

Jan. 23, 1934.

W. A. RAYMOND ET AL

1,944,573

CONTROL HEAD

Filed Oct. 12, 1931

4 Sheets-Sheet 1

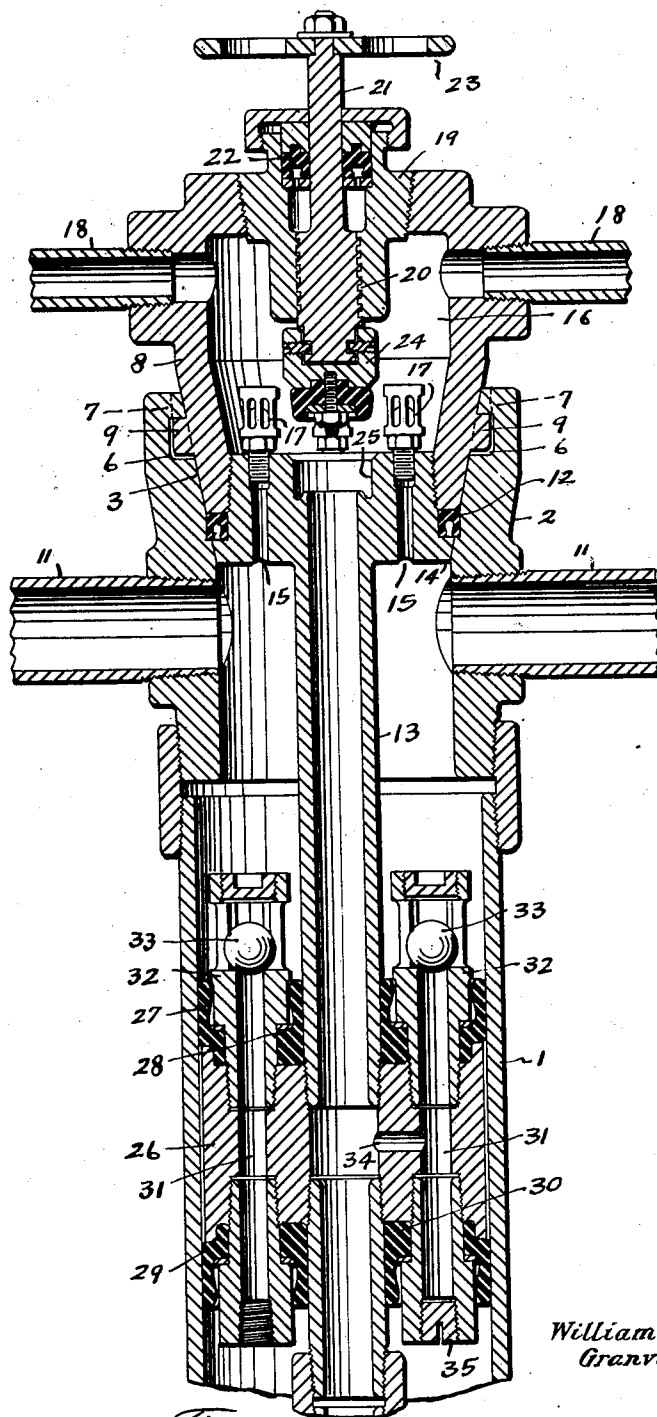


Fig. 1.

