March 7, 1933. L. J. BLACK 1,899,922

BLOW-OUT PREVENTING ATTACHMENT FOR CASING HEADS

Filed July 3, 1931 2 Sheets-Sheet 1

Fig. 1

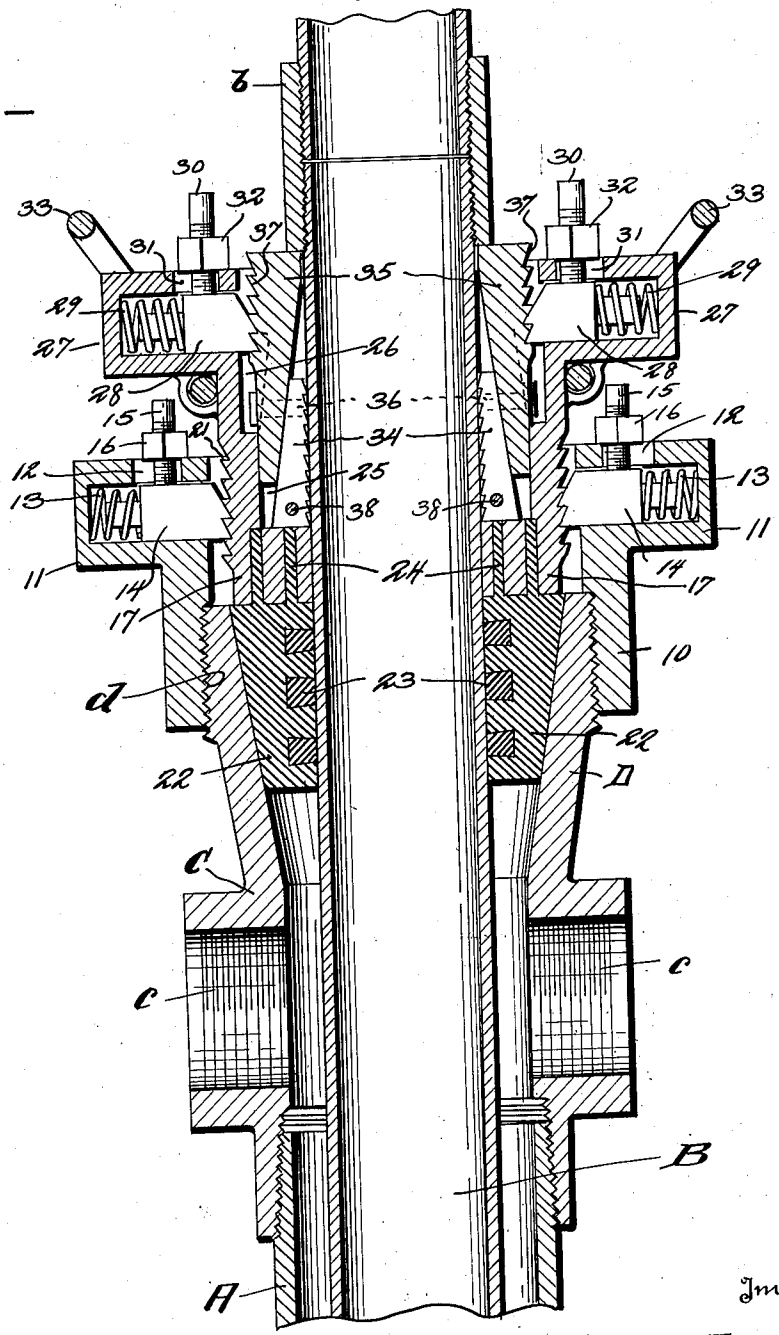

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Fig. 2.

