Sept. 22, 1931. R. M. MARR 1,824,283

PACKING OFF TOOL

Filed July 12, 1929

Fig. 1.

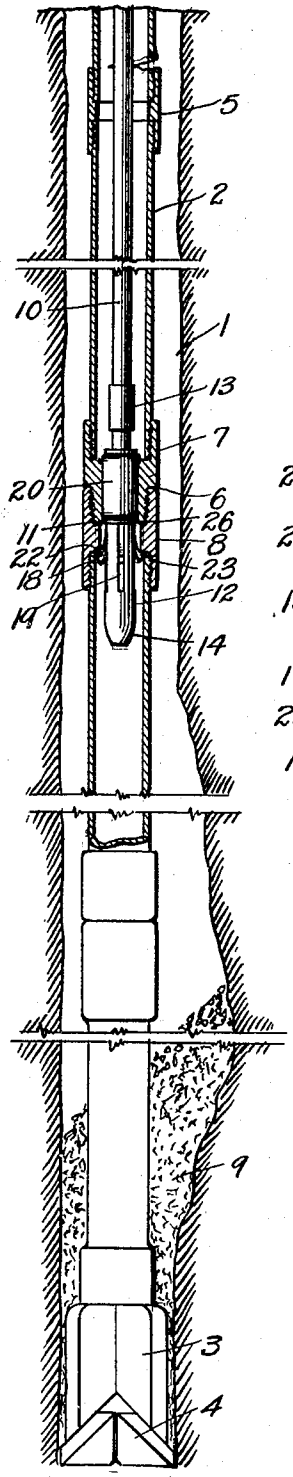


Fig. 2.

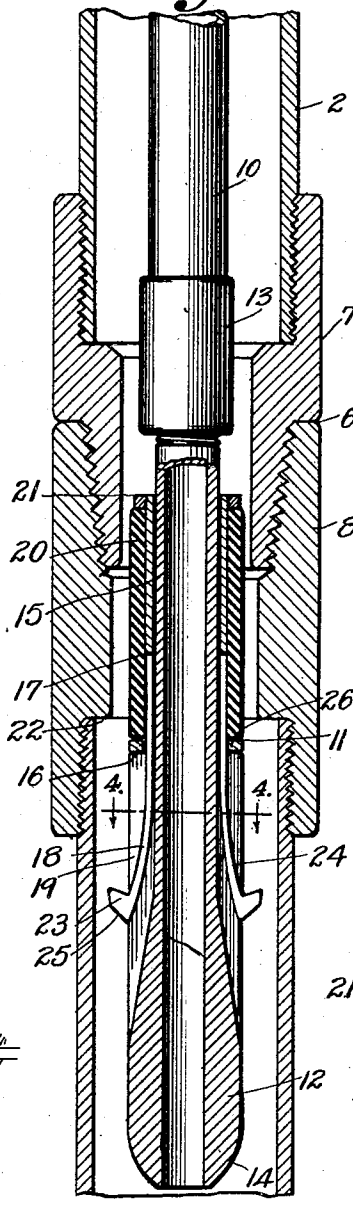


Fig. 3.

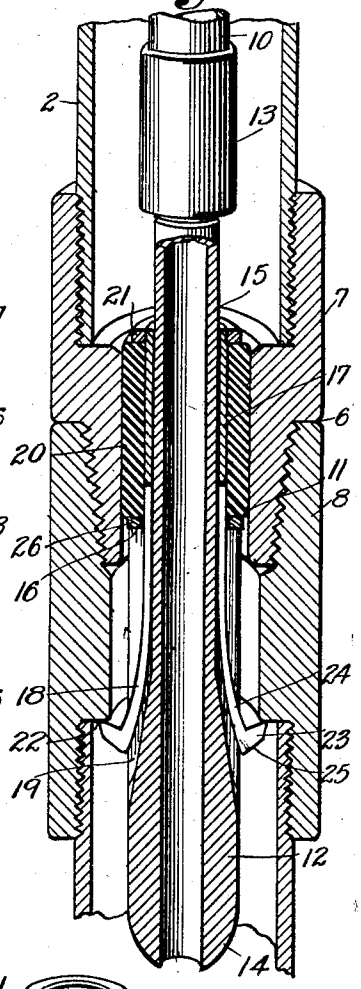


Fig. 4.

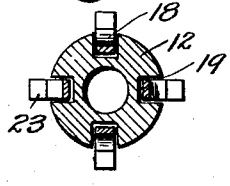
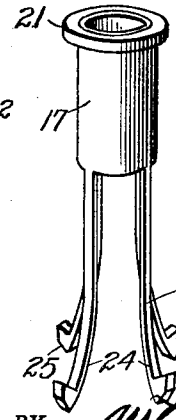


Fig. 5.



