June 22, 1943. H. ALLEN 2,322,269

BLOWOUT PREVENTER

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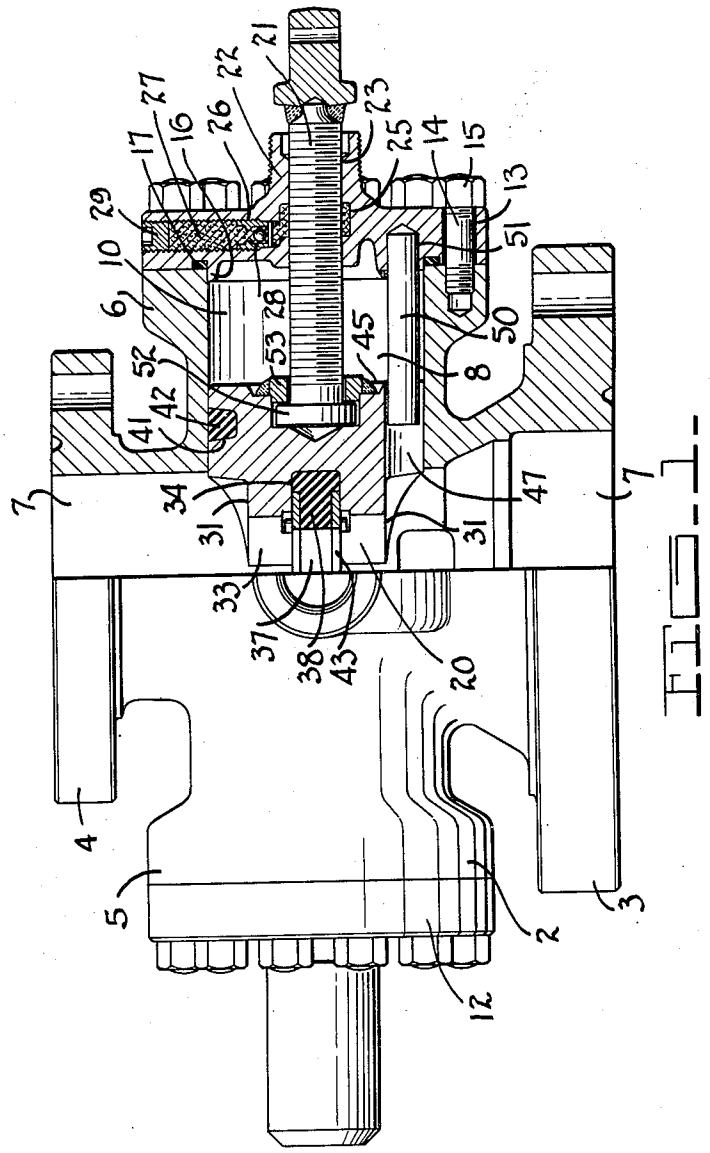


FIG. 1

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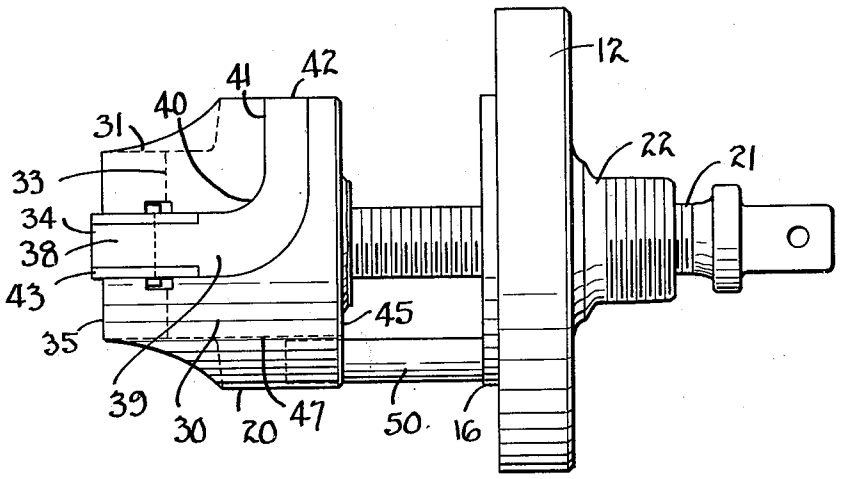


FIG. 2.

