March 30, 1954 G. A. HUMASON 2,673,615

COMBINED WELL HEAD AND CHRISTMAS TREE STRUCTURE

Filed March 27, 1950 3 Sheets-Sheet 1

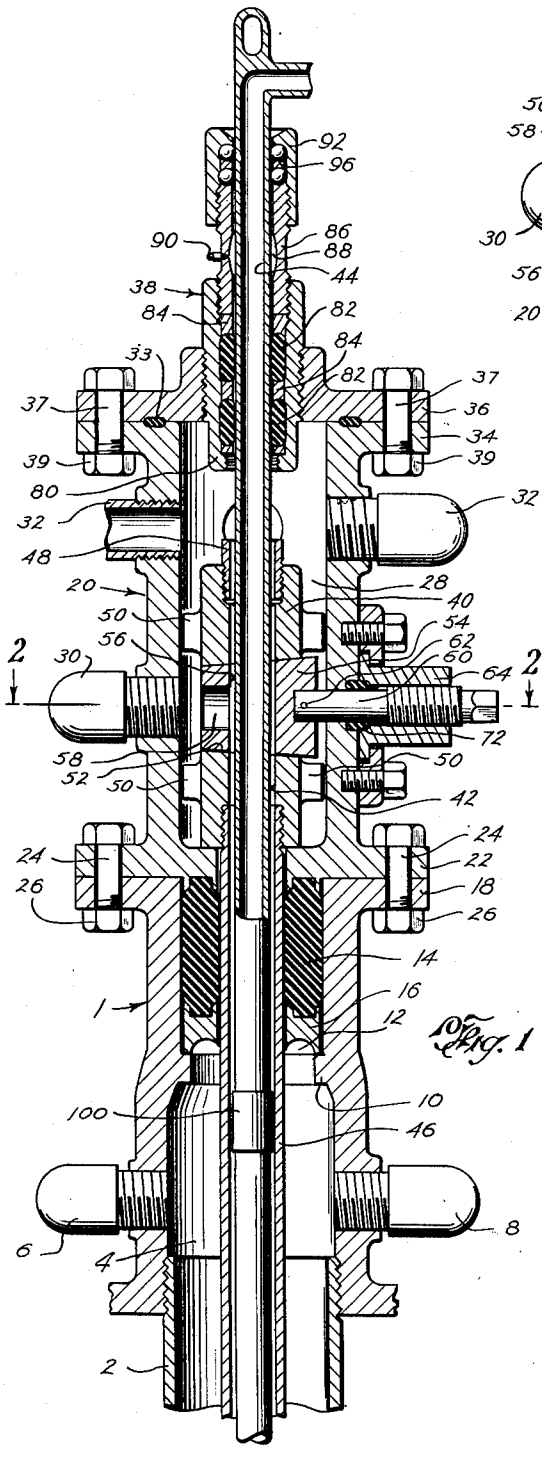


Fig. 1

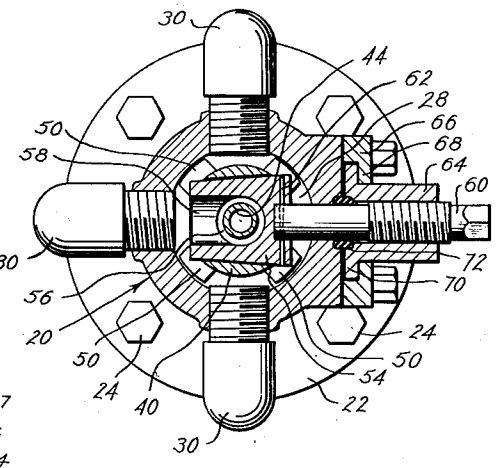


Fig. 2

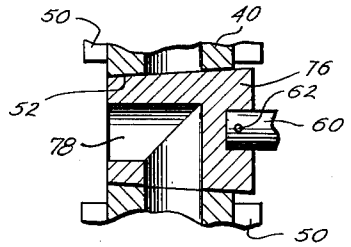


Fig. 7

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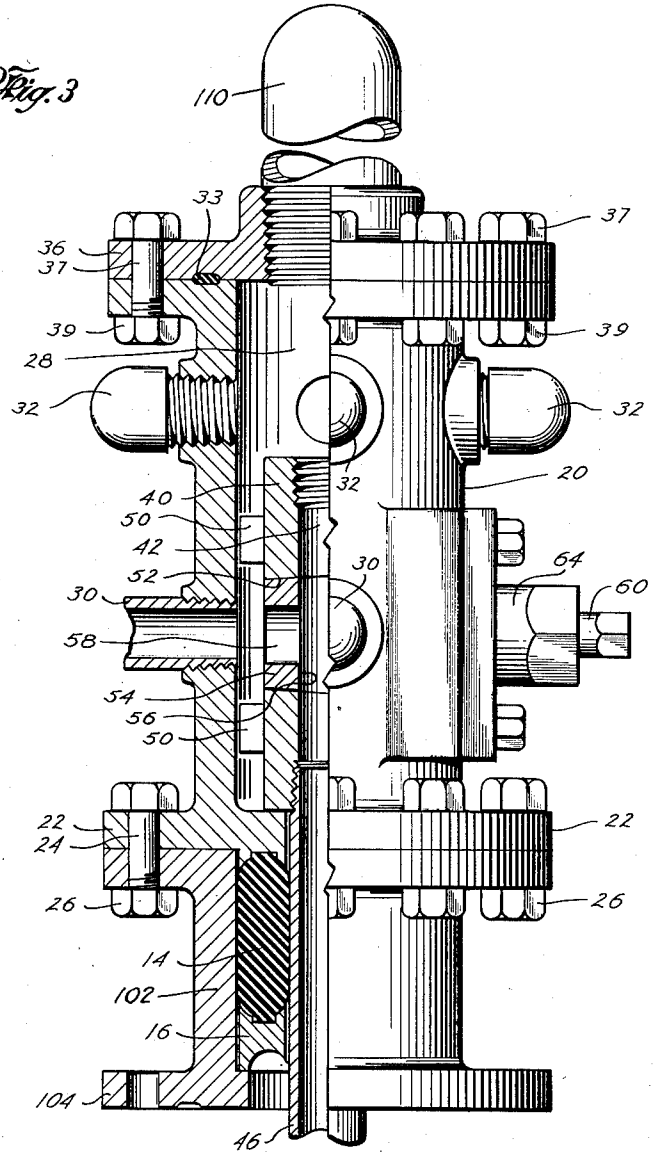
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COMBINED WELL HEAD AND CHRISTMAS TREE STRUCTURE

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Fig. 3



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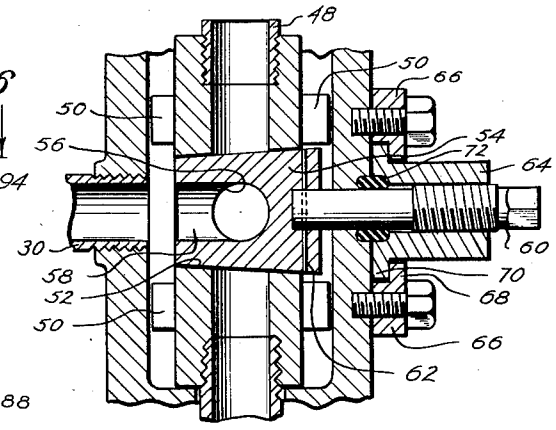
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COMBINED WELL HEAD AND CHRISTMAS TREE STRUCTURE

