July 6, 1948. T. DE W. McCONAHEY ET AL 2,444,842

POLISH ROD HANGER

Filed April 10, 1947 2 Sheets-Sheet 1

Fig. 1.

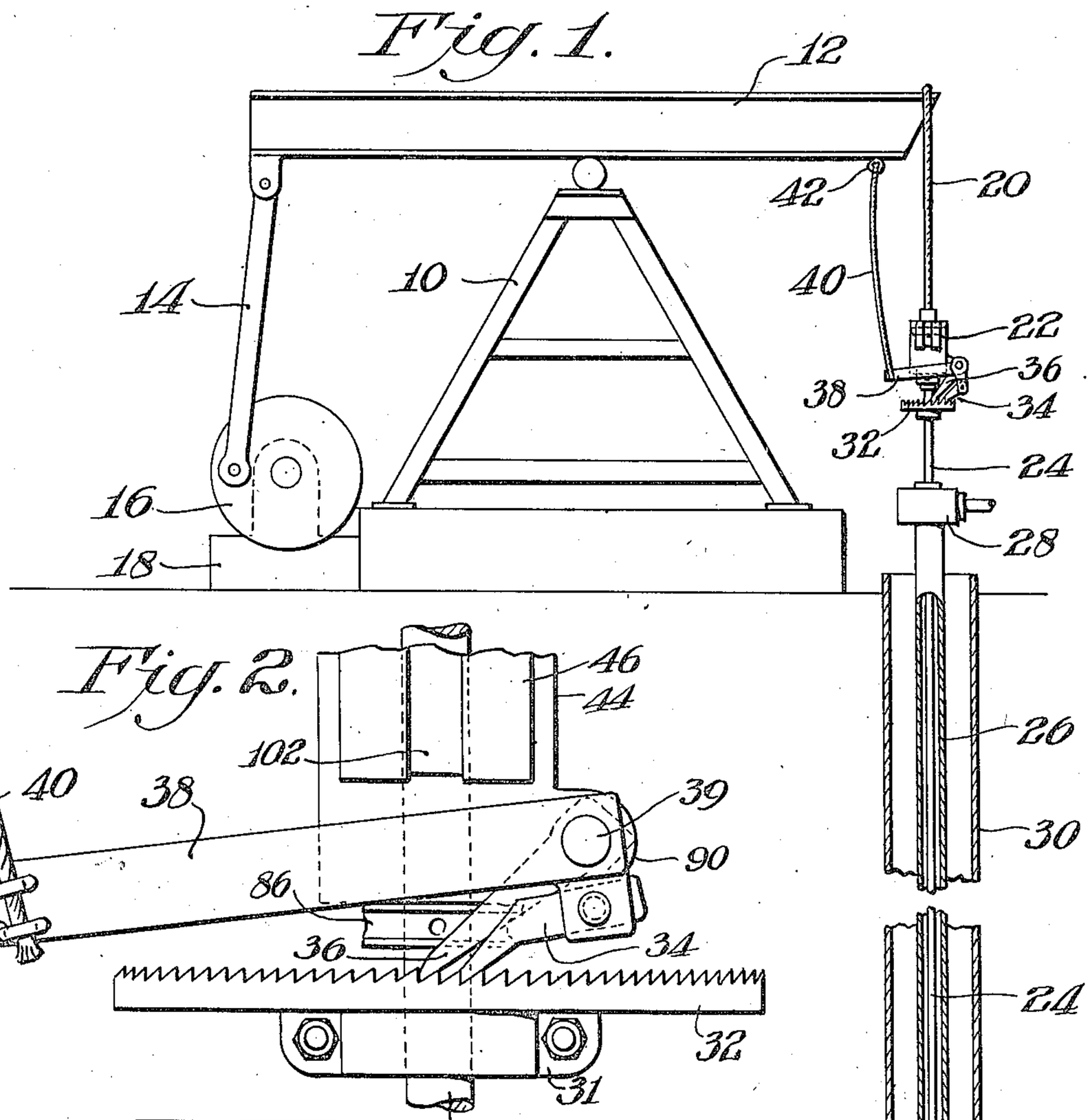


Fig. 2.

