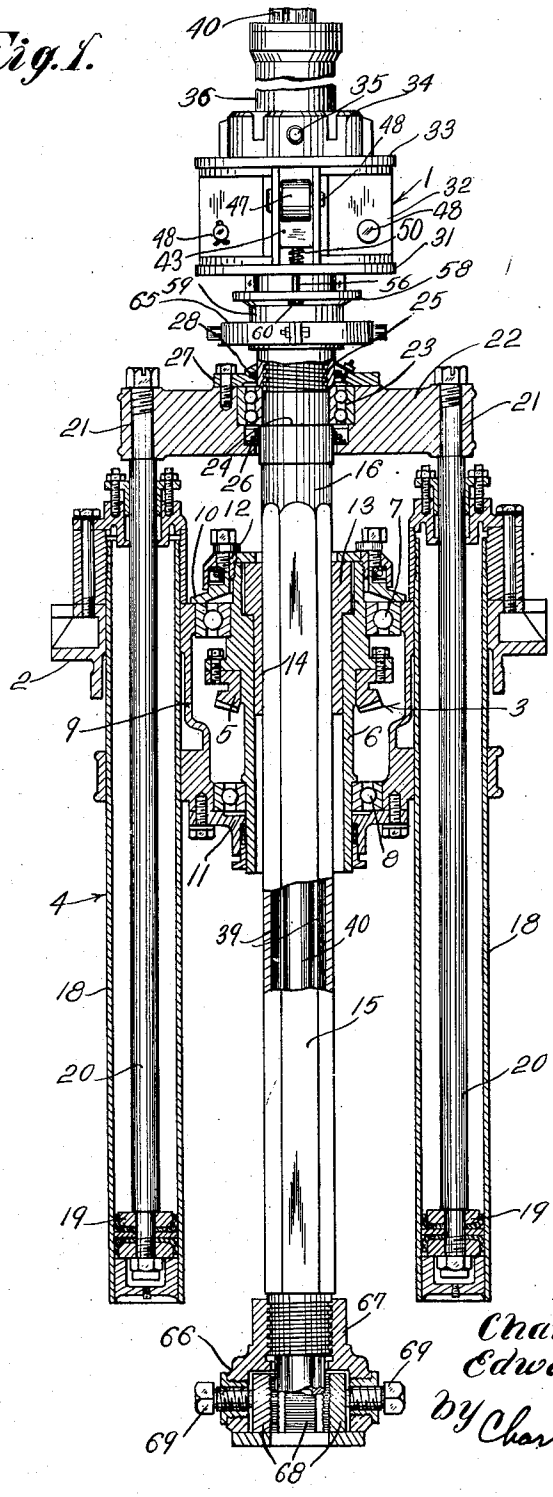
May 12, 1953 C. F. BALL ET AL 2,638,324

CHUCK MECHANISM FOR AN OIL WELL DRILLING APPARATUS

Filed May 4, 1948 4 Sheets-Sheet 1

Fig. 1.



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CHUCK MECHANISM FOR AN OIL WELL DRILLING APPARATUS

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Fig.2.

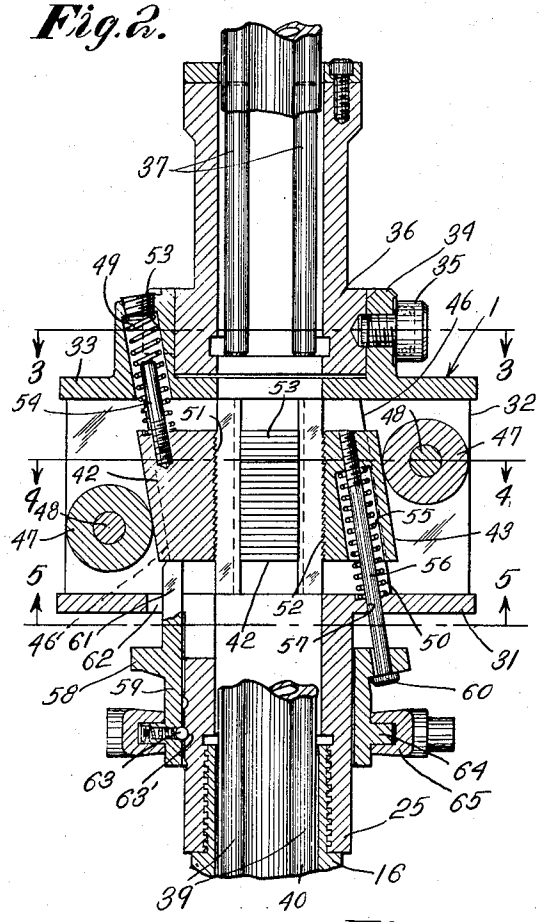


Fig.3.

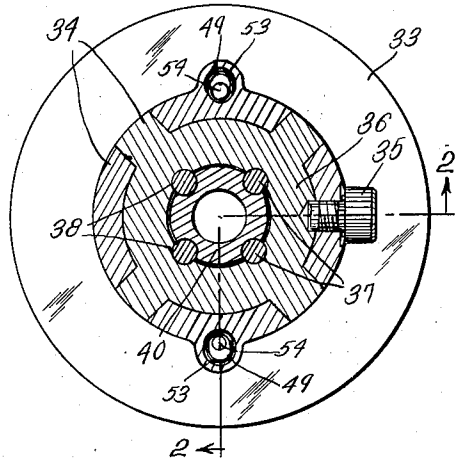


Fig.5.