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4 Sheets-Sheet 2

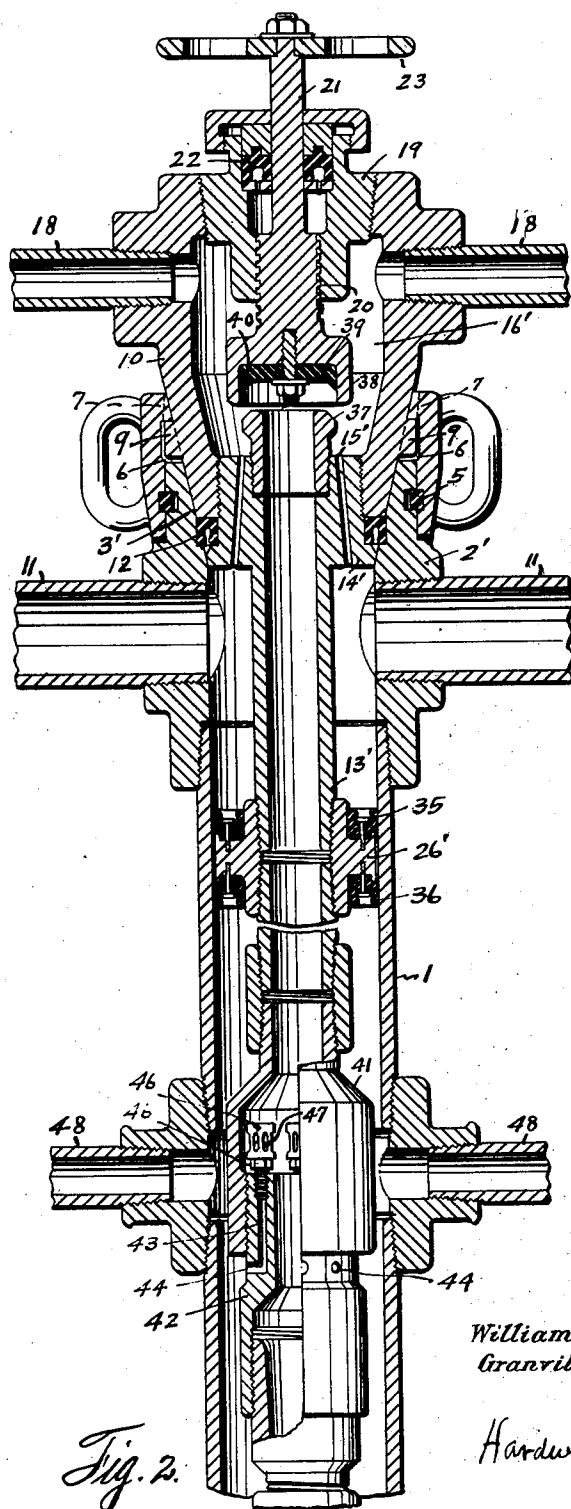


Fig. 2.

