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OIL WELL HOOK

2,519,288

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2 Sheets-Sheet 1

FIG. 1

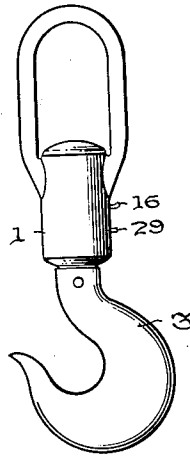
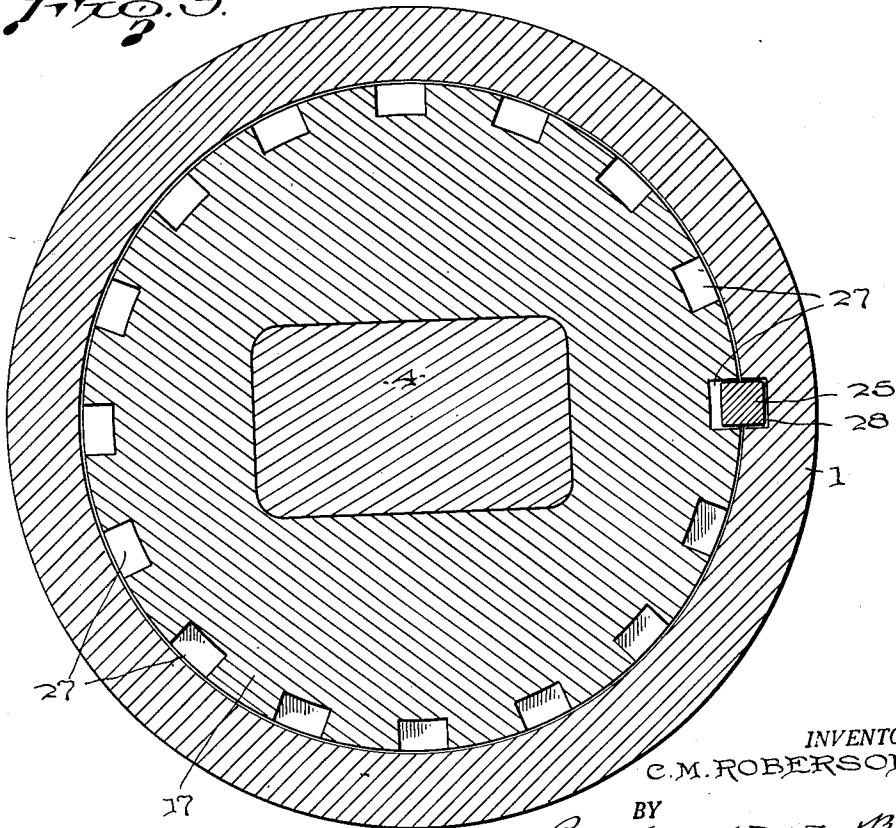