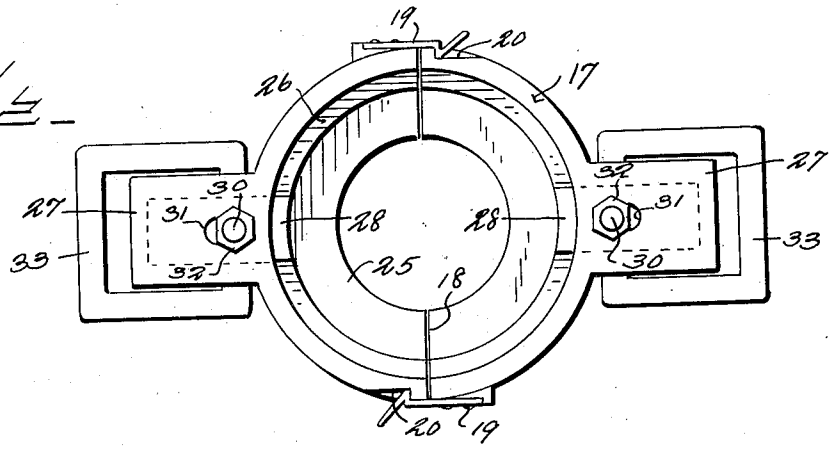


Fig. 3.

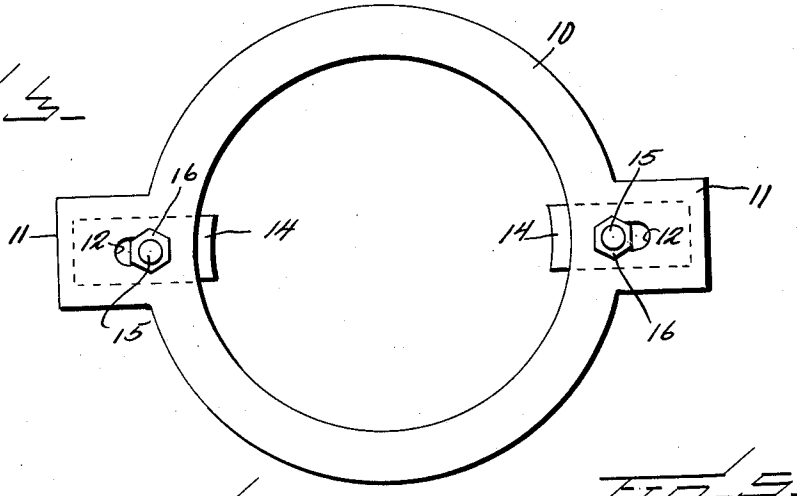


Fig. 4.

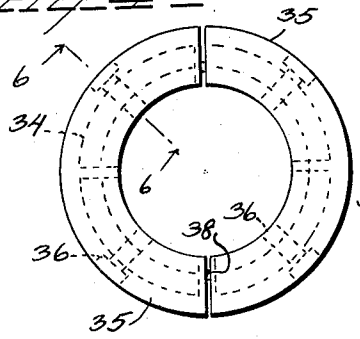


Fig. 5.

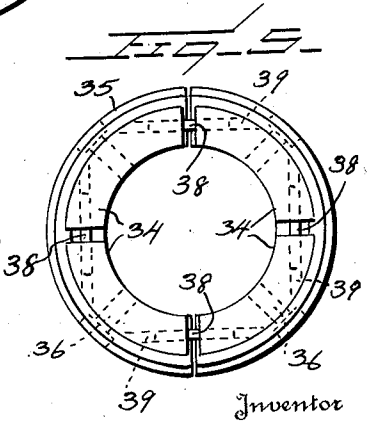
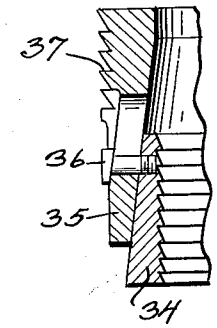


Fig. 6.



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UNITED STATES PATENT OFFICE

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BLOW-OUT PREVENTING ATTACHMENT FOR CASING HEADS

Application filed July 3, 1931. Serial No. 548,659.

This invention relates to the casing heads of oil and gas wells and particularly to means for preventing a well from accidently "coming in" while it is being drilled.