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4 Sheets-Sheet 3

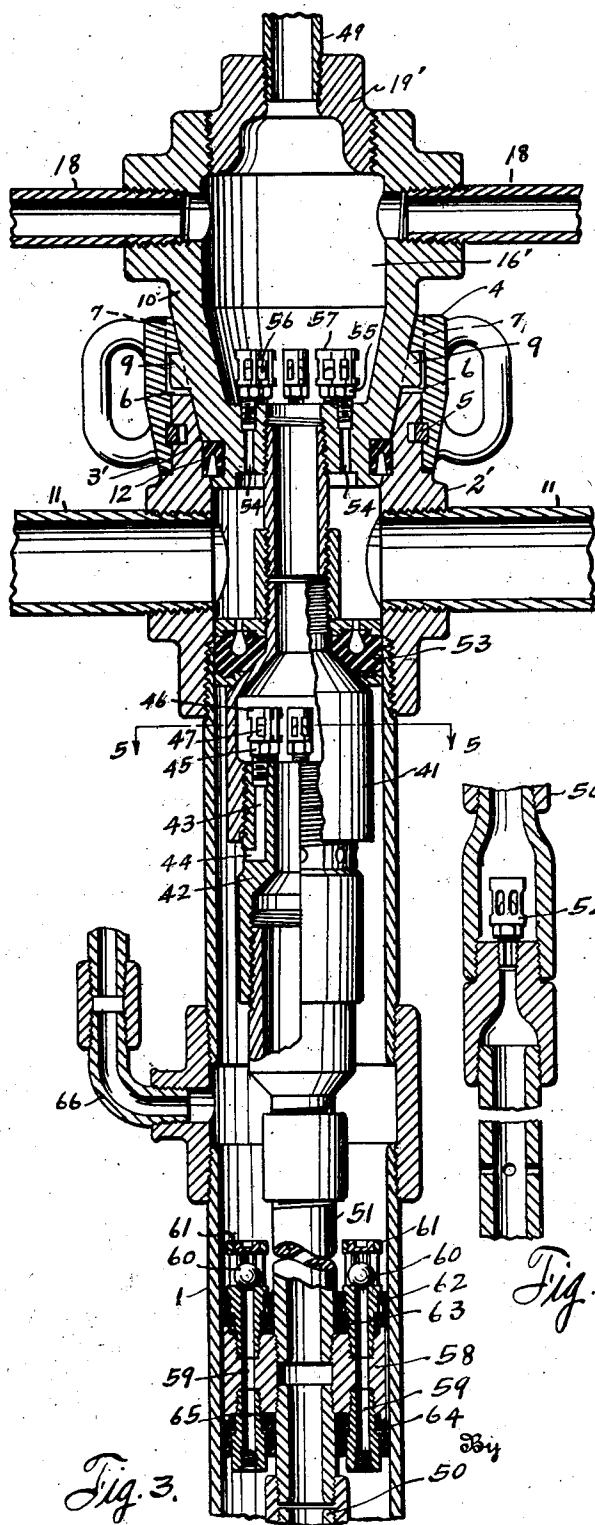


Fig. 3.

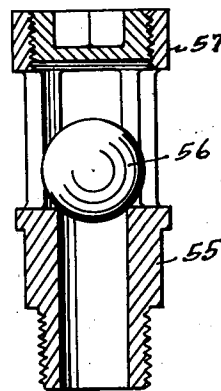


Fig. 4.

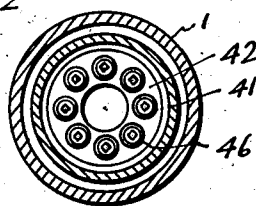


Fig. 5.



Fig. 6.