FIG. 3



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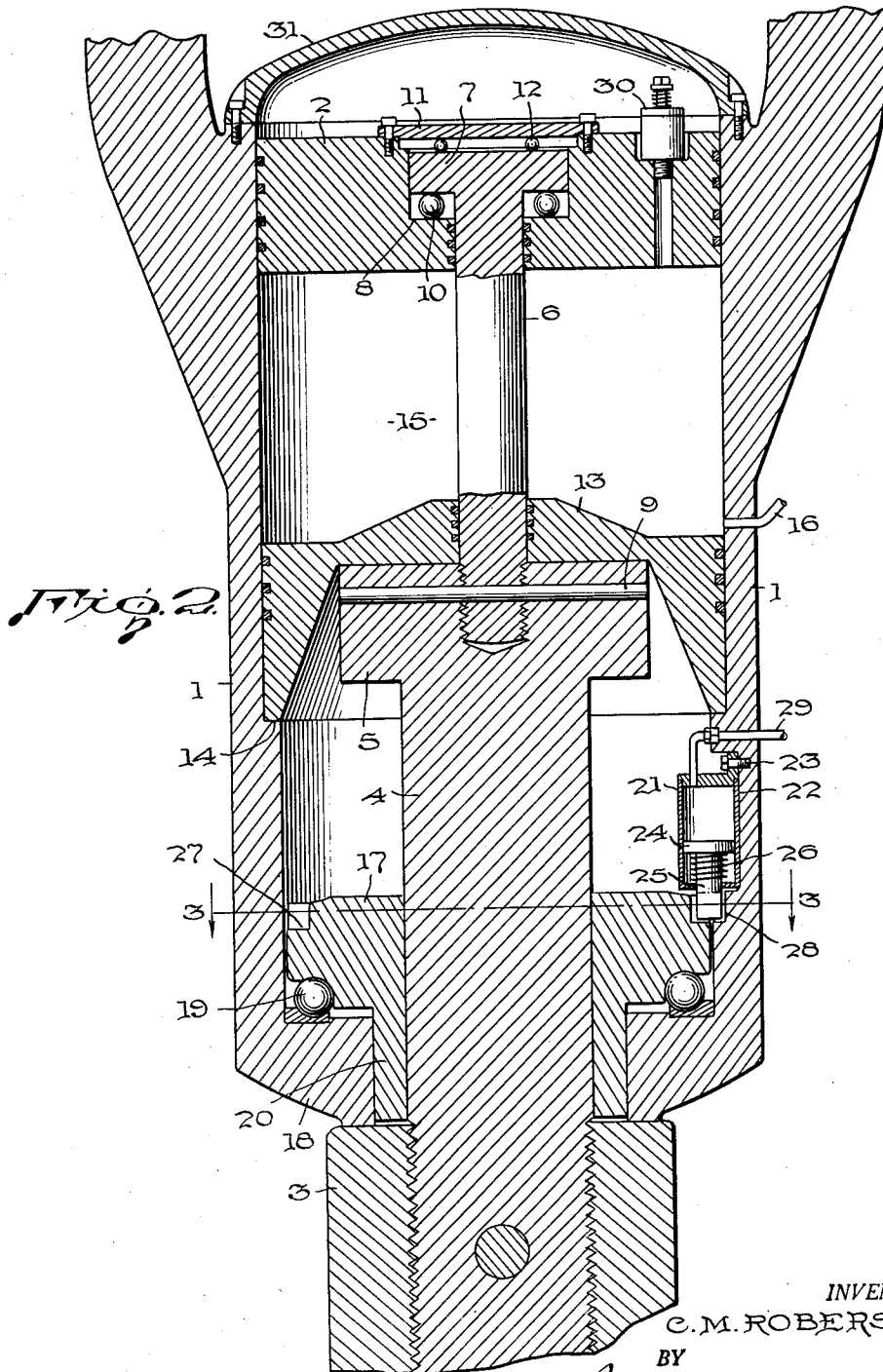
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2 Sheets-Sheet 2



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OIL WELL HOOK

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This invention relates to improvements in hooks, and more particularly to the type of hook utilized in connection with oil well drilling.

In the process of drilling oil or other wells, it is necessary to drill to great depths to reach the oil. For that reason it is necessary that the drilling rod or pipe be made in sections, rather than in one piece. These sections generally are connected together by collars into which the pipe sections are screwed. As the drill is rotated and goes farther into the ground during the drilling operation, more collars and more sections of pipe are added as necessary.

To facilitate the handling of these extra sections of pipe and collars, a derrick is constructed over the well sight from which a block and tackle, and hook carried thereby, are suspended. Such an arrangement is called the well drilling rig. The extra sections of pipe are taken from a stock pile, suspended on the hook over the stand of pipe already in the round, and connected thereto by threading the new sections of pipe to the stand already in the ground. Upon completion of the drilling, or when it is desired to replace the bit of the drill or perform other repair functions on the pipe, the pipe is drawn out of the ground a short distance and its weight supported by suitable means. The section of pipe extending above the ground is then unscrewed from the stand of pipe still in the ground and returned to the stock pile. During such connecting or disconnecting operation the weight of the section of pipe being attached or detached must be supported by the hook in such a manner that the connecting threads will not be injured.