The general object of the mechanism is to provide a device of this character which does not require to be initially put in place around the drill stem and engaged with the casing head but which at any time may be so put in place and which, in case the well accidently comes in, while drilling, will seal the space between the casing head and the drill stem so that the flow from the well can be taken care of by means of the side outlets ordinarily found in casing heads, or if gates were applied to these outlets of the casing head, then with these gates closed, mud pressure may be applied through the drill stem to the wall until the flow is killed.

A further object is to provide a mechanism of this character whereby the well can be controlled any number of times temporarily until the drill stem can be gotten out of the hole and the proper connections can be made to seal the well.

A still further object is to provide means operable to prevent any lifting of the tubing by the pressure in the well.

A further object is to provide a device of this character which may be readily put in place within the usual casing head and automatically locked thereto around the drill pipe and which may also be readily removed.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a vertical sectional view through a casing head and drill stem showing my blow-out preventer attachment applied thereto and in section;

Figure 2 is a top plan view of the upper end of the blow-out preventer;

Figure 3 is a top plan view of the collar;

Figure 4 is a top plan view of the upper wedge section;

Figure 5 is an under side plan view of the upper and lower wedge sections;

Figure 6 is a section on the line 6—6 of Figure 4.

Referring to these drawings, A designates the casing of the well and B the usual drill tube, C indicating the usual casing head formed with the side outlets *c* and with the upwardly expanding slip bowl D formed as part thereof. This slip bowl D at its upper end is exteriorly screw-threaded at *d*. So far I have described a structure common in use.

In connection with the casing head, a collar is commonly used which engages the screw-threads *d* and extends above the upper end of the casing, this collar having teeth upon its inner surface.

As part of my invention, I use such a collar as that referred to which is designated 10 and has screw-threaded engagement with the threads *d*, this collar, however, at its upper end being formed with two or more outwardly projecting bolt casings 11, the upper walls of which are slotted as at 12. Disposed in these casings and engaged by the springs 13 are the bolts or dogs 14 which have their inner ends beveled downwardly. Each bolt has an upwardly projecting screw-threaded pin 15 carrying a nut 16. These nuts may be tightened to hold the bolts 14 retracted or the bolts may be released and the springs 13 will force the bolts inward.

During the drilling of the well and while this drilling operation is proceeding normally, this collar 11 with its bolts 14 is connected to the upper end of the bowl D the bolts being held retracted by the nuts 16.

Coacting with the collar and with its locking bolts is a two-part sealing member designated generally 17. This sealing member is split at 18 so that it is in two halves. Each half is approximately semi-annular and is adapted to embrace the drill stem B and each half is formed with a spring actuated latch 19 adapted to engage in a recess 20 in the other half of this sealing annulus. The exterior of this sealing member 17 is formed with circumferentially extending grooves 21, these grooves being ratchet grooves.

Anchored to the lower ends of the two sections of this sealing member are the two packing sections 22 which may be made of rubber, lead or any other suitable material.

These packing sections, however, are preferably made of lead and are so indicated and if made of lead, the packing sections have rubber inserts 23 disposed upon the inner faces of the packing sections. The outer faces of these packing sections are beveled downwardly so as to fit the inner face of the casing head and pack the space between the inner face of this bowl and the circumferential face of the drill stem D. The anchors for holding this packing material 22 to the lower end of the split annulus 17 are designated 24.

The object of this construction is that inasmuch as the pipe is not always and at all points perfectly round and inasmuch as this pipe furthermore has a semi-rough surface, if the packing element was of steel or any other hard or non-compressible material, the downward movement would be stopped when the circular outside diameter on the taper of the packing element reached a point corresponding to the inside diameter of the taper of the bowl, but by having the packing made of non-compressible material such as lead or vulcanized medium-hard rubber, there would be an inward movement toward the inner string of pipe and the downward movement will continue until all the space between the inner string of pipe and the bowl is filled. The elastic inserts come into action against the pipe and take care of the roughened surface of the pipe, filling and making a complete joint.

Above the packing 22, the inner face of the element 17 is chambered as at 25, this chambered extending upward, then outward and then again upward as at 26.

