

May 18, 1937.

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2,080,610

COMBINATION BLOW-OUT PREVENTER, CASING HEAD CONSTRUCTION

Filed May 6, 1935

4 Sheets-Sheet 1

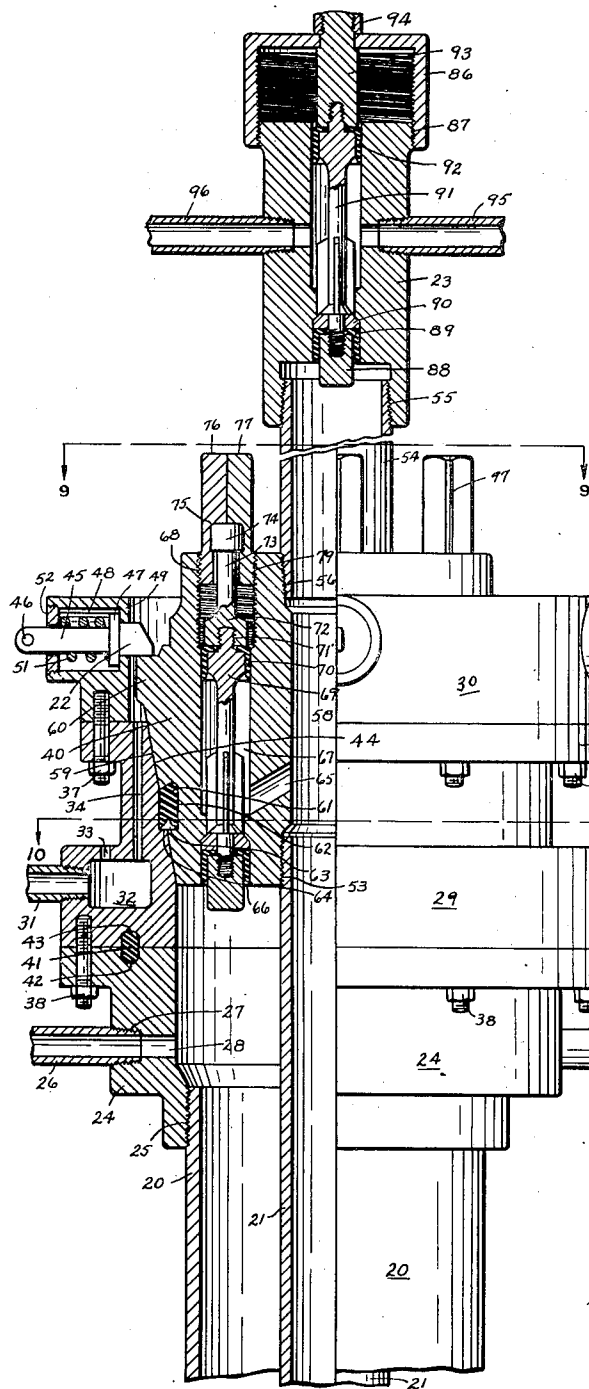


FIG 1.

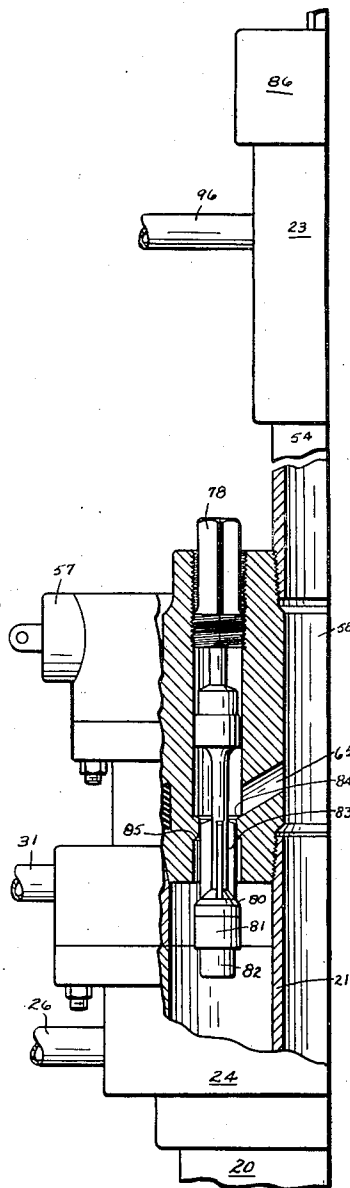


FIG 2.

