Dec. 16, 1924. 1,519,136

C. C. HANSEN

DRILL ROD PACKING

Filed Sept. 14, 1923

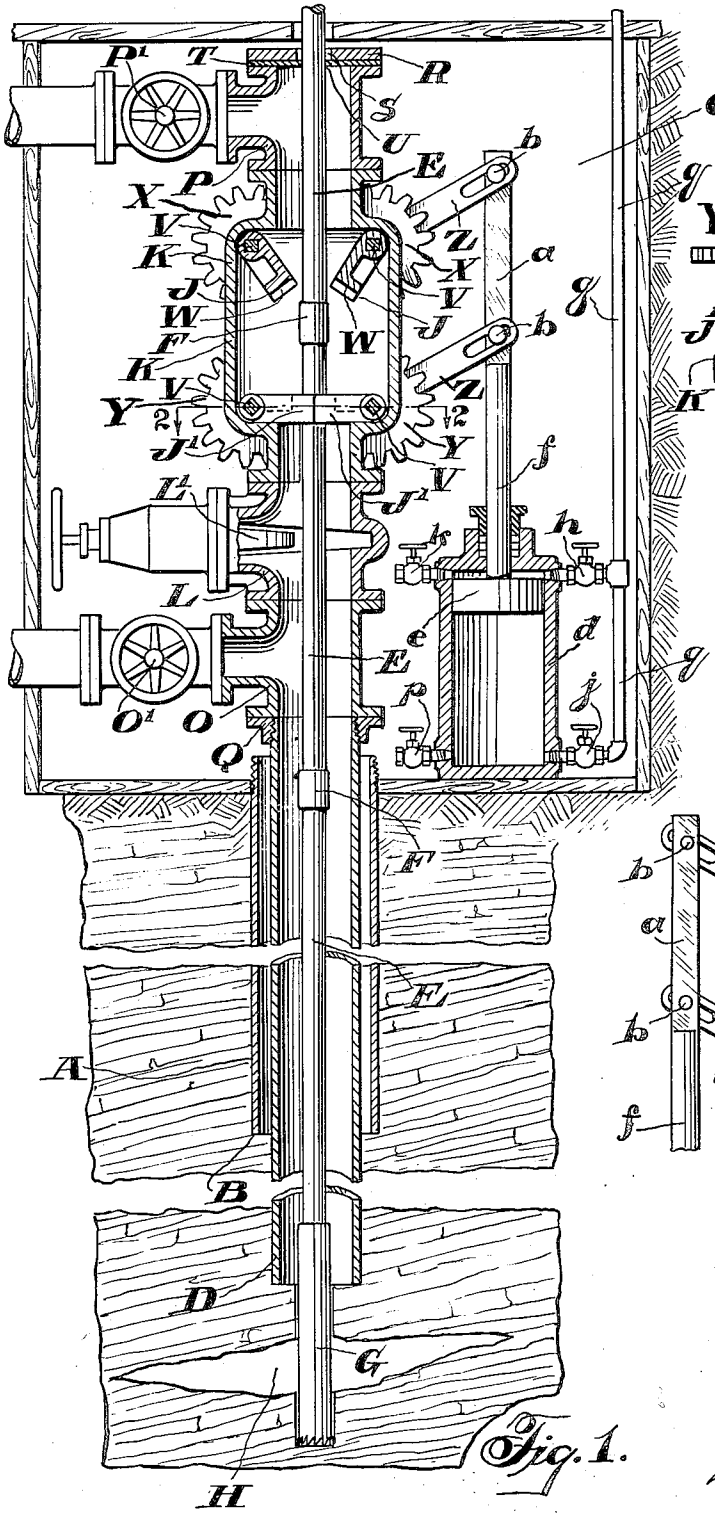


Fig. 1.

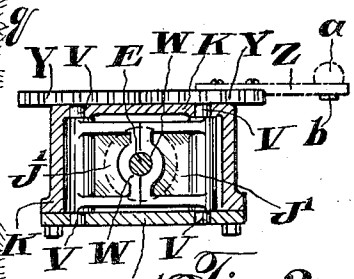


Fig. 2.

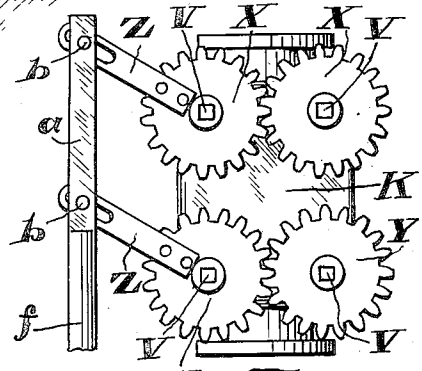


Fig. 3.