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4 Sheets-Sheet 4

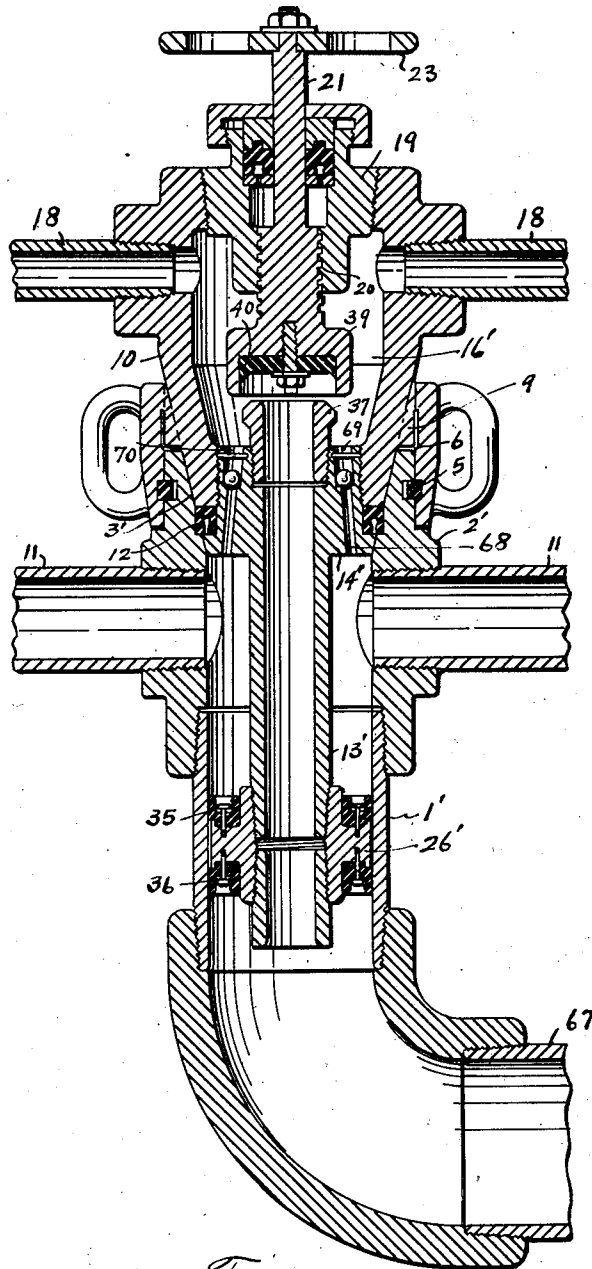


Fig. 7.

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UNITED STATES PATENT OFFICE

1,944,573

CONTROL HEAD

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Application October 12, 1931. Serial No. 568,422

19 Claims. (Cl. 166—14)

This invention relates to a control head.

An object of the invention is to provide in a device of the character described, means for controlling the flow of fluid from a well as well as means for extinguishing the fire, should the oil or gas flowing from the well become ignited.

Another object of the invention is to provide apparatus of the character described for controlling the gas pressure and preventing a blowout should strong gas pressure be encountered in the well.

Another object of the invention is to provide, in apparatus of the character described, means for closing the tubing to prevent the flow of fluid from the well so as to permit the removal or replacement of parts in case of necessity.

Another object of the invention is to provide an apparatus of the character described, a novel type of control valve for controlling or closing the tubing through which the oil is delivered from the well.

A further feature of the invention is to provide, in apparatus of this character, means for utilizing pressure fluid for causing, or assisting, the flow of oil from the well.

The invention may also be adapted for use, in connection with a pipe line, for extinguishing a fire at the point of delivery, as in an oil receiving tank or still.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification, and illustrated in the accompanying drawings, wherein:—

Figure 1 shows a vertical sectional view of the apparatus.

Figure 2 shows a vertical sectional view of a modified form thereof showing a novel type of control valve therein.

Figure 3 shows a side elevation partly in section of still another type of the apparatus.

Figure 4 shows an enlarged vertical sectional view of a type of check valve employed.

Figure 5 shows a cross sectional view taken on the line 5—5 of Figure 3,

Figure 6 shows a fragmentary vertical sectional view of the tubing showing the pump barrel and valve therein,

Figure 7 shows a vertical sectional view of a form of the control head attached to a pipe line.

Referring now more particularly to the drawings wherein like numerals of reference designate similar parts in each of the Figures, the numeral 1 designates the casing set in a well bore.

As shown in Figure 1, a bowl or casing head 2 is connected to the upper end of the casing as shown, and the upper end of this casing head has the upwardly flared seat 3 therein. As shown in Figures 2 and 3 the casing head 2' is connected to the upper end of the casing 1, and has the internal upwardly flared seat 3' therein. The casing head 2' is made in sections, having the upper retainer ring 4 turnable thereon and keyed to the lower or stationary section 5 as shown. In each form the casing head 2, 2' has the oppositely disposed inside arcuate grooves 6, 6 and the oppositely disposed ways 7 leading from the upper end of the casing head down to said respective grooves 6.

In the seat 3, there is seated the hanger 8 which is shaped to conform to the seat 3 and this hanger has the oppositely disposed lugs 9, 9 which may be fitted downwardly through the ways 7 and the hanger 8 then turned to lock said lugs in the grooves 6. Seated in the seats 3' of the respective casing heads 2', 2' are the hangers 10, 10' respectively. These hangers may be seated in the seats 3' by lowering them into place, the lugs 9 thereof passing through the ways 7 and the retainer rings 4 of the bowls, or heads 2, 2' may then be turned to lock said lugs 9 in the grooves 6. In each form, there are the lateral flow lines 11 leading outwardly from the respective casing heads beneath the respective seats 3; 3'. Around each hanger there is a packing ring 12 which is seated in coinciding annular grooves in the casing head and hanger to form a fluid tight joint between them.

