

April 18, 1939.

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2,155,109

KELLY-BAR BUSHING

Filed April 13, 1938

2 Sheets-Sheet 1

Fig. 1

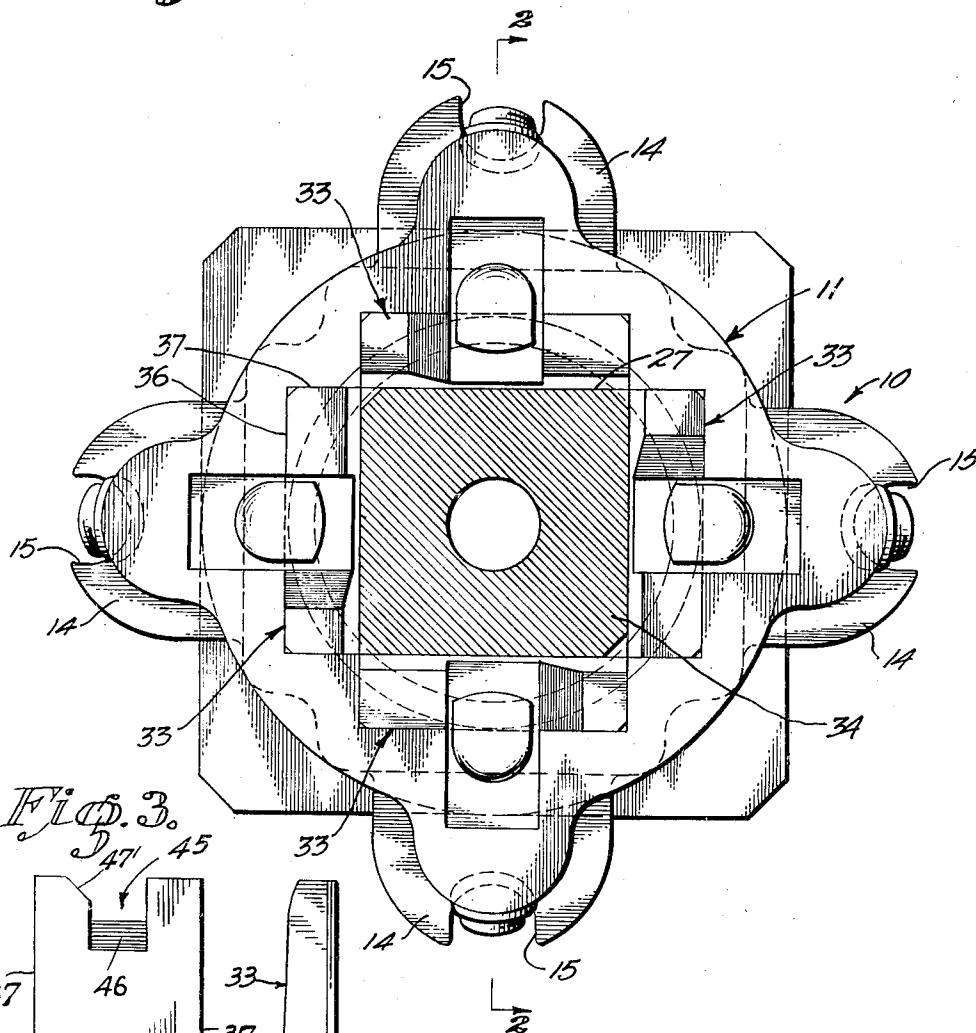


Fig. 3.

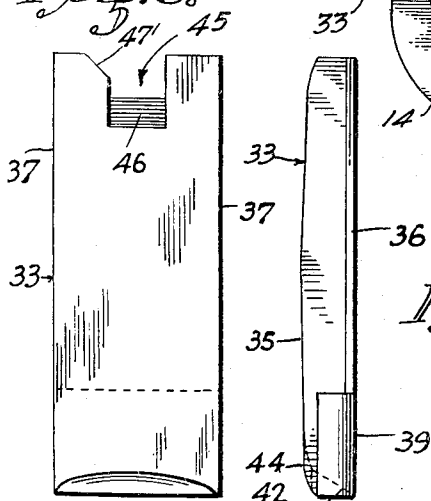


Fig. 4.

