

Dec. 6, 1932.

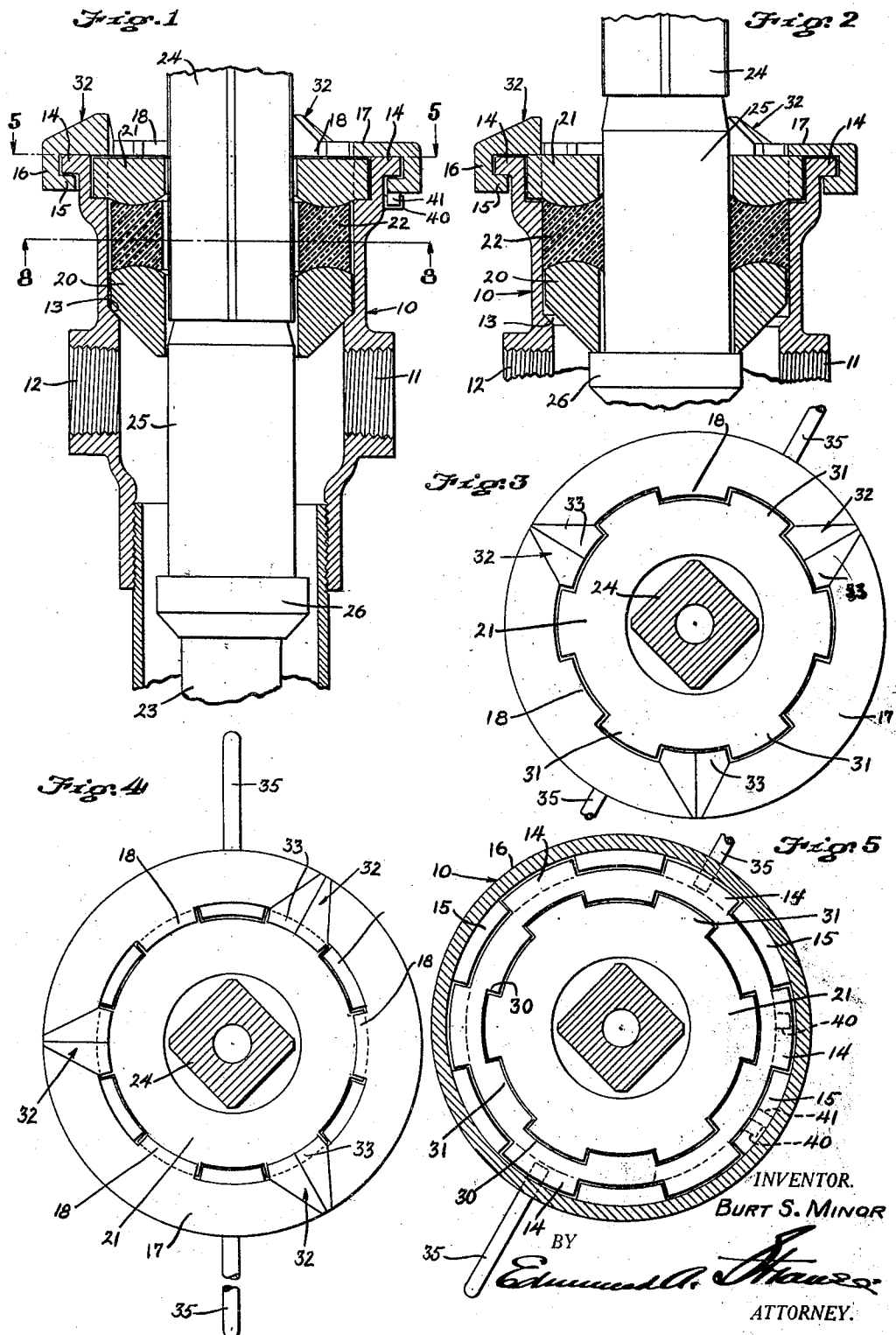
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1,889,787