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Fig. 4



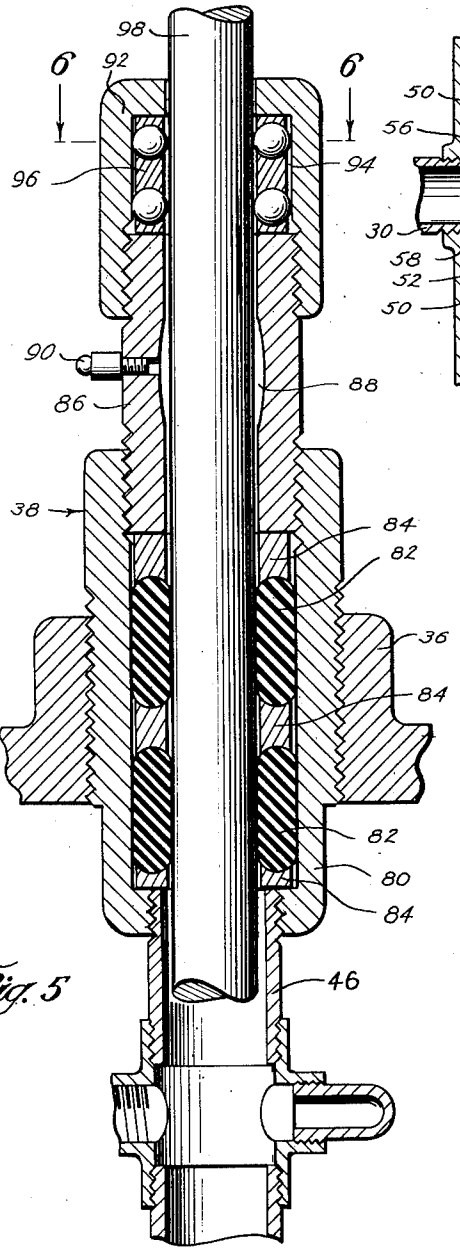


Fig. 5

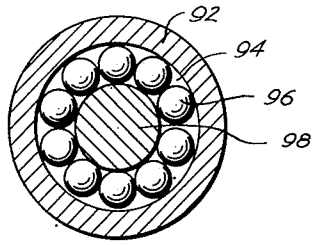


Fig. 6

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UNITED STATES PATENT OFFICE

2,673,615

COMBINED WELL HEAD AND CHRISTMAS TREE STRUCTURE

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Application March 27, 1950, Serial No. 152,243

3 Claims. (Cl. 166—15)

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This invention relates to a combined well head and Christmas tree structure, and more particularly to well equipment wherein a combined bradenhead and casinghead device is provided for use with a Christmas tree structure embodying a plurality of outlets and valve means whereby all of the outlets may be controlled.

The invention has for its chief object the provision of well equipment embodying a novel combination of a bradenhead and casinghead with a Christmas tree having a plug valve structure permitting a variety of operations on the well, such as, the application of steam through an outlet of the Christmas tree to prevent freezing of the well, or for the purpose of treating the oil flowing through the Christmas tree.

Another object of the invention is to provide well equipment including a Christmas tree having a plug valve structure, which permits the use in the well, of devices adapted to be lowered or raised through the valve, without the necessity of removing the valve.

Other objects and advantages of the invention will appear from the following detailed description constituting a specification of the same when considered in conjunction with the annexed drawings, wherein—

Figure 1 is a vertical central cross-sectional view of the invention;

Figure 2 is a cross-sectional view, taken along the line 2—2 of Figure 1, looking in the direction indicated by the arrows;

Figure 3 is a side elevational view, partly in section, of a modified form of the invention;

Figure 4 is a fragmentary cross-sectional view showing structural details of one form of plug valve used in the invention;

Figure 5 is a vertical central cross-sectional view showing structural details of the packing arrangement for the pump or polish rod used in the invention;

Figure 6 is a cross-sectional view taken along the line 6—6 of Figure 5, looking in the direction indicated by the arrows; and

Figure 7 is a fragmentary cross-sectional view showing structural details of a modified form of the plug valve of the invention.

Referring now to the drawings in greater detail the invention includes a combination bradenhead and casinghead structure indicated generally by the numeral 1, which structure is attached by screw threads to the casing 2 of a well. The head structure 1 is preferably formed with a chamber 4, which is threaded at its lower end to receive the threaded end of the well casing 2, and the chamber has a plurality of side outlets into which piping connections such as 6 and 8 are threaded. The chamber has an internal shouldered portion 10, and a packing chamber 12 adapted to accommodate packing element 14 therein, which packing has a pressure receiving member 16 adapted to seat on said shouldered portion. The portion of the head structure 1 which is beneath the internal shouldered portion 10 thereof constitutes the well head part of the invention, while the portion of the head structure disposed above the internal shouldered portion 10 constitutes the bradenhead part of the invention. An outwardly extending flange 18 is formed on the upper end of the head structure 1 whereby a Christmas tree, generally indicated by 20, may be secured thereon.