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Fig. 2.

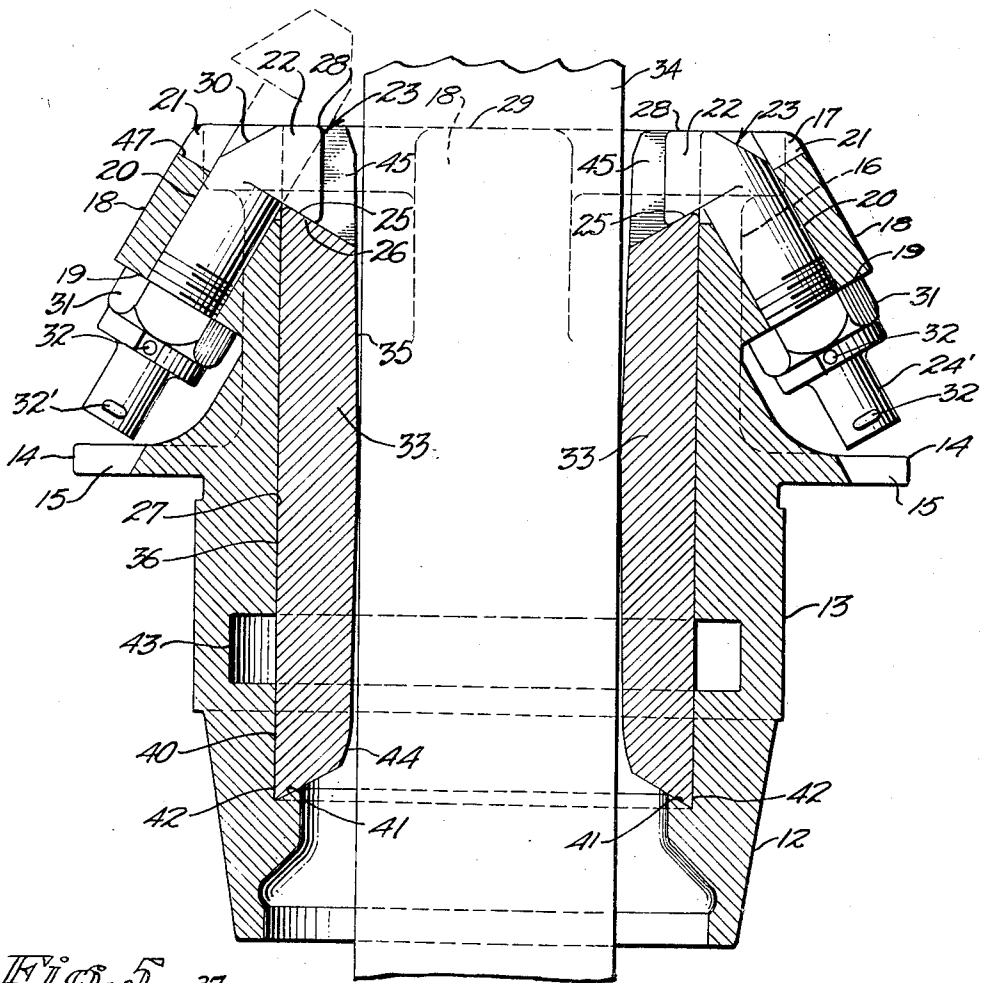


Fig. 5.

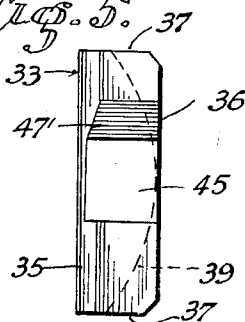
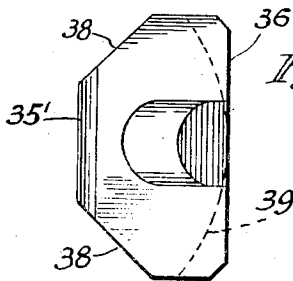


Fig. 6.