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4 Sheets-Sheet 2

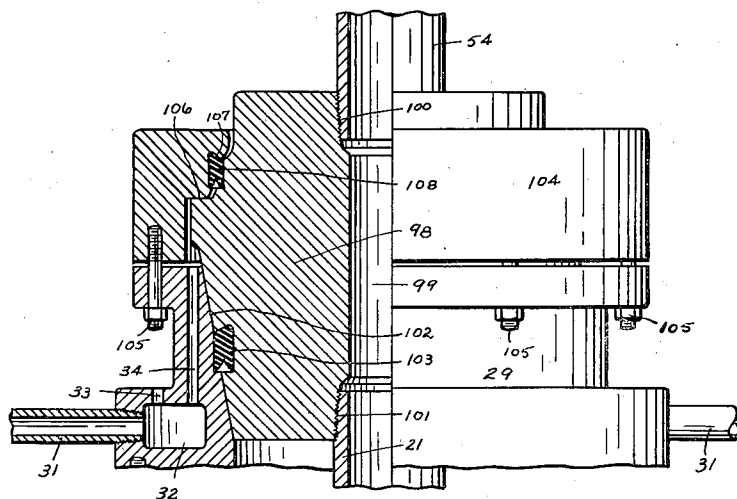


FIG. 3.

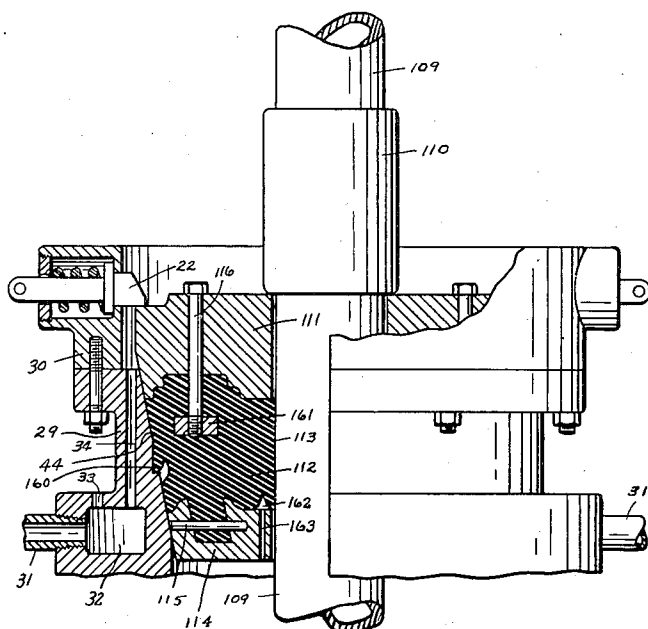


FIG. 4.

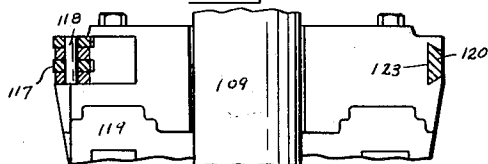
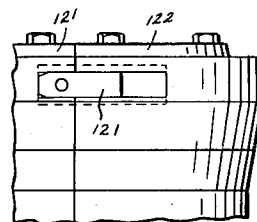


FIG. 5.



