June 17, 1958 J. W. KISLING III 2,839,263

BLOWOUT PREVENTER

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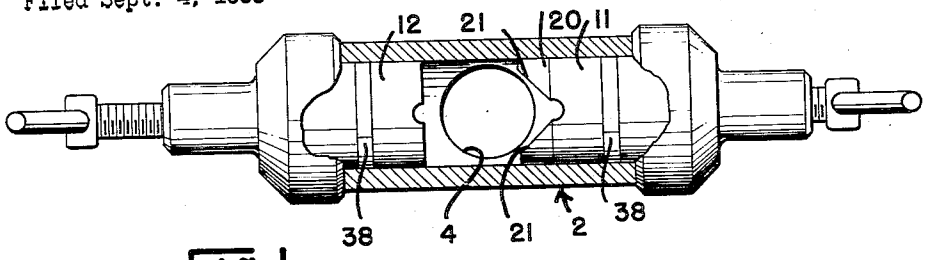


Fig. 1

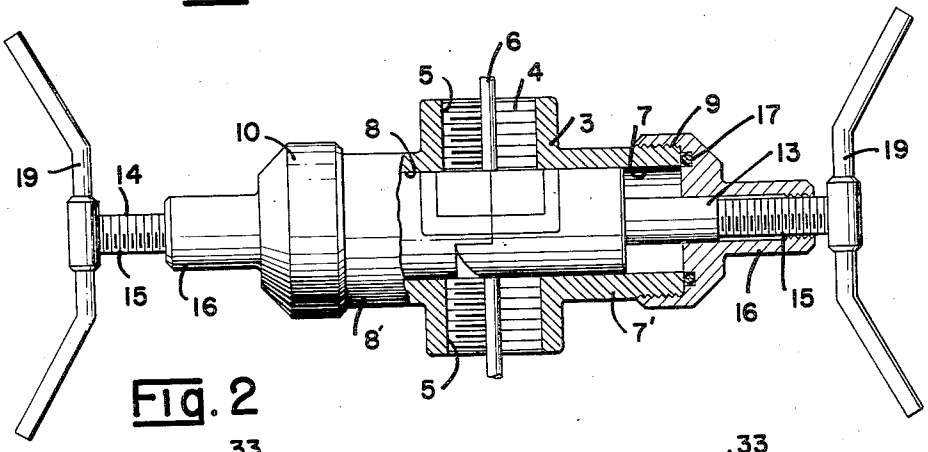


Fig. 2

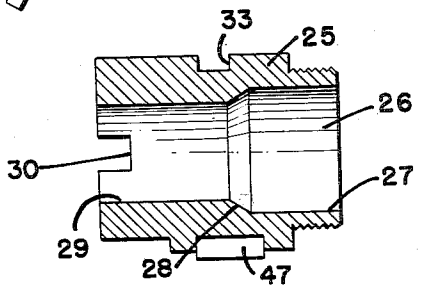


Fig. 3

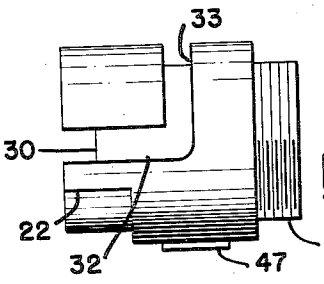


Fig. 5

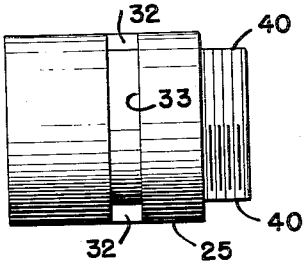


Fig. 4

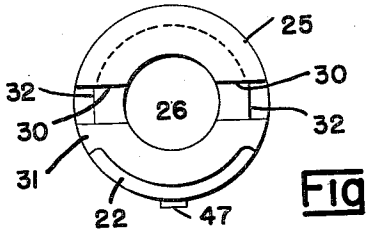


Fig. 6

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BLOWOUT PREVENTER

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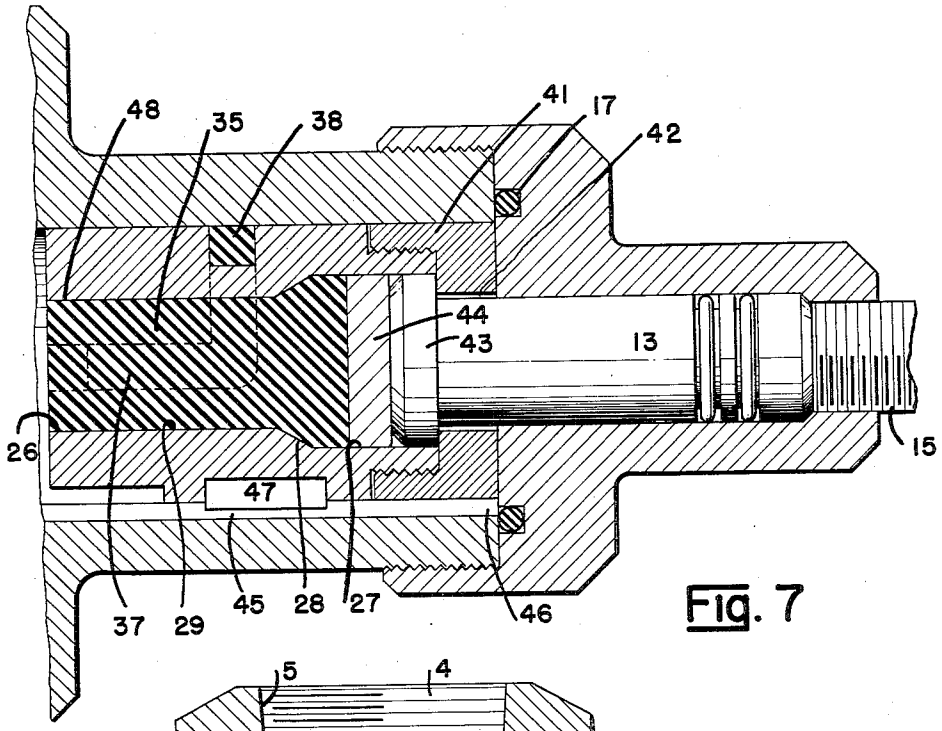


