May 26, 1931. C. A. RASMUSSEN ET AL 1,807,046

CASING SUPPORT

Filed Jan. 5, 1927 2 Sheets-Sheet 1

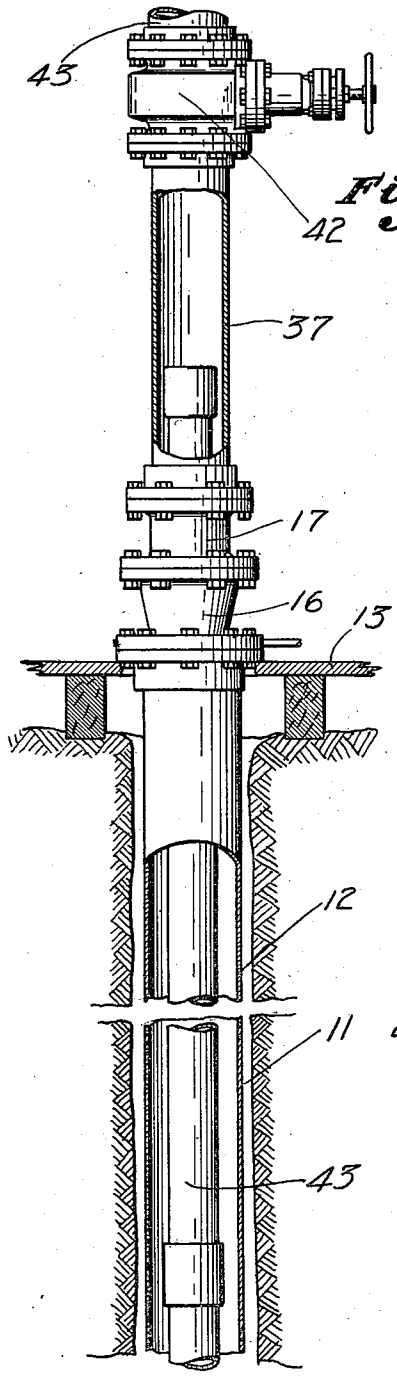


Fig. 1.

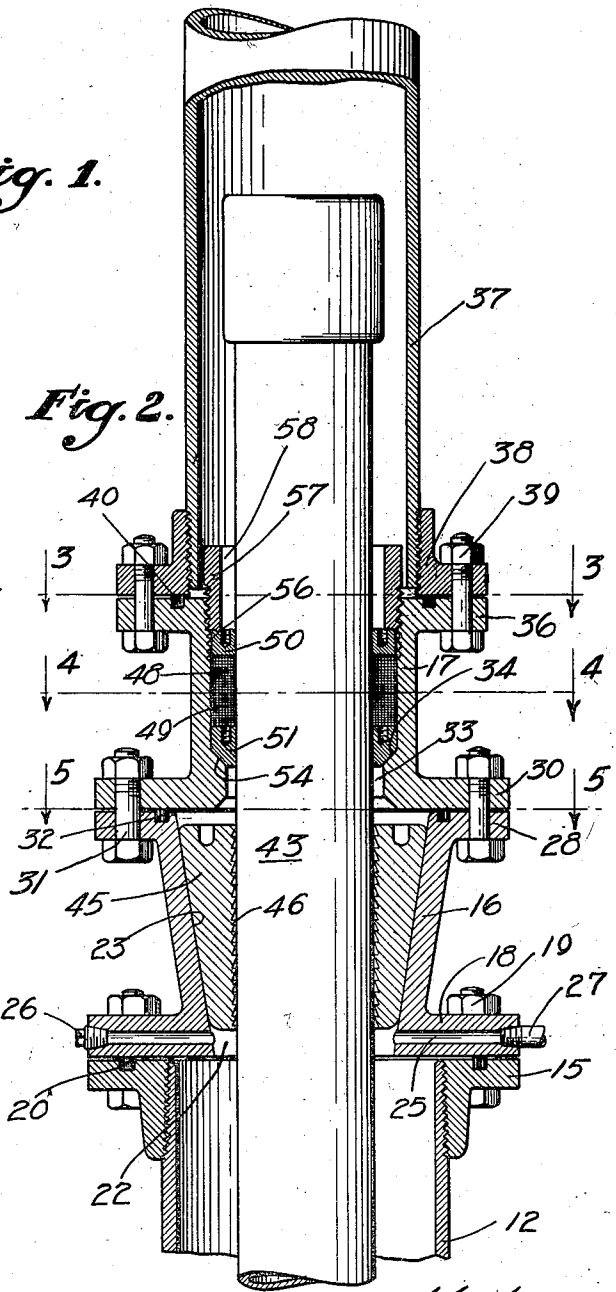


Fig. 2.