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The Christmas tree 20 has a flange 22 adapted to engage the flange 18 of the head structure 1, and attached thereto by suitable means, as bolts 24 and nuts 26. An interior chamber 28 is provided in the Christmas tree, having a plurality of side outlets into which piping connections such as those indicated at 30 and 32 may be threaded. In the present instance seven such connections are provided, three of which are indicated by the numeral 30 and are located adjacent the plug valve 54 in the chamber 28, and four of which are indicated at 32 and are located at a higher level as will be seen in Figures 1 and 2 of the drawings and also in Figure 3.

An outwardly extending flange 34 is formed at the upper end of the Christmas tree to receive thereon a flanged connector 36 by which a ball bearing stuffing box arrangement generally indicated at 38 is attached to the Christmas tree through the use of bolts 37 and nuts 39, or the like. Suitable packing, such as 33, may be disposed between the Christmas tree and the connector member 36.

Within the chamber 28 there is positioned a valve seat and tubing connector member 40, having a central bore 42 therethrough for the passage of a pump rod 44. The bore 42 is internally threaded at its lower end for connection to the upper end of a string of tubing 46 extending into the casing 2. The member 40 is internally threaded at its upper end for the attachment of a short sleeve 48 thereto. Radially extending spacing lugs 50 are provided on the member 40 to maintain the same loosely centered in the chamber 28.

A tapered valve seat 52 extends transversely through the member 40 into which a plug valve 54

is fitted. As seen in Figures 1, 2, 3 and 4 the valve 54 has a passage 56 extending therethrough, which passage is intersected by another passage 58 at right angles to the passage 56. As will be seen in Figures 1 to 4, the valve may be turned to a position wherein the passage 56 is aligned with the bore of the member 40, so that the pump rod 44 may be inserted through the valve into the well.

The valve 54 has an operating stem 60, attached thereto by a pin 62, which stem passes through the wall of the Christmas tree and through a rotatable sleeve member 64 to which the stem is threadably secured. The sleeve member is rotatably secured to the Christmas tree by an annular member 66 bolted to the Christmas tree and having a shouldered portion 68 extending over an outturned flange 70 on the sleeve. Packing, such as that indicated at 72, may be disposed between the sleeve member and the Christmas tree surrounding the stem 60.

The arrangement of the valve and its operating means is such that, as will be seen in the drawings, the stem 60 may be held stationary by means of a wrench or otherwise, while the sleeve member 64 is rotated by another wrench, thus moving the valve laterally of the Christmas tree in order to loosen or tighten the valve on its seat 52. When the valve has been so adjusted it can then be rotated by the wrench or other device by turning the stem 60. Thus a stuck valve can be released, or a loose valve can be tightened.

In Figure 7 there is shown a slightly modified form of plug valve 76 for use in the member 40, which valve 76 has the same stem 60 connected thereto by a pin 62 and is designed to fit the same seat 52 as in the previously described structure, but the valve 76 has no passage such as 56 therethrough which is adapted to be aligned with the bore of the member 40 to permit the insertion of a pump rod. Instead of the passageway 56 of the valve 54, previously described, the valve 76 has a right angled passage 78 therein which may communicate at one end with the passage 42 of member 40 and at the other end with the pipe connection 30 opposite the end of the valve upon rotation of the valve 76, 90 degrees in either direction from the position shown in Figure 7, the tubing 46 may be closed off from communication with the pipe 30.