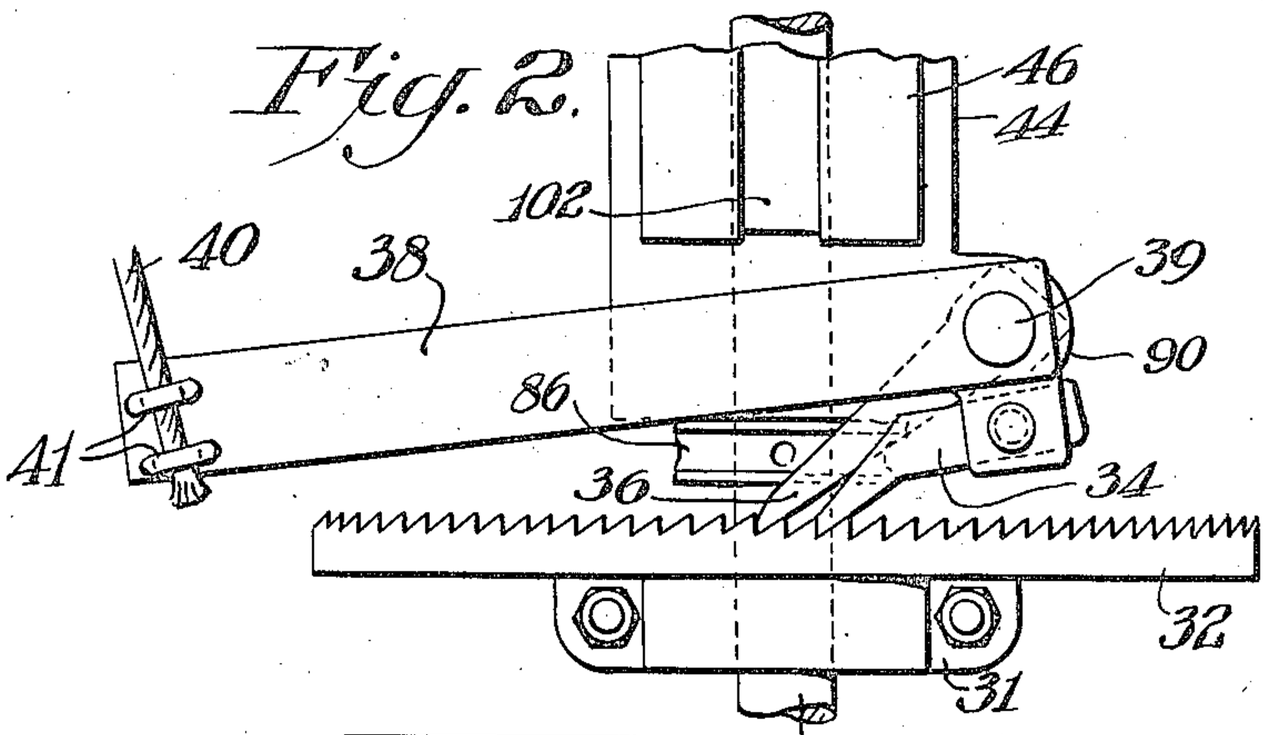


Fig. 5.

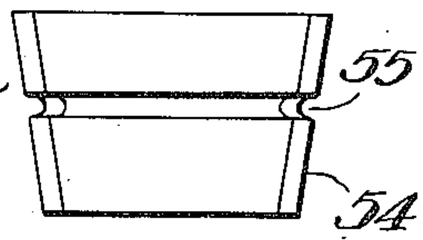


Fig. 6.

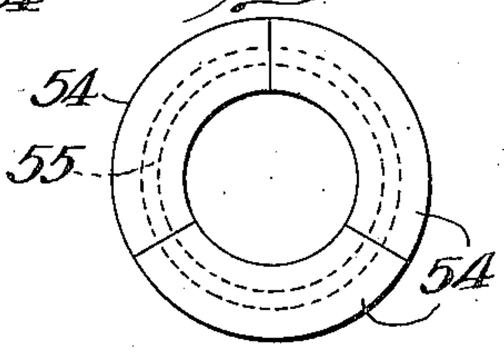
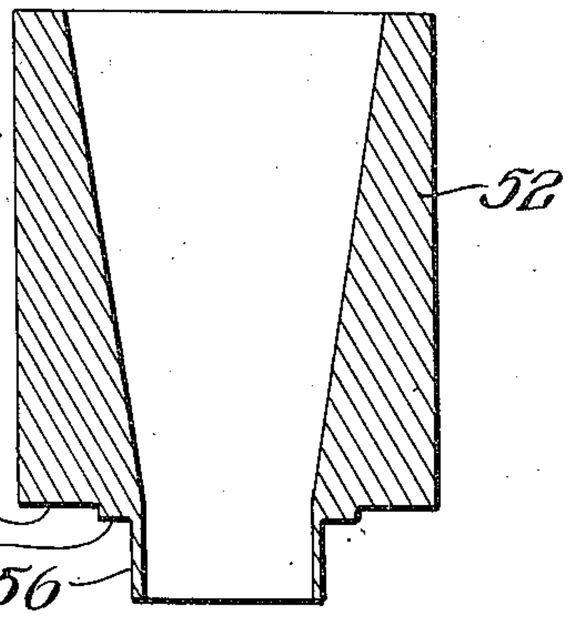


Fig. 7



INVENTORS
Theodore DeWitte McConahey
Fredrick Charles Redell
BY
Edwin L. Woodhouse
ATTORNEY

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Fig. 4.