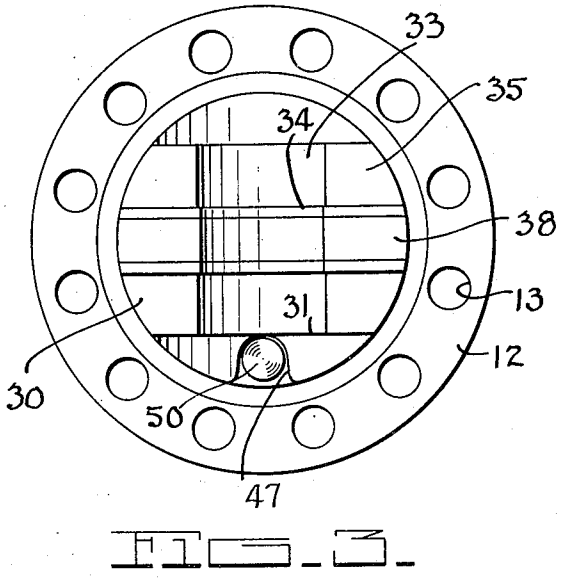


FIG. 3.

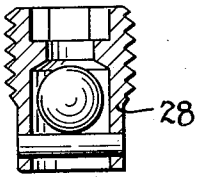


FIG. 4.

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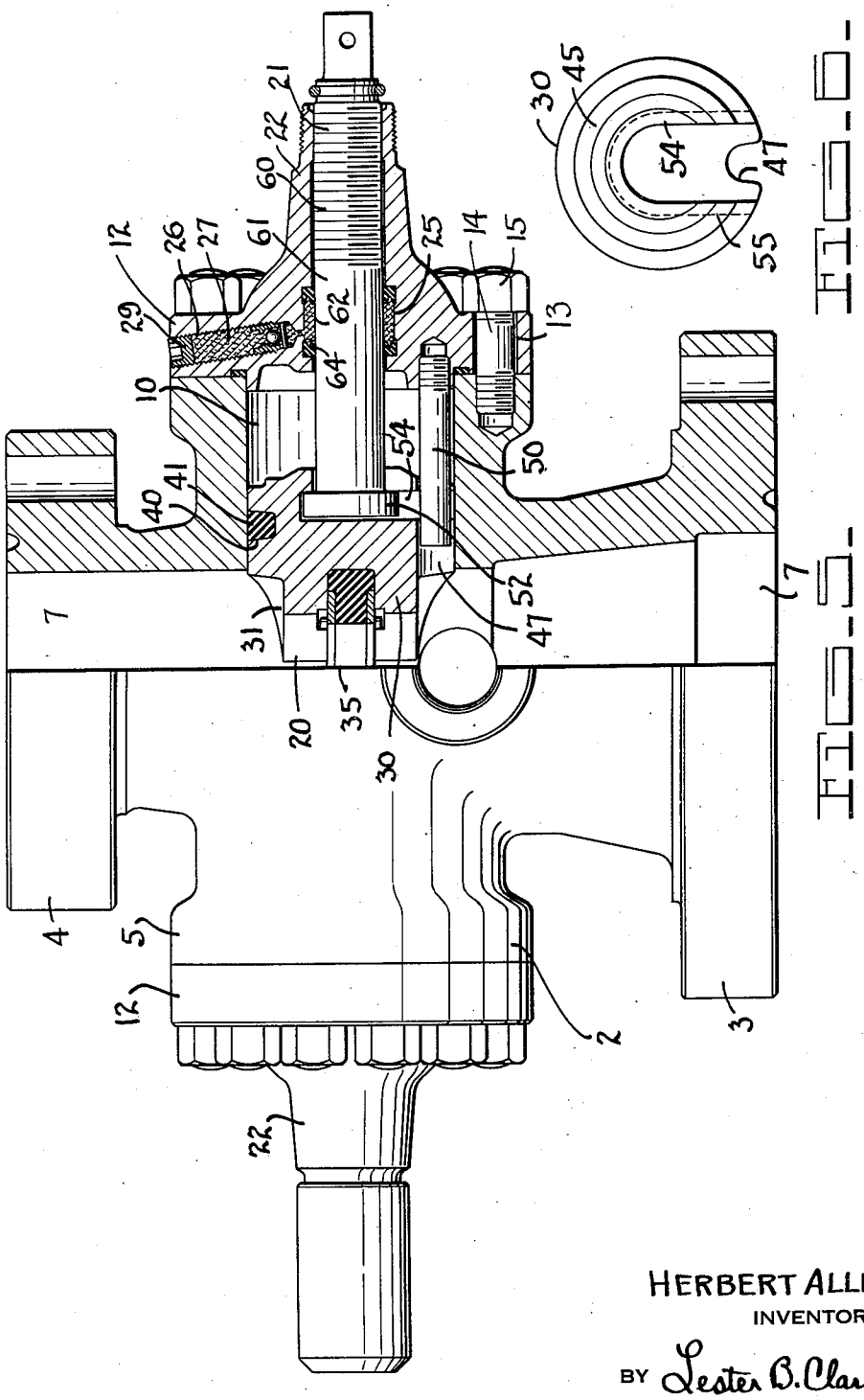


