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F. M. COLLINS

PACKING HEAD AND BLOW-OUT PREVENTER FOR ROTARY TYPE WELL DRILLING APPARATUS

Filed Jan. 27, 1925

2 Sheets-Sheet 1

FIG. 1.

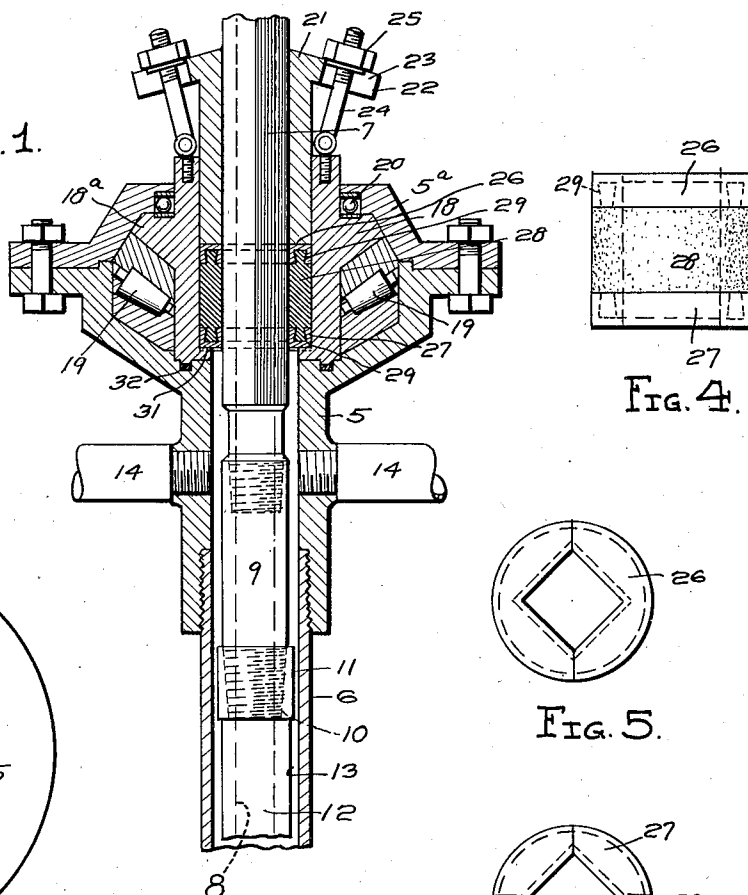


FIG. 4.

FIG. 5.

FIG. 6.

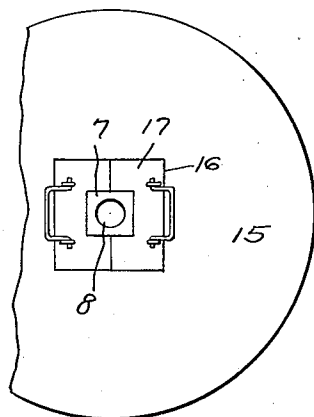


FIG. 3.

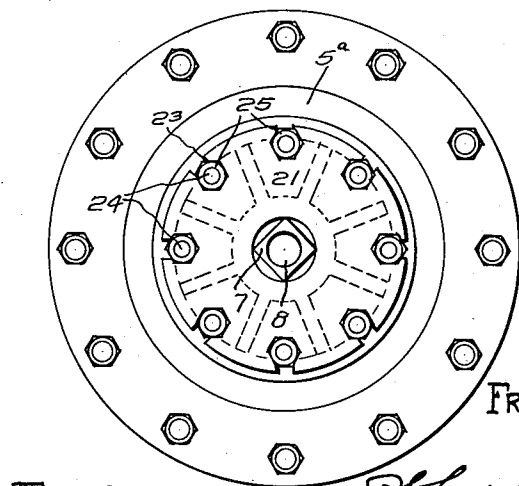


FIG. 2.