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UNITED STATES PATENT OFFICE

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PACKING OFF TOOL

Application filed July 12, 1929. Serial No. 377,752.

This invention relates to control of circulating fluid in the rotary drilling of wells and particularly to a tool for packing off between its self and the inner walls of the drill pipe.

In rotary drilling, the drill bit often sticks due to cavings at the bottom of the well and if the drill pipe has an opening or if it develops a fracture above the bit due to resistance offered by the cavings the drilling fluid will follow the course of least resistance and return to the top of the well through the fracture and will not circulate to the bottom of the well to wash away the cavings and free the bit.

It is therefore the principal object of this invention to provide for continued circulation around the bit by packing off the fluid from the section of drill pipe containing the fracture.

It is also an object of the invention to provide a packer which may be readily set in one of the tool joints.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a central section of the lower portion of a well hole and rotary drill pipe therein, and illustrating my device in packing position in the drill pipe.

Fig. 2 is an enlarged central section of the device and adjacent portions of the drill pipe, illustrating the packing tool in spaced relation with a joint of the drill pipe.

Fig. 3 is a similar section but illustrating the tool in packing relation with the drill pipe joint.

Fig. 4 is a section on the line 4—4, Fig. 2.

Fig. 5 is a perspective view of the dog element whereby the packing is effected.

Referring in detail to the drawings:

1 designates a well hole, and 2 a pipe depending in the hole and illustrated as a string of drill pipe employed in rotary drilling operation and having a bit 3 provided with blades 4 for drilling a hole upon rotation of the pipe.

The ordinary string of drill pipe consists of sections connected by the usual pipe couplings 5 and about every third section connected by tool joints 6 consisting of taper pins and thread boxes 7 and 8 respectively, so that the pipe joints may be quickly made when the drill pipe is being run into the well or broken when it is being pulled.

Due to caving of the walls of the hole or other causes, a mass of material 9 may become packed around the bit, and hampers operation thereof so that attempted rotation of the pipe often fractures the drill pipe particularly at the couplings 5. Then drilling fluid instead of being discharged through the bit to wash away the cavings escapes through the fracture and returns to the top of the well without moving the cavings and the drilling tool cannot be operated. Therefore in order to release the material and lower the stuck drilling tool for removal, I provide for the insertion of a string of pipe 10 comprising a conduit having smaller diameter than the drill pipe and which is lowered into the hole through the drill pipe, for conducting and discharging the drilling fluid below the fracture and inducing circulation around the bit.

In order to restrain the fluid to the bit and lower end of the drill pipe, the conduit is provided at its lower end with a packing device 11 presently described for effecting a sealing joint between the drill pipe and one of the tool joints below the fracture.

The device 11 comprises a tubular body 12 connected to the conduit by a coupling 13, and having a rounded lower end 14 for guiding the device through the string of drill pipe and past the tool joints thereof.

The upper end 15 of the body is reduced forming a shoulder 16, and a dog element comprising a tubular member 17 slidable on the end 15 is provided with a plurality of depending dogs 18 adapted to move longitudinally in grooves 19 of the body.

Mounted on the upper end of the body and encircling the tubular member 17 is a compressible sleeve or packing member 20 formed of rubber or the like anchored by the shoulder 16 against downward movement and having its upper edge engaged by a flange 21 com-

prising a ring threaded on the upper end of the tubular member 17.

The box 8 of the tool joint 6 has an internal lower shoulder 22 and the dogs have outwardly projecting hooks or feet 23 adapted to engage the lower shoulder of the box 8 when the conduit is lifted to restrain the sleeve and cause the same to expand against the inner wall of the box 7.

The dogs comprise resilient fingers secured to the lower edge of the tubular member, and have lower portions 24 normally curved outwardly to project the hooks outwardly from the body for assuring engagement of the hooks with the tool joint 6. The hooks have beveled lower faces or edges 25 adapted to engage and slide over inward projections in the drill pipe and tool joints upon downward movement of the dog element therein, and cause the hooks to be retracted into the grooves to permit the device to pass the projections.

The tubular member is substantially shorter than the reduced end portion of the body, so that the upper end portions of the dogs extend between the rubber sleeve and the body when the sleeve is in normal position.

A washer 26 is preferably mounted on the shoulder 16, to receive the lower edge of the sleeve and support the peripheral portion of the sleeve when the same is expanded.

The floors of the grooves 19 preferably taper outwardly downwardly at their lower ends and merge with the periphery of the body adjacent the rounded tip thereof, but at points in spaced relation with the tip, to comprise slanting walls for retaining the dogs in engagement with the tool joint shoulder.

In using the invention, the conduit is lowered through the drill pipe, the hooks engaging projecting shoulders of joints and the like to depress the resilient dogs into the grooves and permit the device to pass the joints.