FIG. 5.

FIG. 6.

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UNITED STATES PATENT OFFICE

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BLOWOUT PREVENTER

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Application October 14, 1940, Serial No. 361,033

6 Claims. (Cl. 137—139)

The invention relates to a blowout preventer and particularly to an insert assembly therefor which is made up of the ram and a bonnet or cap portion which can be readily applied to or removed from the blowout preventer housing.

Many types of wells require a small and economical type of blowout preventer construction which can be manually operated where the well pressure is permitted behind the rams to facilitate the closing of the blowout preventer under higher pressures. Small preventers of this type are subject to use on the well during the drilling operation and it is necessary to close them at different times about different sizes of pipe or casing. It is therefore desirable that the ram assembly be capable of insertion and removable so as to provide a ram which will fit about pipes of different diameter. With this in mind a unitary assembly has been provided which can be applied or removed by a series of bolts to the blowout preventer housing.

It is one of the objects of the invention to provide a blowout preventer housing with a removable ram and bonnet structure wherein the pressure can be equalized on the ram.

Another object of the invention is to provide a blowout preventer bonnet with a fluid pressure packing in a blowout preventer bonnet about a smooth portion of the ram spindle so as to maintain a seal thereabout.

It is also an object of the invention to provide a unitary bonnet and ram structure for blowout preventers or drilling valves wherein the bonnet is bolted in position.

Another object of the invention is to provide a fluid pressure packing in a blowout preventer bonnet about a smooth portion of the ram spindle so that a seal may be maintained about the spindle.

Another object of the invention is to provide a blowout preventer ram with a transverse packing which extends over the top of the ram as a unitary piece of material.

Another object of the invention is to provide a blowout preventer ram with a groove therein which is arranged to receive a guide pin and also allow the well pressure to flow in behind the ram.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation of a blowout preventer, the right hand of which is shown in section as illustrating the construction of the parts.

Fig. 2 is a side elevation of the ram and bonnet insert assembly.

Fig. 3 is an end elevation looking from the right at the assembly of Fig. 2.

Fig. 4 is a vertical section of the check valve in the fluid pressure packing for the spindle.

Fig. 5 is a side elevation of the blowout preventer, the right hand of which is shown in section as illustrating a modified form of the construction of Fig. 1 where the spindle has a smooth portion about which the packing is applied.

Fig. 6 is an end view of the ram of Fig. 5 illustrating the socket for connection to the spindle.

Fig. 1 illustrates a blowout preventer housing 2 which has the base flange 3 and the top flange 4 by which it is connected in the well head assembly. The housing has the lateral projections 5 and 6 at each side thereof. A vertical passage 7 extends entirely thru the housing and is intersected by a transverse passage 8 which also extends entirely thru the housing. The passage 8 is on each side of the passage 7 which is arranged to receive a ram chamber 10.

Fig. 2 shows the combination ram and bonnet assembly which is to be attached to the housing 2. This construction embodies a bonnet body 12 which is in the form of a flat flange having a series of openings 13 therein to receive the bolts 14 carried by the end of the extensions 5 and 6. The ends 15 are used to affix this bonnet to the body. The bonnet has a forwardly directed rib 16 which confines a packing ring 17 to form a seal with the end of the blowout preventer body.