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Filed Jan. 5, 1927 2 Sheets-Sheet 2

Fig. 3.

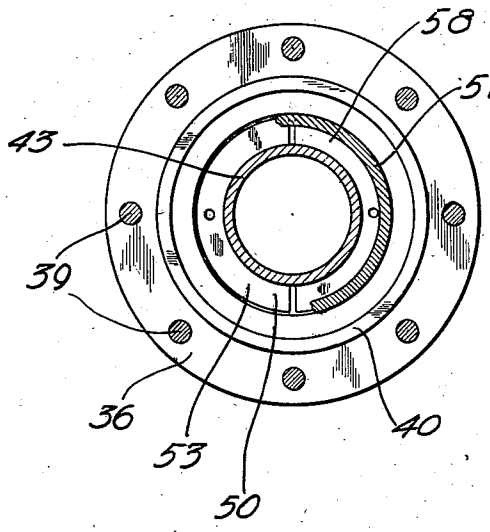


Fig. 4.

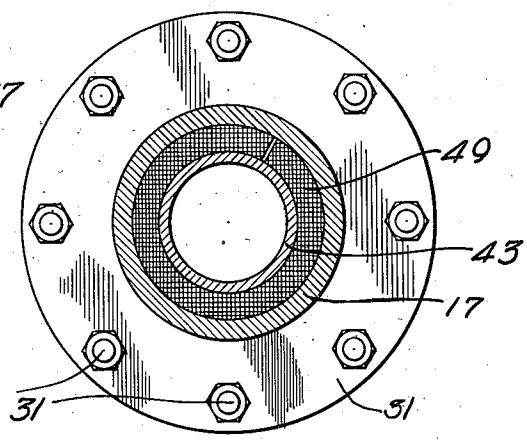
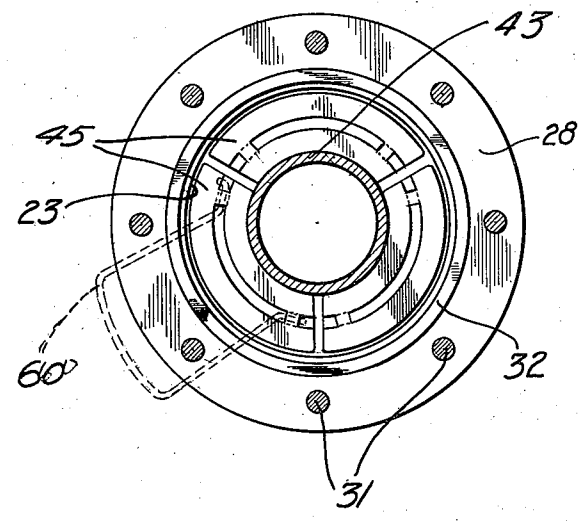


Fig. 5.



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UNITED STATES PATENT OFFICE

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CASING SUPPORT

Application filed January 5, 1927. Serial No. 159,066.

Our invention relates to oil well equipment, and particularly to a unique casing support.

In the oil producing industry after a well is partly drilled it is common practice to set a well casing therein, this well casing being cemented in place. The drilling of the well is recommenced using a smaller bit than was originally used so that the next part of the well is of smaller diameter. Another string of casing is thereafter lowered into the well, this other casing projecting from the floor of the derrick through the upper part of the well already surrounded by the well casing and into the lower part of the well which is of smaller size. The inner casing is supported by a casing support which is attached to the upper end of the well casing. The purpose of the casing support is to close the upper end of the well casing so that the gas may be kept under control and to support the upper end of the inner casing. If the oil in the well is hot the inner casing will be caused to expand when the well starts to flow.