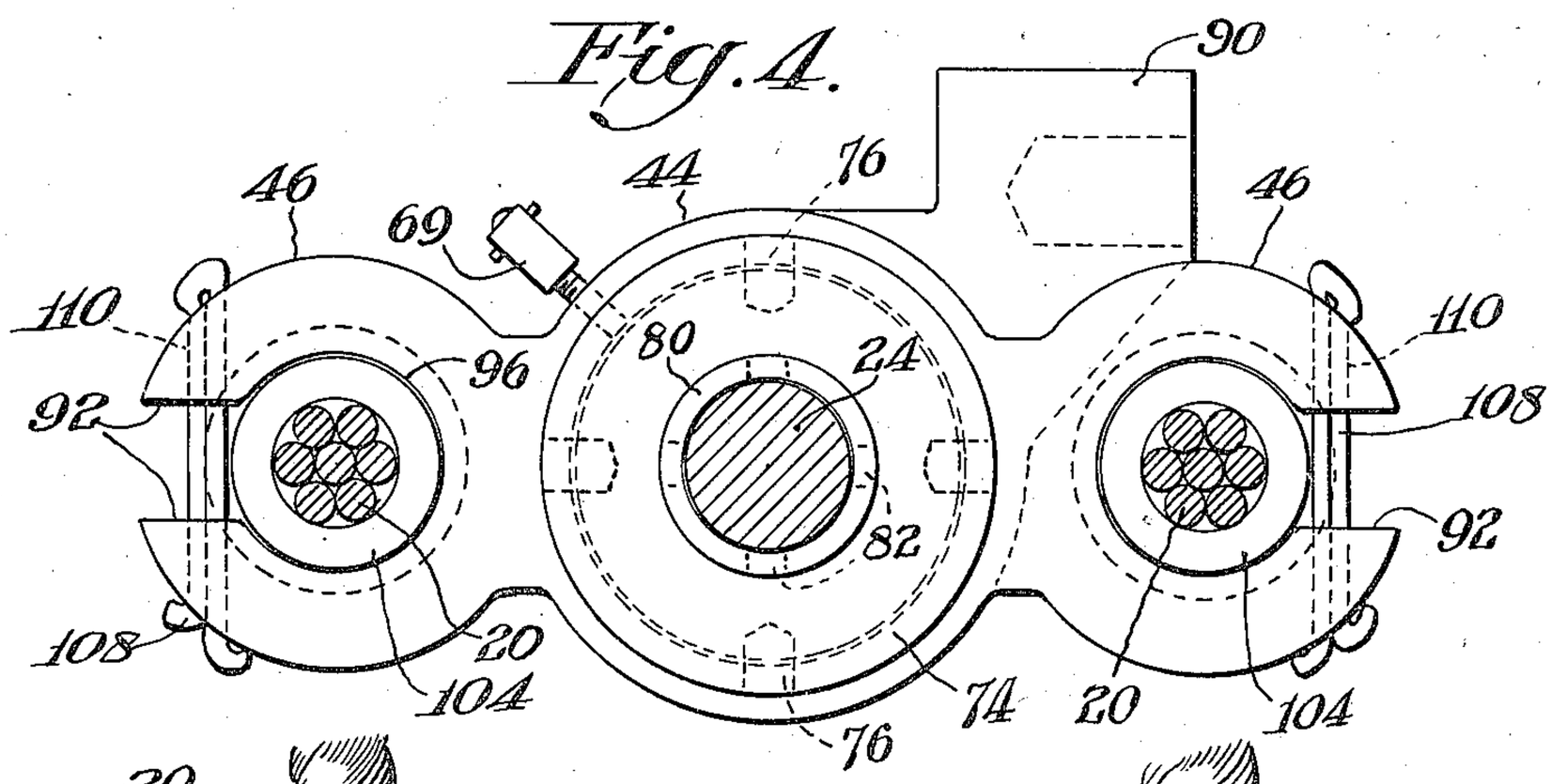