Temporary engagement of the hooks with a projection will tend to shift the tubular member upwardly on the body, whereupon the upper edge of the tubular member will engage the coupling 13 and restrain the dog element to force sliding movement of the hooks over the projection.

The tubular member will tend to move longitudinally within the rubber sleeve during the upward movement described, but the uncurved portions of the dogs extending substantially in alignment with the tubular member, will permit the dog element to move within the sleeve without tending to compress the same.

The sleeve may be carried upwardly by the dog element due to frictional engagement therewith, but will be returned to anchored position on the shoulder of the body when the dog element falls by gravity or is restrained as later described.

When the dogs have passed the desired tool joint, the conduit is elevated, whereupon the projecting hooks engage the shoulder 22 and restrain the sleeve, which is thereupon automatically compressed and expanded to engage the inner periphery of the drill pipe or the tool joint therein, as illustrated in Fig. 3. The conduit may be retained in this position, to effect a seal between the tubular bit and the drill pipe. Fluid passed through the conduit will therefore be discharged to the bottom of the bit and against the bottom of the well hole, and pressure will be built up in the bit, since the fluid cannot pass the packing.

Thus it is apparent that with the use of my device, the fluid is restrained from the fractured portion of the drill pipe, and therefore is effectively discharged to the bottom of the well hole for circulation around the bit.

What I claim and desire to secure by Letters Patent is:

1. In a packing off tool in combination with tubing having an internal shoulder, a tubular body having longitudinal grooves, a dog element including a tubular member slidable on said body and having resilient outbent fingers slidable in said grooves, a packing member, means on the tubular member for engaging one end of the packing member, and means on the fingers for engaging the internal shoulder to effect compression of the packing member upon upward movement of the tubular body in the tubing.

2. In a packing off tool, in combination with tubing including a joint, a tubular body having longitudinal grooves and a reduced portion forming a shoulder, a dog element including a tubular member slidable on said reduced portion and having fingers provided with hook portions adapted to engage said joint and slidable in said grooves, a compressible sleeve on said reduced portion, and means enabling the dog element to press the sleeve against said shoulder when the hooks engage the joint for compressing the sleeve.

3. In a packing off tool, a body having longitudinal grooves and an annular shoulder, an expansible packing member on said body adapted to engage said shoulder, a dog element slidable on the body and including hooks adapted to operate the dog element, and means on said dog element for bearing on the sleeve to urge the same toward the shoulder for expanding the sleeve when the dog element is operated.

4. In combination with rotary drill pipe, including a tool joint and a conduit movable in the drill pipe, a packing off tool including a tubular body mounted in the lower end of the conduit, an expansible sleeve on said body, and means engageable with said tool joint upon upward movement of the conduit for expanding the sleeve against the tool joint.

5. In combination with rotary drill pipe including a tool joint having an internal

shoulder, and a conduit movable in the drill pipe, a packing off tool including a body mounted on the conduit, a packing member on said body, and means engageable with said shoulder upon upward movement of the conduit for engaging the packing member with the tool joint.

6. In combination with rotary drill pipe including a tool joint having an internal shoulder, and a conduit movable in the drill pipe, a packing off tool including a tubular body mounted on the lower end of the conduit, an expansible sleeve on said body, and means engageable with said shoulder upon upward movement of the conduit for expanding the sleeve against the tool joint.

7. In combination with tubing including a coupling having an internal shoulder, and a conduit movable in the tubing, a packing off tool comprising a body connected with the conduit, a dog element slidable on the body, an expansible member on said body, means for anchoring said member to the body, means on the dog element adapted to bear against the anchored sleeve to expand the same against the tubing, and means on the dog element engageable with said shoulder upon movement of the conduit to restrain the dog element for effecting expansion of said member.

8. In combination with rotary drill pipe including a tool joint having an internal shoulder, and a conduit movable in the pipe, a packing off tool comprising a body connected with the conduit and having a reduced portion, a dog element including a tubular member slidable on the reduced portion of the body, an expansible member, means for anchoring said member to the body, means on the dog element adapted to bear against the anchored sleeve to expand the same against the drill pipe, and means on the dog element engageable with said shoulder upon upward movement of the conduit to restrain the dog element for effecting expansion of said member.

9. In a packing off tool, in combination with tubing including a joint, a tubular body having longitudinal grooves and a reduced portion forming a shoulder, a dog element including a tubular member slidable on said reduced portion and outwardly directed resilient fingers provided with hook portions adapted to engage said joint and slidable in said grooves, said hook portions having tapered faces to engage the joint and compress said fingers upon downward travel of the dog element, a compressible sleeve on said reduced portion, and means enabling the dog element to press the sleeve against said shoulder when the hooks engage the joint for compressing the sleeve.

In testimony whereof I affix my signature.

RIZAL M. MARR.