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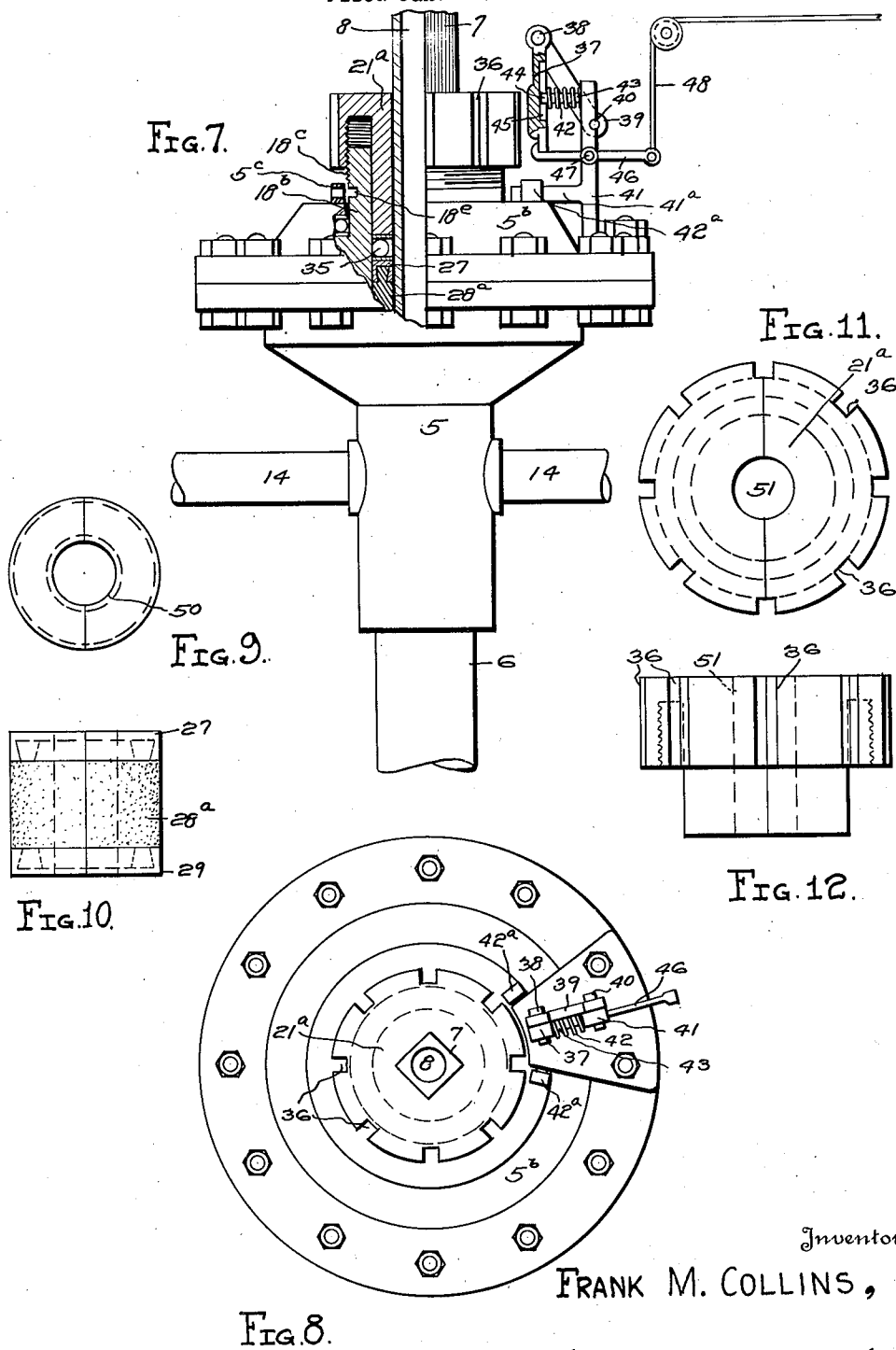
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

FRANK M. COLLINS, OF OILFIELDS, CALIFORNIA.

PACKING HEAD AND BLOW-OUT PREVENTER FOR ROTARY-TYPE WELL-DRILLING APPARATUS.

Application filed January 27, 1925. Serial No. 5,083.