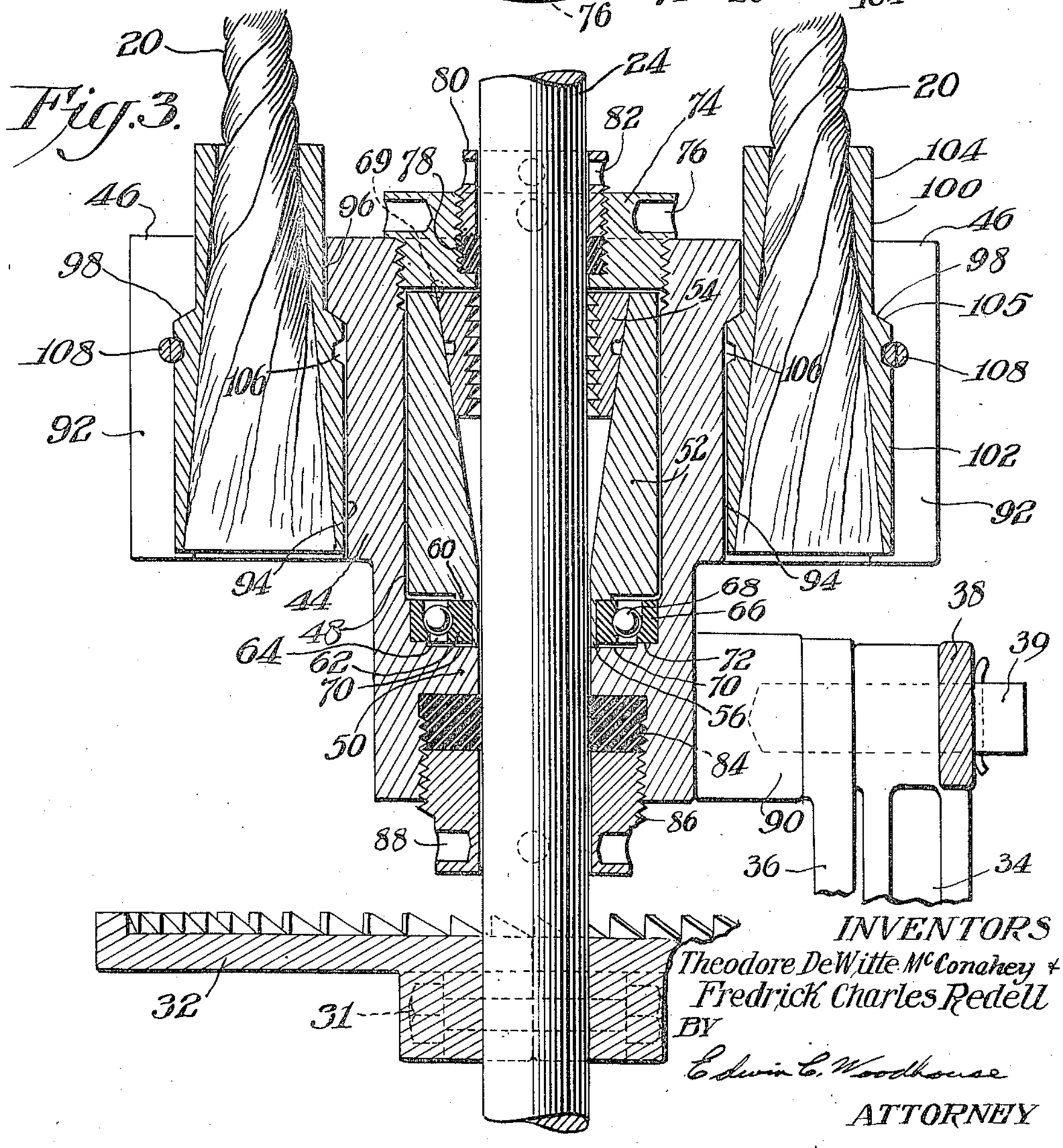