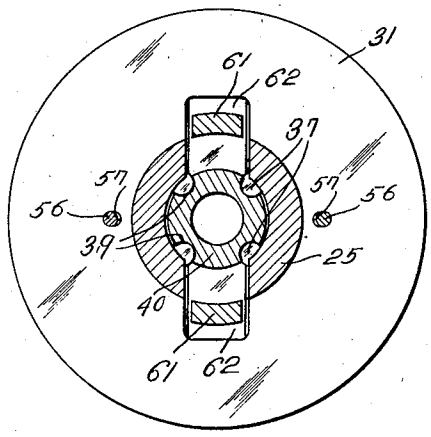
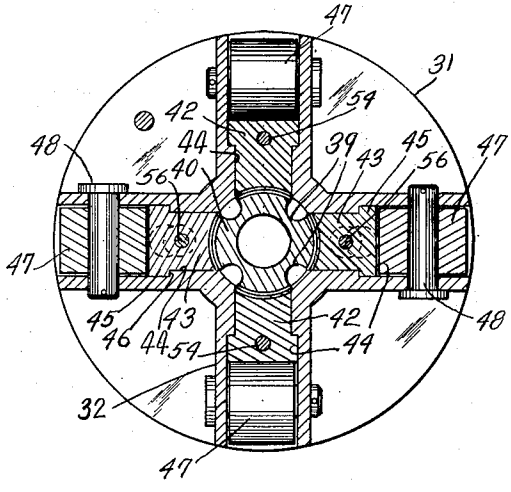


Fig.4.



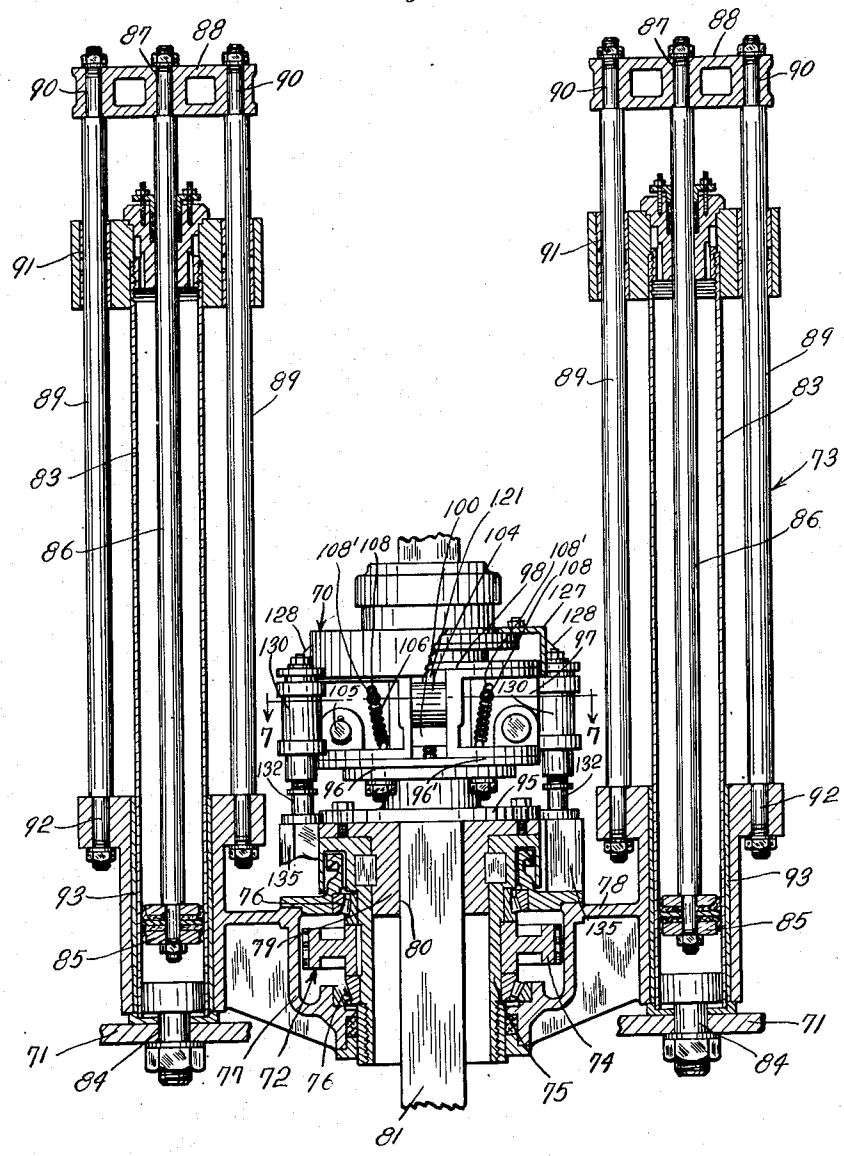
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CHUCK MECHANISM FOR AN OIL WELL DRILLING APPARATUS

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Fig. 6.



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CHUCK MECHANISM FOR AN OIL WELL DRILLING APPARATUS

Filed May 4, 1948 4 Sheets-Sheet 4

Fig. 7.

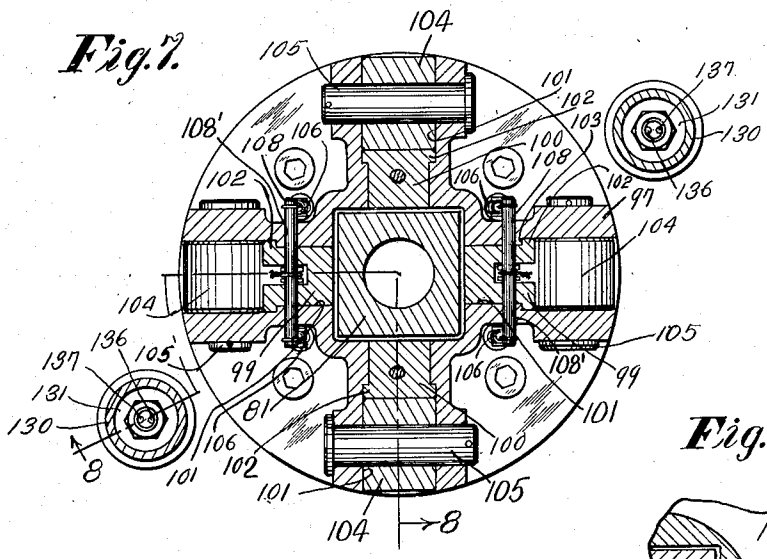


Fig. 9.