To all whom it may concern:

Be it known that I, FRANK M. COLLINS, a citizen of the United States, residing at Oilfields, in the county of Fresno and State of California, have invented certain new and useful Improvements in Packing Head and Blow-out Preventers for Rotary-Type Well-Drilling Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a packing head and blow out preventer for rotary type well drilling apparatus and its object is to provide means to prevent the destructive blowing out of wells using drilling apparatus of the character indicated.

While I have illustrated my invention as applied to oil well apparatus it is to be understood that it is of utility in any relation where it is desired to pack an angular member which must at the same time be capable of longitudinal movement.

In the rotary type well drilling apparatus a power driven, rotative disk, engages and imparts rotation to a tubular element known in the art as a "grief stem" or kelly. This element has an angular external configuration and is locked to the rotative disk by filling blocks or slips in such manner as to be caused to rotate therewith.

During the drilling operation mud is pumped down through the tubular kelly and through the drill pipe to the bottom of the hole and circulation is maintained by the passage of this mud upwardly between the drill pipe and the well casing and thence to a mud box.

The primary object of the present invention is to provide a swivel head including a packing means, the hole being so arranged as to suitably pack the kelly during the drilling operation while rendering it possible to readily withdraw the kelly for the purpose of adding drill pipe as the hole deepens.

A further object of the invention is to provide a packing of the character indicated which will rotate bodily with the kelly so that it will not be subjected to undue wear.

A further object of the invention is to utilize, in conjunction with the swivel head, means for packing the drill pipe itself, if

the well should start to blow out during the time that the kelly is withdrawn, for the purpose of inserting additional drill pipe.

A further object of the invention is to provide means controllable from a distance which will automatically increase the tension upon the packing if the well starts to blow out without warning.

Further objects and advantages of the invention will be set forth in the detailed description which follows:

In the accompanying drawings:

Figure 1 is a vertical sectional view of one type of blow out preventer.

Figure 2 is a plan view thereof with the kelly in section.

Figure 3 is a plan view of a rotative disk hereinafter described.

Figure 4 is a side elevation of the packing element proper.

Figure 5 is a plan view of said packing element.

Figure 6 is an underside plan view of said packing element.

Figure 7 is a vertical sectional view with parts in elevation, of that form of the invention in which the packing is controllable from a distant point.

Figure 8 is a plan view of the structure of Figure 7.

Figure 9 is a plan view of a modified form of packing element adapted for use about the drill pipe proper.

Figure 10 is a side elevation of the packing shown in Figure 9.

Figure 11 is a plan view of a modified form of gland adapted for use in conjunction with the packing shown in Figures 9 and 10, and

Figure 12 is a side elevation of the gland of Figure 11.

Like numerals designate corresponding parts in all of the figures of the drawing.

Referring now more particularly to Figures 1 to 6, the numeral 5 designates a fixed housing adapted to be screwed upon the upper end of a well casing 6. The kelly 7 is angular (in the present instance, square) upon its external face and has an opening 8 formed therethrough. At its lower end, the kelly is provided with a threaded portion adapted to engage the kelly box 9. This

