April 18, 1944. W. A. ABEGG 2,346,958

KELLY BUSHING

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Fig. 1.

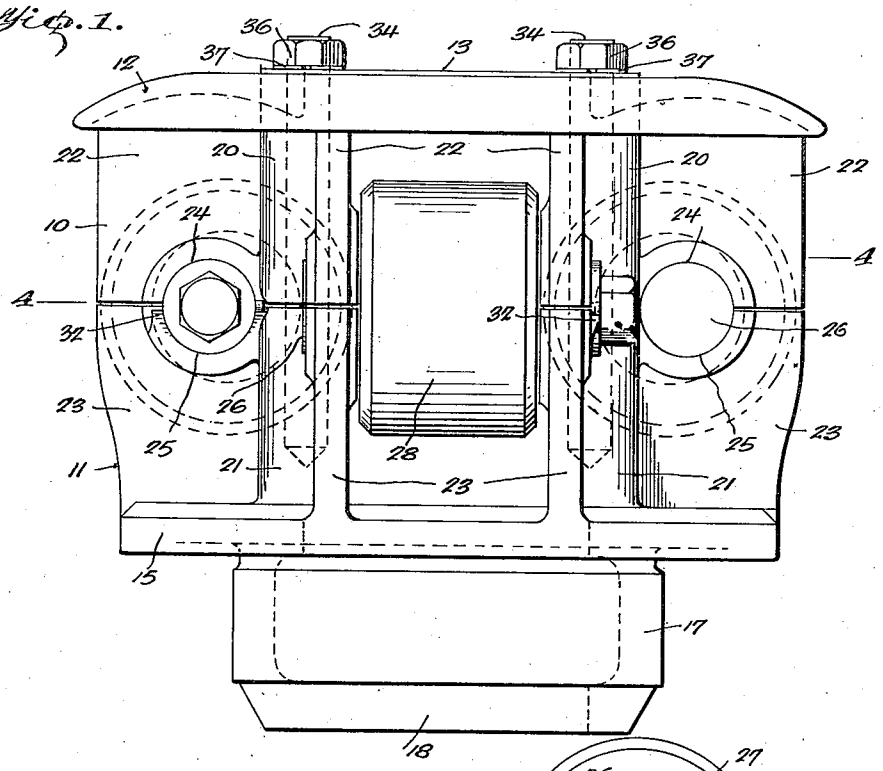


Fig. 2.

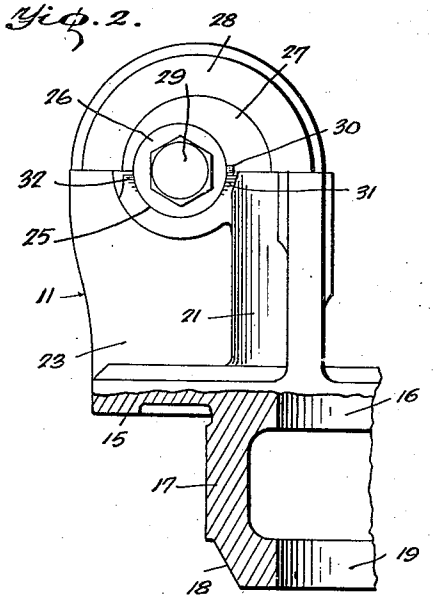
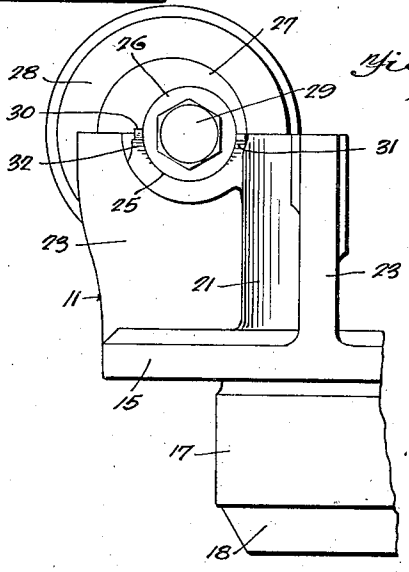


Fig. 3.



INVENTOR
Walter A. Abegg,
BY Myron S. Oles
ATTORNEY

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Fig. 4.