Fig. 3.



INVENTORS
Theodore DeWitte McConahey &
Fredrick Charles Redell
BY
Edwin C. Woodhouse
ATTORNEY

Patented July 6, 1948 2,444,842

UNITED STATES PATENT OFFICE

2,444,842

POLISH ROD HANGER

Theodore De Witte McConahey and Fredrick Charles Redell, Borger, Tex., assignors to J. M. Huber Corporation, Borger, Tex., a corporation of New Jersey

Application April 10, 1947, Serial No. 740,640

3 Claims. (Cl. 255—14)

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This invention relates to a polish rod hanger for supporting a polish rod and imparting a reciprocating motion thereto while permitting rotation of the rod, and, particularly, to a polish rod hanger which is adapted to be employed in conjunction with means for positively rotating the polish rod.

In the operation of an oil well, the pump at the bottom of the well is operated by reciprocating a pump rod, conventionally called a polish rod, by means of the rocking motion of a beam powered by means of a suitable pump unit. It is usual to connect the polish rod with the beam by means of a hanger which is suspended from the end of the beam. Generally, the hanger includes slip means which normally grip the polish rod but release the rod when there is resistance to the downward motion of the rod so that the hanger can move downward relatively to the rod. Frequently, there is a tendency for the rod to twist or turn in the well. Also frequently, means are provided for periodically rotating the rod during certain periods of its reciprocation so as to maintain the joints of the rod tight and also, so as to operate scraping means fastened on the rod. It is therefore common to construct the polish rod hanger to permit the polish rod to rotate relatively to the hanger.

The pumping equipment, including the polish rod hanger, is positioned above the ground and is usually open to the weather. The polish rod hanger is usually so constructed that it will not retain lubricant, and water, such as that from rain, can enter the hanger and pass therethrough so as to wash out any lubricant which may be placed therein and cause rusting of the parts. There is also a tendency for dirt from the atmosphere to enter the hanger and jam the parts.

It is an object of the present invention to provide a new and improved polish rod hanger which is adapted to impart a reciprocating motion to the polish rod while permitting rotation of the rod relative to the hanger. Another object is to provide a polish rod hanger which can be provided with lubricant and which will retain such lubricant and prevent it from being washed out of the hanger by rain and the like. A further object is to provide a polish rod hanger which is strong and more compact and has other advantages over polish rod hangers heretofore employed. Other objects are to provide a new article of manufacture and to advance the art. Still other objects will appear hereinafter.

The above and other objects may be accomplished in accordance with our invention which

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comprises providing a polish rod hanger which is adapted to support a polish rod and to impart a reciprocating motion thereto while permitting rotation of the rod but preventing swaying of the rod, the polish rod hanger comprising a housing, a slip unit for releasably gripping the polish rod and which is rotatably mounted wholly within the housing, closure means at the top of the housing for retaining the slip unit in the housing and which is provided with packing to prevent the passage of water and dirt into the housing and the passage of lubricant out of the top of the housing, closure means at the bottom of the housing provided with packing to retain lubricant in the housing and a normally closed lubricant inlet in a wall of the housing. Another feature of our invention resides in novel means for securing the hanger to its supporting cable which permits ready removal of the housing from the cable to permit repair or replacement of either the cable or the housing, which means comprise two cable-retaining wings extending outwardly from opposite sides of the housing, each wing being substantially C-shaped in horizontal cross section with the ends of the C spaced apart by a distance slightly greater than the diameter of the cable, and having an enlarged lower substantially cylindrical bore and a smaller upper substantially cylindrical bore, a cable-end socket for each cable-retaining wing having an upwardly tapering bore adapted to receive and retain a leaded-in cable end, said socket also having a lower enlarged cylindrical outer surface fitting loosely in the enlarged bore of the wing and an upper smaller cylindrical outer surface fitting loosely in the upper bore of the wing, and means for removably securing each socket in a wing so as to prevent relative vertical motion of the socket and the wing while permitting rotation of the socket within the wing.

Our invention will be more readily understood from the detailed description, hereinafter given, when taken with the accompanying drawings, in which

Fig. 1 is a somewhat diagrammatic illustration, with parts in section, illustrating a conventional assembly of oil well pump equipment with which our invention is particularly adapted to be employed;

Fig. 2 is a detailed view illustrating a conventional type of polish rod rotating means adapted to be employed with the polish rod hanger of our invention;

Fig. 3 is a view in central vertical cross sec-

tion of a polish rod hanger constructed in accordance with our invention;

Fig. 4 is a top plan view of the polish rod hanger shown in Fig. 3 with parts omitted for clearness of illustration;

Fig. 5 is a vertical view of slip means adapted to be employed in the polish rod hanger of our invention;

Fig. 6 is a top plan view of the slip means of Fig. 5;

Fig. 7 is a vertical cross sectional view of a slip bowl constructed in accordance with our invention.

Referring more particularly to Fig. 1, 10 indicates a Samson post supporting the pump jack beam 12. The beam is operated by a pitman rod 14 connected with a driving disc 16 of a pump unit 18. A cable 20 is supported on the outer end of the beam 12 and is connected with and carries the polish rod hanger 22. The polish rod hanger carries and reciprocates the polish rod 24 which extends down through a string of pipe 26 supported on the header 28. The polish rod 24 and the string of pipe 26 extend down through the well casing 30 to the bottom of the well and are connected to the pump of conventional design, not shown.

