Dec. 17, 1929. C. A. RASMUSSEN ET AL 1,739,802

PACKED CASING HEAD

Original Filed Jan. 5, 1927 2 Sheets-Sheet 1

Fig. 2.

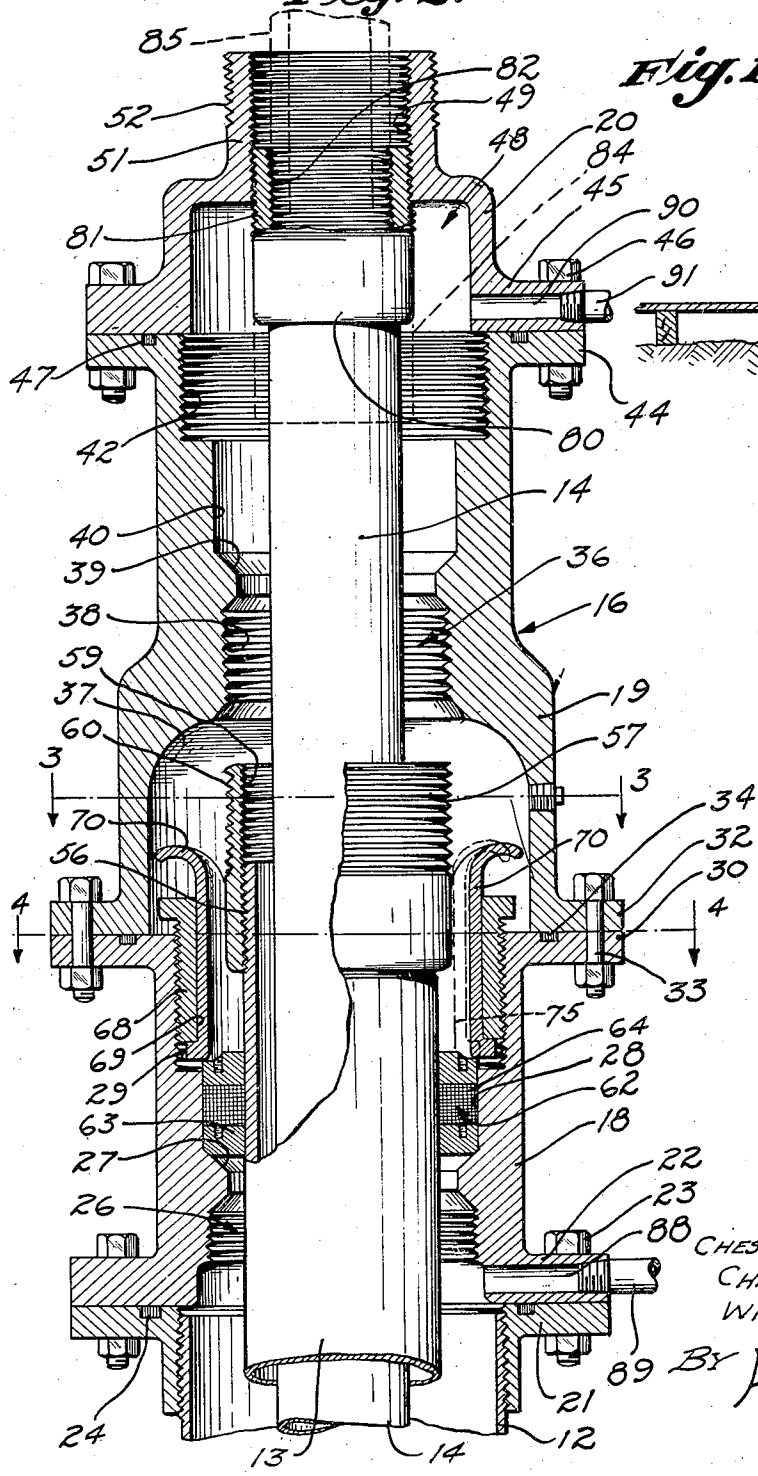
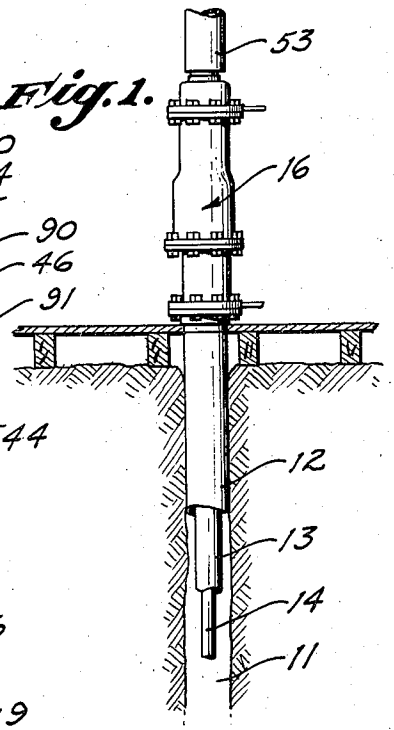