INVENTOR
Charles C. Hansen
BY
Herbert E. Ogden
HIS ATTORNEY

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UNITED STATES PATENT OFFICE.

CHARLES C. HANSEN, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

DRILL-ROD PACKING.

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To all whom it may concern:

Be it known that I, CHARLES C. HANSEN, a citizen of the United States, and a resident of Easton, county of Northampton, State of Pennsylvania, have invented a certain Drill-Rod Packing, of which the following is a specification accompanied by drawings.

This invention relates to well drills and more particularly to drills of the rotary type having a cutting bit attached to a rotary spindle or drill rod, such, for instance, as a core drill. In drilling oil and other wells, gas pressures of considerable magnitude are frequently encountered when a certain depth has been reached. Uncontrolled escape of such gas presents a danger on account of the damage likely to be done to persons and the equipment, as well as because of the impossibility of carrying on the drilling operation. Various means have therefore been employed to pack the well against unintentional escape of the gas during the drilling, as well as during the raising and lowering of the drill rods and drilling tools, but it has heretofore been difficult to satisfactorily prevent the escape of gas from a well in which a core drill of the type mentioned above was being used. This is partly due to the fact that outside coupled drill rods are usually employed, the couplings being of larger diameter than the rods, so that any satisfactory packing for such drill rods must provide for a tight closure at all times in spite of the difference in the diameter of the drill rod.

The primary object of the present invention is to effect substantially pressure-tight sealing of the well around the drill rod and to tightly pack the drill rod during the operation of the drill, and to facilitate passage of portions of the drill rod of different diameter past the seal in either direction without permitting any appreciable amount of the gas under pressure to escape. A further object is to effect automatic adjustment of the packing members to permit passage of the portions of the drill rod of larger diameter during the lowering and raising thereof.

A still further object is to operate the packing members by fluid pressure and to impart fluid pressure resistance to the passage of the portions of the drill rods of larger diameter during the hoisting and lowering of the drilling tools. Still further objects will hereinafter appear, and to the ends set forth the invention consists in the several features of construction and operation set forth in the following specification and shown in one preferred embodiment in the annexed drawing, forming a part hereof, in which—

Figure 1 is a vertical sectional view, partly broken away, of a typical core drill outfit in place in a well being drilled, showing the invention applied thereto;

Figure 2 is a transverse sectional view taken on the line 2—2 of Figure 1, showing one pair of packing members in operative position; and

Figure 3 is a detail side view taken in a direction opposite to Figure 1 showing part of the operating mechanism of the packing members.

The drawings show, diagrammatically, an oil well of considerable depth, which may be from 1000 to 2500 feet or more. The first or outer casing A usually extends to a depth of from 800 to 2000 feet and is tightly embedded at its lower end B. The inner casing D extends below the outer casing A substantially to the bottom of the well. The rotary drill rod or spindle composed of the rod sections E connected by outside couplings F extends through the casing A, and the core barrel and bit G is connected to the lowermost rod section E. The drill spindle is rotated in the usual manner and the drilling is continued with the bit G until the gas strata H has been reached where the gas encountered may be under any pressure up to from 1500 to 2000 pounds per square inch. Means are provided in the working chamber C for sealing the inner casing D and preventing unintentional escape of the gas. In this instance two pairs of oppositely acting packing members J and J′ are suitably mounted within a packing box K around the drill rod in position to alternately embrace the drill rod upon opposite sides and constitute an effective seal. The packing members J and J′ are designed to pack the drill rod and substantially prevent leakage during the operation of the drill and to facilitate the passage of either the smaller diameter rod sections E or larger diameter couplings F between the members J and J′ during the lowering or hoisting of the drilling tools.

A gate valve casing L and a pressure bleeder valve connection O are preferably interposed between the packing box K and the inner well casing D, and a relief valve connection P is preferably superposed above the packing box K having a cover K'. The valve connection P, packing box K, and valve casing L and connection O are concentrically arranged about the drill rod within the working chamber C and secured together. The pressure bleeder valve connection O is suitably secured to the top of the inner casing D, as by the screw threaded flange Q. The top of the relief valve connection P is closed by a circular end plate R having a central aperture S, the diameter of which aperture S is such as to enable the drill rod couplings F to pass through. A disk T of rubber or other suitable compressible material is interposed between the plate R and connection P. This disk T has an opening U concentric with the aperture S but of slightly less diameter, so that a relatively tight fit is provided about the portions of the drill rod of larger and smaller diameter during their movement into and out of the well casing.

The pressure bleeder valve O' is designed to permit a controlled flow of gas to escape from the well when desired. The gate valve L' enables the well casing to be tightly sealed up after removal of the drill rods and other tools from the well. The compressible disk T tends to prevent the escape of any gas which may leak past the seal formed by the packing members J and J' and the relief valve P' permits the safe controlled removal of such gas.