kelly box, in turn, is provided at its lower end with a threaded portion 10 adapted to engage the uppermost collar or coupling 11 of the drill pipe 12. The mud that is pumped downwardly through the opening 8 of the kelly returns through the space 13 which exists between the outside of the drill pipe and the inside of the well casing and passes from said space through pipes 14, to a mud box, (not shown) from which it is delivered by a pump to the kelly to be again circulated through the well. At some suitable point above the structure of Figure 1, which structure is placed beneath the derrick floor, the kelly passes through a rotative disk 15. This disk is provided with an angular opening 16 formed therethrough which is of sufficient size to permit the kelly, the drill pipe and associated parts to be drawn upwardly therethrough when the slips or filling blocks 17 are removed. During the drilling operation these slips or filling blocks fill the opening 16 and fit snugly around the kelly 7 in such manner as to constitute a locking key by which the kelly is locked to the disc and is caused to rotate therewith. The fixed housing 5 comprises a cap 5^a within which the swivel head 18 is mounted upon roller or other anti-friction bearings 19. Anti-friction bearings 20 are also disposed between the head 5^a and a shoulder 18^a of the swivel. A packing gland 21 is slidable upon the kelly and comprises a flange 22, having a plurality of radial slots 23 formed therein, which receive the draw bolts 24. Nuts 25 upon these draw bolts serve to thrust the gland forcibly against the packing element that is disposed beneath the gland and within the swivel. This packing element comprises an upper ring 26, a lower ring 27 and an intermediate rubber or other soft packing ring 28. The rings 26, 27 and 28 are all, preferably, split as will be seen by reference to Figures 4, 5 and 6 but the rings 26 and 27 are held united to the ring section 28 by reason of the dovetail formation indicated at 29. The lower ring 27 is provided with notches 30 which are adapted to be engaged by lugs 31 of the swivel head 18 so that the swivel head, packing rings, gland and draw bolts will all rotate with the kelly. Thus there is no wear upon the packing arising from the rotation of the parts. Ordinarily the packing will only be tightened enough to resist the pump pressure though if the pressure within the well increases it may be tightened to withstand the well pressure and this tightening may be carried to a point where the packing will effectually hold a very considerable pressure which would otherwise cause the well to blow out. To prevent passage of gas or water to the roller bearings 19, a suitable packing ring 32 is disposed between the lower end of the swivel head and the housing 5. When it is desired to withdraw the kelly and the drill pipe and add more pipe, as the hole deepens, the nuts 25 are loosened to that the bolts 24 may be swung outwardly until free of the gland 21. Then the kelly and drill pipe are lifted in a usual and well known way until the top coupling of the double pipe is above the rotative disc 15 and accessible to the workmen. When this is done, the top shoulder of the kelly box 9 catches the bottom ring 27 of the packing element and carries the packing ring and gland upwardly with the kelly. Thus the packing ring and gland remain on the kelly until, an additional section of drill pipe having been inserted, the kelly, packing element and gland are returned to their positions within the swivel head. Then the bolts 24 are swung back to gland engaging position and the nuts are tightened preparatory to resuming drilling operations. The structures shown in Figures 7 and 8 are very similar to those shown in Figures 1 and 2 and in so far as the parts are the same and have the same functions, the same reference characters have been applied. However, in this case, the swivel head 18^b is threaded at 18^c for the reception of a threaded flange 21^a of a packing gland. The lower end of this gland bears upon an anti-friction thrust bearing 35 which in turn bears upon the upper end of a packing element 28^a which corresponds to the packing element 28 of Figure 1. However, the structure of Figure 7 is such that the compression of the packing may be effected from a distant point. This is accomplished by providing the flange 21^a with a series of notches 36, which are adapted to be engaged by a dog 37. This dog is formed as a lever and is pivoted at 38 to a link 39. This link is pivoted, in turn, at 40 to a standard 41 that is secured to cap 5^b of the casing. A spring 42 is engaged with a pin 43 of the standard 41 and carries a pin 44 which engages in a slot 45 formed in the rear facing of the dog 37. A latch 46 is pivoted at 47 to the standard and engages the free end of the dog 37. If a cable 48 be drawn upon to lift the outer end of the latch, and depress its lower end, the spring 42 is left free to act, to throw the dog into engagement with one of the notches 36 of the gland 21^a, it being understood that this gland normally rotates with the swivel head 18^b. If the rotation of the gland is stopped while the rotation of the swivel head continues, it follows that there will be a rotation of one of these elements with respect to the other and the parts are so designed that this will act to screw the gland downwardly and compress the packing ring 28^a. After this action takes place, the rotation of the mechanism is stopped. However, in order to assure that there will be no breakage of the gland or swivel head,

the dog 37 is made of such a nature as to break off or shear off, after the gland has been tightened to a predetermined degree. If the rotation of the swivel head is to the right, as is usually the case, then the threads 18° will be made left hand threads.