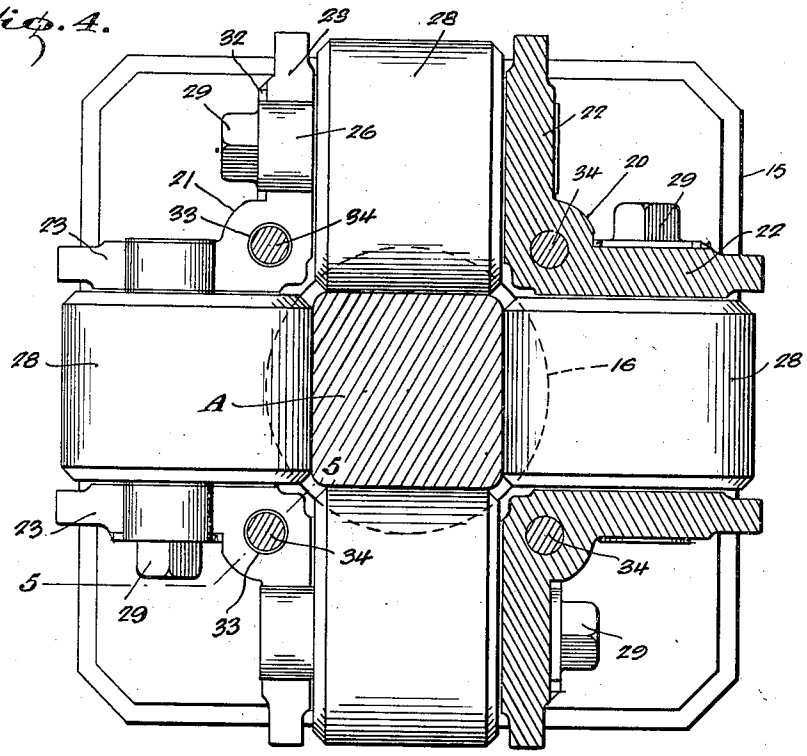


Fig. 5.

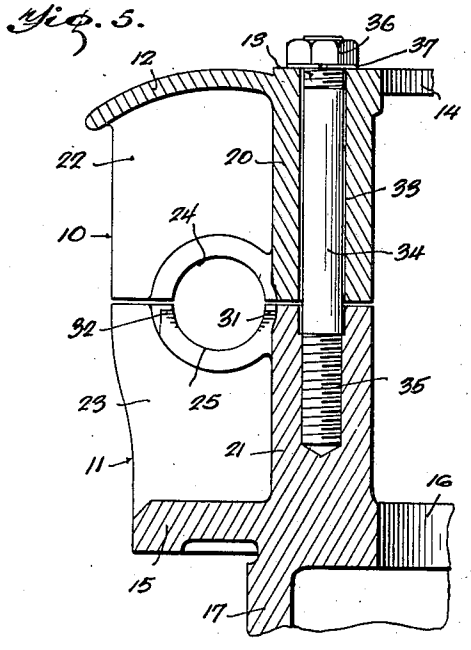
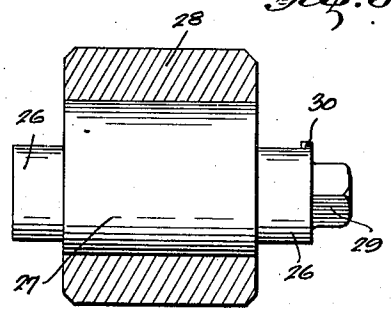


Fig. 6.



INVENTOR
Walter A. Abegg,
BY Myron S. Clear
ATTORNEY

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UNITED STATES PATENT OFFICE

2,346,958

KELLY BUSHING

Walter A. Abegg, Los Angeles, Calif., assignor to Abegg & Reinhold Co. Ltd., Los Angeles, Calif., a corporation of California

Application March 4, 1942, Serial No. 433,323

1 Claim. (Cl. 255—23)

The present invention relates to that type of oil well tool used in the drilling of oil wells, commonly known as a rotary Kelly bushing, now generally in use to drive the Kelly bar from the rotary table and at the same time permit of, and provide for, free vertically sliding movement of the Kelly bar as the drill stem, attached thereto and rotated thereby, feeds downwardly into the hole during the drilling operation.

It is well known that Kelly drive bushings must provide in some manner for engaging the polygonal stem of the Kelly bar, usually square, between its circumferentially greater cylindrical top and bottom connections, so that the kelly may be rotated and so that it may, without danger of sticking, move vertically. In some instances the Kelly bushing has been split vertically necessitating complete detachment of its sections in associating the same with, and removing it from, a Kelly bar. In other instances, inserts are clamped within the bushing to so engage the Kelly bar, which necessitates removal and replacement of the inserts for association with, and disassociation from, the Kelly bar. Such inserts when removed, are often damaged on the floor of the drilling rig, and subject to misplacement and loss.

It is the primary concept of the present invention to provide a Kelly bushing in which the Kelly bar engaging members or elements are shiftable radially of the bushing, or in other words, normal to its longitudinal axis, between an inner active and kelly engaging position and an outer inactive position clearing the lengthwise kelly receiving bore of the bushing, which bore is dimensioned to permit of passage of the kelly end connections therethrough. This inventive concept makes possible the elimination of removable parts during the association of the bushing on, and its removal from, the Kelly bar and permits of association of the bushing on, and its removal from, the Kelly bar by the mere loosening and adjustment of parts capable of ruggedly withstanding relative movement or play in normal operation of the bushing.