The ram and bonnet assembly is a unitary assembly which can be inserted and removed as a single unit relative to the blowout preventer housing.

In order to movably support the ram 20 in the bonnet 12, a spindle 21 is threaded into a hub or extension portion 22 by having the threads 23 engaging the internal threads in the extension 22. In this manner turning of the spindle will cause it to move relative to the body 12 of the bonnet.

In order to maintain a seal about the spindle 21 in the bonnet, a recess 25 is provided in the body of the bonnet and has a lateral port 26 leading out thru the body of the bonnet. This port is arranged to receive a body of material 27, such as a lubricant or grease which can be forced into the recess 25 by a suitable fitting or by adjustment of the closure plug 29. A check valve 28 prevents the return of the liquid material. With this construction any desired pressure may be maintained about the spindle which will preferably be in excess of the pressure en-

countered in the well so as to forestall any leakage along the spindle.

The ram structure 20 is of a particular configuration in that it includes a body portion 30 which is generally circular in configuration but has the depressions or flat portions 31 at the top and the bottom thereof so as to provide a seat for the coupling on a pipe about which a closure is being made. In this manner a string of pipe may be supported against downward movement by the rams or confined against upward movement, as the case may be. This body 30 has a semi-circular area 33 on the front face which will cooperate with a smaller area in the opposite ram so as to close about a string of pipe.

A packing groove 34 extends across the front face 35 of the ram body, as best seen in Fig. 3 and is arranged to receive a packing assembly 37 which is in the form of a body 38 of packing, which has the side leg portions 39 which extend in side grooves along the body of the ram. The side grooves are curved upwardly at 40 and join a curved groove 41 extending around the top of the body.

The side legs 39 of the packing follow this curve and form an arch portion 42 over the top of the ram. The retainer plates 43 are shown as floating on the top and bottom of the packing body 38 so as to confine the material where it projects beyond the body of the ram. In this manner when the ram is forced against a string of pipe the resilient packing material will be compressed so as to establish a uniform pressure throughout the packing material to prevent leakage.

In order that the ram may be operated manually by turning of the spindle 21, it is desirable to equalize the pressure on the forward face 35 and the rear face 45. To accomplish this, as best seen in Figs. 1 and 3, the lower or base portion of the ram body 31 is provided with a longitudinal groove 47. This groove joins the flat portion 41 with the rear face 45 so that there may be flow of pressure from the passage 7 into the ram chamber 10 behind the ram.

In order to hold the ram member 20 against turning, due to rotation of the spindle 21, a guide pin 50 is fixed at 51 in the bonnet 12 and projects into the ram chamber 10 so as to extend into the groove 47. This arrangement is seen in Fig. 1. In this manner the ram may be constrained against rotation and caused to slide back and forth in the chamber 10 and upon movement of the spindle 21.

The spindle 21 and head 52 thereon which is deposited in the recess of the rear face 45 of the ram is held in place by a retainer ring 53 so that the spindle may rotate relative to the ram.

Fig. 5 shows a slightly different arrangement of this connection of the head 52 of the spindle 21, in that a slot 54 is provided in the rear face 45 of the ram so that the ram may be slipped laterally across the head 52 of the spindle and the head 52 will fit into an undercut portion 55 of the slot 54, as best seen in Fig. 6. This construction is provided so that the bonnet assembly can be readily removed, the ram lifted off the end of the spindle and the ram carrying a new packing or a different size recess 33 can be quickly attached and reinserted in the preventer.

Fig. 5 shows a slightly different form of spindle 22, in that the threads 60 on the spindle extend only partially along the surface thereof, leaving a blank or smooth surface 61 which is adjacent the packing 62. In this manner the threads will not effect the packing seal and the packing will not be disturbed by the threads as the spindle is rotated.

This form of packing is of particular advantage under high pressures because the recess 25 may receive a lip type packing ring 64 at each end thereof with the lips of the ring facing toward each other. Thus, the packing material 27 may be forced thru the lateral port 26 into the recess 25 to spread the lip packing ring 64.