DEVICE FOR CONTROLLING PRESSURES IN OIL WELLS

Filed June 9, 1926

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Fig. 6

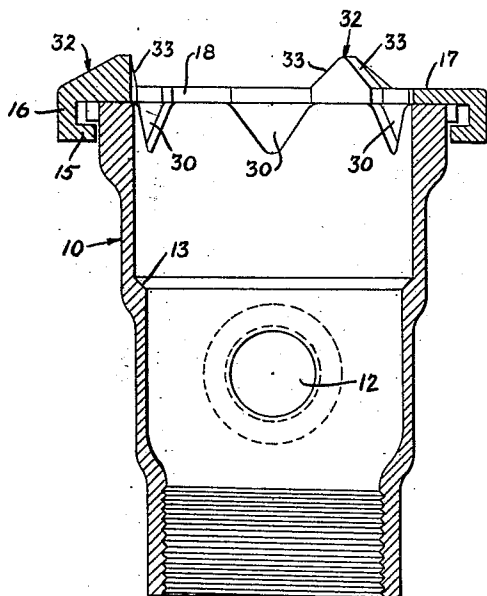


Fig. 7

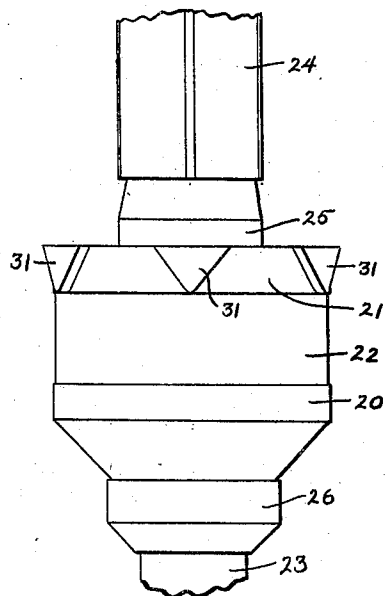


Fig. 8

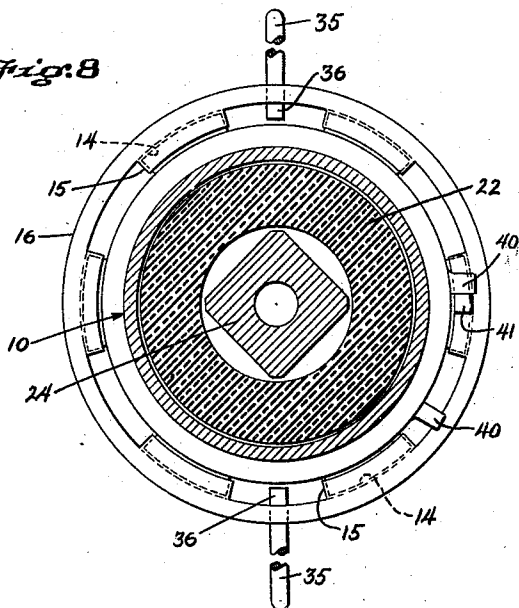
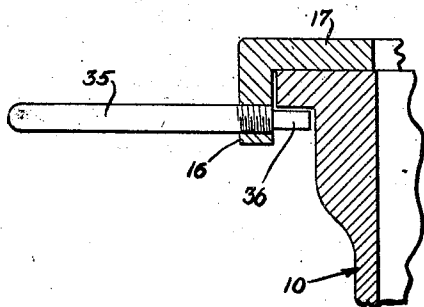


Fig. 9



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DEVICE FOR CONTROLLING PRESSURES IN OIL WELLS

Application filed June 9, 1926. Serial No. 114,605.

This invention refers more specifically to oil well packing mechanisms for controlling excessive gas or fluid pressures in oil wells and relates to improvements in a packing mechanism described and claimed in my application for U. S. Letters Patent entitled "Blow-out device for oil wells" bearing Serial No. 80,439 filed in the U. S. Patent Office January 11, 1926.

