Sept. 6, 1938. G. E. McLAGAN 2,129,531

TUBING BLOW-OUT PREVENTER

Filed Nov. 20, 1936

Fig. 1.

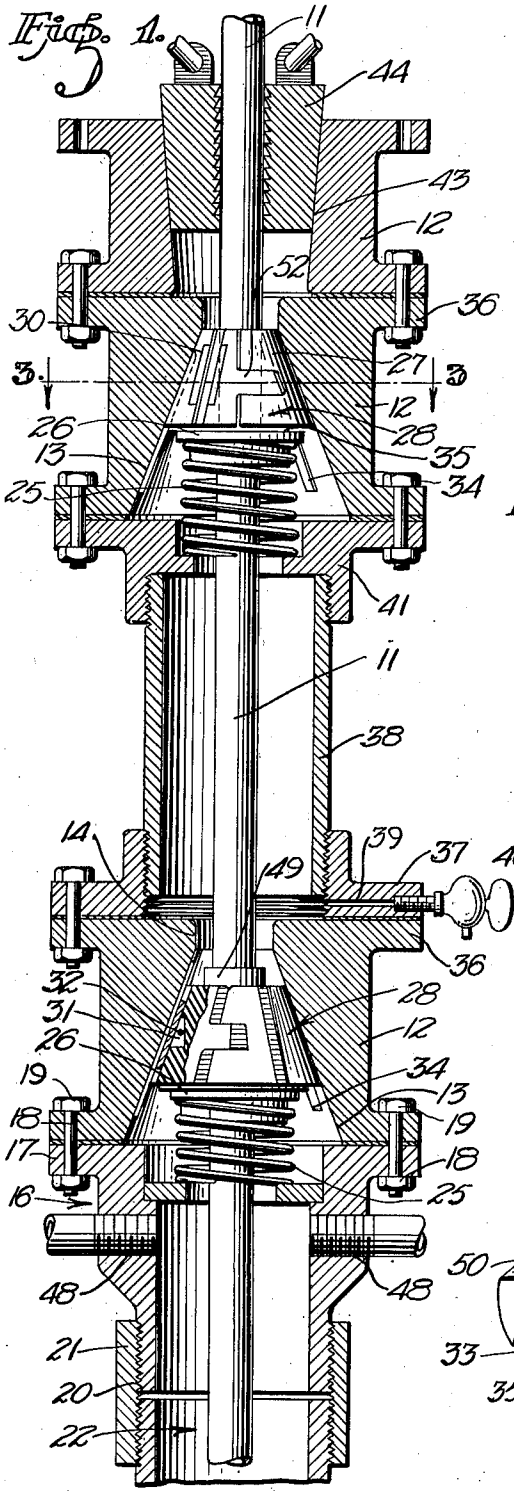



Fig. 2.

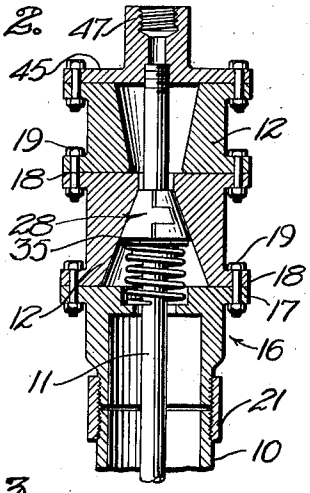



Fig. 3.

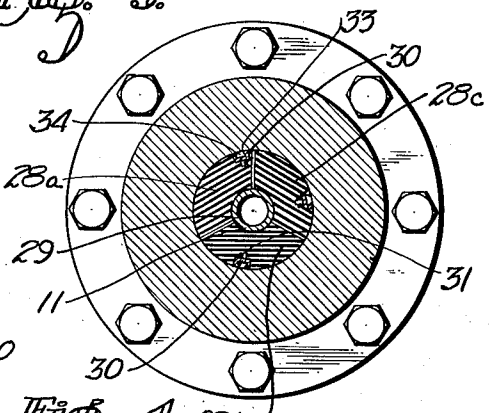



Fig. 4.

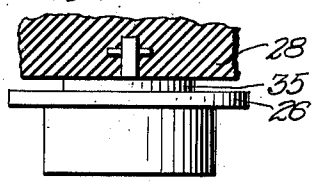
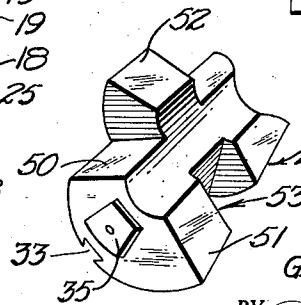



Fig. 5.




INVENTOR.
GEORGE E. McLAGAN

BY James M. Abbett
ATTORNEYS.