Fig. 7

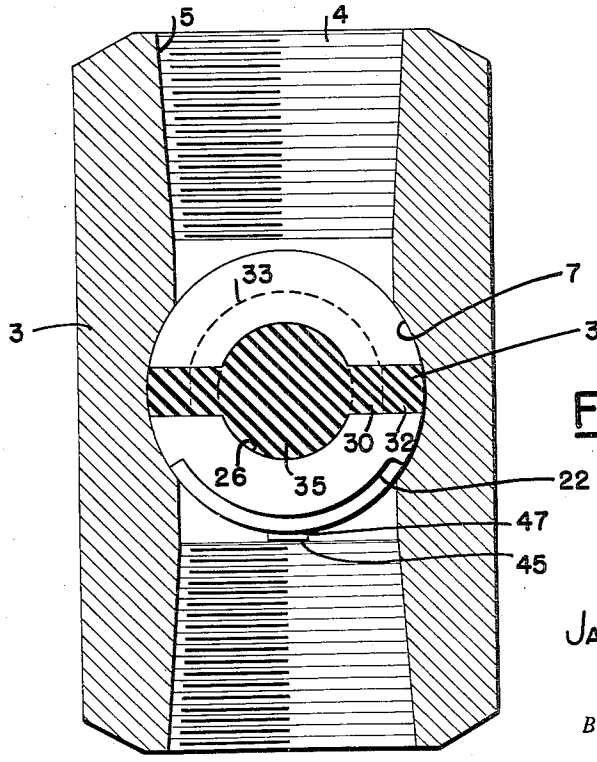


Fig. 8

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BLOWOUT PREVENTER

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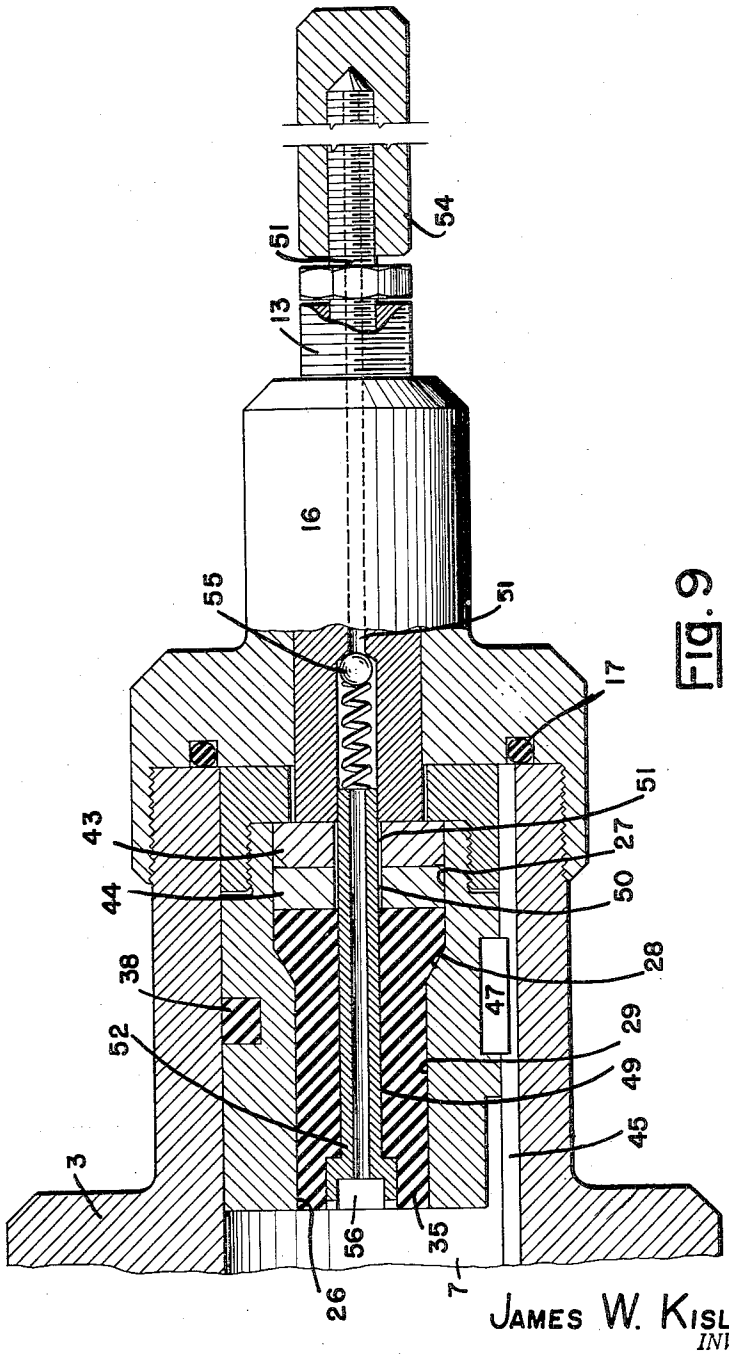


Fig. 9

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United States Patent Office

2,839,263

Patented June 17, 1958

2,839,263

BLOWOUT PREVENTER

James W. Kisling III, Houston, Tex.

Application September 4, 1953, Serial No. 378,576

2 Claims. (Cl. 251—1)

The present invention relates to a blowout preventer and more particularly to a blowout preventer ram construction.

In present day well completion procedures, the well casing, tubing and casing head are set in place after the well has been drilled. The derrick is then moved from the location and the well completed by lowering various completion tools into the well by any suitable means such as a cable or the like.

This procedure allows the derrick to be moved from the location earlier than was possible with previous completion methods. Also, since the well can be completed without the derrick, and its attendant equipment, completion costs of wells are materially reduced.

As previously mentioned, the tools for completing the well may be lowered on a wire line and it is desirable to provide a means at the well head for sealing off about the cable on which the tools are lowered so as to prevent escape of well pressure.

The present invention is directed to a blowout preventer which is light weight, but sturdy in construction and positive in its sealing action. The invention also provides a blowout preventer which may be secured to the casing head or Christmas tree so that tools for completing the well may be lowered therethrough on a wire line and the device operated so as to provide a seal about the member on which the tools are lowered.

Another object of the invention is to provide a blowout preventer ram construction which includes a hollow member, a packing member therein and means for urging the packing member relative to the body whereby such packing member may engage and seal about a member.

Still another object of the invention is to provide a blowout preventer ram construction for movement in a ram chamber comprising a hollow body, a packing member in said body, means engaged with the ram and in abutting relationship with the packing member for effecting relative movement between the packing member and the ram body.

Still another object of the invention is to provide a blowout preventer ram construction for movement in a ram chamber comprising a hollow cylindrical body, a cylindrical packing member in said body, means engaged with the ram and in abutting relationship with the packing member for effecting relative movement between the packing member and the ram body, the ram chamber having a groove extending longitudinally thereof and a key on the ram projecting into the groove for guiding the ram as it moves into the chamber.

Yet a further object of the invention is to provide a blowout preventer ram construction which is adapted to sealably engage a member, such ram construction including a cylindrical body, a cylindrical packing member extending longitudinally of said body, said body having a groove extending diametrically across the face thereof, along each side thereof and around the top half of said body, and said packing member filling said groove.