It is a further concept of the invention to provide for clamping of the kelly engaging members or elements in active and inactive positions, without introducing additional parts or complications, by forming the bushing in upper and lower sections so connected and related that mere tightening pressure of such sections, relative to each other, will serve to clamp the elements in either position thereof and slight release of such pressure will permit of their adjustment between such positions, without requiring disconnection of the sections at any time.

With these general concepts in mind, the detailed description to follow is suggestive of a practical manner of carrying the invention into use, though in no sense a limitation upon the various ways in which such concepts may be capable of practice.

In the accompanying drawing, to which the detailed description refers as a part of this specification;

Figure 1 is a side view in elevation of the suggested form of Kelly bushing.

Figure 2 is a view partly in elevation and partly in section, of a portion of the lower section of the bushing, showing one of the Kelly bar engaging elements in its inner active position.

Figure 3 is a complete elevation of the parts of Figure 2, with the Kelly bar engaging element in outer inactive position.

Figure 4 is a view taken horizontally of the complete bushing on line 4—4 of Figure 1, being in part a top plan view of the lower section of the bushing and in part a sectional view through a portion of the upper section of the bushing.

Figure 5 is a partial vertical sectional view taken substantially on line 5—5 of Figure 4, and

Figure 6 is a longitudinal sectional view through one of the kelly engaging rollers, showing its eccentric support in elevation.

Referring now to the above described figures of the drawings, the suggested embodiment of the inventive concepts first above mentioned is pictured as a Kelly bushing, the body of which is formed in upper and lower sections generally appearing at 10 and 11. The upper section 10 has an overhanging upper skirt 12 around, and integral with, an upstanding crown ring 13 surrounding an upper, circular axial opening 14, partially appearing in Figure 5, which is at the upper end of the axial kelly receiving bore of the body.

The lower section 11 of the body has a lower horizontal base 15 with an axial opening 16 and a reduced depending squared extension 17 for interfitting in rotary driving relation, the similar bore of a master bushing seated in a rotary table, or such a bore of the table itself if a master bushing is not in use. Neither the master bushing nor table have been shown since they are both now well and generally known in the rotary drilling of oil wells.

The squared lower extension 17 is hollow and has a lower tapering guide 18 and a circular bottom opening 19. This opening and the opening

16 of the base 15 form parts of the kelly receiving bore, each being of similar diameter somewhat greater than the diameter of the end connections of a Kelly bar of the largest size which the bushing is intended to accommodate.

The upper and lower sections 10 and 11 of the body of the bushing also have their respective portions 20 and 21 of a series of four upright posts extending vertically between the upper skirt 12 and the base 15 at equidistantly spaced points around, and beyond, the axial bore of the body. The upper post portions 20 are preferably formed integral with the skirt 12 and depend therefrom, and the lower post portions 21 are similarly formed integral with, and rise from, the base 15.

The body sections 10 and 11 are furthermore formed with edgewise mating wing-like walls 22 and 23 outstanding in right angular relation with respect to each of the post sections 20 and 21, and forming, when in mating relation, a series of webs extending between skirt 12 and base 15 and defining between them a series of laterally opening channels radially disposed with relation to the axial kelly receiving bore of the body. It is within these channels that the kelly engaging elements are disposed in a manner to be readily, horizontally adjusted for movement inwardly into active engagement with the square Kelly bar, indicated at A in Figure 4, and outwardly to inactive position. In the active position the elements project partially into the kelly receiving bore of the body, and in the inactive position they are entirely without the limits of the bore so as not to interfere with the association of the bushing on, and its removal from, the kelly.

Each of the several wall sections 22 and 23 has its complementary half section 24 and 25 of horizontally aligned bearings for the end portions of short shafts 26, which shafts cross the channels above mentioned between the walls, and are provided with intermediate eccentric portions 27 within the channels. Thus according to this suggested embodiment of the invention the kelly engaging guide elements may be in the nature of rollers 28 disposed on the eccentric portions 27 of their supporting shafts and capable of bodily displacement between inner active positions in contact with the faces of the Kelly bar A as in Figures 2 and 4, and outer inactive positions clearing the kelly receiving bore as in Figure 3. It will be noted that Figure 2 shows one of the rollers 28 in inner active position, while Figure 3 shows the same roller in outer inactive position.