The hook, with which the present invention is concerned, is carried by the traveling block of the block and tackle and is the connecting link between such block and the pipe sections or whatever other load the rig is handling.

The functions of the hook are several; one being to allow the load to be rotated during the threading or unthreading of the pipe sections, or to prevent the pipe sections, or other load carried thereby, from rotating when so desired. Another function of the hook is to facilitate the speeding up the operation of attaching to and detaching pipe sections from the drilling stand of pipe, as will hereinafter be more fully explained. A further function of the hook is to afford a readily attachable and detachable connecting means between the elevating means and the load carried by the hook. This invention primarily concerns the two first-mentioned functions of the hook.

Hooks for use in connection with oil well drill-

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ing must be selectively rotatable with respect to the traveling block so that when a section of pipe is being rotated and threaded to or unthreaded from the stand of pipe in the ground the traveling block will not rotate simultaneously with the hook and cause the ropes of the block and tackle to be twisted. When moving the pipe or other load to another position it is desirable to have the hook stationary or nonrotatable with respect to the traveling block.

The hooks now generally used in connection with oil well drilling present the disadvantage that they must be manually locked or unlocked from rotation. To accomplish such locking or unlocking of the hook it must be lowered near the derrick floor or the surface of the ground, or be raised to the operator's position in the derrick so that the locking means may be operated to lock the hook against rotation, or to unlock it and permit rotation with respect to the hook body.

As previously stated the sections of pipe are connected to one another by threads. Hence, if the threads, during connection or disconnection, are not relieved of the weight of the section of pipe being attached or detached they will be damaged. It is one function of the hook to support the weight of the section of pipe being attached or detached during such operation.

Oil well drilling hooks generally used at the present time are so constructed that the hook portion is supported from the hook body by a spring the function of which is to support the weight of the load. The spring in such hooks must be strong enough to carry the weight of the stand of pipe being attached or detached, which weight may range from about 600 to 15,000 pounds, depending upon whether the pipe being handled is light drill pipe or tubing, medium weight or the heaviest drill pipe, with the necessary proportionately heavy collars.

When the pipe sections are being removed from a stand of pipe and the upper pipe section has been disconnected, the spring lifts the hook portion and therefore the disconnected pipe section carried thereby upwardly a short distance from the stand of pipe, thereby freeing the disconnected sections from the stand. The spring has no adjustment for loads of different weight and generally is designed to handle loads of from about 1500 to 2,000 pounds, and very seldom is designed to handle loads as great as the weight of the heavier type drill pipe.

In those instances where the drill pipe or tubing is of relatively light weight, the spring

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not being adjustable, frequently will cause too much strain to be applied to the threads of the pipe or tubing with resultant damage to them, to the extent that the pipe or tube must be discarded. When used with drill pipe, which is somewhat heavier than tubing, the spring still may cause too much strain to be applied to the threads causing them to be stripped or otherwise damaged. When the joint is completely separated the spring causes the upper pipe section to jump free. In such a case, the upper section frequently falls back, allowing the pin end of the joint, which has just been unscrewed from the box end of the joint, to strike the machined surface of the box end and cause damage to both of the ends. When it is desired to handle drill pipe of the heaviest type the spring will not support the load, thereby making it necessary for the driller continually to raise the hook and the section of pipe carried thereby to adjust the amount of weight being carried by the threads during the connecting and disconnecting operation, a procedure which is both awkward and time-consuming.

The present invention contemplates a hoisting hook assembly which will overcome the aforesaid disadvantage of hooks currently used, particularly the time-consuming, intermittent raising of the hook during threading or unthreading operation to adjust the weight on the threads, and the necessity of manually locking and unlocking the hook against rotation.