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4 Sheets-Sheet 3

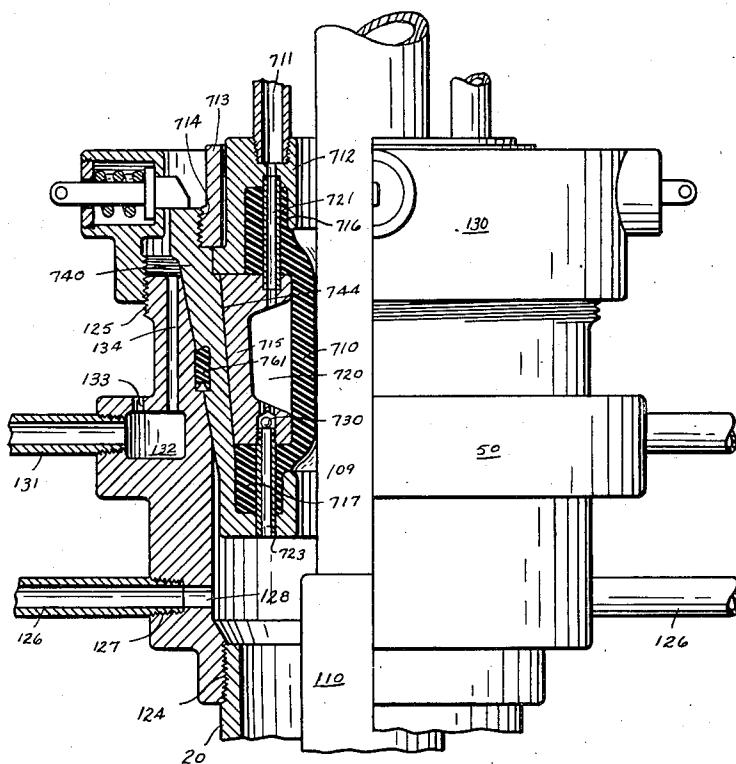


FIG 7.

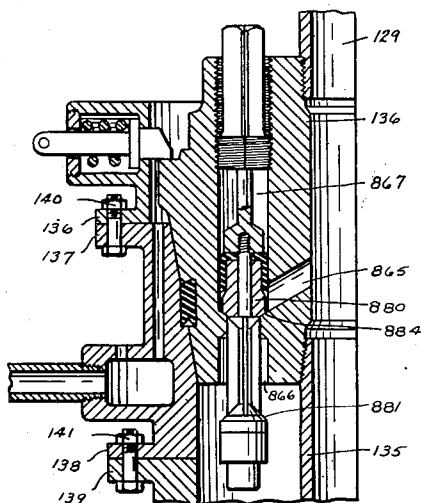


FIG 8.

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4 Sheets-Sheet 4

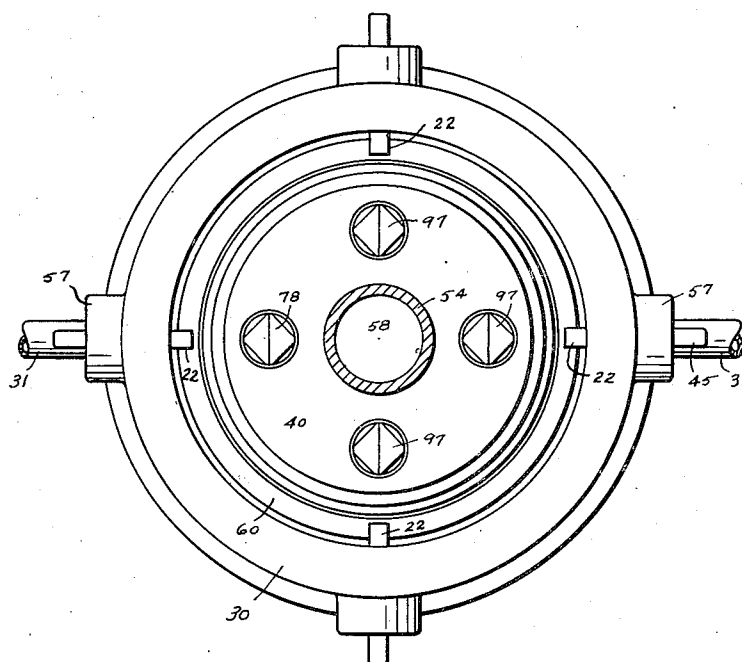


FIG. 9.