Referring now to Figure 1 the numeral 13 designates a tubing extending down into the well and whose upper end is formed with a head 14 forming the lower end of the hanger 8. This head has the channels 15 leading upwardly there-through into the chamber 16 of said hanger and these channels are controlled by the upwardly opening valves 17. Leading outwardly from the chamber 16 are the flow lines 18.

The upper end of the casing head 8 is closed by means of a suitable bushing 19 which is threaded therein and this bushing has the internal coarse threads 20 through which the valve stem 21 is threaded. Around this stem above said threads there is a suitable stuffing box 22 in said bushing and the upper end of the stem carries a hand wheel 23 by means of which the valve stem may be turned. A suitable valve 24 has a swiveling connection with the lower end of the stem 21 and the lower end of the valve 24 is preferably formed of rubber or packing material to fit closely

within the seat 25 with the upper end of the tubing. By manipulating the stem 21 in one direction, the valve 24 may be run downwardly and the seat 25 closed and by manipulating the stem 21 in the other direction, said valve stem 24 may be manipulated upwardly to open said valve.

In the form shown in Figure 1 there is an enlarged coupling 26 connecting adjacent sections of the tubing 13 and which fits closely within the casing 1. The upper and lower ends of this coupling have the upwardly opening outer and inner cup rings 27, 28 and the downwardly opening outer and inner cup rings 29, 30. Said outer cup rings fit closely against the casing 1 and said inner cup rings fit closely around the tubing 13. The coupling 27 has the vertical channels 31 therethrough, said channels extending on upwardly through the valve cages 32, 32 which are anchored to said coupling and are controlled by the upwardly opening ball valves 33, 33 in said cages. A duct 34 leads from within the tubing 13 through the wall of the coupling 26 and terminates in one of the channels 31 and the lower end of this last mentioned channel may be closed as by a plug 35.

In case the well flows voluntarily the fluid may flow up through the tubing 13 into the chamber 16 and thence out through the flow lines 18.

The gas or other fluid flowing upwardly around the tubing 13 may pass on up through the channels 31 past the valves 33 and out through the flow lines 11 and a portion of the fluid passing upwardly through the tubing 13 may be diverted out through the duct 34 and thence up around the tubing 13 and out through the flow lines 11 and/or on up through the channels 15 and out through the flow lines 18, 18. The flow lines 11 and 18 will be equipped with the usual gate valve so that the flow of the fluid may be controlled. In case the flow lines 11 are closed the fluid passing upwardly through the casing 1 outside the tubing 13 may pass on upwardly through the channels 15 past the valve 17 and out through the flow lines 18.

In case the oil or gas flowing from the well becomes ignited, water or drilling fluid or a suitable fire extinguisher may be forced in through one or both of the lines 11, and upwardly through the channels 15 into the chamber 16 and thence out through the flow lines 18 and the fire may be thus extinguished. If the well does not voluntarily flow, the usual pump may be connected to the lower end of the tubing 13 and the valve stem 21 and valve 24 removed and the pump rod may be operated in the usual way through the stuffing box 22.

Referring now more particularly to Figure 2. The tubing 13' has the head 14' at its upper end screwed into the hanger 10, said head having the channels 15' leading upwardly therethrough from the space between the tubing and casing into the chamber 16' in the hanger. Beneath the flow line 11 there is a coupling 26' connecting adjacent sections of the tubing and having the upper and lower cup rings 35, 36 forming fluid tight joints with the casing. In this form the upper end of the hanger has the bushing 19 screwed therein, said bushing also having the internal coarse threads 20 through which the valve stem 21 is threaded and around said stem in said bushing, above said threads there is a suitable stuffing box 22 and the valve stem may be turned by a suitable hand wheel 23 thereon or other suitable means. In this form the upper