The hook assembly of the present invention avoids the use of the usual spring for supporting the load by substituting therefor fluid-operated means controllable from a point remote from the hook. The hook portion is rotatably supported from a piston which is mounted for reciprocation within a cylindrical hook body. An opening or inlet is formed in the body through which fluid may be supplied under any desired pressure so that the hook will be capable of supporting any load ranging from the lightest section of tubing to the heaviest stand of drill pipe.

The invention further contemplates a hook assembly which includes fluid-operated means, operable from the driller's position or other point remote from the hook, for locking and unlocking the hook against rotation relative to the traveling block.

The invention will be further described in connection with the accompanying drawings, but it is to be understood that such further explanation is merely by way of exemplification and that the invention is limited only by the scope of the claims appended thereto.

In the drawings,

Fig. 1 is a perspective view of an oil well hook embodying the present invention,

Fig. 2 is a vertical sectional view through an oil well hook embodying the present invention, and

Fig. 3 is a horizontal sectional view on line 3-3 of Fig. 2.

In the form of the invention shown in the drawings the improved hook assembly comprises a hook body 1 having a substantial portion of the interior of its walls cylindrical in shape. A hook-supporting fluid-operated piston 2 is closely fitted within the hook body and is reciprocable therein. A hook 3 has a rectangular shank portion 4 removably secured thereto and extending upwardly through the lower end of the body. The upper end of the shank is provided with an enlarged bearing portion 5. The bearing por-

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tion 5 has a threaded bore extending into its upper side into which is screwed a cylindrical shaft or upper shank portion 6 which extends through the piston and has its upper end formed into an enlarged cylindrical bearing portion 7 rotatably supported in a recess 8 in the piston 2 by ball bearings 10. A pin 9 extends through the enlarged bearing portion 5 and the lower end of the shaft 6 to prevent relative rotation between them. The hook 3, the shank 4, and the shaft 6 comprise a unit which is rotatable with respect to the hook body 1.

The bearing portion 7 of the shaft is retained within the recess 8 by a disc 11 bolted or otherwise secured to upper or outer surface of the piston 2. Ball bearings 12 are positioned between the inner surface of the disc 11 and the outer surface of the enlarged cylindrical bearing portion 7 of the shaft 6 to permit relative rotation between the disc and the shaft.

A normally stationary piston-like partition 13 is closely fitted within the hook body and is adapted to fit around the shaft 6 below the piston 2. This partition 13 rests on and is prevented from downward movement by an inwardly-extending abutment or shoulder 14 of the hook body. Suitable resilient sealing means are placed in recesses of the piston 2 and the partition 13 so that a fluid-tight chamber 15 is formed in the hook body between the movable piston 2, and the partition 13.

In order to resiliently support the load suspended from the hook, fluid may be admitted through a conduit 16 which enters the chamber 15 through a recess in the hook body slightly above the upper surface of the partition 13.

A main bearing member 17 is positioned within the lower part of the hook body around the rectangular shank of the hook and is rotatably mounted upon an inwardly extending flange 18 of the lower end of the hook body by ball bearings 19. A tubular-like extension 20 of the main bearing 17 depends from the lower side thereof and extends between the shank 4 of the hook and the inwardly-extending flange 18 at the lower end of the hook body. The opening in the main bearing 17 and the extension 20 thereof conforms in size and shape to the rectangular shank 4 of the hook so that the main bearing and hook rotate together; while the outer periphery of the extension 20 is circular and extends through a similar opening in the flange 18 to permit relative rotation between the hook body and the main bearing 17 and hook. The shank 4 of the hook is slidable longitudinally through the main bearing member 17, so that when fluid is admitted to the chamber 15 the hook and the shank thereof will be raised, the shank sliding in the opening of the bearing member.