Fig. 1.



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Fig. 3.

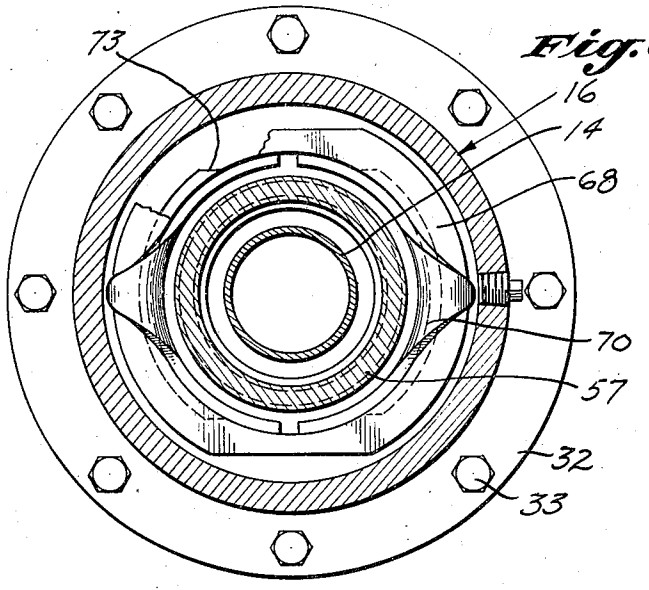


Fig. 7.

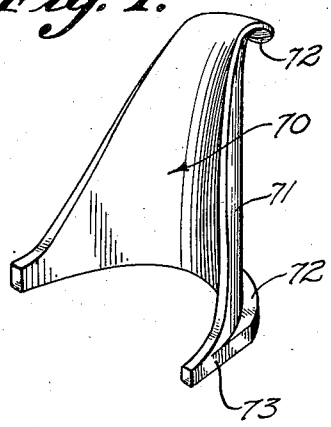


Fig. 5.

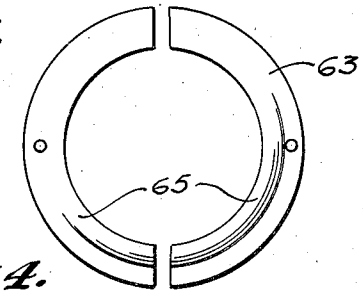


Fig. 6.

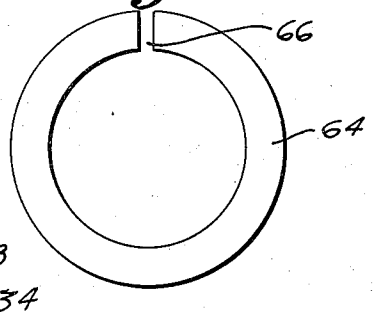
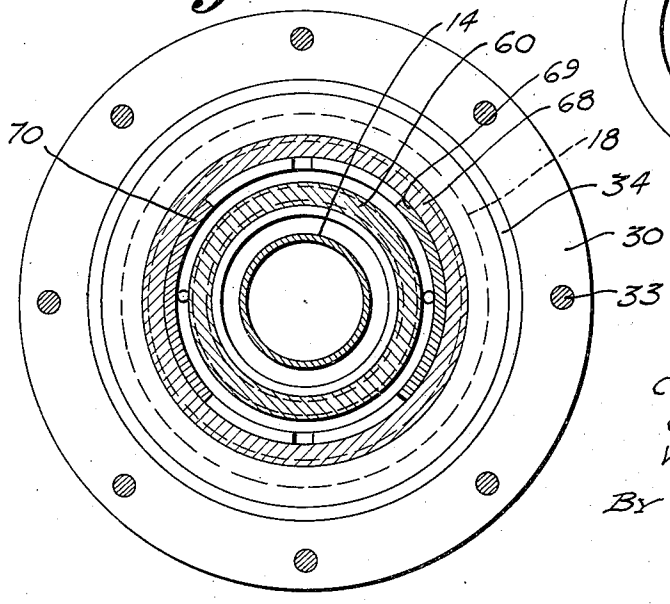