end of the tubing has the external beveled valve seat 37 and the lower end of the stem 2 has an inverted cup shaped valve 38 with the packing 39 secured therein, having the outwardly beveled seat 40 shaped to closely fit over the seat 37 when the valve is closed to form a fluid tight joint. In this type of valve the seats will be effectively protected against the cutting action of gritty substances that may be suspended in the fluid produced from the well. This valve may be readily closed by suitably manipulating the stem 21 to move the valve downwardly to closed position and opened by a reverse rotation of the stem. In this form when said valve is closed the flow of fluid from the well will be cut off. In case of fire, water or drilling fluid or a suitable fire extinguisher may be forced through one or both lines 11 and upwardly through the channels 15' into the chamber 16' and thence out through the flow lines 18 and the fire may be thus extinguished. If the well does not voluntarily flow, the usual pump may be connected to the lower end of the tubing 13' and the valve stem 21 and valve 38 removed and the pump rod may be operated in the usual way through the stuffing box 22.

Beneath the coupling 26' there is connected into the tubing 13' the upper and lower reducing nipples 41, 42, the upper end of the latter of which is screwed into the lower end of the former and leading downwardly through the nipple 42 from the upper end thereof are the channels 43 whose lower ends are outwardly turned through the walls of said nipple forming the inlet ports 44. The channels 43 extend on up through the valve seats 45, attached to the upper end of the nipple 42 and which carry the valve cages 46 in which are confined the upwardly opening ball valves 47. Gas or oil flowing upwardly through the casing 1 around said tubing may pass into the tubing through the channels 43 and up through said tubing or a pressure fluid may be introduced through one or both of the pressure lines 48 and thence up through the channels 43 to assist in pumping the fluid from the well; or a suitable fire extinguishing fluid may be introduced through one or both of the lines 48 to assist in extinguishing the fire, should the oil or gas become ignited.

In the form shown in Figure 3, an additional flow line 49 may lead upwardly from the bushing 19' which closes the upper end of the hanger 10'; or this flow line 49 may be removed and a suitable pump as 50 may be connected to the lower end of the tubing 51 and a packing gland installed around the pump rod in the bushing 19' and oil thus pumped from the well in case it does not voluntarily flow. This pump will be equipped with a suitable standing valve as 52 to prevent the back flow of fluid during pumping operations.

In this form of the apparatus, the reducing nipples 41, 42 are incorporated into the tubing and provided with the channels 43 whose other ends are controlled by the valves 47 as hereinabove described in connection with Figure 2. However in this form the nipple 41 is just beneath the flow lines 11, and there is a suitable packing 53 located thereon and closing the space between the tubing and the casing. The oil or gas flowing up around the tubing and within the casing 1, may pass upwardly through the channels 43 into the tubing and thence out of the chamber 16' and out through the flow lines 18 and/or 49 out of the well. Around the upper

end of the tubing 51 there are the channels 54 which lead up through the bottom of the hanger 10', from the space between the casing and tubing and continue on up into the chamber 16' through the valve seats 55 which are controlled by the ball valves 56, confined within the valve cages 57 on said seats. In case the oil or gas should become ignited, water, drilling fluid or a fire extinguisher may be forced in through one or both of the lines 11 and up through the channels 54 into the chamber 16' and thence out through the flow lines 18, 49 to extinguish the fire. At any point in the well a coupling 58 may be provided to connect adjacent sections of the tubing 51 and this coupling is provided with the channels 59, 59 extending upwardly there-through whose upper ends are controlled by the upwardly opening valves 60, 60 which are confined by the cages 61, 61. The coupling 58 has the upwardly and downwardly opening cup rings, 62, 63 and 64, 65 respectively which form close fitting joints with the casing and tubing, respectively. The gas or oil around the tubing within the casing may flow upwardly through these channels 59 and a pressure line 66 is connected into the casing between the packing 53 and the coupling 58 and through which a suitable pressure fluid may be introduced to assist in lifting the fluid or through which a suitable fire extinguisher may be introduced in case of fire.