In order selectively to prevent rotation between the hook body and the main bearing and hook, a fluid operated locking means is provided comprising a cylinder 21 positioned in a recess 22 in the hook body. The cylinder is secured in the recess 22 in any suitable manner, such as by a bolt 23 extending through an extension of the cylinder. A latching piston 24 is reciprocally mounted within the cylinder 21 and has a cylindrical piston rod 25 formed with a squared outer end extending through the lower end of the cylinder 21. The latching piston 24 is normally held in a retracted position within the cylinder 21 by a compression spring 26 positioned between the piston 24 and the lower end wall of the cylinder.

The upper-outer periphery of the main bearing 17, as shown in Fig. 3, is formed with recesses 27 any one of which may be brought into registry with a similar recess 28 in the hook body. When fluid under pressure is supplied to the cylinder 21 through a conduit 29 passing through a recess in the hook body, the piston 24 is forced downwardly against the action of the spring 26 and the squared lower end of the piston rod 25 is projected into the space formed by the recess 28 and one of the recesses 27 of the main bearing 17 in alignment therewith thus preventing relative rotation between the hook body and the shank of the hook.

To allow for sudden loading of the hook during operation which sometimes causes pressure within the chamber 15 to be multiplied many times, a spring-loaded pop or relief valve 30 of conventional design is positioned within the piston 2.

In order to protect the internal working parts of the hook from dirt and resultant damage thereby, a substantially hemispherical cover 31 is bolted or otherwise secured to the upper edge of the wall of body and forms a cover for the open end of the hook body.

A bail extends from the upper part of the cylindrical body 1 and is the part by which the hook is suspended from the traveling block of the block and tackle or other supporting means.

From the foregoing it will be seen that fluid under pressure may be supplied to the chamber 15 to prevent downward movement of the piston 2 and thereby resiliently support the load carried by the hook. The pressure of the fluid supplied may be varied over a wide range to allow adjustment of the hook for use with, for instance, the lightest or the heaviest drill pipe. This is especially advantageous in connecting or disconnecting sections of pipe from the stand of pipe already in the ground.

Should it be desired to disconnect a section of pipe from the stand in the ground the hook is connected to the upper pipe section of the stand and the later is hoisted out of the well until the section of pipe to be disconnected is above the ground. Suitable supporting means then is secured to the pipe to prevent it from falling back into the well. Fluid under pressure then is admitted to the chamber 15 sufficient in amount just to support the weight of the section of pipe being disconnected from the threads of the connecting joint. If the piston rod 25 is not already in its retracted position to permit relative rotation between the main bearing 17 and the hook body pressure is released from the latching piston 24. The spring then moves the piston 24 and the piston rod 25 carried thereby to their retracted positions withdrawing the squared end of the rod 25 from its locking position between the main bearing 17 and the hook body, thereby permitting rotation of the hook relative to the hook body and the traveling block. With the hook rotatable relative to the hook body, the section of pipe to be disconnected may be unscrewed in any suitable manner until the threads thereof are disengaged from the remainder of the stand. When the disconnection is complete more fluid may be applied to the chamber 15 to cause a gradual lifting or separation of the disconnected section from the remainder of the stand, without any sudden jerking away of the disconnected section and its dropping back with possible resultant damage to the connecting threads such as fre-

quently occurs when using the ordinary spring-loaded hook.

The distance of allowable travel of the piston 2 toward the partition 13 is greater than the allowable travel of the enlarged bearing portion 5 toward the main bearing 17. As a result, when no pressure is applied to resist the downward motion of the piston 2, the shank 4 of the hook will slide longitudinally through the main bearing member 17 and the enlarged bearing portion 5 will descend and rest upon the main bearing 17, which then supports the full load carried by the hook. The hook then may be used merely as a carrier, as for instance when a section of pipe, recently disconnected from the stand of pipe in the ground, is to be carried from the well sight to the pipe stock pile.

When the hook is used merely as a carrier, it generally is desirable to supply fluid to cylinder 21 so as to project the squared end of the piston rod 25 into the space formed by the recess 28 in the hook body and one of the aligned recesses 27 in the main bearing 17 in order to prevent rotation of the hook relative to the hook body and the traveling block.