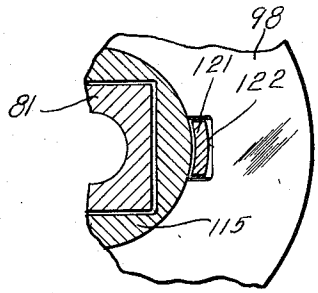
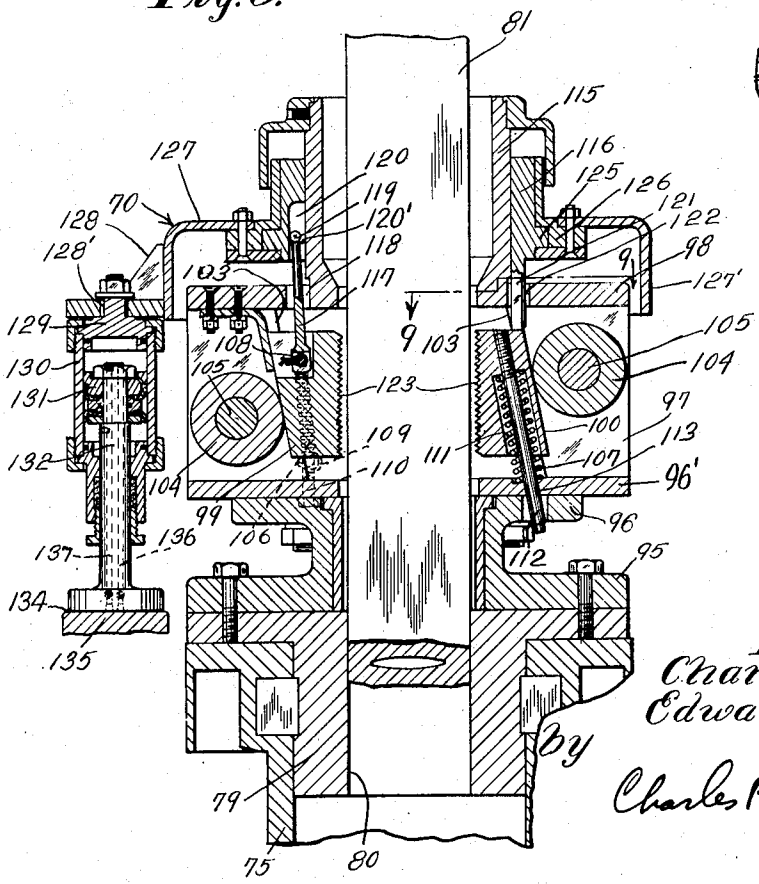


Fig. 8.



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UNITED STATES PATENT OFFICE

2,638,324

CHUCK MECHANISM FOR AN OIL WELL DRILLING APPARATUS

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Application May 4, 1948, Serial No. 24,946

8 Claims. (Cl. 255—22)

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This invention relates to drilling apparatus and more particularly to a double acting, semi-automatic chuck mechanism especially designed for use with rotary oil well drilling apparatus.

In oil well drilling apparatus of the rotary type, there are usually provided drill rod rotating and feeding mechanisms, a hoisting mechanism, and a pump for drilling fluid. A drill stem or kelly is usually attached to the upper end of the drill rod line and passes through a rotary mechanism or rotary table for rotating the drill stem or kelly while the latter moves axially therethrough. The drill stem or kelly may be provided, in a conventional manner, with splineways for engagement by the splines of the driver of the rotating mechanism, or the drill stem or kelly may be of polygonal cross section for engagement with the polygonal opening of a drive bushing of the rotating mechanism, and, in both instances, the drill stem or kelly is slidable axially through the driver, or may move axially with the driver, of the rotating mechanism as it is rotated thereby. The hoisting cable of the drilling apparatus is attachable in a conventional manner to the upper end of the drill stem or kelly, and, at times, the drill stem may be raised or lowered with respect to the rotating mechanism by the hoisting cable. Also, at times, particularly when a rotary drill bit is employed while drilling through relatively soft formations, the rod line is fed downwardly by gravity so that the feeding pressure applied to the drill bit is determined by the weight of the rod line, and when the hole becomes relatively deep, the hoisting cable may be employed to support a portion of the weight of the rod line to prevent the application of an excessive feeding pressure to the drill bit. When drilling in relatively hard formations, particularly when a diamond bit is employed, the drill stem and rod line are fed toward the work by a hydraulic feeding mechanism employing a chuck rigidly to connect the drill stem and feeding mechanism together to provide a positive feed and a sensitive control of the movement of the diamond bit at the bottom of the hole. In such drilling apparatus, it is desirable automatically to disconnect the gripping means of the chuck from the drill stem when the feed is retracted to a new feeding position and to again automatically connect the chuck gripping means to the drill stem when forward feed is again resumed. Moreover, during raising of the drill stem and rod line by means of the hydraulic feeding mechanism, it is also desirable to reverse the gripping means of the chuck so that the drill stem is gripped automatically when the feed is retracted, and when the feed is moved to a new retracting position, the chuck automatically releases to disconnect the feeding mechanism from the drill stem. During repositioning of the chuck gripping means, the drill stem is held against downward movement as by the hoisting cable. Thus, the drill stem may be fed downwardly in the hole or raised from the hole in steps as determined by the feeding travel of the feed pistons, and the chuck automatically releases in one direction and automatically grips in the other during either operation as determined by the proper positioning of the gripping means. Further, in such drilling apparatus, there may be provided an additional manually set chuck whereby, at times, the hydraulic feeding mechanism may be positively connected to the drill stem to raise or lower the drill rod line in the hole independently of the semi-automatic chuck mechanism or the hoisting cable. In such rotary drilling apparatus, the rotating mechanism may be stationary as regards bodily movement or may be carried by the hydraulic feeding mechanism bodily to move up and down with the chuck mechanism, both in a conventional manner.