Yet a further object of the invention is to provide a blowout preventer ram construction which includes a hollow body and a packing member mounted in said body whereby relative movement may be effected between the body and the member.

Other objects and advantages of the invention will become more readily apparent from a consideration of the following description and drawings, wherein:

Fig. 1 is a top view, partly in section, illustrating a form of blowout preventer with the preferred embodiment of the rams of the present invention mounted therein;

Fig. 2 is a side view, partly in section, showing the ram in closed position in the preventer and sealing about a member;

Fig. 3 is a sectional view of the ram body;

Fig. 4 is a top plan view of the ram body;

Fig. 5 is a side elevation of the ram body;

Fig. 6 is a front view of the ram body;

Fig. 7 is a vertical sectional view illustrating an embodiment of the ram construction;

Fig. 8 is a sectional view of a blowout preventer looking towards the ram; and

Fig. 9 is a sectional view of an alternate embodiment of the ram construction.

The blowout preventer is denoted generally by the numeral 2 in Fig. 1 which includes the housing 3 having an opening 4 therethrough. The opening 4 is provided with threads 5 whereby the blowout preventer may be attached to the upper end of the well casing head or Christmas tree so that tools may be lowered through such preventer and into the well bore by any suitable means such as the lowering member or cable 6. Ram chambers 7 and 8 are opposed to each other and extend laterally from the housing 3 of the blowout preventer; such chambers intersect the opening 4 at their front ends and are closed by the heads 9 and 10 which may be threadedly engaged on the wall chambers 7' and 8' respectively.

In Fig. 1, a pair of rams 11 and 12 are shown in the ram chambers 7 and 8, and are adapted to move longitudinally of the chambers whereby they may engage and seal about the member 6 so as to prevent the passage of well fluids from the well. Stems 13 and 14 are secured to the rams by suitable means to be described in more detail hereinafter, and such stems are provided with a threaded portion 15 thereon whereby they may be engaged in the extension 16 of each of the heads 9 and 10 respectively. The stems move the rams in the preventer and effect sealing about the member 6. Suitable handle means 19 may be provided on each of the stems 13 and 14 whereby the rams may be moved towards active or inactive position as desired.

Suitable packing means such as illustrated at 17 in the head 9 may be provided for preventing the leakage of well fluid from the ram chambers where they are closed by the heads 9 and 10.

In Fig. 1, the rams 11 and 12 are illustrated as being moved to open position whereby opening 4 is exposed so that well tools may be lowered therethrough by the cable means 6. A projection 20 on one of the rams is provided with an inwardly tapered surface 21 on each side thereof, and the other ram is provided with a cooperating recess 22, as shown in Fig. 6, whereby the member 6 may be centered relative to each of the rams as they are moved towards each other.

The construction of the rams is more clearly illustrated in Figs. 3–9 of the drawings. The ram body 25 may be of any suitable configuration and is illustrated as being cylindrical, as shown more clearly in Fig. 6. The ram is provided with a bore or hollow portion 26 which extends longitudinally through the body. The bore 26 is preferably of a cylindrical configuration, the diameter of which

is somewhat larger, such as illustrated at 27, adjacent the rear portion of the body 25. A tapered surface 28 joins the larger diameter bore portion 27 with the small diameter bore portion 29 as shown in Fig. 3 of the drawings. A groove 30 extends across the face or front end 31 of the ram and thence along the sides of the ram as indicated at 32 in Fig. 5 of the drawings. The groove extends over the top half portion of the ram body as indicated at 33 in the drawings, intersecting the side portions 32, whereby the side portions 32 of such groove are joined together.

A packing member 35 is arranged in the longitudinally extending bore 26 and is shaped to conform therewith as more clearly illustrated in Figs. 7 and 9 of the drawings. This provides a packing member wherein the area thereof exposed to applied pressure is larger than the area of the packing exposed on the sealing end of the packing, or ram. The decreased area of the packing member increases the amount of pressure per unit area in the packing member. Such packing member also fills the groove 30 which extends across the face of the ram, along the sides thereof and over the top half portion thereof. This is illustrated in Figs. 7 and 8 wherein the packing member 35 is illustrated at 36 as filling the groove 30 on the front of the ram and is shown at 37 in dotted line as extending along the side of such ram with the semicircular portion of the groove being filled with the packing member as illustrated at 38.

In this manner well fluid entering behind the ram from the well string below the blowout preventer will be prevented from escaping by the arrangement of the groove 30 including the portions 32 and 33 with the packing member arranged therein.