It is an object of this invention to provide a well casing and support which supports the inner casing, maintains a fluid-tight relation between the casings at the upper end of the well so that the gas of the well cannot escape therebetween, and permits an upward movement of the inner casing to compensate for expansion thereof.

The rubber packer which forms the seal around the inner casing is not infallible, and a surge of high pressure may blow it out or cause it to leak.

It is an object of our invention to provide an auxiliary sealing means which may be brought into operation whenever desired.

In the preferred form of our invention, we provide a casing-head at the upper end of the well casing, the inner casing extending through the well casing. The casing-head forms a seal around the inner casing. Our invention provides a shell which is connected to the upper part of the casing-head and encloses the upper end of the inner casing. The shell has means for forming a seal above the inner casing.

It is an object of our invention to provide a combination of a casing-head for forming a seal around the inner casing, and means for forming a seal above the inner casing.

The shell, which is connected to the casing head, acts as a conduit for conveying the petroleum of the well to a storage or place of use, the petroleum passing thereinto from the inner casing. Any small leakage of the packer will pass into the shell and pass with the petroleum.

It is a further object of our invention to provide a combination of the character mentioned, in which the leakage around the packer will not pass into the atmosphere, but will pass into the shell.

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

Referring to drawings in which we illustrate the preferred form of the invention,

Fig. 1 is a vertical view showing the utility of the invention.

Fig. 2 is an enlarged vertical view showing partial sections of the casing support of this invention.

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

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

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2.

Referring to the drawings in detail and particularly to Fig. 1, the numeral 11 represents a well having a well casing 12 installed therein. The upper end of the well casing 12 extends through the floor 13 of a derrick. Attached to the upper end of the well casing 12, as illustrated in Fig. 2, is a flange 15.

Our invention provides a body consisting of a lower section 16 and an upper section 17. The lower section 16, as shown best in Fig. 2, is provided with a lower annular flange 18 which rests on the flange 15, being secured thereto by bolts 19. A gasket 20 is provided between the flanges 15 and 18 for providing a tight seal. The section 16 has an opening 22 formed therethrough which is surrounded by a conical seat 23. The conical seat 23 is smallest in diameter at the lower end. Gas take-off openings 25 formed in the flange 18 are connected to the opening 22 of the section 16 and to the outer part of the

flange 18. One of the openings 25 is closed by a plug 26 and the other of the openings has a gas take-off pipe 27 connected thereto.

The upper part of the section 16 is provided with an annular flange 28 which is engaged by an annular flange 30 of the section 17, these flanges 28 and 30 being secured together by bolts 31. A suitable gasket 32 is provided for forming a seal between the sections 16 and 17. The section 17 provides an opening 33 which is connected to the opening 22 of the section 16. This opening 33 is shouldered as indicated at 34. The upper part of the section 17 is provided with an annular flange 36.

Supported by the upper section 17 of the body is a closure having a shell or pipe 37 to the lower end of which a flange 38 is attached. The flange 38 is bolted to the flange 36 of the upper section 17 by suitable bolts 39, there being a suitable gasket 40 for providing a tight seal between these flanges. The closure also includes a gate valve 42 which is attached to the upper end of the closure 37. Attached to the upper part of the gate valve 42 is a pipe 42′ which may extend to a suitable storage or to any other place where oil may be delivered.

Placed in the well 11 and extended inside the well casing 12 is an inner casing 43. This inner casing 43 extends through the body of the casing head and into the shell 37 of the closure.

Arranged in the opening 22 of the lower section 16 is a plurality of pipe slips 45. The pipe slips 45 engage the conical seat 23, and they have teeth 46 which are arranged to engage the inner casing 43. The pipe slips serve the purpose of supporting the inner casing 43.