Fig. 4.



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UNITED STATES PATENT OFFICE

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PACKED CASING HEAD

Application filed January 5, 1927, Serial No. 159,067. Renewed March 12, 1928.

Our invention relates to oil well equipment and particularly to an improved casing head.

In the oil producing industry casing heads are employed for closing the upper ends of the casing of the well. Very often a number of concentric casings are installed in a well, the lower ends of these casings extending to different depths. The upper ends of the casings must be sealed so as to prevent loss of gas.

It is an object of this invention to provide an improved casing head adapted to seal the upper end of a plurality of casings in a well forming tight closures between them.

After the casing has been set in a well it is frequently necessary to very quickly install the casing head and to form a seal at the upper end thereof so as to prevent a flow of gas from being established. If the flow of gas is once established it is very likely that the well will get out of control and considerable gas pressure be dissipated.

It is an object of this invention to provide a casing head in which the packing may be quickly installed so as to seal the upper end of the casing.

Other objects and advantages of the invention will be made evident hereinafter.

Referring to the drawing in which we illustrate a preferred form of our invention,

Fig. 1 is a view illustrating the utility of the invention.

Fig. 2 is a vertical section through the casing head of the invention.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Fig. 5 is a view illustrating rings of the packer of the invention.

Fig. 6 is a view illustrating the packing member of the packer of the invention.

Fig. 7 is a perspective view illustrating inserts of the invention.

Referring to Fig. 1, 11 is a well in which a plurality of casings has been installed, these casings being an outer casing 12, a medial casing 13 which extends through the outer casing 12 and an inner casing 14 which extends through the medial casing 13. Attached to the upper end of the casings is a casing head 16 of our invention.

Referring particularly to Fig. 2, the casing head 16 consists of a body having a lower section 18, an intermediate section 19, and an upper section 20. Attached to the upper end of the outer casing 12 is a flange 21. The lower section 18 is provided with a flange 22 which is bolted against the flange 21 by bolts 23. A gasket 24 is provided to form a tight seal between these parts. The lower section 18 has an opening 26 formed therethrough which is constricted near the central part so as to provide a bevel annular seat 27. The opening 26 has a smooth cylindrical portion 28 formed immediately above the seat 27 and the upper end thereof is enlarged and threaded as indicated at 29.

The upper end of the lower section 18 is provided with an annular flange 30 which is engaged by an annular flange 32 of the intermediate section 19. The flanges 30 and 32 are secured together by bolts 33, there being a gasket 34 provided between these flanges for obtaining a tight seal. The intermediate section 19 has an opening 36 formed therethrough. The opening 36 has an enlarged portion 37 at the lower end thereof which connects to the opening 26 of the lower section 18. A portion 38 formed above the enlarged portion 37 is threaded, as shown. Formed immediately above the threaded portion 38 is an annular shoulder which provides an upper bevel annular seat 39. A smooth cylindrical portion 40 of the opening 37 rests immediately above the seat 39. The upper end of the opening 36 is enlarged and threaded as indicated at 42.