It is, of course, possible, that a well will start to blow out during the time that the kelly and drill pipe are withdrawn for the purpose of adding to the drill pipe. To take care of such a contingency I provide a structure shown in Figures 9, 10, 11 and 12 in which a thick rubber ring 28^a and upper and lower metallic rings 27 and 29 like the corresponding structures of Figures 4, 5 and 6 constitutes a packing element, with the difference that the opening through the center thereof, indicated at 50, is a circular opening adapted to fit about the drill pipe. The structures of Figures 9 and 12 comprise a split emergency gland, the central opening 51 of which is approximately the size of the drill pipe. If the well should start to blow out during the time that the kelly and the packing means 28^a are lifted from the swivel head, then the packing elements of Figures 9 and 10, which is made in two parts as shown, may be fitted around the drill pipe and slipped downwardly into the swivel head 18^b, after which the gland of Figures 9 and 12 may be fitted around the drill pipe and screwed down upon the packing element.

I preferably reenforce and support the standard 21 by providing an extension 41^a thereof, which fits between lugs 42^a formed upon the head 5^b. This will serve to aid in supporting the standard against the sudden twisting strain which comes thereon which the emergency mechanism acts. Ordinarily the gland 21^a is tightened with a wrench and to hold the swivel head 18^b against turning during the tightening of the gland 21^a I provide an eye 5^c upon the head 5^b which has an opening formed therethrough that is adapted to register with an opening 18^c of the swivel head. By inserting a pin through the eye, until it enters the opening 18^c, these parts may be locked together to hold the swivel against turning during the time that the gland is being tightened.

So far as I am aware there is no structure upon the market, today, adapted to pack an angular kelly in such manner as to resist blow out pressures, while at the same time, permitting the necessary rotation and vertical movement of the kelly. It is therefore to be understood that the invention is not limited to the precise construction set forth but that it includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention what I claim is:

1. The combination with a swivel rotative

head adapted to have a kelly passed there-through, of a fixed body in which said swivel is mounted for rotation, a packing element engaged externally of the kelly, a packing gland having threaded engagement with the swivel and normally rotating therewith and means for holding said gland against rotation.

2. A structure as recited in claim 1 wherein the means for holding the gland against rotation is adapted to shear off when the gland has been tightened to a predetermined degree.

3. The combination with a swivel and a gland having threaded engagement therewith and normally rotating together and adapted to have a kelly passed therethrough, of a packing means engaging the exterior of the kelly and compressible by said gland and means controllable from a distance for engaging said glands to hold it against rotation and cause it to screw up to compress the packing, under the action of the rotative swivel head.

4. A device of the character described comprising a fixed casing, a swivel head mounted therein, a gland having threaded engagement with the swivel head, a kelly passing through the gland, a compressible packing element in the exterior of the kelly and acted upon by said gland, said gland having a notched periphery, a dog, a spring tending to move said dog into engagement with the notched periphery of the gland, and a latch for restraining the dog against the action of the spring.

5. A structure as recited in claim 4, in combination with means controllable from a distant point for actuating said latch to permit the spring to actuate the dog.

6. A structure as recited in claim 4, wherein said dog is breakable after the gland has screwed up to a predetermined degree.

7. The combination with a fixed casing, of a swivel head mounted for rotation therein, a packing ring made in two parts and having, complementally, an angular bore, a seat within said swivel head for said packing ring and an auxiliary packing gland for compressing said ring, said packing gland being bodily rotative with the swivel head, said ring comprising an upper ring section, a lower ring section and an intermediate compressible body and dovetail interengaging elements between said body and the sections.

8. In combination with a fixed head adapted to be mounted upon the top of a well casing of anti-friction bearings supported thereby, a rotative swivel mounted upon said bearings and having a bore formed therethrough for the passage of a kelly, said bore being of materially larger diameter than the kelly, a separable compressible packing element having a bore of a con-

figuration to fit snugly about said kelly and being of such size as to have a seating within the bore of the swivel there being a seat formed within said bore for the reception
5 of the lower end of said packing, a gland movable within the bore of the swivel and adapted to compress said packing, and draw-

ing means for moving said gland forcibly toward said packing, said gland and drawing means being mounted wholly upon and bodily rotative with the swivel. 10

In testimony whereof I hereunto affix my signature.

FRANK M. COLLINS.