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KELLY-BAR BUSHING

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Application April 13, 1938, Serial No. 201,768

11 Claims. (Cl. 255—23)

This invention relates to well drilling equipment, and particularly pertains to a Kelly-bar bushing.

In well drilling operations it is the usual practice to lower a string of drill pipe and a cutter into the well through the rotary table and to attach a Kelly-bar to the upper end thereof. A Kelly-bar is usually of square cross-section and extends through a bushing in the rotary table which bushing has a square opening so that rotation of the rotary table may be transmitted to the Kelly-bar to provide driving rotation for the drill bit and the drill string. In view of the fact that the Kelly-bar is supported so that it may move vertically through the bushing, and for the additional reason that the driving torque imparted to the Kelly-bar by the bushing will cause the Kelly-bar to wear, various expedients have been provided in an attempt to permit the Kelly-bar to move through the bushing with a minimum amount of wear and binding, and to make it possible for the wear parts to be taken up or replaced. Heretofore in most instances the structures provided have been expensive to manufacture and to repair, and have also been of relatively delicate construction so that they have become broken easily. It is the principal object of the present invention therefore to provide a Kelly-bar bushing, the body of which is extremely strong and rugged and will not be damaged easily when handled at the drill rig, and which body is designed to receive and to effectually hold guide inserts not liable to be easily damaged while presenting efficient guide and wear surfaces to the faces of the Kelly-bar, with no looseness or lost motion in the seat of the bushing body proper and with wear surfaces readily adapting themselves to the faces of the Kelly-bar. The structure also has the additional advantage that the inserts may be quickly interchanged to accommodate Kelly-bars of different sectional dimensions.

The invention contemplates the provision of a Kelly-bar bushing body adapted to seat within a rotary table and which body is formed with seat sections to receive guide inserts, the guide inserts being detachably secured in place by simple and positive fastening means.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a view in plan showing the Kelly-bar bushing with which the present invention is concerned, and indicating a Kelly-bar in cross section.

Fig. 2 is a view in vertical section showing the

assembled Kelly-bar bushing mounted upon the Kelly-bar.

Fig. 3 is a view in side elevation showing one of the guide inserts.

Fig. 4 is a view in elevation showing one of the inserts edgewise.

Fig. 5 is a view in plan showing one of the inserts.

Fig. 6 is a view in plan showing another insert adapted to engage a Kelly-bar of smaller sectional dimension than would be engaged by the inserts shown in Fig. 5.

Referring more particularly to the drawings, 10 indicates the body of a Kelly-bar bowl of the construction with which the present invention is concerned. This body is formed with a substantially cylindrical main portion 11 extending vertically. The lower end of the main portion 11 is downwardly and inwardly tapered as indicated at 12 in Fig. 2. Above the tapered portion is a squared collar 13 which fits within the usual squared seat of a well rig rotary table. In a horizontal plane directly above the squared seat and disposed in equal spaced relation to each other around the main portion 11 of the body are horizontally extending guard lugs 14 which are substantially semi-circular in plan and at a point midway their circumferential length are formed with arcuate recesses 15. Projecting upwardly from the plane of the guard lugs 14 is a tubular portion 16 of the body. The upper end of this tubular portion terminates in an outwardly projecting annular marginal flange 17, while at points around the body and lying within the vertical planes of the centers of the guard lugs 14 and their recesses 15 downwardly and outwardly extending bosses 18 occur. The bosses 18 terminate in flat faces 19 disposed at right angles to the longitudinal center of bolt openings 20, one of which extends through each boss. The upper end faces of the bosses are formed with transverse inclined slots 21 which are longitudinally aligned with radial axes of the body portion 11. These slots accommodate the hooked head 22 of clamping bolts 23. By reference to Fig. 2 of the drawings it will be seen that the hooked heads have an overhanging gripping face 25 which is at right angles to the longitudinal axis of the bolt, and which portions overhang vertical slotted seats 26 formed in the wall of the central opening 27 of the portion 11 of the body member and which will be hereinafter described. The upper ends of the bolt heads 22 have faces 28 which lie in a plane parallel to the top face 29 of the body member 11. The heads 22 are formed with an