The upper end of the intermediate section 19 is provided with a flange 44 which is engaged by a flange 45 of the upper section 20. These flanges are secured together by bolts 46, there being a gasket 47 provided for forming a tight seal. The upper section 20 is provided with an opening 48 which connects to the opening 36 of the intermediate section 19. Connected to the opening 48 is an opening 49 which is threaded at its inner end, as shown, and which connects to the opening 48. The opening 49 is formed in

a cylindrical projection 51 which is provided with external threads 52 so that a pipe 53 (Fig. 1) may be attached to the casing head 16.

It should be noted that the openings 26, 36 and 48 are all connected together. These three openings cooperate to provide a chamber of the casing head.

The medial casing 13 extends upward from the upper end of the outer casing 12 and terminates in the enlarged portion 37 of the opening 36. The upper end of the medial casing 13 is threaded as indicated at 56, and a collar 57 is threadedly secured thereto. The collar 57 is provided with internal threads 59 and external threads 60.

Placed in the cylindrical portion 28 of the opening 26 is a packer 62. The packer 62 consists of outer metallic rings 63 and a central rubber packing member 64. As illustrated in Fig. 5 the metallic rings 63 are made in two sections 65. As shown in Fig. 6 the rubber packing member 64 is made in one piece but is split as indicated at 66. The purpose of splitting these parts is to make it possible to install them in place in the cylindrical portion 28 of the opening 26 without being compelled to extend them over the end of the casing 13. It will be seen that this cannot be done because of the collar 57. The lower metallic ring 63 engages the seat 27. Screwed into the upper threaded portion 29 of the opening 26 is a nut 68. The nut 68 is provided with an opening 69 which is larger in diameter than the cylindrical portion 28 of the opening 26 and larger than the packer 62. This makes it possible to place the packer 62 in the cylindrical portion 28 even though the nut 68 is in place. For the purpose of applying pressure from the nuts 68 to the packer 62 we provide inserts 70, one of which is shown in Fig. 7. Each of the inserts 70 consists of a shell 71, the lower part of which is semi-cylindrical. The upper part of the shell 71 is cut back and curved outward and downward so as to provide engaging portions 72 whereby they may be manually handled. At the lower semi-cylindrical part of each web 71 is a flange 72. It should be noted that the side of each flange 72 is cut away at 73. The lower parts of the shells 71 are slightly less than one-half a cylinder so that they may be moved inward from the position shown in Fig. 2 into positions indicated by dotted lines 75. When in the position indicated by dotted lines 75 the flange 72 is moved inward out of a position below the nut 68. When the inserts are thus moved inward they may be withdrawn from the upper end of the opening 26.

In installing the packer 62, the nut is substantially in the position shown in Fig. 2 The packer, by reason of the fact that the opening 69 through the nut 68 is larger than the packer, may be lowered into the cylindrical portion 28. It should be understood that the two parts 65 of the lower ring 63 are first lowered separately and placed around the medial casing 13, the packer 64 is then placed, and finally the parts 65 of the upper ring 63 are placed. After this installation the inserts 70 are installed in a manner reverse to that just described as to their removal. The nut 68 during the installation may be about an eighth of an inch higher than that shown in the drawing so that the flanges 72 may be easily moved into position below the lower end of the nut 68. After the inserts have been placed, the nut 68 is screwed down. The nut 68 forces the inserts 70 down by reason of its engagement with the flanges 72. The lower ends of the inserts 70 engage the peripheral part of the upper ring 63 and thus force it downward. The lower ring 63 cannot move downward by reason of its engagement with the seat 27; therefore, the rubber packing member 64 is expanded outward into tight engagement with the wall of the cylindrical portion 28 and inward into tight engagement with the surface of the medial casing 13. It should be noted in Fig. 2 that the pressure of the nut against the flanges 72 tends to hold the outer faces of the shell 71 in engagement with the wall forming the opening 69 through the nut 68. The inserts are thus held in proper position.

