Sept. 1, 1936. H. C. OTIS 2,052,939

WELL DRILLING APPARATUS

Filed Dec. 30, 1935 2 Sheets-Sheet 1

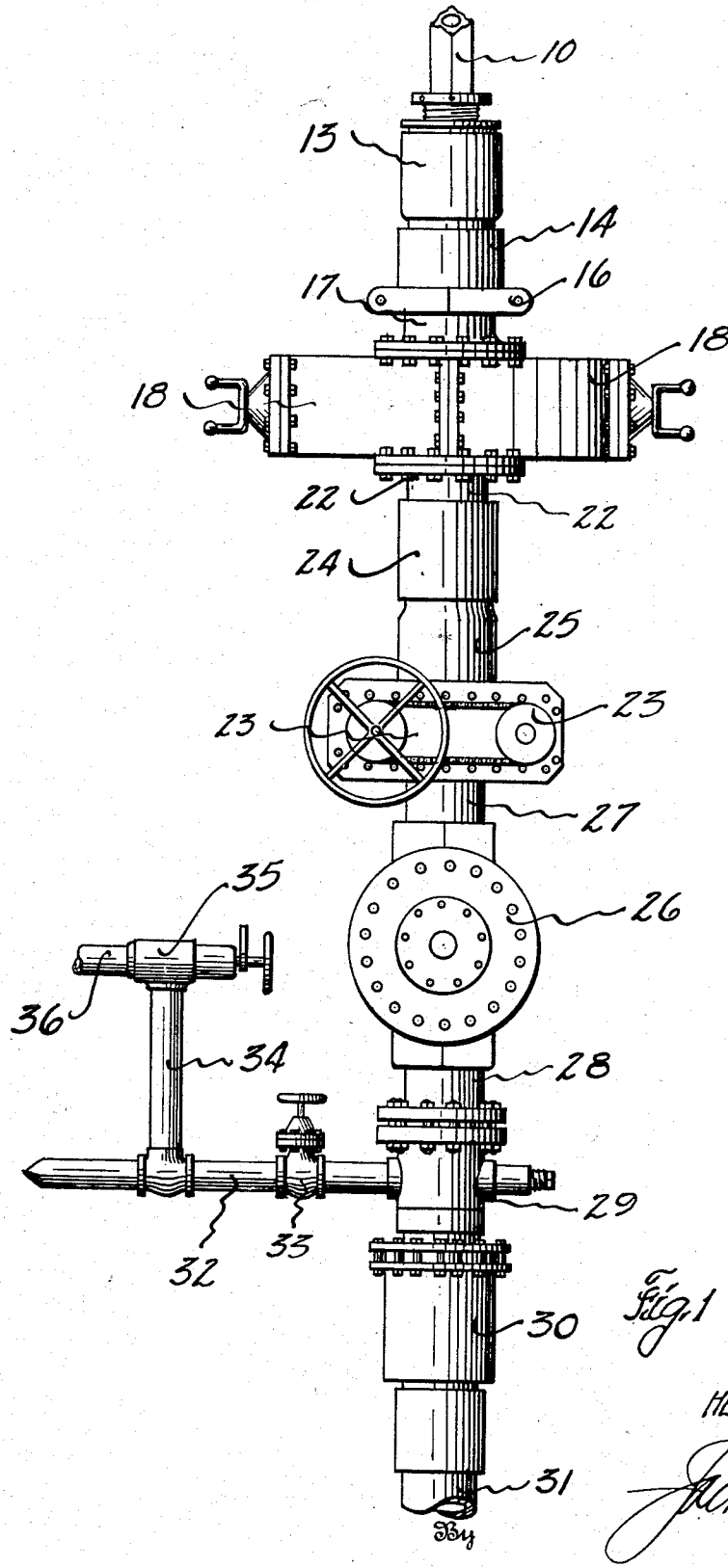


Fig. 1

Inventor
HERBERT C. OTIS

By

Attorney

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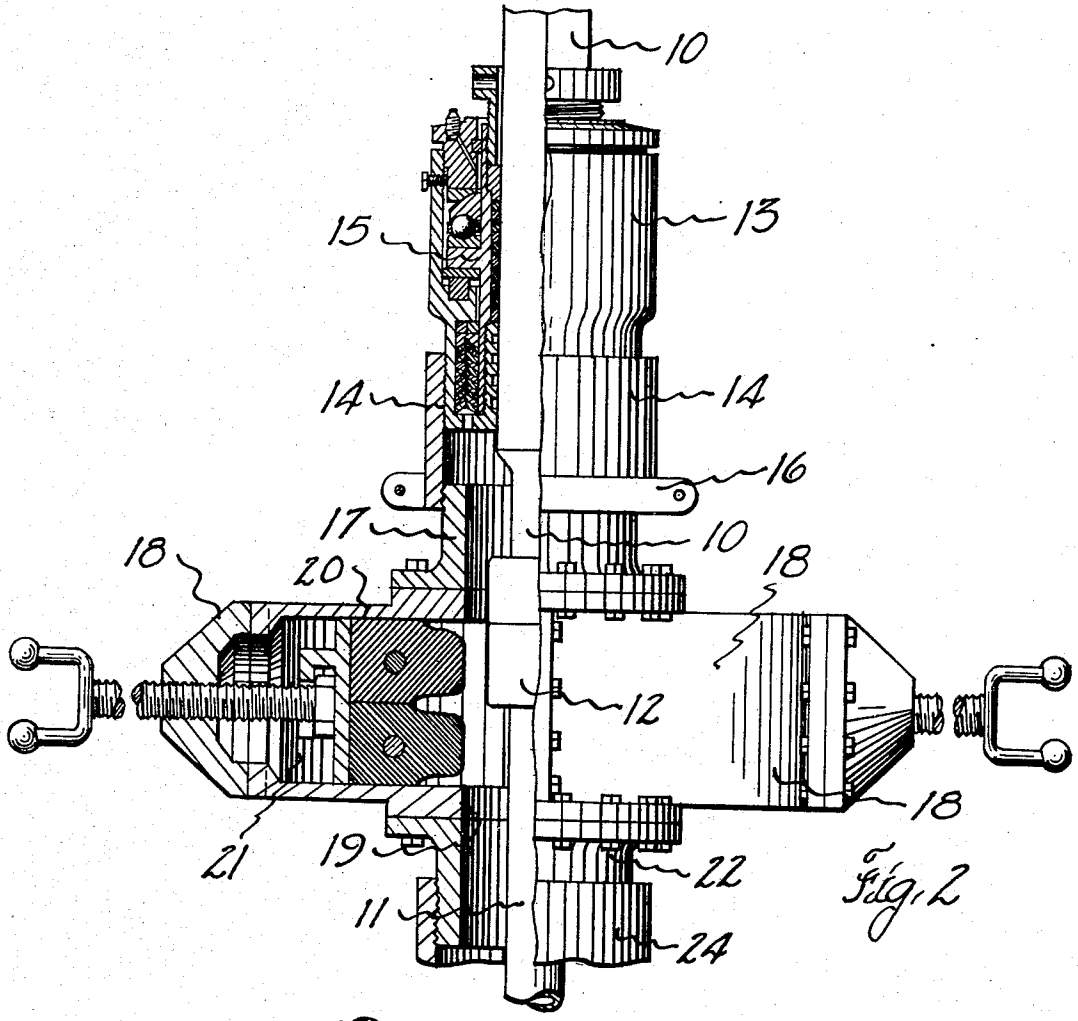