inclined back face 30 which provides suitable clearance. The design and dimensions of the head 22 are such as to insure that when the bolts are in a clamping position the heads 22 will lie within the slotted grooves 21 of the boss and will be protected against blows which might be delivered to them by objects with which they may come in contact. The bolts are of a length designed to allow the bolts to clear the guard lugs 14 and to be thereabove when in a clamping position. Semi-circular recesses 15 of the guard lugs are provided for drilling clearance in the manufacture. Clamping nuts 31 are provided for the bolts. It is preferable that the nuts 31 be castellated to receive a locking cotter pin 32. Attention is directed to the fact that the portion of the bolt below the nut 31 when tightened is of reduced diameter so indicated at 24'. This reduced diameter represents the thread depth so that the nut will screw off the thread and also to insure that the thread will not be uncovered and damaged to prevent the unscrewing of the nut. A cotter pin 32' prevents accidental removal and loss of the nut.

The bolts are designed to grip and hold in position guide inserts 33. These inserts provide the wear surface which intimately contacts the longitudinal side faces of the Kelly-bar 34. The wear faces of the inserts 33 are preferably slightly convexed longitudinally as indicated at 35 so that binding due to a slight mis-alignment or deviation from the perpendicular of the Kelly-bar will not occur. The back faces of the inserts are flat as indicated at 36, while the opposite edges 37 are at right angles to the flat back face. The inserts vertically slide into position within the grooves 26. It is preferable that the horizontal width of the grooves 26 and the horizontal thickness of the inserts 33 will be such as to insure that the contiguous vertical edges of the side faces of the inserts will substantially coincide and that the body portions of the inserts will thus be arranged at right angles to each other to define an opening of square section through which the Kelly-bar 34 passes. The maximum opening through a given Kelly-bar bushing of the type here shown would be obtained by the use of inserts as shown in Figs. 3 and 4 of the drawings where the transverse planes of the inserts would substantially intersect at the forward edges of the side faces of the inserts as shown in Fig. 1. Variations of this arrangement to accommodate Kelly-bars of smaller dimension would be taken care of by inserts formed as shown in Fig. 6 of the drawings where the thickness of the inserts is increased to reduce the size of the opening and where the opposite sides of the insert are beveled at 45° as indicated at 38 in Fig. 6, so that a reduced wear face 35' would be provided in exceeding the width of the flat face of the Kelly-bar with which it is used. In order to hold the inserts in position without the necessity of expensive machine work in forming dovetailed grooves along the sides 37 of the inserts and the vertical seats the body of the inserts are substantially rectangular in section throughout the major portion of their length and terminate in lower ends having an arcuately curved outer face 39 undercut in the back face 36. This arcuately curved outer face fits within an annular seat 40 which is turned in the lower end of the passageway 27 through the body member 10 and which seat terminates in a V-shaped groove 41. The groove 41 receives a tapered toe 42 which interlocks therewith to prevent lateral movement of the