The inner casing 14 projects upward from the upper end of the medial casing 13 and terminates in the opening 48 of the upper section 20. Attached to the upper end of the inner casing 14 is a coupling 80. The coupling 80 is provided with external threads 81 and internal threads 82. It should be noted that the coupling 80 is screwed into the threaded portion of the opening 49. This is accomplished in the following manner:

When it is desired to attach the coupling 80 to the upper section 20, all the parts of the casing head are assembled with the exception of the upper section 20. The coupling 80 may be in the position shown in Fig. 2 or it may be in a lower position such as that indicated by dotted lines 84 of Fig. 2. If it is in the position indicated by dotted lines 84 it will be necessary to lift the entire upper end of the inner casing 14 upward. This is accomplished by screwing a pipe indicated by dotted lines 85 into the upper threaded end 82 of the coupling. The pipe 85 is attached to the traveling block of the derrick and lifted upward until the coupling 80 is moved into the position shown by dotted lines in Fig. 2. The upper section 20 which has been placed over the pipe 85 before it was attached to the traveling block of the derrick is then lowered and screwed downward onto the external threads 81 of the coupling 80, these threads advancing into the threads in the lower end of the opening 49. The upper section is screwed downward

until the flange 45 pressurally engages the flange 44 of the intermediate section 19. The weight is then relieved from the traveling block and applied to the upper section 20. The bolts 46 are then installed in place and the pipe 85 is removed. After this assembly, the pipe 53 shown in Fig. 1 is installed.

The casing head of our invention may be installed in its entirety after all three casings have been installed in the well or it may be installed in sections as the casings are installed. For instance, after the outer casing 12 and the medial casing 13 have been installed it may be desirable to form a tight seal between these casings before the inner casing 14 is installed. This may be done by assembling the lower section 18, the packer 62, the nut 68 and the inserts 70. After the casing 14 has been installed the sections 19 and 20 may be installed and the coupling 80 secured to the section 20 as previously explained.

Any gas which collects in the upper end of the outer casing 12 may be withdrawn through an opening 88 formed in the flange 22 of the lower section 18 which opening is connected to a take-off pipe 89. Any gas which collects in the upper end of the medial casing 13 and in the upper part of the chamber provided by the head may be withdrawn through an opening 90 formed in the flange 45 of the upper section, which opening 90 is connected to a gas take-off pipe 91.

One feature of the type of packing employed for forming a seal around the upper end of the medial casing 13 is that it forms a tight seal but permits the upper end of the casing 13 to move upward. This is sometimes desirable where the oil flowing from the well is hot. The hot oil causes the pipe to expand and to compensate for this expansion the upper end of the pipe may move upward. This same type of packing may be employed around the upper end of the inner casing 14. It should be noted that the upper part of the intermediate section 19 is formed so that the same packing element, nut and inserts may be used.

The casing head is also so constructed that if desired the collar 57 attached to the upper end of the medial casing 13 may be rigidly attached to the intermediate section 19. This is accomplished in the same manner as the attaching of the coupling 80 to the upper section 20 is accomplished. This must be done before the upper section 20 is installed. A pipe is screwed into the threads 59 of the collar 57 and the upper end of the medial casing 13 is lifted upward. The intermediate section 19 which has been placed around the lifting pipe is then rotated so that the threaded portion 38 advances downward on the thread 60 of the collar. When the flange 32 of the intermediate section engages the flange 30 of the lower section 18 the weight is released from the lift pipe employed and applied directly to the intermediate section. The bolts 33 are then installed in place and the lift pipe is then detached from the collar 57.

Another important feature of the invention is that the packing arrangement around the medial casing 13 may be quickly installed in an emergency. By using the insert 70 it is not necessary to have the nut 68 removed from the threaded opening 29 but the nut may be always substantially in the position shown in the drawings. When expanding the packing into fluid-tight relationship with the casing 13, it is only necessary to rotate the nut 68 a few revolutions.

We claim as our invention:

1. In a combination of the class described: an outer casing adapted to extend into a well; a body connected to the upper end of said outer casing, said body having a chamber connected to the interior of said outer casing, and an opening connected to said chamber; a medial casing extended into said outer casing, the upper end of said medial casing terminating in said chamber, a packer placed in said chamber around said medial casing; a nut screwed into said chamber above said packer, said nut having an opening of larger diameter than said packer; inserts engaging said nut and said packer, said packer being compressed by said inserts, said inserts being removable without entirely removing said nut; an inner casing extended into said medial casing, the upper end of said inner casing terminating in said chamber above said medial casing; and means for forming a seal between the interior of said inner casing and the interior of said medial casing, said inner casing being communicated with said opening.