It will be further apparent that the hook easily may be assembled and disassembled for repair or replacement of parts. After the hook portion 3 is detached from the main shaft and the cover 31 is removed all the internal working parts may be removed from the upper portion of the cylindrical body.

Various changes may be made in the details of construction without departing from the invention or sacrificing any of the advantages thereof.

I claim:

1. A hoisting hook assembly comprising a body having its walls in the form of a cylinder, a fluid-operated piston reciprocable within said cylinder and provided with a recess, a partition extending across said cylinder, said cylinder having an inwardly-extending shoulder against which said partition rests, a hook having its shank extending through said partition and through at least a part of said piston, said shank having an enlarged portion rotatably mounted in said piston recess, said piston, said partition, and said cylinder forming a fluid-tight chamber, and means for admitting fluid under pressure into said chamber for resiliently supporting said hook from said hook body.

2. A hoisting hook assembly comprising a body the walls of which form a cylinder, a fluid-operated piston reciprocable therein and forming a movable end for a fluid-tight chamber within said cylinder, means extending across the cylinder to form the other end of said chamber, means for admitting fluid under pressure to said chamber, a bearing member rotatably supported in said cylinder, a hook shank non-rotatable with respect to said bearing member extending through said bearing member and being supported from and rotatable with respect to said piston, and remotely-operable means for selectively preventing and permitting relative rotation between said bearing member and therefore said shank, and said body.

3. A hoisting hook assembly comprising a body the walls of which form a cylinder, a fluid-operated piston reciprocable within said body forming one end of a fluid-tight chamber within said cylinder, a member extending across said cylinder forming the other end of said chamber, an opening in said chamber for admitting fluid under

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pressure, a relief valve forming an outlet from said chamber, a hook having its shank extending through said part and said chamber and rotatably supported by said piston, a bearing rotatably supported in said cylinder and surrounding said shank in non-rotative relation thereto, and remotely-operated fluid-operated means for selectively permitting and preventing relative rotation between said bearing and therefore shank, and said body.

4. A hoisting hook assembly comprising a body the walls of which form a cylinder, a fluid-operated piston reciprocable within said cylinder, a partition extending across said cylinder, said piston, said partition, and said cylinder forming a fluid-tight chamber, means for admitting fluid under pressure to said chamber, a bearing member rotatably mounted within said cylinder, said bearing member having spaced recesses, a hook shank non-rotatable with respect to said bearing member extending through said bearing member and said partition and being rotatably supported from said piston, a cylinder attached to said body, a fluid-operated piston reciprocable within said last-mentioned cylinder, a rod extending from said last-mentioned piston, said last-mentioned piston and said rod being so positioned with respect to said main bearing that said rod may be projected into the recess therein, and means for admitting fluid to said last-mentioned cylinder under pressure to project said rod into one of the recesses in said bearing member to prevent relative rotation thereof with respect to said body.

5. A hoisting hook assembly comprising a body the walls of which form a cylinder, a piston with-

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in said cylinder, a bearing member rotatably mounted in said cylinder, a hook shank extending through said bearing member and rotatably supported from said piston, a part carried by said shank adapted to rest upon said bearing member and to support the hook shank therefrom, and remotely-operable means for selectively preventing relative rotation of said bearing member and therefore said hook shank, with respect to said body.

6. A hoisting hook assembly comprising a body, the walls of which form a cylinder, a fluid-operated piston reciprocable therein and forming a movable end of a fluid-tight chamber within said cylinder, means extending across the cylinder to form the other end of said chamber, a hook having the shank thereof extending through the means forming the other end of said chamber and having its distal end rotatably mounted on said piston and means for admitting fluid under pressure to said chamber.

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REFERENCES CITED

25. The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
30. 679,421	Halsey	July 30, 1901
1,657,260	Holt	Jan. 24, 1928
1,806,908	Long	May 26, 1931
2,158,373	Long	May 16, 1939
2,215,049	Minor	Sept. 17, 1940
35. 2,242,707	Haynes	May 20, 1941