July 12, 1932. J. YOUNG ET AL. 1,867,045

BLOW-OUT PREVENTER

Filed Dec. 14, 1929 2 Sheets-Sheet 1

Fig. 1

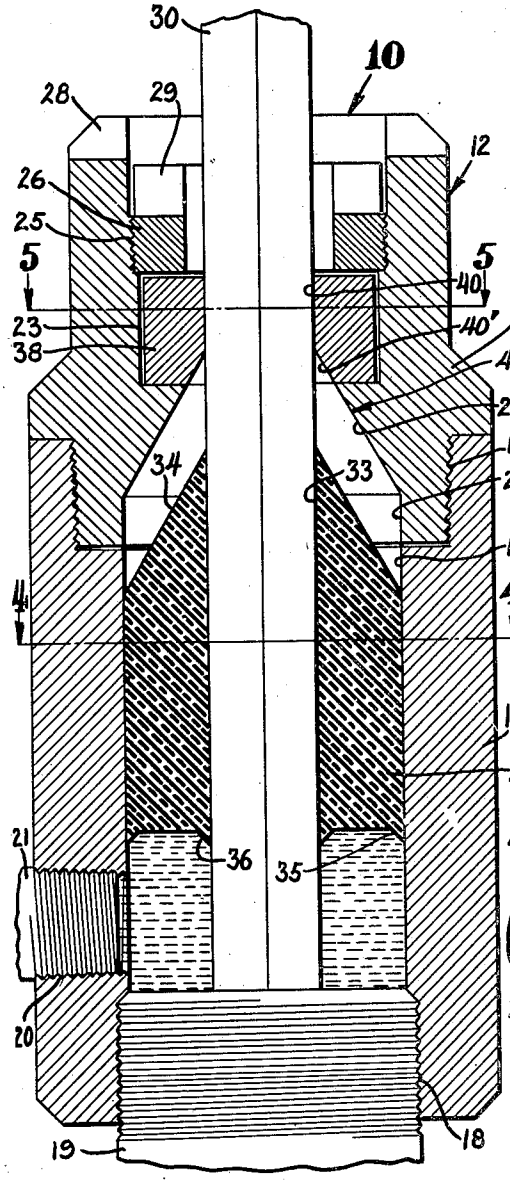
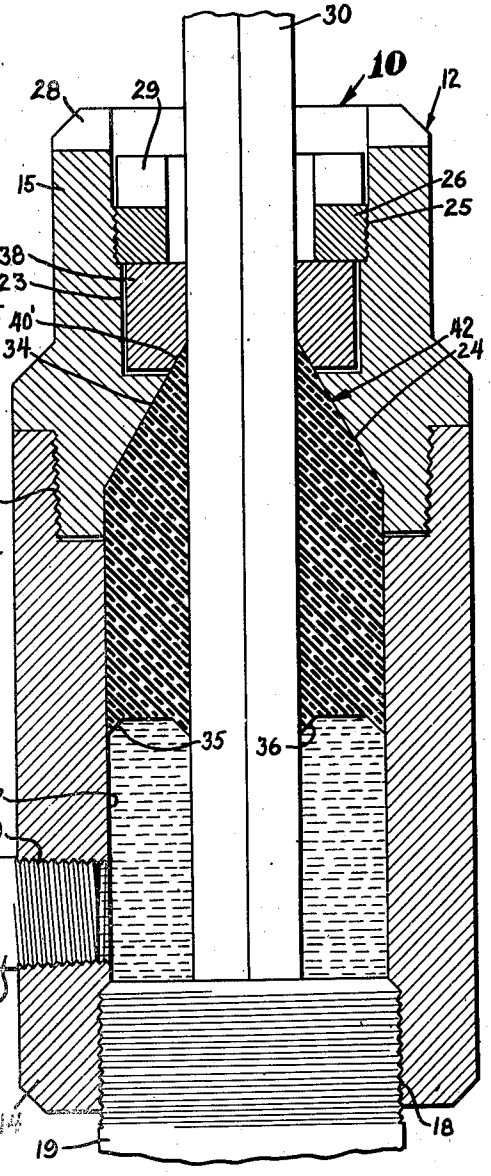


Fig. 2



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Filed Dec. 14, 1929 2 Sheets-Sheet 2