The polish rod is caused to rotate by means of a suitable ratchet turntable, pawl and lever. The ratchet turntable 32 is in two parts and is fastened to the polish rod 24 by two bolts at 31. The turntable is rotated periodically by means of an actuating pawl 34 on lever 38 pivotally supported on the polish rod hanger at 39. A holding pawl 36 is also rotatably supported on the pivot 39. The lever 38 is actuated by a cable 40, one end of which is fastened to the lever by any suitable means, such as staples or U-bolts 41, and the other end of which is fastened to the jack beam 12 at a point suitably spaced from the end thereof.

The structure so far described is conventional and its purpose and mode of operation are well known to those skilled in the art.

Referring more particularly to Figs. 3 to 7, the polish rod hanger comprises a housing 44 provided with two cable-retaining wings 46, 46 extending outwardly from opposite sides thereof. As shown, the body of the housing is generally cylindrical in form but may be of other suitable form, such as square, polygonal, and the like. The housing is provided with an enlarged cylindrical bore 48 which extends downward from the top of the housing to near the bottom thereof, but which is terminated, at a point spaced a short distance from the bottom of the housing, by an inturned annular flange 50 which has an inner diameter slightly larger than the outside diameter of the polish rod.

A slip bowl 52 is rotatably supported wholly within the bore of the housing. This slip bowl has an outer cylindrical surface which is slightly smaller in diameter than the bore of the housing so as to permit the passage of a lubricant, such as a lubricating grease, between the two surfaces for proper lubrication and so as to form a lubricated bearing fit with the bore of the housing which, however, prevents side sway of the bowl in the housing. The slip bowl has a downwardly tapered bore, which, at its lower end, is slightly larger than the outer diameter of the polish rod and which at its upper end is sufficiently large to carry suitable slips 54. At its lower end, the slip bowl is provided with a downwardly projecting cylindrical portion 56 which

has an inner bore slightly larger than the diameter of the polish rod and which is sufficiently thick to be substantially rigid and strong, usually about $\frac{1}{16}$''. The slip bowl is of such height that its upper end terminates a substantial distance below the top of the housing, sufficient to provide space for a cover to be screwed into the upper end of the bore of the housing for closing such bore.

The lower surface of the slip bowl, outwardly of the downwardly projecting cylindrical portion 56, is cut away as at 58 to form a depending ledge 60. The inner annular race 62 of a thrust bearing is fitted tightly to the outer surface of the downwardly projecting cylindrical portion 56 so as to rotate with the slip bowl and has its upper surface engaging the lower surface of the ledge 60 for supporting the slip bowl. The outer annular race 66 of the thrust bearing is fitted tightly to the inner surface of the bore of the housing so as to be maintained stationary therewith and rests upon the upper surface of the flange 50. The races are separated by rolling bearing members 68 which, preferably, are balls. The upper surface of the flange 50 is cut away inwardly of the outer bearing race as at 70 to provide a ledge 72 supporting the outer bearing race. By this construction, a continuous pasage for lubricant is provided for the moving parts of the hanger. The lubricant can flow between the outer surface of the slip bowl and the inner surface of the housing, between the lower surface of the slip bowl and the upper surface of the outer race, through the space 64 between the inner and outer races, and between the upper surface of the flange 50 and the lower surface of the inner race 62.

A lubricant inlet is provided at 69 for the introduction of any suitable lubricant such as grease and the like. This inlet will be normally closed by a conventional type of lubricant inlet closure 69, such as a zerk connection.

The slips 54 may be of conventional construction and will usually be in two or more sections held together by a retaining ring in an annular groove 55 in the outer surface of the slips. As illustrated, the slips, in this case, are in three sections. Also, preferably, the teeth on the slips will be right angle teeth as shown in Fig. 3 for better gripping of the polish rod. The outer surfaces of the slips are tapered downwardly to conform with the inner surface of the bore of the slip bowl so that the surfaces of the slips will frictionally engage the surface of the bore of the slip bowl and cause the slip bowl to rotate with the slips. The slips are also of such size that they will be positioned wholly within the slip bowl, the top of the slips not extending above the top of the slip bowl when the slips are in their upper position for releasing the polish rod.

The top of the bore of the housing is closed by a cover 74 threaded into the top thereof to retain the slips and slip bowl in the housing. Openings 76 are provided in the outer surface of the top of the cover to accommodate a suitable wrench for manipulating the cover. The cover is also provided with an enlarged bore in its upper portion adapted to receive a suitable oil and water resistant packing 78 and a packing nut 80 screwed into the cover to compress the packing and maintain it in contact with the polish rod. By this construction, neither water nor dirt can enter the top of the housing nor can grease or lubricant escape from the top thereof.