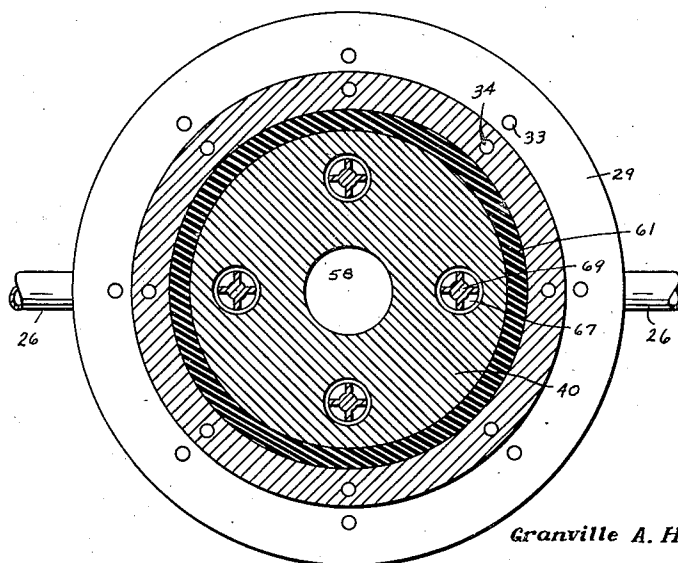


FIG. 10.

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UNITED STATES PATENT OFFICE

2,080,610

COMBINATION BLOW-OUT PREVENTER,
CASING HEAD CONSTRUCTION

Granville A. Humason, Houston, Tex.

Application May 6, 1935, Serial No. 19,920

5 Claims. (Cl. 166—15)

My invention relates to well apparatus, and more especially to apparatus of the control head type adapted for use in connection with oil and/or other types of wells. The invention is equally applicable to means for connecting concentric and/or continuous tubular members of the same or different diameter.

Among the objects of my invention may be mentioned the elimination of the customary Christmas tree, the avoidance of exterior valve and pipe appendages, economy of manufacture, simplicity of construction and use, effective internal intercommunication of parts, effective interior by-passing by exteriorly controlled means, by-pass means effective at either extreme position, remotely controlled releasing means, remotely controlled fire extinguishing means, combinations of the foregoing, and other advantages pointed out in the subjoined specification.

I have attained the foregoing and other objects by means of a control head having a by-passing means.

Further objects and advantages of my invention will be more readily ascertainable from a reading of the subjoined specification in connection with the accompanying drawings wherein like parts are represented by the same numbers in the various figures, and in which Fig. 1 is an elevation of one form of construction utilized in my invention shown partly in section; Fig. 2 is a similar elevational view partly in section showing further details of the by-pass means; Fig. 3 is a vertical elevation in partial section substantially at right angles to the position of Fig. 1 by way of rearrangement; Fig. 4 is similar to Fig. 1 showing a variation in the packing assembly; Figs. 5 and 6 show detail enlargements of the construction of Fig. 4, and/or other figures; Fig. 7 illustrates a variation in the arrangement of Fig. 1; Fig. 8 illustrates the manner in which the valve may be seated at the opposite extremity of its motion, and Figs. 9 and 10 are transverse plan views on the respective lines 9—9 and 10—10 in Fig. 1.

Various figures in the drawings illustrate the parts assembled in relation to a casing head and tubing, although this is not to be construed by way of limitation, but merely by way of illustration as showing a preferred manner of using the invention.

Considering the drawings in greater detail, the parts are shown assembled in Fig. 1 having a suitable collar and other elements fastened to the top of the casing 20 and a suitable casing head or blow out preventer fastened to the top of the tubing or tubular member 21, the various parts

being seated and latched in position by the latching means 22, and the tubing being closed by the member 23.

The casing 20 is shown with a collar 24 fastened in screw threaded engagement to the casing at 25. This latter member is shown with a tube connection 26 threadedly engaged at 27 to a suitable port 28. The drawing illustrates a plurality of these tubes and ports, although it is obvious that there may be more or less in number, and it is also contemplated that the ports may be dispensed with entirely, leaving this member as a solid collar instead of being of the type shown. Mounted upon the ring or collar 24 is a second ring or collar member 29, and upon this latter member is mounted a latch ring 30. The first mentioned ring is the fire extinguishing ring, being intended to normally carry fire extinguishing connections arranged for remote control. The fire extinguishing ring preferably receives one or more pipes 31 connecting with an annular passage 32, which latter passageway may obviously be varied in accordance with the exigencies of the situation. The annular passage is vented at a plurality of points by means of ports 33 and 34, the former of which are adapted to vent the fire extinguishing passageways about the ring, whereas the latter are arranged to vent a substantially annular zone about the flange of suitable packing or casing head member 40. The pipes 31 are naturally associated with any other connection for purposes of fire prevention or extinguishing such as water, live steam, chemicals, etc.