Patented Sept. 6, 1938 2,129,531

# UNITED STATES PATENT OFFICE

2,129,531

## TUBING BLOW-OUT PREVENTER

George E. McLagan, Los Angeles, Calif., assignor to Abegg & Reinhold Company, Los Angeles, Calif., a corporation of California

Application November 20, 1936, Serial No. 111,877

1 Claim. (Cl. 166—15)

This invention relates to oil well equipment and particularly pertains to a blowout preventer. In the operation of oil wells in which there is an appreciable gas pressure it is necessary to confine the gas within the well and to permit it to flow under control, and since the drilling operation of a well requires that the drill tubing and tools shall be passed downwardly into the bore a difficult problem is provided due to the fact that the tubing must be passed downwardly into the casing without permitting an appreciable escape of gas.

It is the principal object of the present invention to provide means automatically operating at the upper end of a well casing to permit the drill pipe or tubing to be inserted into the casing and lowered without causing the gas to leak from the end of the casing and around the inserted tube or shaft.

The present invention contemplates the provision of a structure mounted upon the upper end of a well casing, and which structure is provided with means for automatically packing a tube or shaft which is inserted into the casing and is adapted to move therealong, whereby a leakage of gas from the casing and around the tube will be prevented, and which packing will automatically accommodate protuberances or enlargements upon the shaft or tubing, such as might be caused by the collar, and whereby the packing will expand and recede as the collar attempts to pass it, and will thereafter move to a position around the tubing where it will tightly fit to prevent the leakage of gas or liquid, said movement being produced by a spring expansion and the pressure of gas within the well.

The invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a view in vertical section and elevation showing the application of the present invention.

Fig. 2 is a view in vertical section, drawn at a reduced scale and indicating an alternative arrangement of parts in combination with a landing flange.

Fig. 3 is a view in transverse section through one of the packing units as seen on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary view in section and elevation showing one of the bottom wear plates of the packing units.

Fig. 5 is a view in perspective showing one of the elements of the packing unit.

Referring more particularly to the drawing, 10 indicates a well casing into which a drill tube pipe string 11 extends, and at the upper end of which casing said drill string is supported. It is the principal object of the present invention to provide means for lowering the drill string into the well casing under conditions where the gas and oil are under pressure sufficient to cause an objectionable leakage of gas and the overflow of oil when the tube of the well casing is uncovered to permit the tubing 11 to be lowered into the casing. The structure with which the invention is concerned includes one or more units of a blowout preventer which makes it possible for the tubing to be lowered into the casing without leakage of the fluid therefrom, and while maintaining a seal between the casing and around the tube.

It is to be understood that a plurality of blowout preventers may be used in superposed relation to each other, or that a single one may be used if desired. In the construction shown in Fig. 1 of the drawing the lowermost member is shown as provided with a cylindrical body member 12, having a downwardly and outwardly tapering central bore 13 therethrough, which bore communicates with a cylindrical passageway 14 at its upper end and registers with a recessed spring seat 15 at its lower end. The recessed seat is formed in the end face of a coupling 16 which is secured to the body member 12 of a bolting flange 17, complementary to a bolting flange 18 on the body members, and through which flanges bolts 19 are fastened. The lower end of the coupling 19 is externally threaded as indicated at 20 to receive a collar 21 by which this member may be secured to the upper end of the well casing 10 and its central passageway 22 disposed in longitudinal register therewith. A supporting ring 23 is seated within the spring seat 15 and is formed with a central opening 24 of sufficient diameter to accommodate the tubing 11. Mounted upon this ring 23 is a helical compression spring 25 which carries a packing collar 26 at its upper end. This collar has a downturned flange extending into the upper end of the spring 25 and being thus positioned against lateral movement with relation thereto. The horizontal face of the collar 25 supports the packing unit 27 which comprises a plurality of packing segments 28.

In Fig. 2 of the drawing the device is shown as constructed with three packing segments indicated at 28*a*, 28*b*, and 28*c*. These segments have an externally inclined face agreeing in angularity with the inclined face of the tapered bore 13 in the body member 12. A central passageway 29

is formed between and by the packing units for the purpose of accommodating the tube 11 and the coupling or collars thereon. Embedded in the outer inclined wall of each of the packing units is a guide plate 30 which extends throughout a part of the height of the inclined face and is secured in position by a flange 31 carrying pins 32, and which flange and pins are embedded in the body of the packing units, it being understood that the packing units are formed of resilient material, such as rubber. The guide plates 30 are formed with a longitudinally extending dovetailed groove 33 which receive dovetailed ribs 34 extending circularly and lengthwise of the inclined faces 13 of the passageway into which the packing elements fit. Attention is directed to the fact that the guide plates 30 do not extend the full length of the packing elements and that the dovetailed grooves 33 are continued in the body of the packing elements at opposite ends of the plate so that under pressure this rubber will fit tightly around the ribs and prevent leakage at the opposite ends of the packing structure. Interposed between the bases of the packing units 28 are wear plates 35 which rest upon the collar 26 and make it possible for the packing units 28 to move with relation to the supporting collar without any great frictional resistance.

The upper end of the body member 12 is provided with a flange 36 which receives a coupling flange 37 of a casing extension 38. A drain duct 39 is formed in the coupling member 37 and is fitted with a valve 40, which will permit fluid to be drained from the casing extension 38 if it accumulates therein to excess. At the upper end of the casing extension 38 is a coupling flange 41 provided with a spring seat 42 to receive an expansion spring 25, similar to that previously described. The coupling flange 41 is intended to receive a second body member 12 equipped with the packing unit 27 constructed in the manner described for the lower unit.