Oil and water resistant packing 84 is also pro-

vided in the lower bore of the housing below the flange 50. This packing is held in place, compressed and brought into contact with the polish rod by a packing nut 86 screwed into the lower end of the lower bore of the housing. Openings 88 are provided in the lower portion of the packing nut so that the packing nut may be manipulated by a suitable wrench. By this construction, grease or other lubricant in the housing will not escape through the bottom thereof, nor will it be washed through the housing by rain, or the like.

The lower portion of the housing is, as shown, provided with a boss 90 for supporting the pivot 39 of the ratchet operating mechanism.

Each cable-retaining wing 46 is substantially C-shaped in cross section, with the ends 92 of the C spaced apart by a distance greater than the diameter of the cable 20. Each wing is provided with a lower enlarged cylindrical bore 94 and a smaller upper cylindrical bore 96, the connecting surface between the surfaces of the two bores forming an inclined shoulder 98.

A cable-end socket 100 is provided for each wing 46. This cable-end socket has an upwardly tapered bore with the upper opening slightly larger than the diameter of the cable 20 and the lower opening of substantially larger diameter. Each cable-end socket is attached to an end of the cable 20 by inserting the end of the cable, fuzzing out such end of the cable and then leading the fuzzed out end in the socket by pouring in a suitable molten metal, such as lead, Babbitt and the like. Each cable-end socket has a lower enlarged outer cylindrical surface 102 of a diameter slightly smaller than the inner cylindrical surface 94 of the wing 46 and an upper smaller cylindrical surface 104 slightly smaller in diameter than the upper bore 96 of the wing 46. The surfaces 102 and 104 are connected by an inclined surface 105 forming a shoulder adapted to fit against the inclined surface 98 of the wing 46.

An annular groove 106 is provided in the outer surface of the lower enlarged portion of each socket 100 a short distance below the shoulder 105. This groove can be placed higher or lower on the socket but is preferably placed at the point where the wall of the socket is thickest. When the socket is in position in the wing 46, it is held in place by a suitable pin 108 which passes through an opening 110 provided therefor in the wing 46. This pin 108 engages in the annular groove 106 to prevent the socket moving vertically with respect to the wing but does not prevent rotation of the socket within the wing as the cable tends to twist or turn with the operation of the apparatus. This pin 108 is preferably in the form of a cotter pin, nut and bolt, or the like, so that it may be readily removed to release the socket from the wing.

By this arrangement of cable-retaining wings and removable cable-end sockets, the polish rod hanger can be readily removed from the cable for repair of either the cable or the hanger. It is merely necessary to remove the pin 108 and raise the hanger so that the socket 100 will drop out of the wing 46 by its own weight to below the wing, whereby the socket and cable can be moved outwardly with the cable passing out between the ends 92 of the wing. Reassembly of the parts may be accomplished by a simple reversal of this operation. This is a simple and strong construction permitting quick and easy separation of the cable and hanger.

From the above, it will be apparent that the polish rod hanger of our invention is a compact and sturdy piece of equipment which permits the polish rod to be rotated while reciprocating and holds the polish rod steady in the hanger, there being a minimum of side-wise motion of the rod relative to the hanger. The structure is such as to provide positive and efficient lubrication of the thrust bearing and all other moving parts within the hanger while at the same time protecting such parts from rain, dirt and other deleterious effects of the weather. Thereby, the hanger will give longer service without objectionable wearing or rusting of the parts, greatly reducing the necessity of repair or replacement of parts with consequent shut-down of the well. Also, the tendency for the parts to become jammed by rust, dirt, and the like is substantially eliminated so that the hanger will give trouble-free operation over long periods of time. At the same time, the parts are readily accessible for any necessary repairs or replacements.

It will be understood that the specific structure shown is merely illustrative of a preferred embodiment of our invention and that many variations and modifications can be made in the details thereof without departing from the spirit or scope of our invention. Accordingly, our invention is not to be limited to the specific embodiment shown and described in detail. We intend to cover our invention broadly as well as specifically as in the appended claims.