At the upper end of this member 17, there are provided the opposed lock bolt casings 27 within each of which is disposed a sliding lock bolt 28 urged outward by a spring 29 and each having a pin 30 extending out through a slot 31 formed in the top of the casing and each pin carrying the nut 32. Shackle rings 33 engage the member 17 so that this member may be lifted or otherwise handled by the usual cables, chains or other devices.

Disposed within the annular chamber 25 are the opposed wedges 34 and 35. The wedge 34 has a straight upwardly extending inner face and is formed with downwardly inclined teeth upon its inner face to engage the drill stem. The outer face of the wedge 34 is beveled downward and outward. The inner face of the wedge 35 is complementary to the outer face of the wedge 34. The two wedges are held in engagement with each other by the screws 36. The upper end of the wedge 35 is formed with the upwardly and outwardly inclined circumferential teeth 37 with which the lock bolts 31 are adapted to coact. The adjoined wedges are annular in plan view. The wedge 35 is formed in two sections and the wedge 34 is also formed in two sections, these sections, however, being disposed with their joints at right angles to the joints of the sections of the wedges 35. The sections are connected by pins 38 disposed in bores 39, thus permitting the two sections to approach and recede from each other.

In the operation of this mechanism, the casing head and hold-down ring 10 are installed and drilling into the oil sands or running tubing is performed in the usual manner. Slips for supporting the tubing during this operation will be used in the taper bowl D of the casing head as usual.

Should the well attempt to flow, all that is necessary in order to form a seal is to pick up the assembly formed of the parts 17 with the packing 22 anchored thereto and place it on the tube or drill stem and lower into the collar. This causes the packing 23 to compress against the pipe and the taper on the seal 22 to fit into the taper bowl of the casing head. The bolts 14, of course, yield to permit the downward movement of the assembly, but lock over the teeth 21 and resist any upward movement of the assembly.

If now for any reason the pressure on the well is great enough to start to lift the tubing, the wedges or slips 34 and 35, which, as I have described are made in two halves, can be dropped into the space of chamber 25 and the drill stem or tubing can be dropped down until the coupling *b* on the drill stem or tubing rests upon the upper end of the wedges 35. This forces the slips 34 inward against the tubing or pipe. The latch 33 taking hold of the teeth 37 on wedge 35, prevents the whole assembly from lifting as well as preventing the pipe from lifting through the packing. It will be seen that my construction is particularly designed to hold the pipe against any upward movement, but only in case the pressure in the well is sufficient to lift the pipe out. My construction, however, does not hold the pipe against downward movement which is permitted to a certain extent and indeed is necessary in order that the packing 22 and 23 shall be fully compressed. When the flow is stopped, then by sliding the latch bolts out of their engaging position, the operator would be capable of picking up the drill stem and the first coupling on the drill stem or pipe bearing against the packing 22 would lift this emergency control out of the casing head.

In this manner, the well can be controlled any number of times temporarily until the drill stem could finally be gotten out of the hole and the proper connections could be made to seal the well up.

I claim:—

1. In a well drilling apparatus, a casing head having an upwardly extending bowl, a collar carried by the bowl, an annular packing member, the packing member being in-

sertible into the casing head bowl around an inner string of pipe, a plurality of spring projected latches carried by said collar and having means whereby they may be manually retracted, the packing member having upwardly inclined teeth with which said latches are adapted to engage to prevent upward movement of the packing member, but permitting free downward movement of the packing member under the action of gravity and means engaged by the collar against upward movement, said means preventing upward movement of the string of pipe passing through the casing head and collar.

2. In a well drilling apparatus, a casing head having a bowl, and a collar carried by the bowl, an annular element having an annular packing member anchored at its lower end, the outside face of the packing member being beveled to fit the bowl and the element and packing member being insertible within the collar and bowl respectively, the annular element being chambered at its center and having its exterior face formed with upwardly extending teeth, latches carried by the collar and engageable with said teeth to permit downward movement of the element but prevent upward movement thereof, reversely disposed wedges disposed within said chamber and adapted to engage against and hold a central pipe against upward movement, and means carried by said annular element for locking the wedges against upward movement, but permitting downward movement thereof.