lower end of the inserts. An annular groove 43 is formed around the wall of the central opening 27 in the body and above the annular seat 40 to facilitate in machining. The face 35 of the insert has a curved upper and lower portion 44 which reduces the thickness of the inserts and facilitates in the movement of the Kelly-bar 34 therethrough as well as in the insertion of the inserts 33 while the Kelly-bar is in place. The upper ends of the inserts 33 are formed with a vertical groove 45 which is disposed centrally of the width of the inserts. The vertical grooves 45 terminate in an inclined bottom face 46 which extends inwardly and downwardly across the insert at the same inclination as the face 25 of the head 22 of the bolt 24. The upper edge of the inclined face 46 lies in a plane above the plane of the bottom face 47 of the groove 21 which is cut in the boss 18. Thus the head 22 of the bolts 24 will hook over the upper edges of the face 46 and will hold the inserts down in their seated position within the grooves 45 and with the toes 42 of the inserts firmly held in the V-shaped seats 41 at the bottom of the annular seat 40. It is to be understood that the heads 22 of the bolts 24 have opposite flat faces which are disposed between side faces of the grooves 45 so that the head cannot rotate when in position. In order to facilitate removal and insertion of the bolts 24 into the openings 20 through the bosses 18 one side face of each of the grooves 45 is relieved with an inclined cutaway portion 47'. This makes it possible to gradually rotate the head 22 as the nut 31 is unscrewed so that the head may be retracted from the face of the Kelly-bar, thus insuring that the bolt may be removed or placed in position without interference with the Kelly-bar when the Kelly-bar is in place.

In operation of the present invention the body structure 10, including the bowl 11, is constructed as here shown. In some instances, however, if desired the guard lugs 14 may be eliminated. The bowl 11 is machined to form the annular seat 40 and the vertical seat grooves 26. The bolts 24 are inserted through their openings 20 with their heads turned away from the faces of the Kelly-bar as indicated by dotted lines in Fig. 2 of the drawings. A Kelly-bar may be inserted through the body member and the body member may be mounted within the portion of a rotary table designed to receive it without obstruction by the bolts. When the Kelly-bar has been extended through the body member the inserts 33 may be lowered in position along the flat faces of the Kelly-bar 34 until their toe portions 42 seat within the V-shaped grooves 41 and at which time the body of the inserts 33 will be properly seated within the vertical seats 26 formed to receive them. The heads 24 of the bolts may be rotated to positions overhanging the upper ends of the inserts. The nut 31 at the lower ends of the bolts may then be screwed up until the head begins to tighten, after which the head may be drawn down the inclined face 47 of the groove 45 and may be rotated as it moves downwardly to a position in register with the groove, at which time the overhanging face 25 of the head will overhang and abut against the inclined upper face 46 of the insert with which it is associated. As the nut is tightened the overhanging portion of the head will hook over and exert a downward gripping action to hold the insert in position. As shown in Fig. 2 of the drawings the longitudinally convexed face 35 of each of the inserts will be presented toward the side face of the Kelly-bar

34 and will make it possible for the insert to properly contact therewith while permitting the Kelly-bar to reciprocate through the bushing structure without binding or excessive wear. It will be understood that when the maximum size to be accommodated, special inserts for a particular sized Kelly-bar may be provided, as shown in Fig. 6 of the drawings. By the use of these inserts a contracted square opening will be formed, the dimensions of which will appropriately agree with the squared section of the Kelly-bar.

It is to be understood that while the inserts 33 are here shown as provided one for each Kelly-bar face it might be desirable to apply them to a lesser number of only or that one insert might engage more than one face. It is also within the contemplation of this invention to install inserts permanently and to form them with or without the convex wear faces.

It will thus be seen that by the construction here disclosed, a rugged Kelly-bar bushing will be provided, having strong clamping means which are not liable to be damaged in normal drilling operations, and which bushing is further provided with guide inserts each made of a single piece of material selected for its strength and wear resisting qualities, and designed so that it may be easily placed in position or removed therefrom.

While I have shown the preferred form of my invention, as now known to me, it will be understood that various changes might be made in the combination, construction, and arrangement of parts, by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A Kelly-bar bushing comprising a body member engaging a rotary table on which it is placed, a bowl formed as a part of said body member and extending upwardly therefrom and being formed with an opening therethrough, longitudinal slots formed in the wall of said opening, the number of slots agreeing with the side faces of a Kelly-bar, guide inserts adapted to be vertically aligned, one in each of said longitudinal grooves, the innermost faces of said inserts bearing against the vertical faces of the Kelly-bar, interlocking means between the lower ends of the guide inserts and body member to limit downward movement of the inserts and to hold the lower ends of the inserts against lateral movement within the grooves, inclined bosses formed as a part of the body member and formed around the bowl adjacent to the grooves therein, and hook bolts disposed in said bosses with their heads overhanging the grooves and engaging faces at the upper ends of the guide inserts, whereby to hold the guide inserts in their interlocking position when the bolts are positioned in their bosses and tightened.