Fig. 2

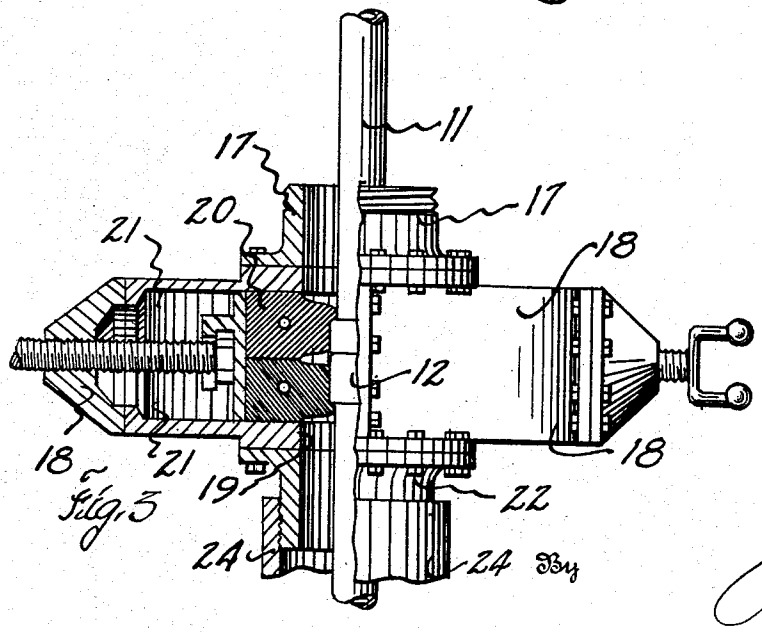


Fig. 3

Inventor
HERBERT C. OTIS

By

Attorney

Patented Sept. 1, 1936

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WELL DRILLING APPARATUS

Herbert C. Otis, Dallas, Tex.