Fig. 3

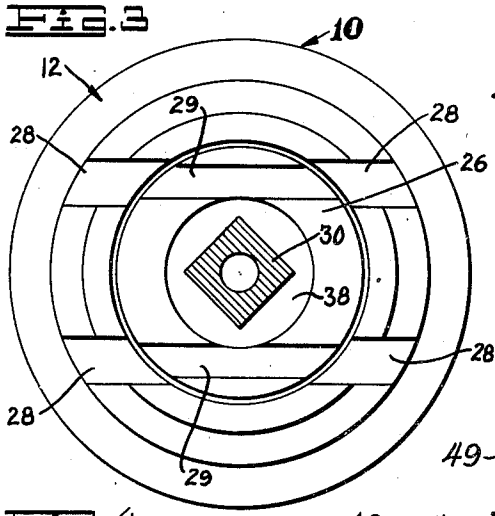


Fig. 4

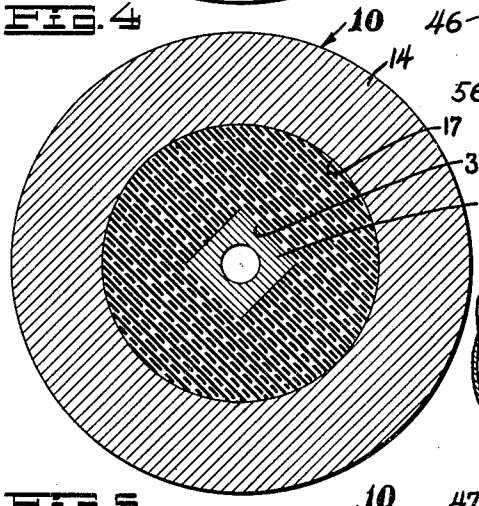


Fig. 5

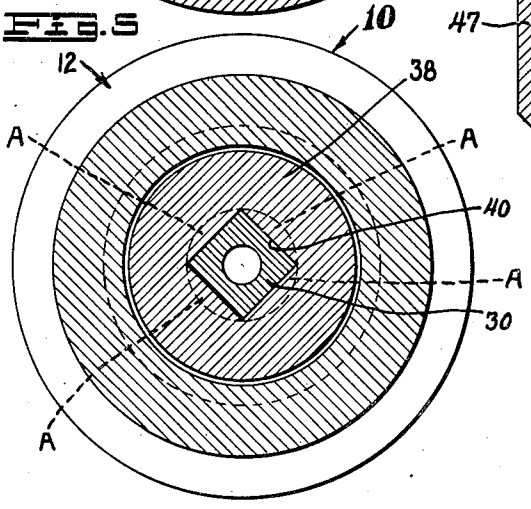
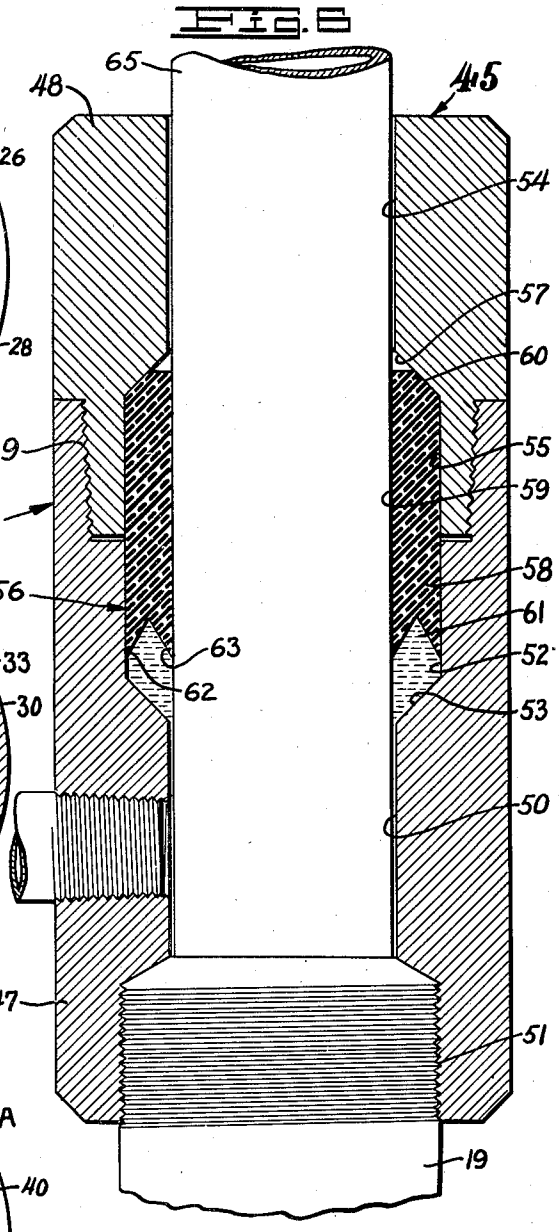


Fig. 6



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UNITED STATES PATENT OFFICE

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BLOW-OUT PREVENTER

Application filed December 14, 1929. Serial No. 414,060.