2. A Kelly-bar bushing comprising a substantially tubular body member adapted to be operatively positioned with relation to a rotary table, longitudinal seats formed in the inner wall of said tubular body member, said seats being characterized as having opposite flat side walls disposed parallel to each other and parallel to an intermediate radial center line and a flat back wall at right angles thereto, a transverse groove at the lower end of said seat, a guide insert fitting into the seat and having greater thickness than the depth of the seat whereby a guide face will be presented to the side of a Kelly-bar extending through the body member, a boss formed in connection with the body member and having

an opening therethrough inclined downwardly and outwardly, a hooked bolt extending through said opening and having an overhanging hook end engaging an upper face of the guide insert, the lower end of the guide insert engaging the interlocking means whereby the hook bolt will hold the guide insert within the seat.

3. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-section and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts, one for each of said bosses, said bolts being formed with an overhanging head portion having a gripping face disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat.

4. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-section and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts, one for each of said bosses, said bolts being formed with an overhanging head portion having a gripping face disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat, the head of said bolt overhanging one side of its shank only and being formed to fit between the side walls of the groove in the upper end of the insert.

5. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-section

tion and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts one for each of said bosses, said bolts being formed with an overhanging head portion having a gripping face disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat, the head of said bolt overhanging one side of its shank only and being formed to fit between the side walls of the groove in the upper end of the insert, the overhanging end face of said head lying parallel to the vertical face of the Kelly-bar and spaced therefrom.

6. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-section and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts one for each of said bosses, said bolts being formed with an overhanging head portion having a gripping face disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat, the head of said bolt overhanging one side of its shank only and being formed to fit between the side walls of the groove in the upper end of the insert, the overhanging end face of said head lying parallel to the vertical face of the Kelly-bar and spaced therefrom, with the upper end of the head lying in a plane parallel to the mouth of the bowl.

7. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-

section and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat, the head of said bolt overhanging one side of its shank only and being formed to fit between the side walls of the groove in the upper end of the insert, the overhanging end face of said head lying parallel to the vertical face of the Kelly-bar and spaced therefrom, with the upper end of the head lying in a plane parallel to the mouth of the bowl, the back of the head being inclined with relation to the longitudinal axis of the bolt.

8. A Kelly-bar bushing comprising a tubular bowl through which a Kelly-bar extends, a plurality of longitudinally extending seats formed in the inner face of the wall of the bowl, said seats being substantially rectangular in cross-section and extending downwardly from the mouth of the bowl to a point adjacent the lower end thereof, an undercut annular seat being formed at the lower ends of said seats and having a diameter tangent to the back wall of the bowl and terminating in a V-shaped groove, a relatively flat guide insert of substantially rectangular section, one of which fits within each of said seats and terminates at its lower end in a portion of arcuate section fitting into the annular seat portion and the V-shaped recess, the upper end of the insert terminating substantially in the plane of the mouth of the bowl, a slotted recess formed in the upper end of the bowl and terminating in a downwardly and inwardly inclined bottom face, a set of bolt bosses carried by the bowl, one disposed along the plane of the radial center line of each of the seats and being inclined downwardly and outwardly, and a set of bolts, one for each of said bosses, said bolts being formed with an overhanging head portion having a gripping face disposed in a plane at right angles to the longitudinal axis of the bolt and coinciding with and exerting pressure against the inclined bottom face of the groove within its seat, one side wall of the groove in the insert being upwardly and outwardly tapered whereby the head may be rotated upwardly and out of the groove and away from the Kelly-bar as the nut of the bolt is loosened.