The ring 29 is provided with two annular, or substantially annular, flanges 35 and 36, the former being arranged for bolted engagement by means of the bolts and studs 37, to the latching ring 30; and the latter by way of the bolts or studs 38 to the flange 39 of collar 24. These two members 24 and 29 may be made as a unitary member 50 as in Fig. 7, or as in Fig. 1 having a suitable gasket 41 fitting in annular grooves 42 and 43 in each of the members. Ring 29 in either case has a tapered inner surface 44.

The latch ring 30 is securely fastened on the top of the ring 29 and carries a plurality of latches 22. In the form illustrated these latches have extensions or shafts 45 with suitable means 46 at one end for securement to means capable of operating the latch from a distance. Between the latch per se and the shaft 45 is carried a collar 47. The latches are mounted in a plurality of suitable compartments 48 with the latch projecting through the inner surface 49, and

having a spring 51 yieldably urging it through this inner wall. Those compartments are positioned interiorly of a plurality of protuberances 57. These protuberances are shown as four in number but there will naturally be two or more of these members commensurate with the size of the casing and tubing which are being connected. The latching parts are retained in these housings 48 by screw threaded discs 52.

The detail description just completed describes the parts of the device or system which are mounted on the casing head including the fire prevention and latching means, etc. either when composed of a plurality of units as in Fig. 1, or as a smaller number of units as illustrated in Fig. 7.

Those parts which are mounted upon or secured to the tubing 21 will now be described. The combination packing, blow out preventer and by-pass etc. 40 is illustrated in screw threaded engagement 53 with the tubing 21. The control head 40 for the purpose of sealing off the tubing may have a section of tubing or pin member 54, which is threaded at its upper and lower ends 55 and 56, respectively, the latter being in engagement with the control head and the upper end being in engagement with the valve member 23.

The member or ring 40 has a central opening 58 which provides a continuous passageway between the pin 54 and the tubing 21. The outer periphery of the ring has a tapered surface 59 which rides on the surface 44 of the annulus 29. The upper part of the ring 40 has an annularly extending off-set 60 which fits under the latches 22 when the control head is dropped in place, thus securely engaging or interconnecting the parts. For the purpose of sealing the two members and providing additional sealing action if leakage should occur between them, the annular seal 61 is carried in a groove 62 of the control head. It is split at its lower end 63 so that the seal will spread if pressure is applied from below. The seal engages an annular shoulder 64 on the ring 29, effectively sealing the parts.

In the preferred embodiment of this invention means is provided to by-pass the passageway 58 connecting the tubing, into the casing 20, or vice versa. This means is illustrated as a valve controlled passageway, and can be constructed with various forms of modified structure for application under the many exigencies of use. The central passageway 58 is connected by a plurality of ports 65 to a plurality of other ports 66. These ports are one or more in number depending upon the pressures and/or quantities of fluid, etc. which must be effectually by-passed in use. In the construction illustrated four such passageways are provided and a valve system is arranged to seal the passageways and to be controlled from the exterior of the control head or casing head. These valves are illustrated in one form of construction. It will be readily understood, however, that various arrangements may be used. Fig. 1 shows the valve in a closed position and Fig. 2 shows the same valve in open position. Fig. 8 shows the upper part of the valve illustrated with a similar type of valve head at each end so that the ports may be sealed at either extremity of movement of the valve elements per se.

These valve mechanisms are complete assemblies which can be mounted in passageways 67 in the control head, and if for any reason it should be desirable to remove one of these valves

and connect up a piping system to its passageway at 68, this can be readily accomplished.

The valve shown in Fig. 1 is a composite structure riding in the passageway 67 just discussed. The lower end has a piston rod 69 which is threaded at each end. The upper end carries a cup-shaped gasket 70 which is retained on the member 69 by screw threaded engagement 71 of the latter member with the shoulder 72 of the upper rod 73, which member has a shoulder 74 at its upper end. This latter shoulder is engaged by and free to turn in a shoulder opening 75 which is a composite opening interiorly of the two split members 76 and 77, which together comprise the means for controlling the valve, which extends exteriorly of the casing head. These members preferably form either a square or hexagon head portion as at 78 to receive a suitable wrench, and are screw threaded at 79 to engage the threads 68 at the upper end of the passageway 67. The lower end of this valve mechanism carries a valve seat 80 which is replaceable, having a sealing gasket 81 and a nut 82 retaining the parts in assembled relation. Adjacent the valve seat may be a fluted portion 83 to break up the flow of fluid through the valve. The valve seat in the control head comprises upper and lower tapered seats 84 and 85 so that the valve may be seated in its upper position as seen in Fig. 1, and may be open as in Fig. 2, or seated in its lower position as in Fig. 8.