Broadly the invention contemplates a simple and economical type of blowout preventer wherein the spindle may be properly sealed against leakage and the ram and bonnet assembly readily inserted or removed.

What is claimed is:

1. A blowout preventer including a housing, vertical and transverse passages thru said housing, an insert ram and bonnet assembly bolted on each end of said transverse passage, each insert including a bonnet cap, means to attach said cap to the housing, an extension on said cap, a manually operable spindle extending thru said cap and extension and threaded into said extension, a smooth surface on said spindle where it passes thru said cap, a fluid pressure packing in said cap about said smooth spindle portion so as to maintain a seal about said spindle, a ram fitted into said passage, a head and slot connection for said ram to the inner end of said spindle, a packing on said ram to seal across the front face and around the upper side thereof, a groove longitudinally of the ram at its lower side, and a guide pin fixed in said cap and projecting into said transverse passage and into said groove so that said ram will be held against rotation, said head and slot and pin and groove connections permitting the raising and lowering of the ram relative to said bonnet assembly whereby the size of ram may be readily changed by disconnecting the bonnet.

2. A blowout preventer including a housing, vertical and transverse passages thru said housing, an insert ram and bonnet assembly for each end of said transverse passage, each insert including a bonnet cap, means to attach said cap to the housing, an extension on said cap, a manually operable spindle extending thru said cap and extension and threaded into said extension, a smooth surface on said spindle where it passes thru said cap, a fluid pressure packing in said cap about said smooth spindle portion so as to maintain a seal about said spindle, a ram fitted into said passage and having a slot and head connection so as to be moved by the inner end of said spindle, a packing on said ram to seal across the front face and around the upper side thereof, a groove longitudinally of the ram at its lower side, and a guide pin fixed in said cap and projecting into said transverse passage and into said groove so that said ram will be held against rotation, said packing having a flat front body portion, a side leg extending rearwardly at each edge of the body and upwardly curved to join together in forming an arch portion to extend over the top of the ram, said assemblies being bolted to said housing.

3. A blowout preventer including a housing, vertical and transverse passages through said housing, an insert ram and bonnet assembly bolted to each end of said transverse passage, each insert including a bonnet cap, means to attach said cap to the housing, an extension on said cap, a manually operable spindle extending through said cap and extension and threaded for

axial movement in said extension, a fluid pressure packing in said cap about said spindle portion so as to maintain a seal about said spindle, a ram fitted into said passage and connected to be moved by the inner end of said spindle, a packing on said ram to seal across the front face and around the upper side thereof, a groove longitudinally of the ram at its lower side, and a guide pin fixed in said cap and projecting into said transverse passage and into said groove so that said ram will be held against rotation, said spindle and pin connections to the ram being such that the ram may be removed laterally therefrom.

4. A blowout preventer ram assembly including a cylindrical body, a packing groove extending across the front end of the ram partially along the sides and curved to extend over the top of the body, a flat portion at the top and bottom forward edges of the body, a longitudinal groove along the bottom of the body, a spindle recess in the back of the body, and a bonnet having a spindle and a pin projecting therefrom, said spindle being adapted for said spindle recess and said pin fitting into said bottom groove whereby said pin and spindle removably receive said ram.

5. A blowout preventer ram including a cylindrical body, a packing groove extending across the front end of the ram partially along the sides and curved to extend over the top of the body, a flat portion at the top and bottom forward edges of the body, a longitudinal groove along the bottom of the body, a spindle recess in the back of the body, a unitary piece of resilient packing material in said groove including top and bottom retainer plates in the front cross section, and means including a projecting pin and a projecting spindle to removably receive said ram by fitting into said bottom groove and said recess respectively whereby said ram may be interchangeably carried by said means.

6. A blowout preventer bonnet and ram assembly whereby the rams of a blowout preventer may be removed and interchanged to provide rams to accommodate different sized pipe or to close the well including a bonnet structure, a ram spindle rotatable therein, a ram guide pin projecting therefrom, a ram, a spindle slot transversely of the ram, a guide pin groove in the periphery of said ram whereby said ram may be deposited and removed relative to the bonnet, spindle and pin by a transverse sliding movement.

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