Since it is only necessary to rotate the shafts 26 through a half revolution to shift the rollers from one position to the other, one end of each shaft may be extended beyond its respective wall bearing a sufficient distance to provide thereon a polygonal wrench engaging end portion 29 and a diametrically outstanding stop pin 30 for movement against stop lugs 31 and 32 at relatively opposite sides of the bearing recesses of the lower wall sections 23, in order to provide for, and arrest, manual rotation of the shafts when the rollers are in the active and inactive positions above mentioned.

Furthermore, since the edgewise mating wall sections 22 and 23 may be utilized to exert pressure on the bearing ends of the shafts for securely holding the latter against accidental rotational movement and in this way vertically lock the kelly engaging rollers 28 in their active as well as inactive positions, the means employed to connect the body sections 10 and 11 may be of such nature as to readily admit of the creation of such pressure and its relief when adjustment of the rollers is desired.

Thus, the upper posts sections 20 may be axially bored throughout, with the upper ends of their bores 33 opening through the crown ring 13, to receive the upper portions of stud bolts 34 as best seen in Figure 5. The lower portions of these stud bolts 34 may be suitably anchored in axial sockets 35 formed in the lower post sections 21, and their upper extremities threaded for the reception of pressure adjusting nuts 36 bearing on the crown ring 13 of the upper body section and preferably bottomed on lock washers shown at 37.

It is obvious that in normal use the several clamping nuts 36 may be loosened to relieve clamping pressure between the upper and lower sections of the body or housing and thus permit the supporting shafts 26 to be turned so that their stop pins 30 engage the outer shoulders 32 as in Figure 3. This retracts the several rollers 28 so as to clear the kelly receiving bore of the body and permit the lower box or drill stem connection of the kelly to be passed downwardly through said bore. The supporting shafts are then rotated until stop pins 30 engage the inner shoulders 31, in order to shift the rollers 28 into effective contact with the Kelly bar A, as seen in Figures 2 and 4. Thereafter the clamping nuts 36 are again tightened to effectively and rigidly connect the body sections 10 and 11 and at the same time clamp the supporting shafts 26 against accidental rotation. Removal of the bushing from the kelly is accomplished in a similar manner.

It is particularly to be noted that in the above described operations it is provided that an ordinary wrench is the only tool that is necessary; that no special tools are needed, and that no parts need be entirely detached or removed or subjected to possible defacement or loss on the rig floor.

It is also plain that the bushing as thus described may be used on Kelly bars which are worn or under size interchanging the Kelly bar engaging rollers to provide rollers 28 of suitable diameter and/or eccentrics 27 of greater throw, whereby in their inner effective positions the rollers will project to the necessary degree into the kelly receiving bore of the body to properly fit a particular Kelly bar.

While the rollers 28 have been shown with plain bearings on the supporting shaft eccentrics 27, it is obvious any suitable antifriction bearings, such as balls or rollers, may be used between them, and that the rollers 28 may be replaced by slide blocks and the like constituting the Kelly bar engaging elements. It is to be understood that these and all other changes are reserved within the terms of the following claims.

It will be especially noted that the sections of the housing have a parting line approximately midway of the length or height thereof, giving each section a similar, substantial clamping power against the supports of the kelly engaging elements, and that by so clamping these supports, it is provided that the housing sections and their clamping means, as well as the kelly engaging elements and their supports may all take the form of rugged, durable members lastingly proof against relative movement or play which is a prominent factor in the rapid wear, and comparatively short life, of many Kelly bushings now in use.

Having thus fully described the invention, what is claimed is:

A Kelly bushing adapted to be rotated on a vertical axis in use, comprising a vertically bored body, including upper and lower sections of approximately similar vertical dimensions and similarly having upright posts at spaced points around the perimeter of the bore and wall-forming portions extending angularly with relation to said bore and radially therefrom in pairs, the said wall-forming portions of each pair being laterally separated in parallel relation and forming between them radial bearing spaces opening at their inner ends into the bore, the lower section having a depending externally polygonal seating extension, said wall-like portions of the upper and lower sections presenting horizontal facing edges having complementary semi-cylindrical recesses forming, in their assembled relation, horizontal bearing apertures, a shaft having its end portions journalled in the apertures of each pair of walls and adapted to be rigidly clamped by pressure of one section against the other, each shaft having an eccentric intermediate portion in its respective bearing space, rollers journalled on the eccentric portions of said shafts in said bearing spaces to engage a polygonal Kelly bar in the bore and provide for communication of rotative movement thereto, said posts of the sections having, in vertical alignment, bolt-receiving bores, and vertical bolts in said bores clamping the sections together and rigidly against said shaft ends in lines at right angles to the applied force of rotation of the bushing, to thus coact with the clamped shaft ends in resisting torsional stresses of the sections relative to each other in use.

WALTER A. ABEGG.