The apparatus may also be readily adapted for use in connection with pipe lines or other oil conducting lines. For such use the apparatus is illustrated in Figure 7 wherein the numeral 67 designates the pipe line into which the apparatus may be connected by means of the pipe 1' onto which the bowl 2' is connected. This bowl is of the same general structure as that shown in Figure 2 having the downwardly converging seat 3' in which the hanger 10 is seated. In this form the head 14' has the channels 68 leading upwardly and through into the chamber 16' and whose upper ends are enlarged to receive the upwardly opening ball valves 69 which are retained in place by the cross pins 70. In the tubing 13' depending from the head 14' there is the coupling 26' having the upper and lower piston rings 35, 36 to close the space between the tubing 13' and the pipe 1'. In this form, the tubing 13' is not extended beneath the pipe 1'. In other respects, the construction disclosed in Figure 7 is substantially the same as that shown mounted on the casing head as shown in Figure 2.

When used in connection with a pipe line the oil may flow out through the flow lines 18 to the storage tanks or still and in case a fire should occur at such storage tank or other point of destination the valve 39 may be closed and a suitable fire extinguisher introduced through one or both the lines 11, 11 and the fluid will pass up through the channels 68 into the chamber 16' and then out through the lines 18 to the point of fire whereby said fire may be extinguished.

The drawings and description disclose what is now considered to be preferred forms of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What we claim is:

1. The combination with an outer casing and an inner tubing therein, in a well, of a bowl on said casing having a seat and a wall opening beneath said seat, a tubing hanger seated on said seat supporting said tubing and means around the tubing, beneath said opening, closing the space

between the tubing and casing against the downward passage of fluid, said hanger having a passageway for fluid leading upwardly from said space above said closing means.

2. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat having an internal chamber, a tubing supported in the casing by said hanger, said hanger having a channel leading from the space between the casing and tubing into said chamber, and packing means closing the space between the casing and tubing beneath said outlet.

3. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat, a tubing supported in the casing by said hanger, said hanger having an outlet passageway for fluid leading upwardly therethrough from the space between the casing and tubing, packing means beneath said outlet and around the tubing and closing said space between casing and tubing.

4. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat, a tubing supported in the casing by said hanger, said hanger, having an outlet passageway for fluid leading upwardly therethrough from the space between the casing and tubing, packing means beneath said outlet and around the tubing and closing said space between casing and tubing, and an outwardly opening valve controlling said passageway.

5. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat, a tubing supported in the casing by said hanger, said hanger having an outlet passageway for fluid leading upwardly therethrough from the space between the casing and tubing, packing means beneath said outlet and around the tubing and closing said space between casing and tubing, said packing means having a fluid channel leading upwardly therethrough and are upwardly opening valve controlling said channel.

6. The combination with an outer casing in a well of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat, a tubing supported in the casing by said hanger, said hanger having an outlet passageway for fluid leading upwardly therethrough from the space between the casing and tubing, packing means beneath said outlet and around the tubing and closing said space between casing and tubing, said packing means having a channel leading upwardly through and also having a channel leading from within the tubing into said space above the packing means and upwardly opening valves controlling said channels.

7. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat, a tubing supported in the casing by said hanger, said hanger having an outlet passageway for fluid leading upwardly therethrough from the space between the casing and tubing, packing means beneath the tubing and closing said space between casing and tubing, and valve means having an operative connection with the hanger whereby the upper end of the tubing may be closed.

8. The combination with a casing in a well, of

a bowl on said casing, a tubing hanger on said bowl, a tubing in the casing suspended from said hanger, said bowl having an outlet beneath said hanger, means beneath said outlet for closing the space between the casing and tubing, said hanger having an internal chamber provided with an outlet and also having a passageway leading from said space into said chamber.

9. The combination with a casing in a well, of a bowl on said casing, a tubing hanger on said bowl, a tubing in the casing suspended from said hanger, said bowl having an outlet beneath said hanger, means beneath said outlet for closing the space between the casing and tubing, said hanger having an internal chamber provided with an outlet and also having a passageway leading from said space into said chamber, and a back pressure valve controlling said passageway.