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An object of the present invention is to provide an improved chuck mechanism for connecting the hydraulic feeding mechanism of a rotary drilling apparatus to or releasing the same from the drill stem or kelly for raising or lowering the drill rod line. Another object is to provide a semi-automatic chuck mechanism for automatically connecting the feeding mechanism to the drill stem upon feed in one direction and for automatically releasing the feeding mechanism from the drill stem when the feed is retracted. A further object is to provide an improved double acting, semi-automatic chuck mechanism which is positionable to grip a drill stem selectively in opposite directions. Yet another object is to provide a reversible chuck mechanism having oppositely acting chuck jaws adapted selectively to be rendered effective depending upon the direction of feed. A still further object is to provide an improved double acting, semi-automatic chuck mechanism embodying oppositely acting chuck jaws and associated shifter means for selectively positioning the jaws for automatic operation so that when the feeding mechanism is operated in one direction or the other, the drill stem may be automatically gripped and may be automatically re-

leased when the feeding mechanism is retracted to a new feeding position. Another object is to provide a chuck mechanism embodying wedge shaped chuck jaws yieldingly urged toward gripping position and associated shifter means acting in opposition to the yielding action on the jaws for controlling movement of the latter into operative gripping relation with respect to a member to be gripped. A still further object is to provide a double acting, semi-automatic chuck mechanism having oppositely acting wedge shaped jaws yieldingly urged towards gripping position and shiftable selectively into operative gripping position. Still another object is to provide an improved drill stem chuck mechanism having novel structural features and arrangement of parts. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration two forms which the invention may assume in practice.

In these drawings:

Fig. 1 is a vertical sectional view, with parts shown in full, taken through the feeding and rotating mechanisms of a rotary oil well drilling apparatus, with which a preferred illustrative embodiment of the improved chuck mechanism is associated.

Fig. 2 is an enlarged central vertical sectional view taken on lines 2—2 of Fig. 3, with parts broken out.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a sectional view, similar to Fig. 1, illustrating a modified construction.

Fig. 7 is an enlarged cross-sectional view taken substantially on line 7—7 of Fig. 6.

Fig. 8 is a developed longitudinal vertical sectional view taken substantially on lines 8—8 of Fig. 7.

Fig. 9 is a detail horizontal sectional view taken on line 9—9 of Fig. 8.

In the illustrative embodiment shown in Figs. 1 to 5 inclusive, the improved chuck mechanism is generally designated 1 and is associated with a rotary oil well drilling apparatus of the portable type generally comprising a support 2 mounted on a mobile base, such as the platform of an automotive vehicle. The support 2 carries a rotating mechanism, generally designated 3, and a hydraulic feeding mechanism, generally designated 4.

The rotating mechanism 3 is herein of a conventional design and includes a power operated rotating member, herein preferably a bevel gear 5, secured to a tubular shaft or drive sleeve 6, the latter being suitably journaled in spaced bearings 7 and 8 supported within a casing 9, herein preferably formed integral with the support 2. The casing has usual detachable upper and lower heads 10 and 11, and the lower head carries a suitable packing which sealingly engages the exterior surface of the lower portion of the drive sleeve 6. A cap 12, threadedly secured to the upper end of the drive sleeve 6, carries a packing which sealingly engages the exterior periphery of an upstanding circular portion of the upper head 10. The head and cap packings serve to prevent oil leakage from the casing chamber which contains the rotating gearing, including the bevel gear 5. The rotating gearing may be driven in any suitable manner from any suitable power source, such as an engine carried by the vehicle platform or the vehicle engine itself. Secured to and driven by the drive sleeve 6 is a drive bushing 13 which has an opening 14 of polygonal cross section which slidingly receives the polygonal portion 15 of a rotatable hollow quill or drive spindle or rod 16. If desired, in lieu of the polygonal drive opening, the drive bushing 13 may carry splines which engage splineways on the quill or drive rod 16.

The hydraulic feeding mechanism 4 may assume various forms but herein comprises a pair of parallel vertical hydraulic feed cylinders 18 suitably rigidly secured to the support 2 at the outer sides of the rotating mechanism 3. Reciprocable in these cylinders are feed pistons 19 having piston rods 20 which extend upwardly through the packed top heads of the cylinders. The piston rods are rigidly secured at 21 at their upper ends to the opposite sides of a cross frame or yoke 22 which carries a ball thrust bearing 23 in which the quill or drive spindle 16 is journaled. The quill has a shoulder 24 engaging the bottom of the inner race of the bearing 23 and a sleeve portion 25, threaded on the upper end of the spindle, engages at its lower side the top of the inner bearing race. Thus, the cross frame and bearing 23 serve as a thrust head for receiving the axial thrust of the quill 16 which carries the drill rod line. A packing 26, arranged within a recess in the cross frame, has sealing engagement with the exterior surface of the quill. A cap 27, secured as by screws to the upper side of the cross frame, surrounds the sleeve portion 25 are carries a packing 28 sealingly engaging the exterior of the sleeve portion. The packings 26 and 28 serve to prevent oil leakage from the bearing recess. When fluid under pressure is supplied to the feed cylinders under the control of a suitable valve mechanism (not shown), the drive quill 16 may be fed axially relative to the drive bushing 13, and the quill is always rotated by the drive bushing whenever the latter is driven irrespective of the axial position of the quill with respect thereto.