10 In the above application I described and illustrated a packing mechanism mounted in the well casing head adapted to be expanded to "pack off" the well casing and drill stem by impact of an annular abutment formed on the drill stem. Such mechanism has 15 proven satisfactory in well drilling operations with the single exception that the insertion and removal of the packing mechanism to and from the head has entailed considerable labor and consequent loss of time.

20 In my improved device the packing mechanism may be quickly guided into seated position within the casing head, and by the provision of a locking ring rotatably and detachably secured to the head, the packing mechanism can be securely locked therein, or may be as quickly removed therefrom without 25 detaching the locking ring.

30 An important object of this invention is to provide a packing mechanism for casing heads that may be quickly locked into position in the head, and as readily removed therefrom when it is desired to withdraw the stem with its bit from the well.

35 A further object is to provide a packing mechanism for casing heads in which means are provided for preventing its accidental rotation during a drilling operation.

40 A still further object is to provide a means on the packing mechanism locking ring for automatically guiding the packing mechanism into a seated position within the casing head when the same is lowered into position.

45 Briefly, the invention consists of a vented casing head member adapted to be detachably secured to the upper end of a string of well casing. The upper end of this member is provided with a plurality of offset locking lugs equally spaced apart and adapted to 50 co-operate with similar lugs formed on a

locking ring for locking the same to the casing head member. Formed on the interior surface of the casing head member directly above the vented openings is an annular seat for the reception of the packing mechanism. 55 This mechanism is here shown as consisting of a pair of apertured metallic disk members, and an apertured disk member formed of a compressible material interposed therebetween, the lower disk member being normally disposed upon the annular seat formed on the head member. Extending downwardly from the upper end of the tubular member and on its interior surface are a plurality of V shaped recesses, or seats adapted to be engaged by V shaped lugs formed on the edge 60 of the upper metallic disk member, the seated lugs preventing an accidental rotation of the packing mechanism during a drilling operation. Around the circular opening in the locking ring is formed a plurality of lugs 65 equally spaced apart adapted to engage the upper ends of the V shaped lugs formed on the upper metal disk of the packing mechanism when the ring is rotated to lock the packing mechanism in the casing head. The drill stem and "kelly" attached to the upper end thereof pass through the disk apertures, and the packing mechanism is adapted to be 70 engaged by an annular abutment formed on the drill stem when the same is pulled upwardly thereagainst to expand the compressible disk into fluid tight engagement with the stem and the head on the development of an excess pressure in the well. 75

80 In order to position the V shaped lugs formed on the upper metallic disk members with respect to their seats formed on the casing head, a plurality of positioning lugs of inverted V shape are formed on the upper face of the locking ring. By means of these lugs the V shaped locking lugs formed on the upper metallic disk member, the packing disk is rotated and the lugs are guided into 85 the seats of the casing head, thus avoiding the necessity of manually rotating the heavy packing mechanism to position the lugs with respect to their seats on the casing head.

100 In the drawings wherein certain embodi-

ments of the invention are disclosed by way of example:

Fig. 1 is a central vertical section through the casing head showing the packing mechanism in unexpanded position.

Fig. 2 is a similar view with the packing mechanism expanded.

Fig. 3 is a plan view of the device with the locking ring rotated to an unlocked position.

Fig. 4 is a similar view with the locking ring rotated to a locked position.

Fig. 5 is a transverse section taken on line 5—5 of Fig. 1 with the locking ring rotated to an unlocked position.

Fig. 6 is a central vertical section through the casing head with the drill stem and packing mechanism removed.

Fig. 7 is a side elevation of the packing mechanism.

Fig. 8 is a transverse section through the casing head taken on line 8—8 of Fig. 1.

Fig. 9 is an enlarged detail sectional view of the upper wall of the casing head showing the means for rotating the locking ring and preventing its detachment from the head.