3. In well drilling apparatus, a casing head having a bowl, and a collar carried by the bowl, an annular element having an annular packing member anchored at its lower end, the outside face of the packing member being beveled to fit the bowl and the element and packing member being insertible within the collar and bowl respectively, the annular element being chambered at its center and having its exterior face formed with downwardly inclined ratchet teeth, latching means carried on the collar for engaging said ratchet teeth and permitting downward movement of the element but preventing upward movement thereof, wedges disposed within said chamber at the lower end thereof and having an outwardly and downwardly inclined outer face, outer wedging elements having downwardly and outwardly inclined inner faces coacting with the outer faces of the first named wedging elements and disposed within said chamber adapted to be forced downward by engagement with a coupling of a drill pipe, and means on said annular element for latching the second named wedges against upward movement, but permitting the downward movement thereof.

4. In well drilling apparatus, a casing head having a bowl, and a collar carried by the bowl, an annular element having an annular packing member anchored at its lower end, the outside face of the packing member being beveled to fit the bowl and the element and packing member being insertible within the collar and bowl respectively, the annular element being chambered at its center and having its exterior face formed with downwardly inclined ratchet teeth, latching means carried on the collar for engaging said ratchet teeth and permitting downward movement of the element but preventing upward movement thereof, wedges disposed within said chamber at the lower end thereof and having an outwardly and downwardly inclined outer face, outer wedging elements having downwardly and outwardly inclined inner faces coacting with the outer faces of the first named wedging elements and disposed within said chamber adapted to be forced downward by engagement with a coupling of a drill pipe, and means on said annular element for latching the second named wedges against upward movement, but permitting the downward movement thereof including spring actuated inwardly projecting latching bolts carried by the annular element, the outer faces of the second named wedging elements having upwardly inclined teeth with which said latching bolts are adapted to engage.

5. In a well drilling apparatus, a casing head having a bowl and a collar carried by the bowl and inwardly projected spring actuated latch bolts carried by the collar, an annular member carrying an annular packing at its lower end and adapted to be inserted into the space between said collar and a central pipe with the packing disposed in said bowl, the outer face of the annular member having teeth with which the bolts engage, the teeth being inclined upon their lower faces and the bolt being inclined upon its upper face to permit downward movement of the annular member, pipe gripping means carried by the annular member, means for forcing said pipe gripping means inwardly under the weight of a central pipe, and means for latching said pipe gripping means from upward movement but permitting its downward movement.

6. A structure of the character described, comprising a packing member having a compressible portion formed with a downwardly and inwardly inclined outer face whereby it may be inserted within the bowl of the casing head and packed around a central element therein, a collar detachably engageable with the casing head and having spring actuated inwardly projecting latches, the upper faces of the latches being beveled downward and inward, the packing member having upwardly inclined teeth engageable by said latches, and means detachably engaged with the collar above the packing member and

operating to prevent upward movement of the central element.

7. In a well drilling apparatus, a casing head having a bowl through which an inner string of pipe may pass, an annular compressible packing member insertible into the bowl, means carried by the bowl for locking the packing member against upward movement but permitting free downward movement of the packing member, and means carried entirely by the packing member locking the inner string of pipe against upward movement in any position of the pipe.

8. In a well drilling apparatus, a casing head having a bowl through which an inner string of pipe may pass, an annular compressible packing member insertible into the bowl, means carried by the bowl for locking the packing member against upward movement but permitting free downward movement thereof, and means carried by the packing member locking the inner string of pipe against upward movement including wedges engaging the inner string of pipe, downwardly movable wedges engaging the first named wedges and upon downward movement urging them into engagement with the string of pipe and resiliently operated latches carried by the packing member and engaging the last named wedges to prevent upward movement thereof but permit downward movement thereof.

In testimony whereof I affix my signature.

LEE J. BLACK.