The ram is provided with a threaded area 40 at the rear end thereof whereby suitable means such as the apertured cap 41 may be engaged with the ram. The stem 13 extends through the aperture 42 in the cap 41 and is connected to the ram by means of such cap. The inner end of the stem is provided with an enlarged portion 43 which is adapted to abut the plate 44 that is slidably arranged in the bore 26 of the ram body 25.

A groove 45 extends longitudinally of the ram chamber on the lower side 46 thereof and a key or projection 47 on the ram body 25 engages in such groove and guides the ram body as it moves towards and away from active position in the blowout preventer.

While it is believed that the operation of the ram is apparent by reason of the foregoing discussion, it will be assumed that the ram is mounted in the ram chamber 7 and is withdrawn to inactive position as illustrated in Fig. 7 of the drawings. Rotation of the stem 13 causes the ram to move transversely of the blowout preventer body 3 and towards the member 6 for sealing engagement therewith. The key 47 fitting in groove 45 guides the rams as it is moved in the chamber. Simultaneously, the opposed ram may be moved towards sealing engagement with the member 6 whereby such rams meet as shown in Fig. 2 of the drawings. Continued rotation of the stem 13 is effected so that enlarged portion 43 on stem 13, and slidable plate 44 exerts a force against longitudinally extending packing member 35, whereby the packing element is moved relative to the body member 25. Rotation of the stem applies a force directly to the packing member and causes it to tend to flow about member 6 and seal about the member 6. If any defects are present on the surface of such member, then the rubber or packing element 35 will flow into such defects thereby forming a seal so as to prevent leakage of well fluid about such members and between the ends of the rams. Rotation of the stem 13 may be continued until a proper seal about the member 6 is obtained.

If desired the packing element 35 may be bonded to the ram body 25 adjacent the portion 48 of the bore 26.

While bonding of the packing element in the body may not be necessary, undue working or relative movement between the ram and the packing member may be lessened by such bonding.

Fig. 9 illustrates an alternate embodiment of the invention wherein a passage 49 extending longitudinally through the packing member 35 communicates with a passage 50 through the movable plate 44 and also communicates with a passage 51 in stem 13. One form of providing such communication is to arrange hollow tube 52 in passage 49 of packing member 35, such tube being of a length to slidably extend through passage 50 in slidable plate 44 and into passage 51 of stem 13. By means of the communicating passages through the stem 13, plate 44 and packing member 35, communication with the front of the packing member may be effected.

In some cases it may be desirable to provide an additional seal either about the member 6 or to flow material between the strands of wire forming cable 6 in order to insure non leakage of well liquids from the well. To this end, suitable plastic material may be placed in the cap 54 and such cap threadedly engaged on the stem 13. The material in such cap would, of course, be forced through the opening 51 extending through the stem past the check valve means 55 and through the communicating passages to the forward end of the packing member as illustrated at 56. Such plastic material may then flow outwardly and into the member 6 to fill any voids which may be contained internally thereof and which are not susceptible to being sealed by the rams as previously discussed. The tube 52, as shown in the drawing telescopes into the stem 13 as the stem is moved relative to packing member 35, whereby the stem may be moved relative to such tube after the rams have contacted, as shown in Fig. 2, so as to force the packing member 35 relative to the ram body 25 in order to provide a seal about member 6.

The plastic material used may comprise any suitable substance to accomplish internal sealing of the member 6 by filling the internal voids therein. For example, the plastic material may consist of asbestos or short cotton fibers, which are mixed with a vehicle such as wax, grease, paraffin, etc.

Broadly, the invention relates to a blowout preventer and more particularly to a blowout preventer ram construction.

What is claimed is:

1. A blowout preventer ram construction for sealing against an elongate member, said ram construction including a ram body having a bore extending longitudinally of said body, a groove extending diametrically across the front of said body and intersecting said bore on each side thereof on the front of said body, said groove being smaller in vertical height than the vertical height of said bore at the front of said body, said groove extending along each side of said body, a connecting groove extending transversely over half of said body and intersecting said side grooves between the ends of said body, a resilient packing member fitting in said bore and said grooves and shaped to conform therewith, said packing member having a substantially vertical rear surface and a substantially vertical front surface, and ram closing means for applying a closing force directly to said rear surface to move said packing member and the ram body therewith to a closing position in which said front surface engages said elongate member, the area of said rear surface being larger than the area of said front surface of said packing member to provide a resultant closing force which acts on the body in the same direction as the direction of the closing force which is applied to the packing member.

2. The structure set forth in claim 1, wherein said longitudinal bore in said ram body is cylindrical at the front of said body.

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