Arranged in the opening 33 of the upper section 17 is a packer 48 which comprises a sealing means of the invention. The packer 48 consists of a rubber packing member 49 and upper and lower rings 50 and 51. As illustrated in Fig. 3, the rings 50 and 51 which are formed from metal are made into two sections 53 to permit them to be placed around the inner casing 43 without being required to be extended over to the end thereof. The rubber packing member 49 is also split so that it may be readily placed around the casing. The lower ring 51 is provided with a bevel face 54 which engages the shoulder 34. The upper end of the opening 33 is provided with internal threads 56. Screwed into the upper end of the opening 33 is a nut 57 having a large opening 58 through which the inner casing 43 extends. The nut 57 engages the upper ring 50 of the packer 48, forcing it downward so that the packing member 49 is expanded so that it will pressurally engage the section 17 and the inner casing 43.

The casing support of our invention is installed as shown in the drawings after the well casing 12 and the inner casing 43 have been installed in the positions in which they are shown. The section 16 is first secured in place and then the slips 45 are placed in a position to support the inner casing 43. The slips 45 are conveniently placed in the opening of the section 16 and removed therefrom by slip handles indicated by dotted lines 60 in Fig. 5. The upper section 17 is then secured in place as shown in the drawings and the packer 48 is then placed in the opening 33 and compressed into engagement with the section 17 and the inner casing 43 by means of the nut 57. The closure consisting of the shell 37 and the valve 42 is then installed in place.

The paramount feature of the invention as specified in the statement of objects of the invention is that the inner casing 43 is supported but the upper end thereof is permitted to move upward if said casing expands. This is possible because of the type of supporting means and the type of sealing means which we employ. When the upper end of the inner casing 43 is moving upward, the slips 45 move upward therewith, moving into a larger part of the opening 22 and reducing their pressure of engagement with the conical seat 23. The packer 48 being cylindrical permits the inner casing 43 to slide therethrough.

Another feature of the invention is that even though it supports the inner casing 43 and permits an upward movement of the upward end thereof, it also maintains a tight seal and prevents gas from escaping from the upper end of the well casing 12. The gas may be withdrawn from the upper end of the well through the gas take-off pipe 27 as desired. It is very important that the gas be prevented from escaping from the upper end of the well since an undue loss of gas will reduce the pressure which tends to force oil up through the inner casing 43 and therefore the production of the well will be decreased. The oil flowing upward through the inner casing 43 passes into the shell 37 and passes through the valve 42 if it is in an open position.

The shell 37 and the valve 42 serve as the auxiliary seal for the device. If the packer 49 should give away, the valve 42 may be closed, thus sealing the well. This feature is valuable should a sudden surge of pressure incapacitate the packer 49. Any small leakages through the packer 49 will not be wasteful nor create a fire hazard, due to the fact that this leakage will pass into the lower end of the shell 37 and be carried with the main flow of petroleum.

The broad conception of the invention consists of a casing support having a body and supporting means carried by the body and a sealing means supported by the body above the supporting means. In addition to this, our invention includes the closure

means which encloses the upper end of the inner casing 43. This may be optionally used since in the deep wells there are sometimes three or four casings installed one within the other. In such an event the inner casing 43 would not be the oil string through which the oil flows, but another casing would be extended into the well through the inner casing 43. It will be seen that under these circumstances all of the casing support would be used except the closure since there would be no oil flowing through the inner casing 43. If the casing extended through the inner casing 43 was the oil string, then a casing support similar to the one shown in the drawings would be used on this inner casing.

Although we have shown a preferred form of our invention, it should be understood that various modifications may be made without departing from the spirit and scope of the invention.

We claim as our invention:

1. In combination: a well casing; an inner casing extending through said well casing; a casing-head body attached to the upper end of said well casing, said inner casing extending through said casing-head body, said casing-head body providing a lower slip receiving chamber, a slip retaining wall above said slip receiving chamber, and an upper packer receiving chamber above said slip receiving chamber; slips in said slip receiving chamber for supporting said inner casing, said slips being retained in place by said slip retaining wall; a packer in said packer receiving chamber for forming a seal around said inner casing; and means for placing said packer under compression.

2. In combination: a well casing; an inner casing extending through said well casing; a lower section secured to said well casing, said lower section having a conical seat surrounding said inner casing; an upper section secured to said lower section, said upper section having a slip retaining wall above said conical seat, and a packer seat surrounding said inner casing; slips supported by said conical seat, said slips being retained in place by said slip retaining wall; a packer supported by said packer seat; and means for placing said packer under compression.

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

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