This invention relates to improvements in blow-out preventers.

The general object of the invention is to provide an improved packing member for use in oil or similar wells to prevent back pressure of the gases therein from causing a blow-out.

Another object of the invention is to provide a device of the class described which includes means for packing off when a tool, which is polygonal in cross section, is operating in the well.

A further object of the invention is to provide a device of the class described which includes means to pack off around a string of casing in the well.

A still further object of the invention is to provide a device of the class described wherein the packing element is normally free or floating and is adapted to be moved to a position to pack off by the gas pressure in the well.

A specific object of this invention is to provide a blow-out preventer including a packing member which is adapted to normally float or be supported above the top of the circulating fluid, and when the back pressure in the well becomes excessive to be forced into a position to pack off around the drill stem.

Other objects and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a central vertical cross section through my improved device showing the packing member in a normal operating position.

Fig. 2 is a view similar to Fig. 1 showing the packing member in a position to pack off.

Fig. 3 is a top plan view of Fig. 1.

Fig. 4 is a section taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 5—5 of Fig. 1, and

Fig. 6 is a view similar to Fig. 1 of a modified form of my improved device.

Referring to the drawings by reference characters we have indicated our improved blow out preventer generally at 10. As shown this device comprises a housing 12 which includes a body portion 14 and a cap 15 which is secured to the body by threaded engagement therewith as indicated at 16.

The body portion 14 includes a central longitudinal aperture 17 which is provided with screw threads 18 adjacent the lower end thereof for securing the device to the casing head nipple indicated at 19. A threaded aperture 20 is provided in the side wall of the body portion in which the threaded portion of a pipe 21 may be secured.

The cap 15 includes a central recess 22 which is coaxial with and of the same diameter as the body aperture 17 and a recess 23 which is spaced from and coaxial with the body aperture 17. The shoulder between the recess 22 and the recess 23 is tapered as indicated at 24. The apertures 17 and 23 are circular in cross section.

Above the recess 23 of the cap 15 we provide an enlarged countersunk screw threaded recess 25 in which a plug 26 is positioned, the lower end of which when in position abuts the shoulder at the juncture of the recesses 23 and 25 and forming a chamber. At the top of the cap 15 we provide wrench sockets 28 and at the top of the plug 26 we provide similar sockets 29.

In operation a drill stem 30 which is shown as polygonal in cross section, is adapted to operate through the device 10 and is positioned in the aperture 17 of the body.

Within the recess 17 of the body portion 12 we provide a packing member 32 which is preferably made of resilient material such as a good grade of rubber or some similar material. The packing member 32 has a sliding fit in the recess 17 and surrounds the drill stem 30, being provided with an aperture 33 which is polygonal in cross section to correspond to the shape of the drill stem

and being of a size to allow free sliding action of the drill stem therethrough.

The upper end of the packing member is tapered as at 34 to correspond to the shape of the tapered shoulder 24 and the opposite end of the packing member is provided with an outer feather edge 35 which is adapted to engage the surface of the body aperture 17 and an inner feather edge 36 which is adapted to engage the outer periphery of the drill stem 30.

Positioned in the chamber 23 of the cap 15 we provide a ring 38 which is free to rotate therein and which includes an aperture 40 shaped to correspond to the outer periphery of the drill stem 30. The lower end of the aperture 40 is preferably tapered as at 40′ to correspond to the taper 24 on the body 14 and these two tapered surfaces are adapted to form a seat indicated generally at 42.

In a normal drilling operation the packing member 32 will float on the top of the circulating fluid as shown in Fig. 1, but when excessive back pressure of the gases in the well occurs this pressure will raise the packing member until the upper conical end thereof engages the conical seat 42 formed by the tapered surfaces 24 and 40′, and as the pressure continues the packing member will be expanded in diameter and forced into tight engagement with the drill stem 30 and the surfaces of the aperture 17 and the seat 42.

Should the gas pressure become great enough to force the packing member 30 through the spaces indicated at A in Fig. 5 caused by the differences in the shapes of the aperture 40′ and the drill stem 30 the ring 38 will prevent the entire packing member from being forced out through these spaces.

The back pressure then passes through the pipe 21 which is preferably provided with suitable valves for controlling the flow therethrough, and which may communicate with a suitable reservoir or may exhaust directly into the atmosphere.

When the drill stem 30 is backed out to secure more pipe thereto the cap 15 is disengaged from the body portion 14 and as the drill stem is raised the shoulder on the drill stem joint engages the packing member 32 and carries it and the cap upward with it. After the additional pipe has been secured to the drill stem it is lowered whereupon the packing member is again positioned in the body aperture 17 and the cap 15 is secured to the body portion 14.