9. A Kelly-bar bushing comprising a tubular bowl, guide seat inserts formed longitudinally along the inner face of the bowl, said guide seats being substantially rectangular in shape and having a vertical back wall and parallel side walls, the seats agreeing in number with the side faces of a Kelly-bar extending through the

bowl, said seats terminating at their lower end
 in an annular wall section concentric with the
 bowl, the circumference of which is tangent to
 the back face of the seats and which annular
 5 portion terminates in a shoulder forming an up-
 wardly presented V-shaped annular groove, a
 plurality of bosses formed around the mouth of
 the bowl and as a part of the bowl, said bosses
 having a bolt opening therethrough, the longitu-
 10 dinal axis of which extends downwardly and
 outwardly and lies in a plane coincident with the
 median center line of a complementary insert
 seat, the upper end of the bolt opening intersect-
 ing the seat at a point below its upper end, a
 15 plurality of guide inserts substantially rectangu-
 lar in section seated within the several guide
 insert seats and having a toe portion interlock-
 ing within the V-shaped groove at the bottom
 of the guide insert seats, a recess formed in the
 20 upper edge of each of the guide inserts and hav-
 ing opposite parallel side walls and a down-
 wardly and inwardly inclined bottom face, bolts,
 one for each of said bosses, a head overhanging
 one side of each of said bolts and fitting in the
 25 recess of a complementary guide insert, said
 head being formed with a face coinciding with
 the inclined face of said recess, and a nut for
 each bolt to draw the bolt down in a clamping
 position.
 30 10. A Kelly-bar bushing comprising a tubular
 bowl, guide seat inserts formed longitudinally
 along the inner face of the bowl, said guide seats
 being substantially rectangular in shape and
 having a vertical back wall and parallel side
 35 walls, the seats agreeing in number with the side
 faces of a Kelly-bar extending through the bowl,
 said seats terminating at their lower end in an
 annular wall section concentric with the bowl,
 the circumference of which is tangent to the
 40 back face of the seats and which annular por-
 tion terminates in a shoulder forming an up-
 wardly presented V-shaped annular groove, a
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 the bowl and as a part of the bowl, said bosses
 having a bolt opening therethrough, the longitu-
 45 dinal axis of which extends downwardly and

outwardly and lies in a plane coincident with
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 sert seat, the upper end of the bolt opening in-
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 terlocking within the V-shaped groove at the
 bottom of the guide insert seats, a recess formed
 in the upper edge of each of the guide inserts
 10 and having opposite parallel side walls and a
 downwardly and inwardly inclined bottom face,
 bolts, one for each of said bosses, a head over-
 hanging one side of each of said bolts and fitting
 in the recess of a complementary guide insert,
 15 said head being formed with a face coinciding
 with the inclined face of said recess, and a nut
 for each bolt to draw the bolt down in a clamp-
 ing position, said inserts having their outer faces
 convexed longitudinally and contacting with the
 20 side faces of the Kelly-bar.

11. A Kelly-bar bushing comprising a body
 portion adapted to engage the rotary table of a
 well drilling rig, a bowl formed as a part thereof
 and having a relatively square passageway there-
 25 through to accommodate a Kelly-bar, longitudi-
 nal extending seats, one in each face of the pas-
 sageway through the bowl, guide inserts, one
 being disposed within each of said seats and ex-
 tending longitudinally thereof, each of said in-
 30 serts being substantially rectangular in hori-
 zontal cross section and extending substantially
 the width of the face of the Kelly-bar with which
 it contacts, said contacting face being flat hori-
 zontally and longitudinally tapered vertically
 35 from a transverse median line whereby there
 will be surface contact between the insert and
 the face of the bushing throughout the width of
 the face of the insert and the face of the bush-
 ing, and complete surface contact between the
 40 surface of the bushing and a vertically inclined
 face of an insert when the Kelly-bar assumes a
 position of vertical misalignment in angularity
 with that of the vertical taper of the faces.

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