Referring more specifically to the drawings 10 designates a tubular casing head, interiorly threaded on its lower end for attachment to the upper threaded end of a string of well casing. This head is provided with a pair of internally threaded openings 11, 12 for the reception of the usual pipe lines (not shown) and directly above these openings is an annular seat 13, for the reception of the packing mechanism. The upper end of the casing head is provided with a plurality of segmental outwardly extending locking lugs 14, equally spaced apart adapted to co-operate with similar inwardly projecting lugs 15 formed on the downwardly extending circular flange 16, of a flat detachable locking ring 17, the length of said lugs being slightly less than the space between the lugs 14 formed on the casing head in order that the lugs 15 may freely pass therebetween. The lugs 15 are disposed in a plane directly below the lugs 14, so that when the ring is rotated to a locked position the lugs will register with and engage the lugs 14 to lock the ring to the locking head. Formed around the inner circular edge of the flat ring 17 are a plurality of segmental lugs 18 equally spaced apart designed to form abutments for the lugs on the upper metal disk of the packing mechanism when the drill stem is drawn upwardly to expand the packing disk on a development of an unexpected or excessive pressure, and to lock the packing mechanism within the head.

The packing mechanism preferably consists of a plurality of apertured rings disposed one upon another, the lower metal ring 20 having a convexed upper surface and a conical external portion 19, while the upper

metal ring 21, is convexed on its lower face. The packing ring 22 is formed of an elastic material such as rubber and is concaved on its upper and lower faces, the convexed surfaces of the metal rings snugly nesting within the concavities of the packing ring. Detachably secured to the oppositely disposed ends of the drill pipe 23 and the "kelly" 24 is a short hollow sleeve 25 provided at its lower end with an annular abutment 26 adapted to engage and contact with the lower metal disk 20 on an upward movement of the drill stem when it is desired to pack the head against pressure, see Fig. 2. At the upper end of the casing head on its interior surface are formed downwardly extending V shaped recesses or seats 30, for the reception of similarly formed lugs 31 formed on the periphery of the metal disk 21 of the packing mechanism the seated lugs designed to prevent an accidental rotation of the packing mechanism during the rotation of the drilling mechanism.

When the drill stem and packing mechanism connected thereto is lowered into the well casing the locking lugs 31 formed on the upper metal disk member are oftentimes out of alinement with their seats formed on the casing head, and as the packing disks are of heavy construction and difficult to rotate manually, a positioning or guiding means has been devised for automatically rotating the disk member to guide the lugs formed thereon into their seats. This guiding means is here shown as consisting of a plurality of inverted V shaped lugs 32 formed integrally with the upper face of locking ring 17, the lugs being disposed between some of the recesses 30 of the locking ring. During a lowering operation of the drill stem should the lugs 31 of the disk 21 be out of alinement with their seats formed on the casing head, the moment the pointed ends of the lugs of the disk member engages the lugs 32 their inclined surfaces 33 will rotate the disk 21 and guide the lugs 31 into their seated position.

By forming a conical external surface 19 on the lower metal packing ring 20 it will be apparent that the packing mechanism may be easily guided into position within the head when the drill stem is lowered into the well casing.

Locking ring 17 is provided with a pair of oppositely disposed handles 35 that are attached to the flange 16 of the ring in order that the ring may be easily rotated to a locked or unlocked position, the inner ends 36 of the handles projecting beyond the inner peripheral surface of the flange 16 engage the under surface of the lugs 14 when the ring is rotated to an unlocked position to prevent the accidental detachment of the ring 17 from the head on a withdrawal of the packing mechanism from the well casing.

The outer surface of the casing head is

provided with a pair of stops 40, in the form of lugs, and the locking ring is provided with a lug 41 formed integrally with the under surface of one of the ring locking lugs 15. By means of the above the ring 17 may be rotated readily into a locked or unlocked position, the stops limiting its movement in either direction of rotation.

From the above description it will be apparent that the drill stem with the packing mechanism may be readily inserted within the wall casing, and as easily removed therefrom without the necessity of unscrewing collars or other mechanism from the casing head, as in my former construction.