Now referring to the improved chuck mechanism 1, it will be noted that the rotatable sleeve portion 25 which is threadedly secured to the drive quill 16 is herein preferably formed integral with a bottom plate or cover 31 suitably secured, as by welding, to a rotatable chuck casing 32. Also, suitably secured, as by welding, to the chuck casing at the top thereof is a top plate or cover 33. Detachably connected, as by interlocking lugs 34 and a releasable locking screw 35, to the top cover 33 of the chuck casing is a driver casing or adaptor 36 carrying cylindrical splines 37 seated in concave recesses 38 in the inner wall of the adaptor casing, as shown, and suitably held against axial movement within the casing. These cylindrical splines slidingly engage splineways 39 in a conventional cylindrical, hollow drill stem or kelly 40 which extends axially through the adaptor and chuck casings into the drive quill 16. This drill stem is attached in a usual manner at its lower end to the upper end of a conventional drill rod line (not shown), which carries a conventional drill bit. In a drilling apparatus of the type disclosed, the drill stem also carries, at its upper end above the adaptor-casing 36, a conventional water swivel and lifting bail (not shown), so that drilling fluid may be conducted from the pump of the drilling apparatus through

the swivel, drill stem and hollow drill rod line to the bottom of the hole to clear away the cuttings from the bit face. The usual hoisting cable of the drilling apparatus is connectible to the lifting bail in a well known manner to effect raising and lowering of the drill stem and drill rod line in the drill hole. The splines 37 of the adaptor engaging the splineways 39 on the drill stem serve to rotate the drill stem while the latter freely slides axially relative to the adaptor and chuck casing. Instead of the splines and splineways, the drill stem may be of polygonal cross section and engageable in a polygonal opening in a driving bushing secured within the adaptor casing in a well known manner.

In this improved construction, arranged in the chuck casing 32 are pairs of chuck jaws 42, 42 and 43, 43, the former pair being "pull-up" jaws and acting upwardly, and the latter pair being "pull-down" jaws and acting downwardly. The chuck casing has four equally spaced radially located recesses 44 in which the four jaws are arranged, as shown in Fig. 4. The jaws are wedge shaped and have outer lateral gibs 45 slidably engaging sloping shoulders or inclined surfaces 46 on the casing. The jaws are retained in position with the gibs in engagement with the inclined surfaces by rollers 47 arranged in the recesses 44 and journaled on horizontal pins 48 supported within the casing at the sides of the recesses. Sets of oppositely acting springs 49 and 50 act on the jaws, and the upper springs 49 serve to urge the pull-up jaws 42 downwardly toward gripping position, while the lower springs 50 serve to urge the pull-down jaws 43 upwardly toward gripping position. The pull-up jaws have upwardly facing teeth or serrations 51, and the pull-down jaws have downwardly facing teeth or serrations 52, and these teeth are formed on the curved inner faces of the jaws and are shaped to grip the cylindrical outer surface of the drill stem 40. Evidently, if a drill stem of polygonal cross section is employed, the jaws would have straight teeth which would grip the flat surfaces of the stem in an obvious manner. The top and bottom inner surfaces respectively of the top and bottom plates 33 and 31 serve to limit the up and down movements of the jaws along the inclined guiding surfaces. Sufficient freedom of movement of the jaws may be afforded by the wedges and rollers so that the jaws may move slightly to accommodate themselves to the exterior surface of the drill stem in the event the latter is inclined slightly or otherwise out of axial alignment with the chuck mechanism. The upper springs 49 are arranged in recesses 53 in the top plate 33 and are guided by pilot pins 54 threadedly secured to the pull-up jaws 42. The lower springs 50 are arranged in recesses 55 in the pull-down jaws 43 and are guided by elongated screws 56 which pass outwardly through openings 57 in the bottom plate 31. The screws 56 extend downwardly through openings in a collar 58 of a shifter ring 59, herein slidingly guided on the exterior of the sleeve portion 25 beneath the chuck casing, as shown in Fig. 2. The screw heads 60 engage the lower side of the collar 58 so that when the shifter ring is slid downwardly, the pull-down jaws 43 are moved downwardly against the action of the springs 50 toward their lowermost released positions, while the pull-up jaws 42 move downwardly and inwardly, under the influence of the springs 49, into gripping position. When the shifter ring is moved upwardly from the position shown in Fig. 2, upward projections or release fingers 61 on the ring and located in slots 62 in the bottom plate engage the bottoms of the pull-up jaws 42 to move the latter upwardly against the action of the springs 49 toward upper released position, while the springs 50 move the pull-down jaws 43 upwardly and inwardly into gripping position. A spring pressed detent 63, carried by the shifter ring, is engageable with holding notches 63' on the sleeve portion 25 and serves to hold the shifter ring in its different positions. The shifter ring has a flange 64 engageable by a shifter collar 65 which may be operated in any conventional manner. When the shifter ring is moved into either its upper or lower positions, the jaws of one pair are yieldingly urged by the springs into light frictional contact with the exterior surface of the drill stem so that when the feed pistons of the hydraulic feeding mechanism are moved in the desired direction, the teeth of the effective pair of jaws move automatically with a wedging action into firm gripping engagement with the drill stem. When the shifter ring is in its central position, all of the jaws are held released from the drill stem.