In Fig. 6 we have indicated generally at 45 a modification of our device which is adapted to be positioned on the casing head after the casing has been set. As shown this device comprises a housing 46 which includes a body portion 47 and a cap 48 which is secured to the body by threaded engagement therewith as indicated at 49.

The body portion 47 includes a central longitudinal aperture 50 which is provided with screw threads 51 adjacent the lower end thereof and which communicates with an enlarged recess 52 adjacent the upper end thereof. The shoulder at the juncture of the aperture 50 and the recess 52 is preferably tapered as at 53.

The cap 48 includes a central aperture 54 of the same size in cross section and coaxial with the body aperture 50 and an enlarged recess 55 which is of the same size in cross section and coaxial with the body recess 52 thereby forming a chamber 56. The shoulder at the juncture of the aperture 54 and the recess 55 is tapered to form a seat 57.

Positioned in the chamber 56 we provide a packing member 58 which is preferably made of a resilient material similar to the packing member 32 of the device 10. This packing member is provided with a central aperture 59 which is of approximately the same size in cross section as the apertures 50 and 54 and the upper end of the packing member is tapered as at 60 to correspond to the shape of the seat 57 and the opposite end is provided with a V-groove 61 to form an outer feather edge 62 and an inner feather edge 63.

In operation the cap 48 is disengaged from the body portion 47, the packing member 58 removed therefrom and the body portion 47 secured to the casing head nipple 19. The casing 65 is then run through the body portion until all the casing has been set. Then the packing member 58 is slipped down over the casing until it is positioned in the body recess 52 and then the cap 48 is secured in position on the body portion 47.

When the gas in the well with which the device 45 is associated backs up around the casing 65 it forces the packing member 58 upward into tight engagement with the seat 57 thereby expanding the packing member and forcing it into tight engagement with the outer surface of the casing 65 and the inner surface of the chamber 56, thereby preventing the gas from escaping through the space between the aperture 54 and the outside of the casing.

From the foregoing description it will be apparent that we have provided a novel blow-out preventer which is simple in construction and highly efficient in use.

What we claim is:

1. A packing device, said device comprising a body, a longitudinal cylindrical bore in said body, the base of said bore being tapered, a stem positioned in said bore and rotatable therein, said stem being polygonal in cross section, a resilient member positioned in said bore, said member surrounding said stem and conforming to the shape thereof, the outer periphery of said member being cylindrical, one end of said member being ta-

pered to conform to said tapered portion of said bore, the opposite end of said member including a feather edge adapted to engage the outer periphery of said stem and a feather edge adapted to engage the side walls of said bore, a chamber adjacent the top of said body, a ring positioned in said chamber, said ring surrounding said stem and snugly fitting the outer surface of said stem, said ring having a tapered recess in alignment with the taper in said bore, the tapered end of said resilient member being movable into said tapered recess in said ring.

2. A packing device, said device comprising a body, a longitudinal cylindrical bore in said body, one end of said bore being tapered, a stem positioned in said bore and rotatable therein, a resilient member positioned in said bore, said member surrounding said stem, said member being annular in cross section, one end of said member being tapered to conform to the tapered portion of said bore, a chamber in said body, a ring positioned in said chamber, said ring surrounding said stem and snugly fitting the outer surface of said stem, said ring having a tapered recess in alignment with the taper in said bore, the tapered end of said resilient member being movable into said tapered recess in said ring.

3. A packing device, said device comprising a housing, said housing including a body portion and a cap, means to removably secure said cap to said body, a longitudinal cylindrical aperture in said body, a recess in said cap of a size corresponding to the size of said body recess and coaxial therewith, a reduced cylindrical recess in said cap, the shoulder at the juncture of said first cap recess and said second cap recess being conically shaped, a stem, said stem being adapted to rotate in said apertures, a resilient member positioned in said body aperture, said member surrounding said stem and conforming to the shape thereof, the outer periphery of said member being cylindrical, the end of said member adjacent said cap being conically shaped to conform to said conical shoulder, a ring positioned in said second cap recess and adapted to rotate therein, said ring surrounding said stem and snugly fitting the outer surface of said stem.