The operation of the packing mechanism is substantially as follows. The packing mechanism which consists of the metallic rings with an elastic ring interposed therebetween is mounted on the drill stem, and the ring 17 is rotated to bring the lugs 18 out of register with the lugs 31 on the upper metal packing disk. The bit and drill stem with the packing mechanism is then lowered downwardly into the well casing, the lower metal disk of the packing mechanism resting on the annular inner flange 13 of the head and the lugs 31 of the upper metal ring resting in the recesses at the top of the head, the locking ring is then rotated in a reverse direction to bring the lugs 18 into register with the lugs 31 to lock the packing mechanism in the head. The drill stem is then rotated in the usual manner, and when an excess fluid pressure is encountered in the drilling operation the stem is drawn rapidly upward out of the well until the annular abutment 26 of the sleeve 25 contacts with the lower surface of the metallic ring 21 to expand the elastic member 22 into packed relation with the head and sleeve as clearly shown in Fig. 2 of the drawings. When the casing head and stem have been packed off to control the excess pressure of the well semi-fluid mud of a denser consistency than the mud usually employed in drilling operations is forced downwardly under pressure through the hollow drill stem into the well above the excess pressure to control same. The introduction of the heavy semi-fluid mud in the well is usually sufficient to control any premature blow-out, the mud circulation being controlled through the valve outlets 11 and 12 in the casing head. As soon as the excess pressure has been sufficiently controlled the stem may be again lowered into the well and drilling operation resumed.

What I claim is:

1. In combination with a well drilling mechanism provided with an abutment, of a vented casing head having a plurality of seats formed around the upper end thereof, said head adapted to be detachably secured to the upper end of a string of well casing, a packing mechanism including a pair of aper-

tured metal disk members and an expansible apertured disk member interposed between said members, the upper disk member being provided with a plurality of offset lugs adapted to engage the seats formed on the casing head at the upper end thereof, a locking ring provided with means for locking the ring to the casing head and the packing disks within said head, and means formed on said ring for guiding the offset lugs on the upper disk member into the seats formed on the casing head when the drilling mechanism is lowered into the well.

2. In combination with a drilling mechanism including a stem having an annular abutment formed thereof, of a vented casing head having an annular seat formed above the vents therein and a plurality of bearing seats around its interior upper end, an expansible packing mechanism comprising a pair of metallic disks and an expansible disk interposed therebetween, the lower of said disks engaging the annular seat of the casing head, the upper disk being provided with a plurality of bearing lugs each having inclined surfaces adapted to engage the seats formed on the casing head, a locking ring detachably secured to the upper end of said casing head, said ring being provided with a plurality of offset lugs around its inner periphery adapted to engage and register with the lugs formed on the upper disk member of the packing mechanism to lock said mechanism within said casing head, and a plurality of positioning lugs each having inclined surfaces formed on the upper face of the locking ring around its opening and in register with the offset lugs, whereby when the packing mechanism is lowered into the casing head the positioning lugs on the locking ring will rotate the upper packing ring and guide the lugs formed thereon into their seats on the casing head.

3. A packing mechanism for oil well casing heads comprising an open ended vented body member adapted for attachment to an upper string of oil well casing, a compressible packing mechanism disposed in the upper end of said head above the vents, said packing mechanism being provided with openings there-through to permit of the free passage of the drilling mechanism therethrough and to permit of the free operation of the "kelly" bar during a drilling operation, detachable means carrying an abutment member interposed between the "kelly" bar and the drill stem adapted to fill the opening in the packing mechanism, whereby when the drill stem is moved upwardly the abutment member will compress the packing around said means to form a seal, and a mechanism carried by the upper end of said head for holding the packing mechanism against upward movement.

4. A packing mechanism for oil well casing heads comprising an open ended head adapt-

ed to be mounted on a casing having a drill
stem and "kelly" bar disposed therein, a com-
pressible packing member mounted in the
upper end of said head, a detachable abut-
ment member having a cylindrical portion
secured between the drill stem and "kelly"
for compressing the packing around the cy-
lindrical portion of the abutment member on
an upward movement of the drill stem, and
means secured to the upper end of said head
for holding the packing mechanism against
upward movement.

In witness that I claim the foregoing I
have hereunto subscribed my name this 24th
day of May, 1926.

BURT S. MINOR.

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