The drilling apparatus also includes a manually set bottom chuck 66 for positively connecting the hydraulic feeding mechanism to the drill stem or kelly 40 independently of the semi-automatic top chuck mechanism 1. This chuck comprises a casing 67 threadedly secured to the lower end of the drive quill 16, as shown in Fig. 1. The drill stem extends axially through the chuck casing 67, and the latter contains radial jaws 68 operated by screws 69. When the screws are tightened, the jaws firmly grip the drill stem rigidly to connect the stem to the feeding mechanism during feed in either direction. The chuck jaws 68 are, however, released during normal drilling operations and, under certain conditions, this bottom chuck may be dispensed with.

In the modified construction shown in Figs. 6 to 9 inclusive, the chuck mechanism is generally designated 70 and is associated with a rotary oil well drilling apparatus, generally comprising a support 71, mounted as on a mobile base and which carries a rotating mechanism generally designated 72 and a hydraulic feeding mechanism generally designated 73.

The rotating mechanism is of a conventional design and includes a power operated rotating member, herein preferably a spur gear 74, secured to a tubular shaft or drive sleeve 75, the latter being suitably journaled in spaced bearings 76 supported within a casing 77, herein secured to a sliding cross frame or yoke 78. The casing, at its bottom, carries a packing which sealingly engages the outer surface of a sleeve threaded on the lower portion of the drive sleeve 75. Attached to and driven by the drive sleeve 75 is a drive bushing 79 which has an opening 80 of polygonal cross section, which slidingly receives the polygonal portion of a hollow drill stem or kelly 81. The opening 80 in the drive bushing and the polygonal portion of the drill stem are herein preferably square in cross section, as shown in Fig. 7. In lieu of the polygonal opening in the drive bushing and the polygonal portion of the drill stem, the drive bushing may carry splines which engage splineways on the drill stem in the manner of the preferred embodiment above described. The rotating gearing, enclosed in the casing 77 and including the spur gear 74, may be driven in any suitable manner through suitable flexible or self-adjusting connections.

The feeding mechanism 73 may assume various forms but herein comprises a pair of parallel

hydraulic feed cylinders 83 suitably rigidly secured at 84 to the support 71 at the outer sides of the rotating mechanism. Reciprocable in these cylinders are feed pistons 85 having piston rods 86 which extend upwardly through the packed top heads of the cylinders. The piston rods are rigidly secured at 87 at their upper ends to yokes 88 to which connecting rods 89 are, in turn, secured thereto at 90. These connecting rods are suitably guided in guides 91 secured to the top cylinder heads and extend downwardly in parallelism with the feed cylinders and are rigidly secured at 92 at their lower ends to the sliding cross frame or yoke 73. This cross frame or yoke has tubular guide portions 93 surrounding and slidably guided on the exterior peripheries of the feed cylinders. When fluid under pressure is supplied to the feed cylinders under the control of a suitable valve mechanism (not shown), the drill stem may be fed axially as it is rotated by the drive bushing 79.

Now referring to the improved chuck mechanism 76, it will be noted that a flange 95 of a bushing support is secured, as by screws, to the horizontal upper portion of the drive bushing 79, and this flange is formed integral with an upper flange 96 secured, as by bolts, to a bottom plate 96' welded to a chuck casing 97, which is similar to the chuck casing 32 of the preferred embodiment described above. Also, suitably secured, as by welding, to the chuck casing at the top thereof is a top plate or cover 98. Arranged in the chuck casing are pairs of chuck jaws 99, 99 and 100, 100, the former pair being "pull-up" jaws and acting upwardly, and the latter being "pull-down" jaws and acting downwardly. The chuck casing has four equally spaced radially located recesses 101 in which the four jaws are arranged, as shown in Fig. 7. The jaws are wedge shaped and have outer gibs 102 slidably engaging sloping shoulders or inclined surfaces 103 on the casing. The jaws are retained in position with respect to their guiding surfaces, with some slight freedom of movement, by rollers 104 arranged in the recesses 101 and journaled on pins 105 supported within the side walls of the recesses. Sets of oppositely acting springs 106 and 107 act on the jaws 99 and 100 to urge the latter toward gripping position. The springs 106 are arranged in pairs exteriorly of the chuck casing and are connected at their upper ends to the ends of cross pins 108 secured to the jaws 99, and at their lower ends have hook shaped portions 109 connected within the eyes of eye-bolts 110 suitably secured to the bottom of the chuck casing. These cross pins project outwardly through slots 108' in the casing walls. The springs 107 are arranged within recesses 111 in the jaws 100 and are guided by pilot pins 112 threadedly secured to the jaws. These pilot pins are guided in inclined openings 113 formed in the bottom plate of the chuck casing and extend downwardly through openings in the bottom plate 96, as shown in Fig. 8. Slidably guided on an upstanding circular sleevelike portion 115 integral with the top plate 98 at the top of the chuck casing is a shifter ring 116. Pivotally connected to the cross pins 108 carried by the pull-up jaws 99, midway between the ends of the pins, are link members 117 which extend upwardly through openings 118 in the top plate 98 and have upper laterally bent or T-shaped head portions 119 engaged in vertical slots 120 within the shifter ring 116 and engaging side ledges 120' at the bottoms of said slots. The shifter ring also has downward projections or release fingers 121 which extend through slot-like openings 122 in the top plate 98 into engagement with the upper surfaces of the pull-down jaws 100. Both pairs of jaws have straight teeth or serrations 123 on their inner faces for gripping the flat surfaces of the drill stem. When the jaws are in their intermediate position shown in Fig. 8, the jaw teeth are maintained out of contact with the drill stem. When the shifter ring is moved upwardly, the pull-up jaws 99 are moved upwardly through the links 117 and the link heads 119, with the latter engaging the ledges 120' at the bottoms of the slots 120, while the pull-down jaws 100 are moved upwardly into and are yieldingly held by the springs 107 in gripping contact with the drill stem. When the shifter ring 116 is moved downwardly from the position shown in Fig. 8, the release fingers 121 move the pull-down jaws 100 into released position, while the pull-up jaws 99 are moved downwardly into and yieldingly held by the springs 106 in gripping contact with the drill stem. The shifter ring 116 has an annular flange 125 with which engages a shifter collar 126. An annular member 127, secured to the shifter collar and of inverted drumlike shape, has a depending flange 127' and provides a hood to keep dirt from the chuck mechanism. Integrally connected to opposite sides of this flange are brackets 128 secured at 128' to the upper heads 129 of reciprocable hydraulic cylinders 130. Contained in these cylinders are stationary pistons 131 having piston rods 132 which extend downwardly through the packed lower heads of the cylinders. The piston rods are rigidly secured at 134 at their lower ends to lugs 135 secured to the top cover of the casing 77. So as not to interfere with the inner adjacent connecting rods 89 of the feeding means, the cylinders 130 are diagonally arranged, as shown in Fig. 7. The piston rods 132 have fluid conducting passages 136 and 137 formed therein which communicate with the bores of the cylinders 130 respectively above and below the pistons 131. A suitable valve mechanism (not shown) is provided for controlling fluid flow through these passages to effect movement of the cylinders 130 either upwardly or downwardly with respect to the stationary pistons, thereby to move the shifter ring 116 into its different positions. By trapping the liquid within the cylinders, the shifter ring may be locked in the desired position. When either pair of wedge-jaws is yieldingly held in contact with the drill stem, and when the feed is operated in the proper direction, the effective wedge-jaws automatically firmly grip the stem to connect the latter to the feed pistons for movement therewith, and when the feed is reversed, the jaws are automatically released. Thus, as determined by the proper positioning of the shifter ring 116, the drill stem 31 may be either raised or lowered by the hydraulic feeding mechanism through the chuck.