Application December 30, 1935, Serial No. 56,649

5 Claims. (Cl. 255—1)

This invention relates to new and useful improvements in well drilling apparatus.

The invention has particularly to do with drilling into the producing formation or oil sands and a particular object of the invention is to provide an improved apparatus for drilling under pressure.

One object of the invention is to provide an improved closure structure for the top of the well which will permit the use of an angular-sided drill stem, commonly known as a "Kelly"; and also the use of outside coupled drill pipe.

A further object of the invention is to provide a closure structure so arranged that the Kelly may be rotated and lowered through the closure and outside coupled pipe run through the closure structure, without losing pressure both when the Kelly is connected and disconnected.

An important object of the invention is to provide an improved drilling apparatus including an enclosure having a pressure drilling head at its upper end arranged to receive a flat-sided drill stem, a closure device connected in the enclosure below the head and arranged to permit the passage of coupling without losing pressure, and a blowout preventer in the enclosure so as to provide a positive closure to withstand well pressures and prevent the blowing out of tools and the drill string.

Another object of the invention is to provide a drilling apparatus of the character described wherein a pack-off drilling head is arranged to be readily detached from the remaining structure, so as to be picked up with the drill stem, when the latter is disconnected from the drill pipe.

Still another object of the invention is to provide a pressure-sealed or packed-off drilling head adapted to have a "Kelly" or flat-sided drill stem passed therethrough while holding the well pressure, together with a closure device connected to the head and below the same and arranged to pass the couplings of outside coupled pipe without losing pressure and also to be retracted to be free of the drill stem when the same is rotated therethrough.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is an elevation of an apparatus constructed in accordance with the invention,

Figure 2 is an enlarged view of the upper portion of the same, partly in elevation and partly in section, and

Figure 3 is a view of the oil saver, partly in elevation and partly in section.

In the drawings, the numeral 10 designates an ordinary Kelly drilling stem which is usually square in cross-section. The flat sides of the Kelly are gripped by the bushings of the rotary table (not shown), whereby the Kelly is rotated. The lower end of the Kelly is joined to the drill pipe 11, in the usual manner, and the sections of drill pipe are connected together by collars 12 and such a connection is known as outside coupled pipe. A drilling head 13, such as is shown in my co-pending application, Serial No. 32,685, filed July 22, 1935, is screwed into the upper end of a coupling 14. Any other type of head through which a Kelly stem may rotate and slide, may be used. The stem engages in a rotatable member 15 in said head and this member is packed so as to hold the well pressure below said head.

The coupling is provided in its lower end with a clamp 16 and receives the upper end of an adapter 17. By loosening the clamp 16, the structure may be lifted from the adapter very quickly and without prolonged rotation. The adapter is bolted on top of an oil saver 18 having a bore 19 registering with the bore of the adapter. The oil saver is provided with opposite elastic heads 20 adapted to engage the pipe 11 from each side. One of the essential features of the invention is the provision whereby the elastic heads are so flexible as to permit the collar 12 to pass therethrough while they are engaging the pipe 11, thus preventing the escape of fluid or a reduction in the pressure below said heads; and also whereby said heads may be completely withdrawn into the chamber 21 of the oil saver to permit the Kelly to pass down through the oil saver and rotate without injuring said heads. Such an arrangement also permits tools to pass through the bore 19 without injuring the heads 20.

The oil saver 18 is supported on an adapter 22 which is connected to a blow-out preventer 23 by a coupling 24 and a nipple 25. The blow-out preventer is coupled to a master gate 26 by a nipple 27 which in turn is carried by an adapter 28 bolted on a flow head 29. The flow head is mounted on a casing head 30 carried on top of the casing 31.

A flow pipe 32 including a hand valve 33 ex-

tends from the flow head and connects with a riser 34 on the upper end of which is mounted an ordinary pressure choke 35 from which extends the flow line 36. By adjusting the choke any desired pressure may be maintained in the casing and superstructure thereon.

In using the apparatus, the elastic heads 20 are retracted as shown in Figure 2. This permits the Kelly stem 10 to freely pass down through the oil saver 18 and rotate without injuring the elastic heads. The drilling is carried on under pressure, the fluid being pumped down through the Kelly 10 and pipe 11 in the usual manner. When it is desired to add additional sections to the pipe 11 or to withdraw the pipe from the well, it is necessary to remove the Kelly 10 and the head 13. Before this is done, the heads 20 of the oil saver 18 are advanced so as to engage the pipe as is shown in Figure 3. This packs off the structure below said oil saver and permits the removal of the head 13 without the loss of pressure in the well.