The ball bearing and stuffing box arrangement 38, seen in Figures 1 and 5, has a stuffing box member 80 extending through and threadably secured to the connector member 36, in which are positioned resilient packing elements 82 disposed between pressure transmitting elements 84. The lower end of the stuffing box is threaded to receive the upper end of the tubing 46, when it may be desired to secure the same thereto, and the upper end of the stuffing box is threaded to receive one end of a nipple 86, having a lubricant receiving chamber 88 therein, which is provided with a suitable grease fitting 90 for the introduction of lubricant into said chamber. A cap 92 is threaded over the upper end of the nipple forming therewith a chamber 94 for the reception of a ball bearing structure 96 therein.

The tubular pump rod 44 passes through the ball bearing and stuffing box arrangement and is adapted to reciprocate therethrough, as seen in Figure 1, or as indicated in Figure 5, a solid polish rod 98 or the like may be likewise disposed.

As indicated at 100 in Figure 1, a coupling is conveniently provided for connecting sections of the tubular pump rod 44 together, and similar coupling means may also be provided in the case of the rod 98, so that the rod 44 or the rod 98 as the case may be can be disconnected below the plug valve 54 and removed to permit rotation of the valve. In this manner the pump rod or polish rod can be quickly disconnected and removed and the valve closed to shut off all of the Christmas tree outlets should it be necessary.

In the modification of the invention shown in Figure 3, the same Christmas tree, valve structure and stuffing box is employed, but a connector member 102 is attached to the lower end of the Christmas tree instead of the combination bradenhead and casinghead structure 1 previously described. The connector member 102 has a perforated outturned flange 104 thereon for attachment to any type of casinghead structure which may already be in use on the well, whereby the invention is adapted for use with existing well equipment.

The connector member 102 may have therein the same packing element 14 and pressure receiving member 16 as used in the previously described form of the invention. The invention as shown in Figure 3 may also have a closure cap 110 threadably secured in the connector member 36, when no pump rod or the like is being used.

It will be evident from the above description that the invention provides a combined bradenhead and casinghead and Christmas tree and plug valve structure, whereby a plurality of outlets can be conveniently controlled and by the use of which numerous operations can be performed in the well, such as, lowering testing devices therein, operating a swab, pressurizing the well, or admitting steam to prevent freezing, without removing or otherwise interfering with the Christmas tree or casinghead structure.

While the invention has been illustrated and described in connection with specific embodiments, it is to be understood that the same are by way of example only, and numerous modifications in the structures of the various parts and in the arrangement thereof can be made, within the spirit of the invention and without departing from the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. The combination with well equipment having a casinghead disposed on a well casing, a Christmas tree disposed on said head and tubing extending through said head and into said Christmas tree, of means providing a passage through said equipment for insertion of a tool into said well, said means including a tubing connector in said Christmas tree connected to said tubing and having a passage aligned therewith, a valve seat intersecting said passage, a plug valve in said connector cooperable with said seat, said valve having a bore therethrough adapted to be aligned with said passage, a valve stem connected to said valve and adapted to be turned to rotate said valve and rotatable means carried by the Christmas tree and threadably engaging said stem and operable to move said valve toward and away from said seat.

2. The combination with well equipment having a casinghead disposed on a well casing, a Christmas tree disposed on said head and tubing extending through said head and into said Christmas tree, of means providing a passage through said equipment for insertion of a tool into said well, said means including a tubing connector in said Christmas tree connected to said tubing

and having a passage aligned therewith, a valve seat intersecting said passage, a laterally movable valve rotatably disposed in said seat and having a bore adapted to be aligned with said passage, a valve stem connected to said valve and operable to rotate said valve, and means rotatably mounted on the Christmas tree and threadably engaging said stem for moving said valve laterally of said connector.

3. The combination with well equipment for use on a well having a casing and tubing in said casing, said equipment including a Christmas tree disposed above said casing, said tubing extending into said Christmas tree, of valve means comprising a tubing connector disposed in said Christmas tree, said connector having a passage therethrough for the insertion of a tool into said tubing, a valve seat in said connector intersecting said passage, a rotatable valve in said seat

and having a bore adapted to be aligned with said passage by rotation of said valve, said valve having a second bore communicating with said passage and with the interior of said Christmas tree.

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