As is also common practice in the well drilling art, the rotary table shown in Fig. 6 may have its supporting frame mounted in a stationary position on the derrick floor, and, in such a construction, the chuck mechanism may be applied to a separate pull-down mechanism which is usually operated by the cable of the hoisting mechanism or drawworks. With such an arrangement, the jaws of the chuck mechanism may be operated, in the manner above described, to feed the drill stem downwardly through the table as it is rotated thereby, or to raise the drill stem upwardly through the table. Of course, in the em-

bodiment shown in Fig. 1, the rotating mechanism is mounted in such a stationary position and the operation is similar, with the exception that a standard rotary drill structure is employed.

As a result of this invention, an improved chuck mechanism is provided for a rotary oil well drilling apparatus whereby the hydraulic feeding mechanism may be employed to raise or lower the drill stem or kelly and drill rod line as desired. By the provision of the double acting, semiautomatic chuck, the chuck jaws may be readily positioned to grip automatically the drill stem upon feed in one direction and to release automatically from the drill stem when the feed is reversed, and by the proper positioning of the jaws, such gripping and releasing functions may occur in either direction, as desired. Thus, the chuck mechanism may be used to pull the rod line as well as to feed the rod line toward the work. The novel arrangement of the chuck jaws and the shifter means therefor not only results in ease in operation but also in substantially increased overall drilling speeds. The structure of the chuck mechanism is simple and rugged in design, and may be associated with a conventional rotary oil well drilling apparatus with a minimum of change. Other manners of use and advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, the combination with a rotating mechanism for a drill stem and reversible feeding mechanism for a drill stem, said rotating mechanism including a rotatable element and said feeding mechanism including means effective to feed said element axially selectively in opposite directions, of a double acting chuck mechanism carried by and rotatable with said rotatable element and embodying a casing having an axial passageway for receiving the drill stem, oppositely acting chuck jaws arranged in said casing about said passageway, means for guiding said jaws comprising relatively inclined guides of substantially the same extent and disposed between said casing and said jaws for guiding the latter toward and away from the axis of said passageway, said guides disposed in a common transverse zone with respect to said casing and the guides inclined in one direction alternating with those inclined in the opposite direction, yieldable means between said casing and said jaws for urging the latter toward gripping position, said oppositely acting chuck jaws adapted to grip selectively the drill stem automatically in accordance with the direction of axial movement of said rotatable element, and a shiftable member mounted on said casing for selectively rendering said chuck jaws effective to grip the stem and embodying oppositely acting shifter elements respectively engaging said oppositely acting jaws for rendering said oppositely acting jaws concurrently ineffective with said jaws disposed in a common transverse zone with respect to said casing.

2. In a drilling apparatus, a combination with hydraulic feeding mechanism for a drill stem including a reversible feeding element and rotating mechanism for a drill stem including a tubular driving element through which the drill stem is adapted to extend, of a double acting chuck mechanism carried by said feeding element at the upper end thereof and embodying a casing having an axial passageway for receiving the drill stem, oppositely acting chuck jaws arranged in said casing about said passageway, guiding means for said jaws comprising inclined guides between said casing and said jaws for guiding the latter toward and away from the axis of said passageway, said guides being oppositely inclined and of substantially the same extent, yieldable means between said casing and said jaws for urging the latter toward gripping position, said oppositely acting chuck jaws adapted to grip selectively the drill stem automatically in accordance with the direction of axial movement of said feeding element, and a shiftable member surrounding a portion of and guided on said casing and having oppositely acting shifter elements for selectively rendering said jaws effective to grip the drill stem against the action of the opposed yieldable means.