The clamp 16 is loosened and the coupling 14 quickly detached from the adapter 17. The head and coupling are either lifted or the Kelly is elevated until the joint at the bottom thereof picks up the head 13 and carries it upward through the rotary table. Whenever the pipe 11 is raised the collar 12 will pass through the heads 20 without losing pressure and any pipe operations may be performed while the well is still under pressure. When it is desired to resume operation, the Kelly and head 13 are lowered and the coupling 14 quickly fastened on the adapter 17. The heads 20 are then withdrawn and the device is ready to continue drilling.

In drilling operations, the saving of time and the speed of working are vitally important to the success of the well. By use of the structure which has been described much time may be saved by employing the quick clamp 16 and the elastic heads 20. It is not necessary to slow down the pipe when it is passing through the elastic heads and little time is lost in coupling and uncoupling the head 13. Unless the elastic heads are protected, any member rotating therethrough would soon cut them to pieces. In drilling the Kelly will probably pass some distance through the oil saver and therefore it is necessary to fully retract the heads therein.

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

1. A well drilling apparatus including, a pressure sealed drilling head having a rotating member therein adapted to permit vertical passage of a flat-sided drill stem while rotating and without loss of well pressure, and a packing device below and connected with the head and having retractable members provided with yieldable faces for engaging the drill pipe and permitting the passage of outside couplings without loss of well pressure, the packing members being retractable to permit a flat-sided drill stem passing down through the head to pass between the said members without contacting the yieldable faces thereof while rotating.

2. A well drilling apparatus including an elongate vertical enclosure adapted to be mounted on the upper end of a well casing and arranged to permit the passage of drills and tools therethrough, said enclosure being pressure tight, a pressure tight drilling head mounted on the upper end of the enclosure and having a rotating member therein arranged so that a flat-sided drill stem may be passed vertically therethrough while rotating and without losing well pressure, and a packing device connected in the enclosure below the drilling head and having yieldable packing elements permitting the passage of the outside pipe couplings of a drill pipe without losing well pressure, said packing elements being retractable to permit a drill stem to pass and rotate therebetween without contact therewith.

3. A well drilling apparatus including an elongate vertical enclosure adapted to be mounted on the upper end of a well casing and arranged to permit the passage of drills and tools therethrough, said enclosure being pressure tight, a pressure tight drilling head mounted on the upper end of the enclosure and having a rotating member therein arranged so that a flat sided drill stem may be passed vertically therethrough while rotating and without losing well pressure, a packing device connected in the enclosure below the drilling head and having yieldable packing elements permitting the passage of the outside pipe couplings of a drill pipe without losing well pressure, said packing elements being retractable to permit a drill stem to pass and rotate therebetween without contact therewith, and means for readily detaching the drilling head from the enclosure above the packing device.

4. A well drilling apparatus including an elongate vertical enclosure adapted to be mounted on the upper end of a well casing and arranged to permit the passage of drills and tools therethrough, said enclosure being pressure tight, a pressure tight drilling head mounted on the upper end of the enclosure and having a rotating member therein arranged so that a flat sided drill stem may be passed vertically therethrough while rotating and without losing well pressure, a packing device connected in the enclosure below the drilling head and having retractable yieldable packing elements permitting the passage of the outside pipe couplings of a drill pipe without losing well pressure, said packing elements being retractable to permit a drill stem to pass and rotate therebetween without contact therewith, and a blowout preventer connected in the enclosure below the packing device and above the casing.

5. A well drilling apparatus including an elongate vertical enclosure adapted to be mounted on the upper end of a well casing and arranged to permit the passage of drills and tools therethrough, said enclosure being pressure tight, a pressure tight drilling head mounted on the upper end of the enclosure and having a rotating member therein arranged so that a flat sided drill stem may be passed vertically therethrough while rotating and without losing well pressure, a packing device connected in the enclosure below the drilling and having retractable yieldable packing elements permitting the passage of the outside pipe couplings of a drill pipe without losing well pressure, said packing elements being retractable to permit a drill stem to pass and rotate therebetween without contact therewith, means for readily detaching the drilling head from the enclosure above the packing device, a blowout preventer connected in the enclosure below the packing device and above the casing, and a master gate connected in the enclosure between the blowout preventer and the casing.

HERBERT C. OTIS.