10. The combination with an outer casing in a well, of a bowl on said casing having an inside seat and an outlet beneath said seat, a tubing hanger on said seat having an internal chamber, a tubing supported in the casing by said hanger, said hanger having a channel leading from the space between the casing and tubing into said chamber, and packing means closing the space between the casing and tubing beneath said outlet.

11. The combination with an outer casing a well, of a bowl on the casing, forming a head and having a hanger seat on a lateral flow line beneath said seat, a hanger on said seat, a tubing suspended in the casing by said hanger, said hanger having an internal chamber and a flow line leading from the chamber and forming an outlet for the fluid flowing through the tubing, a valve mechanism operatively connected with the hanger and arranged to control the flow of fluid through said tubing.

12. The combination with an outer casing in a well, of a bowl on the casing, forming a head and having a hanger seat on said seat, a tubing suspended in the casing by said hanger, said hanger having an internal chamber and a flow line leading from the chamber and forming an outlet for the fluid flowing through the tubing, a valve mechanism operatively connected with the hanger and arranged to control the flow of fluid through said tubing, said valve mechanism including an external, tapering valve seat on the tubing and a cup shaped valve having a packing element therein adapted to fit over said seat when the valve is closed.

13. The combination with a casing in a well bore, of a bowl on the casing having a hanger seat, a hanger on said seat, a tubing in the casing suspended from the hanger, packing means about the tubing closing the space between the tubing and casing, a flow line connected into said space between the hanger and packing, said hanger having an outlet passageway leading from said space, said tubing having a valve controlled inlet leading inwardly from said space.

14. The combination with a casing in a well bore, of a bowl on said casing forming a head and having a seat, a hanger on said seat, a tubing

suspended in the casing from said hanger, a packing means about the tubing and closing the space between the tubing and casing, a flow line connected into said space above said packing means, said tubing having a valve controlled inlet beneath said packing means.

15. The combination with a casing in a well bore, of a bowl on said casing forming a head and having a seat, a hanger on said seat, a tubing suspended in the casing from said hanger, a packing means about the tubing and closing the space between the tubing and casing, a flow line connected into said space above said packing means, said tubing having a valve controlled inlet beneath said packing means, and a flow line connected into the casing beneath said packing means.

16. The combination with a casing in a well bore, of a bowl on the casing forming a head and having a seat, a hanger on said seat, a tubing suspended in the casing from said hanger, upper and lower packing means about the tubing closing the space between the tubing and casing, a flow line connected into the casing above the upper packing means, a flow line connected into the casing between said packing means, said tubing having a valve controlled inlet between said upper and lower packing means.

17. The combination with a casing in a well bore, of a bowl on the casing forming a head and having a seat, a hanger on said seat, a tubing suspended in the casing from said hanger, upper and lower packing means about the tubing closing the space between the tubing and casing, a flow line connected into the casing above the upper packing means, a flow line connected into the casing between said packing means, said tubing having a valve controlled inlet between said upper and lower packing means, said lower packing means having a valve controlled channel leading upwardly therethrough.

18. The combination with a fluid conducting line, of a bowl connected into the line having an inside seat, and a side opening beneath the seat, a hanger on said seat having an internal chamber therein provided with an outlet, a flow tubing anchored to the hanger and extended into said line, means closing the space between the tubing and line on one side of said opening, said hanger having a channel leading from said space into said chamber, and means on the hanger for closing said flow tubing.

19. The combination with a fluid conducting line, of a bowl connected into said line having an inside seat and an inlet beneath said seat, a flow tube in said line, means around the tube, on one side of the inlet, closing the space between said line and tube, a hanger on said seat having an internal chamber into which the tube is connected, said hanger having a channel, on the other side of the inlet, leading into said chamber, a flow line leading out from said chamber and means for opening and closing said tube.

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