The control means 23 provides a valve of similar construction to that in the casing head, and may be arranged to be interchangeable. In this instance, however, the opening and closing of the valve is effected by the cap member 86 which is screw-threaded to the valve body at 87. The lower portion of the valve is constructed the same as illustrated in Fig. 1, comprising a nut 88, gasket 89, valve 90, rod 91, gasket 92 and pin member 93 bolted at 94 to the cap 86. The valve is shown as connected to two pipe sections 95 and 96.

The operation of the system thus far described is readily apparent. The casing 20 may be tapped as at 28 by a plurality of passages connected with suitable pipes or tubing 26. These members, however, may be entirely omitted and the collar 24 be a solid member. The tubing 21 may be tapped by way of the valve 23 to the pipes 95 and 96, or may be sealed off. The casing 20 may be by-passed into the tubing 21 by means of the valves 67 or the tubing may be by-passed by means of these valves into the casing. The control head 40 can be assembled with the tubing in secured relation thereto and very quickly dropped into position and latched to the parts of the casing head. If it is desired to remove the parts the latches may be released and the tubing withdrawn by the derrick or structure above the derrick floor.

If the well head should become ignited for any reason whatsoever, the pipes 21 are immediately connected to fire extinguishing means, and by way of ports 33 and 34 an intensive application of fire extinguishing mediums is immediately applied to the well head. This provides a means for effectively blanketing a fire before it reaches any dangerous proportions.

The control head of Fig. 1 may under certain circumstances be varied. In Fig. 3 the fire extinguisher ring 29 is shown with respect to a variation in the structure. In this case the tubing 21 and the pin 54 are interconnected by packing 98. This member has a central passageway

99, and is threaded at 100 and 101, similarly to the control head 40. The tapered wall 102 and the gasket 103 are similar to the construction in Fig. 1. In this construction the valves may or may not be omitted. However, instead of the latch ring 30, a collar 104 is secured to the fire extinguisher ring 29 by a plurality of bolts 105. The collar has an undercut portion 106 which engages the packing 98, and has a second undercut portion 107 carrying a gasket 108 which seals the collar and packing together. The fire extinguishing arrangement is the same as previously used. This construction is more adaptable to what may be termed a more permanent arrangement wherein it is not anticipated that the parts will be put together and taken apart very often.

In Fig. 4 the fire extinguishing ring 29 and the latch collar 30 are assembled, and are shown as receiving a sealing packing allowing the tubing 109 with its tool joint 110 to rest upon the packing member 111. This packing member is shown as constructed of a rubber seal 112 which seals against the tapered portion 44 of the fire extinguisher collar 29, and also sealing at 113 against the tubing. This packing 111 may be composed of three rings, the upper ring 111, the sealing ring 112, and the bottom ring 114. The parts being secured together by pins 115 and bolts 116. The bolts 116 may be secured into an annulus 161 or a split ring or other means depending on circumstances. The sealing means 112 may have annular grooves or lips 160 similar to the means 63 in Fig. 1. A second groove 162 may be in the bottom, positioned in communication with ports 163 in the member 114 which ports can utilize the pressure in the casing 20 to react on the groove 162 and seal the ring 112 against the tubing 109. This control head 40 or packing member 98 or 111 may or may not be constructed as a split member under some circumstances, so that it may be rapidly assembled to the parts. When so constructed the component parts are pivotally constructed as at 117 and 118 with the tool joint in the same relation as in Fig. 4. In this instance, however, the sealing member 119 is a split member instead of an annulus.

Additionally, to fasten the split member together a latch 120 is utilized. The latch illustrated may take various forms, but as shown the two parts 121 and 122 of the packing have a dove-tailed slot 123 in which the dove-tail latch member 123 slides. When this member is latched into position the parts are effectively locked together as clearly seen in Fig. 6.