The packing members J and J' are identical in construction and consist of substantially rectangular blocks pivoted on shafts V trunnioned in the opposite walls of the packing box K and adapted to swing in the form of gates. The ends of the respective pairs of members J and J' are adapted to abut against each other and are provided with grooves W together forming an opening conforming to the contour of the drill rod and closely embracing the drill rod so as to constitute an effective seal when in their normal operative position. In the present instance two pairs of packing members are employed, one pair J being located in the upper portion of the packing box K and the pair J' in the lower portion. The respective pairs of members J and J' are adapted to swing alternately in directions opposite to each other so that when one pair is in operative position in engagement with the drill rod, the other pair will be inoperative. One pair is adapted to act during the raising or hoisting of the drill rod and drilling tools and the other pair during the lowering of the drilling equipment. Suitable means are preferably provided for coordinating the action of the respective pairs of members J and J', and in the present instance pairs of intermeshing gears X and Y are secured at one end of the shafts V of the packing members J and J', respectively. The pairs of gears X and Y are interconnected to operate in unison and for this purpose arms Z are rigidly secured to one of the gears in each pair and pivoted to a lever *a* as indicated at *b*.

The lever *a* may be operated in any suitable manner and in this instance forms part of a fluid pressure operated mechanism which controls the movements of the packing members J and J'. The fluid pressure operated mechanism includes a cylinder *d* having a piston *e* therein. The piston rod *f* of the piston *e* is in the present case employed as the lever *a* for operating the gears X and Y. Means are also provided for admitting pressure fluid to the cylinder *d* for actuating the piston *e* in both directions, and such means may include a pressure fluid supply pipe *q* leading from any suitable source of supply having valve controlled inlet connections *h* and *j* and valve controlled exhaust ports *k* and *p*.

In operation, presupposing the parts to be in the position illustrated in Figure 1, the packing members J' are held in place about the drill rod E by the piston *e* which is under fluid pressure supplied through the inlet connection *j*, the exhaust port *p* being closed and the packing members J being out of engagement or packing relation with the rod. This is the position assumed when the drill rods are being raised from the hole. Suitable hoisting means are employed for withdrawing the drilling tools from the hole. In the upward movement of the drill rod the larger diameter portions F engage the under sides of the packing members J' and move the members J' on their axles V sufficiently to allow the coupling F of larger diameter to pass by. Flexible resistance to such movement is imparted by the fluid pressure mechanism so that as soon as the coupling has left the packing members the fluid pressure acting on the piston *e* will cause the packing members to return to their normal position. The opening movement of the packing members is sufficient to enable the core barrel G to also pass through the packing box K, after which the gate valve L may be closed to completely seal the well casing. When the drilling tools are to be lowered into the well the valves *j* and *k* are closed and the valves *h* and *p* opened. Fluid pressure will then enter the cylinder, moving the piston to the opposite end thereof and carrying with it the lever *a*, thus effecting a reversal of the action of the packing members J and J'. The drilling tools may then be lowered past the upper packing members J in a manner in all respects similar to that

already described for the hoisting operation.

The grooves W of the packing members may be inclined or otherwise shaped to facilitate the passage of the larger diameter portions of the drill rod, as well as to make the fit between the packing members and drill rod as tight as possible, so that the interval of opening will be as brief as possible during the passage of the larger diameter portions through the packing members.

I claim:

1. A packing device for drill rods, comprising a well casing and a drill rod adapted to operate therein, said drill rod being composed of a plurality of separate sections with joints between the sections of larger diameter, two pairs of oppositely acting packing members having grooves adapted to embrace the drill rod to substantially seal the well casing, and means for normally maintaining either one of said pairs of packing members in engagement with the drill rod while the other pair is out of engagement therewith, said pairs of packing members being adapted to open in opposite directions to permit passage of the portions of the drill rod of larger diameter in either direction and to automatically return to normal position after a portion of larger diameter has passed either in one direction or the other.

2. A packing device for drill rods, comprising a well casing and a drill rod adapted to operate therein, said drill rod being composed of a plurality of separate sections with joints of larger diameter between the sections and two pairs of cooperating pivoted packing members adapted to swing towards each other and having grooves adapted to embrace opposite sides of said drill rod to effect substantial sealing of the well casing during passage of the drill rod between said members, and automatic fluid operated means for effecting movement of the packing members to cause either pair to engage the drill rod while the other pair remains out of engagement with the rod and permitting passage of the joints of the drill rod of larger diameter to pass the seal formed by the engaging pair of packing members.

In testimony whereof I have signed this specification.

CHARLES C. HANSEN.