Mounted at the upper end of the upper body member 12 and secured to its bolting flange 36 is a slip seat 43 to receive the pipe slips 44 by which the tube may be held in position at such times as desired. In certain cases a landing flange 45 may be mounted upon the upper face of the slip seat 43 and at any other point at which it is intended to terminate, and support the string so that the tubing 11 may be threaded into the threaded bore 46 of the landing flange, and so that any suitable piping arrangements, such as a "Christmas tree" may be secured to the upwardly extending cylindrical connection 47. Attention is directed to the fact that the lower coupling member 16 may be formed with threaded openings extending through its side wall as indicated at 48 and into which pipes may be secured to permit the material from the well casing to drain outwardly.

In operation of this invention, it is to be understood that the tubing 11 may be formed with joints 49 which are of larger diameter than the diameter of the main body of the tubing and which necessitate that the packing units shall recede from their normal position, embracing the tubing, to accommodate the enlarged diameter and to then contract around the tube to again pack the tubing and to prevent leakage through the packing from the casing. In order to insure that the tubing 11 is packed at all times the structure here shown is provided with two complete packing units through which the tubing successively passes, and it will therefore be seen that at a time when the segments of one packing unit have been caused to recede to accommodate the enlarged diameter of the coupling, the segments of the other packing unit have securely embraced the tubing 11 to form a tight joint therearound. It will be noted that each of the packing segments 28 is formed with radial faces 50 and 51, and that substantially midway the length of the face 50 is a protruding arcuate lug 52, which is intended to extend into a complementary recess 53 formed in the face 51 of a contiguous unit 28. When the tubing is inserted at the upper end of the member 12 it will force downwardly upon the packing unit 27, and this downward movement will cause the various segments to move downwardly and outwardly against the compression of the spring 25. The outward movement of the segments 28 is brought about due to the fact that the dovetailed grooves in the guide plates 33 engage the dovetailed ribs of the inclined side walls in the body 12 and will thus cause the segments 28 to move outwardly and downwardly along these inclined faces. As they thus move their wear plates 35 will slide over the surface of the collar 26 and will cause an enlarged opening 29 to be formed between the packing segments 28. This opening will increase in diameter until it agrees with the diameter of the collar which is to pass through it, at which time it will accommodate the collar, and after the collar has passed through the opening 29 formed by the expanded packing structure the compression spring 25 will act to force the packing segments 28 in against the side wall of the tubing and securely hold and pack it.

It will be assumed that the description previously set forth describes the action of the uppermost packing device in accommodating the stem and its coupling and packing the same after the enlarged coupling has passed the packing, and it will be understood that a similar operation will take place when the next packing unit is reached, thus insuring that at all times when an enlarged coupling is passing through one of the packings that the body of the stem will be securely gripped at some point adjacent thereto. This will prevent a direct outward communication from the casing through one packing unit, and will insure that the pressure around the packing is materially less than that in the well. It may also occur that there will be a slight accumulation of fluid within the casing extension 38 and between the packing members, and this may be drained out through the pet-cock 40 and the duct 39.

By an analysis of the structure shown in Fig. 1 of the drawing, it will be seen that the various units may be assembled in any desired manner and that one or more of the packers may optionally be used, and that when desired the packing structures may be eliminated and the tubing may be suspended from the landing flange. It will also be evident that under some conditions it may be necessary to withdraw the tubing 11 during the time when there is pressure within the well, and at such times the packing units may be inverted so that they will expand as the couplings draw up to them, and will permit the tubing to be pulled from the casing without immaterial loss in well pressure.

It will thus be seen that the device here disclosed comprises a few simple parts which may be readily assembled to meet the varying conditions of operation, and which will act efficiently to permit the tubing to be rapidly lowered into a well which is under pressure, without causing a

blowout around the tubing during the operation.

While I have shown the preferred form of my invention, as now known to me, it will be understood that various changes may be made in the combination, construction, and arrangement of parts without departing from the spirit of the invention as claimed.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

A blowout preventer for well casing, comprising a cylindrical base member adapted to be mounted upon the upper end of a well casing, a tubular body member disposed in longitudinal alignment therewith, and detachably secured thereto, said body member having an upwardly and inwardly converging wall portion, a frustoconical packer mounted within the body member, its outer surface coinciding with the tapered wall through said member, said packer comprising a plurality of resilient segments forming a central opening through which a tubing may pass, the segments each being provided with metal wear plates making contact with the wall of the body member, the longitudinal edges of said packing segments interlocking whereby said segments may move relatively without becoming disengaged, and resilient means constantly holding said packer segments against the tapered side walls of the body member irrespective of the diameter of the tubing extending therethrough, a pressure washer interposed between said resilient means and the bottom of the packer, and anti-friction plates carried by the packer segments and resting upon said pressure washer.

GEORGE E. McLAGAN.