In Fig. 7 the fire extinguisher head and casing head are made integral as the member 50, which is screw-threaded at 124 to the casing 20, and screw-threaded at 125 to the latch ring 130. The tubing 109 and tool joint 110 are shown sealed to the casing head. The fire extinguishing pipes 131, passageway 132 and ports 133 and 134 are as previously constructed. The by-pass member 126, if used, is assembled as previously described by the screw threads 127 to the ports 128.

In Fig. 8 the valve as shown in Figs. 1 and 2 is seated in the opposite extremity of its movement from that shown in Fig. 1. The pin 129 and the tubing 135 are fastened to the control head 136, the control head having similar passageways 865, 867 and 866. The latch ring, fire extinguishing ring and casing head collar are fastened together, and are composed of similar component

parts as in Fig. 1, with the exception that the bolted engagement is by way of what may be termed true flanges 136 and 137 and 138 and 139 by bolts 140 and 141. The one structural difference in the valve per se residing in the provision of the upper valve seat 880 corresponding to the lower valve seat 881 which is similar to the construction shown in Fig. 1. This upper valve is shown seated on the valve seat 884.

Fig. 9 is a plan view on the line 9—9 of Fig. 1 showing the ring 30 with the various latch containing protuberances 57, the pin 54, the control valves and the control head 40 latched in place. Fig. 10 is a section on the line 10—10 of Fig. 1 showing the fire extinguishing ring 29 with fire extinguishing ports 33 and 34, packing 61, control head 40, valve stem 69 in the passages 67.

The sealing head or packing in Fig. 7 is the member 740 which has a tapered surface 744 to seat upon the corresponding surface of the fire extinguisher of the casing head 50 with a sealing ring 761. In this construction, however, the blow out preventer or packing may be arranged to seal the tubing by way of the casing pressure or some external pressure means. The rubber member 710 abuts the tubing 109 and allows the tubing to slide through it and effectually seals the tubing in the well. An external source of pressure 711 connects with the annular channel member 712 which is locked to the ring 740 by an annular member 713 by the screw-threaded arrangement 714. A spacing annulus 715 is arranged to space the upper and lower parts of the sealing members 716 and 717, respectively. The pressure supply 711 is in communication with the annular passageway of the pressure chamber 720 by tube 721. If the casing pressure exceeds the external pressure, the passageway 723 is placed in communication with the passage 720 by the ball valve 730. In either instance the sealing member 710 is held against the tubing.

The corresponding members of the various figures of the drawings are similarly numbered.

Modifications of the parts shown and described which come within the true spirit and scope of my invention are aimed to be covered in the here-appended claims.

I claim:

1. The combination of a casing, a tubing, a control head on the tubing, means on the casing to engage the control head, and means to bypass the tubing to the casing or vice versa through the control head, said means arranged to close the bypass at either extremity of its movement.

2. The combination of a casing, a tubing, a control head on the tubing, means on the casing to engage the control head, means to bypass the tubing to the casing or vice versa through the control head, and a valve movable in either direction to close said bypass means.

3. The combination of a casing, a tubing, a control head on the tubing, means on the casing to engage the control head, means to bypass the tubing to the casing or vice versa, and a double-seating valve adapted to be moved in one direction to seat when the higher pressure is in the casing and to be moved in the other direction to seat when the higher pressure is in the tubing.

4. The combination of a casing, a tubing, a control head on the tubing, means on the casing to engage the control head, means to bypass the tubing to the casing or vice versa, and a double-seating valve adapted to be moved in one direction to seat when the higher pressure is in the

casing and to be moved in the other direction to seat when the higher pressure is in the tubing, said valve and its seats being so arranged that the higher pressure will always tend to hold the valve against its seat.

5 5. The combination of a casing, a tubing, a control head on the tubing, means on the casing to engage the control head, means to bypass the tubing to the casing or vice versa, and a double-

seating valve adapted to be moved in one direction to seat when the higher pressure is in the casing and to be moved in the other direction to seat when the higher pressure is in the tubing, said valve being operable from outside the control head, and packing means on the valve to prevent leakage of pressure to the outside of the control head.

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