valve means including a valve means and a second position at which said valve means is open responsive to change in the relationship of pressure at said inlet and pressure in said control fluid tubing: dump means responsive to the pressure of production fluid in said flow line and to the pressure of said control fluid pressure source for dumping said control fluid tubing in response to a change in the pressure of the production fluid in the flow line, said dump means comprising a body having a vent outlet, piston means in said body exposed to the pressure of fluid in said flow line and to the pressure of said source and movable to one position for closing said vent outlet when the force on said piston means derived from said flow line exceeds the force on said piston means derived from said source, said piston means being movable to another position to open said vent outlet when the force on said piston means derived from said source exceeds the force on said piston derived from said flow line, said body having a first bore communicating with said control fluid tubing and with said source, said body having a second bore axially spaced from said first bore and communicating with said flow line, said piston means including a first piston axially shiftable in said first bore, a second piston axially shiftable in said second bore, a rod interconnecting said pistons, and said body having another bore between said first and second bores communicating with said vent outlet, said first piston being movable from said first bore into said another bore to communicate said source with said vent outlet.

18. In a disaster valve system as defined in claim 17, said body having a wall therein between said second piston and said another bore through which said rod reciprocally extends, and vent valve means communicating with said second bore between said wall and said second piston.

19. In a disaster valve system as defined in claim 17, said body having a wall therein between said second piston and said another bore through which said rod reciprocally extends, vent valve means communicating with said second bore between said wall and said second piston, said rod having a passage leading to said second bore at the other side of said second piston from said wall, said passage in said rod opening between said wall and said second piston when said second piston and said first piston move to a position opening said vent outlet, and including sealing means between said rod and said wall for closing off said passage in said rod from said second bore when said second piston and said first piston move to a position closing said vent outlet.