3. In a drilling apparatus, the combination with a reversible feeding mechanism for a drill stem including a feeding element movable selectively in opposite directions and drill stem rotating mechanism including a stem rotating element carried by and movable with said feeding element, of double acting chuck mechanism carried by said feeding element and embodying a casing having an axial passageway for said drill stem, oppositely acting chuck jaws arranged in said casing about said passageway, guiding means for said jaws for guiding the latter toward and away from said axis of said passageway including inclined guides disposed in a common transverse zone between said casing and said jaws, yieldable means between said casing and said jaws for urging the latter toward gripping position, said oppositely acting chuck jaws adapted to grip selectively the drill stem automatically in accordance with the direction of movement of the reversible feeding element, and shiftable means guided on said casing for selectively rendering said jaws effective against the action of the opposed yieldable means to grip the drill stem rotated by said rotating element automatically in accordance with the direction of feed, said shiftable means having a projection adapted to push upwardly on one jaw and a tension member adapted to pull downwardly on the oppositely acting jaw.

4. In a drill stem chuck mechanism, a casing through which a drill stem is adapted to extend, said casing having oppositely inclined guiding surfaces of substantially the same extent and disposed in a common transverse zone lying across said casing, oppositely acting wedge shaped chuck jaws respectively engaging said inclined guiding surfaces, rollers journaled on said casing and respectively engaging said oppositely acting jaws for maintaining the latter in guided relation with said guiding surfaces, said rollers respectively engaging said jaws near the narrow ends of the latter, yieldable means for urging said jaws toward gripping position with said jaws in contact with said rollers, and shifter means guided on said casing and embodying oppositely acting shifter elements respectively engaging said jaws for shifting the latter along said guiding surfaces in opposition to the yieldable means which oppose such movement to bring one or the other of said

jaws into operative gripping relation with a drill stem.

5. A drill stem chuck mechanism comprising a casing, oppositely acting chuck jaws carried by said casing, one jaw adapted to grip the drill stem in one direction, and the other jaw adapted to grip the stem in the opposite direction, yieldable means for urging said jaws toward gripping position, and means for oppositely positioning said jaws in said casing to grip automatically a drill stem upon bodily movement of the chuck mechanism in either direction relative to the stem, said positioning means including a shifter element movably mounted at one end of said casing in coaxial relation therewith and shiftable axially of said casing, said shifter element having oppositely acting members projecting into said casing for engaging said jaws and movable into one position relative to said casing to cause one jaw to grip the drill stem in one direction and into another position relative to said casing, to cause the other jaw to grip the stem in the opposite direction.

6. A double acting chuck mechanism, including a casing having an axial passageway for a member to be gripped, said casing having a cruciform shaped body portion providing four rectangularly disposed recesses each having parallel sidewalls, oppositely acting chuck jaws arranged in said recesses of said casing body portion about said passageway to engage the member to be gripped and having outer surfaces inclined relative to the axis of the passageway, correspondingly inclined guiding means between said casing and the respective jaws for individual movement of the jaws in opposite axial directions of said passageway while moving toward and away from said axis, springs between said jaws and said casing for moving said jaws in relatively opposite directions selectively to grip said member, rollers arranged in said recesses and journaled on said sidewalls of said recesses of said body portion and respectively engaging the inlined surfaces of said jaws, said rollers having their axes respectively lying in parallel transverse planes at right angles to the axial line of said passageway, means for mounting said rollers in said recesses with their peripheral surfaces in engagement with the inclined surfaces of the jaws for maintaining the latter in gripping contact with said gripped member when said casing is shifted in one longitudinal direction or the other, and means carried by said casing for shifting said jaws to effect engagement of one jaw to effect gripping of said member in one direction and to effect engagement of the other jaw to effect gripping of said member in the opposite direction.

7. A double acting chuck mechanism including a casing having an axial passageway for a member to be gripped, pairs of oppositely acting chuck jaws arranged in said casing about said passageway to engage the member to be gripped, said pairs of jaws having outer surfaces inclined relative to the axis of said passageway with the surfaces of one pair inclined oppositely with respect to the surfaces of the other pair, guiding means for said jaws comprising correspondingly inclined guides of substantially the same extent disposed in a common transverse zone with respect to said casing between the latter and the respective jaws for individual movement of said jaws in an up and down direction while moving toward and away from said axis of said passageway, oppositely acting springs between said pairs of jaws and said casing for moving said jaws in a direction to grip said member, and manual shifter means embodying oppositely projecting shifter elements respectively engaging said jaws for moving said jaws in opposition to said springs whereby one pair or the other of said jaws may be rendered effective to grip said member depending upon the longitudinal direction in which said casing is moved, one of said shifter elements secured to one jaw and being placed under tension upon shifting of its respective jaw in one direction.

8. A double acting chuck mechanism including a casing having an axial passageway for a member to be gripped, pairs of oppositely acting chuck jaws arranged in said casing about said passageway to engage the member to be gripped, said pairs of jaws having outer surfaces inclined relative to the axis of said passageway with the surfaces of one pair inclined oppositely with respect to the surfaces of the other pair, correspondingly inclined guiding means between said casing and the respective jaws for individual movement of said jaws in an up and down direction while moving toward and away from said axis of said passageway, said pairs of jaws being arranged in right angular relation with respect to each other and so arranged with respect to said casing that a single transverse plane at right angles to said axis of said passageway cuts through all of said jaws, oppositely acting springs between said pairs of jaws and said casing for moving said jaws in a direction to grip said member, and manual means for moving said jaws in opposition to said springs whereby one pair or the other of said jaws may be rendered effective to grip said member depending upon the longitudinal direction in which said casing is moved.

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