4. A packing device, said device comprising a body, a longitudinal cylindrical bore in said body, the base of said bore being conically shaped, a stem positioned in said aperture and rotatable therein, said stem being polygonal in cross section, a resilient member positioned in said bore, said member surrounding said stem and conforming to the shape thereof, the outer periphery of said member being cylindrical, one end of said member being conically shaped to conform to said conical portion of said bore, the opposite end of said member including a feather edge adapted to engage the outer periphery of said stem and a feather edge adapted to engage the side walls of said bore, a chamber adjacent the top of said body, a ring positioned in said chamber and adapted to rotate therein, said ring surrounding said stem and snugly fitting the outer polygonal surfaces of said stem.

5. A packing device, said device comprising a housing, said housing including a body portion and a cap, means to removably secure said cap to said body, a longitudinal cylindrical bore in said body, a cylindrical recess in said cap of a size corresponding to the size of said body bore and coaxial therewith, a reduced cylindrical recess in said cap, the shoulder at the juncture of said first cap recess and said second cap recess being frustro-conically shaped, said body having an aperture disposed at an angle to said bore, a stem positioned in said body bore and rotatable therein, said stem being polygonal in cross section, a resilient member positioned in said body bore, said member surrounding said stem and conforming to the shape thereof, the body of said member being cylindrical, the end of said member adjacent said cap being frustro-conically shaped to conform to said conical shoulder, the opposite end of said member including a feather edge engaging the outer periphery of said stem and a feather edge engaging the side walls of said body aperture, a ring positioned in said second cap recess and adapted to rotate therein, said ring having an aperture and said ring surrounding said stem and said aperture snugly fitting the outer polygonal surfaces of said stem, the lower end of said ring aperture being tapered to correspond to the tapered end of said packing member, said conical shoulder of said body and said tapered portion of said ring forming a seat for the tapered end of said packing member and means in said cap to prevent displacement of said ring.

6. In combination with a casing head, a blow out preventer including a hollow body adapted to be arranged about a drill member, said body having an aperture through which the drill member may be fitted, and a packing member freely movable in said body and adapted to normally float therein, said packing member being apertured in alignment with said body aperture and including a joint sealing portion and means to establish communication between said packing member and the space below the casing head to cause said packing member to be moved into a sealing position when a blow-out occurs.

7. In a packing device, a body including a hollow housing having a cap secured thereto, a cylindrical bore in said body, said bore terminating in a frustro-conical cavity arranged in said cap, said cap having a recess therein, a resilient packing member freely movable in said body and having a cylindrical portion

fitting said bore and having a tapered portion fitting said frustro-conical cavity, said resilient member having a hole therethrough and including an end portion of the tapered portion which projects into said cap recess and means in said cap recess to engage the end portion of said tapered portion of the resilient packing member.

8. In a packing device, a body including an elongated housing having a joint therein, a cylindrical bore in said body, said bore terminating in a tapered cavity arranged in one end, a resilient packing member having a cylindrical portion fitting said bore and extending over said joint and having a tapered portion fitting said tapered cavity, said resilient member having a hole therethrough, said resilient member being movable in said body and in all positions therein extending over said joint.

9. A packing device, said device comprising a body, a longitudinal bore in said body, the end of said bore being tapered, a stem positioned in said bore and rotatable therein, said stem being polygonal in cross section, there being a joint between said stem and said body, a resilient member positioned in said bore and adapted in one position to close said joint, said member surrounding said stem and conforming to the shape thereof, said member fitting said bore, one end of said member being tapered to conform to the tapered portion of said bore, the opposite end of said member engaging the outer periphery of said stem and the side wall of said bore.

10. In a packing device, a body including a hollow housing having a cap secured thereto, a cylindrical bore in said body, said bore terminating in a frustro-conical cavity arranged in said cap, said cap having a recess therein, a resilient packing member having a cylindrical portion fitting said bore and having a tapered portion fitting said frustro-conical cavity, said resilient member having a hole therethrough and including an end portion on the tapered portion which projects into said cap recess, a ring positioned in said cap recess and having a tapered lower portion to receive the end portion of said tapered portion of the resilient packing member, and means to hold said ring in said recess.

11. A packing device, said device comprising a housing, said housing including a body portion and a cap, means to secure said cap to said body, a longitudinal cylindrical bore in said body, a cylindrical recess in said cap of a size corresponding to the size of said body bore and coaxial therewith, a reduced cylindrical recess in said cap, the shoulder at the juncture of said first cap recess and said second cap recess being frustro-conically shaped, a ring positioned in said second cap recess and adapted to rotate therein, said ring having an aperture, the lower end of said ring aperture being tapered to correspond to the tapered end of said shoulder, said conical shoulder of said body and said tapered portion of said ring forming a seat for a packing member and means in said cap to prevent displacement of said ring.

In testimony whereof, we hereunto affix our signatures.

JOHN YOUNG.
WILSON B. WIGLE.