2. In a combination of the class described: an outer casing adapted to extend into a well; a body connected to the upper end of said outer casing, said body having a chamber connected to the interior of said outer casing, and an opening connected to said chamber; a medial casing extended into said outer casing, the upper end of said medial casing terminating in said chamber; a packer placed in said chamber around said medial casing; a nut screwed into said chamber above said packer, said nut having an opening of larger diameter than said packer; inserts engaging said nut and said packer, said packer being compressed by said inserts, said inserts being removable without entirely removing said nut; an inner casing extended into said medial casing, the upper end of said inner casing terminating in said chamber above said medial casing; and a coupling attached to said inner casing and said body for forming a seal between the interior of said inner casing and the interior of said medial casing, said inner casing being communicated with said opening.

3. In a combination of the class described: an outer casing adapted to extend into a well; a body connected to the upper end of said outer casing, said body having a chamber connected to the interior of said outer casing, and an opening connected to said chamber; a medial casing extended into said outer casing, the upper end of said medial casing terminating in said chamber; a packer placed in said chamber around said medial casing; a nut screwed into said chamber above said packer, said nut having an opening of larger diameter than said packer; inserts engaging said nut and said packer, said packer being compressed by said inserts, said inserts being removable without entirely removing said nut; an inner casing extended into said medial casing, the upper end of said inner casing terminating in said chamber above said medial casing; and a coupling attached to said inner casing and said body for supporting said inner casing and for forming a seal between the interior of said inner casing and the interior of said medial casing, said inner casing being communicated with said opening.

4. In a combination of the class described: an outer casing adapted to extend into a well; a body connected to the upper end of said outer casing and having a central packing receiving opening; a second casing within said outer casing having its upper end extended through said opening; a packing placed in said opening around said second casing; a tubular nut screwed into said opening above said packing, said nut having a central bore of larger diameter than the outer periphery of the packing whereby said packing may be removed through said bore; and inserts engaging said packing and adapted to be engaged by said nut to compress said packing and form a seal between said body and the second casing, said inserts being removable through said bore of the nut when said nut is loosened sufficiently to eliminate its clamping pressure upon said inserts.

5. In a combination of the class described; an outer casing adapted to extend into a well; a casing head comprising a body having upper intermediate and lower sections, said lower section being connected to the upper end of said outer casing, said upper and intermediate sections having internally screw-threaded bores; a second casing disposed within said outer casing and extending upwardly within said body, said second casing having an externally screw-threaded upper end adapted to engage within said screw-threaded bore of said intermediate section to form a seal between the interiors of said outer and said second casings, said upper end of said second casing being internally screw-threaded for engagement by an elevator element; and a third casing disposed within and extending upwardly through said second casing and provided with an externally screw-threaded upper end adapted to engage within the screw-threaded bore of said upper section to form a seal between the interiors of said second and said third casings, said upper end of the third casing being internally screw-threaded for engagement by an elevator element.

6. In a combination of the class described: an outer casing adapted to extend into a well; a casing head comprising intermediate, upper and lower sections, said lower section being connected to the upper end of said outer casing, said intermediate section having an internally screw-threaded bore, said upper section having an internally screw-threaded outlet; a second casing disposed within said outer casing and extending upwardly within said intermediate section, said second casing having an externally screw-threaded upper end adapted to engage within the internally screw-threaded bore of said intermediate section to form a seal between the interiors of said outer and said second casings, said upper end of said second casing being internally screw-threaded for engagement by an elevator element; and a third casing disposed within and extending upwardly through said second casing and provided with an externally screw-threaded upper end adapted to engage the screw-threaded outlet of said upper section to form a seal between the interiors of said second and third casings, said upper end of said third casing being internally threaded for engagement by an elevator element.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 31st day of December, 1926.

CHESTER A. RASMUSSEN.
CHARLES R. BUTLER.
WILLIAM A. TROUT.