We claim:

1. A polish rod hanger adapted to support a polish rod and to impart a reciprocating motion to the rod while permitting rotation of the rod, which comprises a housing; means for vertically reciprocating the housing; the housing having an enlarged central vertical cylindrical bore extending downward from the top of the housing and terminated, at a point spaced from the bottom of the housing, by an inturned annular flange; an outer annular thrust bearing race supported on the upper surface of the flange and fitted tightly to the inner surface of the bore of the housing; an inner annular thrust bearing race positioned opposite the outer race; the upper surface of the flange being spaced slightly below the opposing lower surface of the inner race to provide a passage for lubricant between the flange and the inner bearing race; rolling bearing members between the races; a slip bowl supported on and fitted tightly to the inner bearing race and having an outer cylindrical surface slightly smaller than the enlarged bore of the housing so as to provide a space for lubricant between such surface and the housing, and its upper end spaced below the top of the housing, the lower surface of the bowl being spaced slightly above the opposing upper surface of the outer bearing race to provide a passage for lubricant between the lower surface of the bowl and the outer bearing race; a passage for lubricant between the races, communicating with and connecting the lubricant passage above the outer race and the lubricant passage below the inner race; slips for releasably gripping a polish rod, positioned wholly within the slip bowl and fitted therein so as to cause the slip bowl to rotate therewith; closure means at the top of the housing above the slip bowl for retaining the slip bowl and slips within the housing, provided with packing to prevent the passage of water into the housing and the passage of lubricant out of the top of the housing; closure means at the bottom of

the housing provided with packing to retain lubricant in the housing; and a normally closed lubricant inlet in a wall of the housing.

2. A polish rod hanger adapted to support a polish rod and to impart a reciprocating motion to the rod while permitting rotation of the rod, which comprises a housing; means for vertically reciprocating the housing; the housing having an enlarged central vertical cylindrical bore extending downward from the top of the housing and terminated, at a point spaced from the bottom of the housing, by an inturned annular flange; an outer annular thrust bearing race supported on the upper surface of the flange and fitted tightly to the inner surface of the bore of the housing; an inner annular thrust bearing race positioned opposite the outer race; the upper surface of the flange, opposite the inner race, being cut away so as to be spaced below the opposing lower surface of the inner race, providing a passage for lubricant between the flange and the inner race; rolling bearing members between the races; a slip bowl supported on and fitted tightly to the inner bearing race and having an enlarged outer cylindrical surface slightly smaller than the enlarged bore of the housing so as to provide a space for lubricant between such surface and the housing, and its upper end spaced below the top of the housing, the lower surface of the bowl being cut away so as to be spaced slightly above the opposing upper surface of the outer bearing race to provide a passage for lubricant between the bowl and the outer race; the inner and outer bearing races being spaced apart to provide a passage for lubricant between the races communicating with and connecting the lubricant passage above the outer race and the lubricant passage below the inner race; slips for releasably gripping a polish rod, positioned wholly within the slip bowl and fitted therein so as to cause the slip bowl to rotate therewith; closure means at the top of the housing above the slip bowl for retaining the slip bowl and slips within the housing, provided with packing to prevent the passage of water into the housing and the passage of lubricant out of the top of the housing; closure means at the bottom of the housing below the flange provided with packing to retain lubricant in the housing; and a normally closed lubricant inlet in a wall of the housing.

3. A polish rod hanger adapted to support a polish rod and to impart a reciprocating motion to the rod while permitting rotation of the rod, which comprises a housing; means for vertically reciprocating the housing; the housing having an enlarged central vertical cylindrical bore extending downward from the top of the housing and terminated, at a point spaced from the bottom of the housing, by an inturned annular flange; an outer annular thrust bearing race supported on the upper surface of the flange and fitted tightly to the inner surface of the bore of the housing; an inner annular thrust bearing race positioned opposite the outer race; the upper surface of the flange, opposite the inner race, being cut away so as to be spaced below the opposing lower surface of the inner race, providing a passage for lubricant between the flange and the inner race; rolling bearing members between the races; a slip bowl supported on the inner bearing race and having a downwardly projecting cylindrical portion fitted tightly to the inner surface of the inner bearing race, an enlarged outer cylindrical surface slightly smaller than the enlarged bore of the housing so as to provide a space for lubricant between such surface and the housing, and its upper end spaced below the top of the housing, the lower surface of the bowl being cut away so as to be spaced slightly above the opposing upper surface of the outer bearing race to provide a passage for lubricant between the bowl and the outer race; the inner and outer bearing races being spaced apart to provide a passage for lubricant between the races communicating with and connecting the lubricant passage above the outer race and the lubricant passage below the inner race; slips for releasably gripping a polish rod, positioned wholly within the slip bowl and fitted therein so as to cause the slip bowl to rotate therewith; closure means at the top of the housing above the slip bowl for retaining the slip bowl and slips within the housing, provided with packing to prevent the passage of water into the housing and the passage of lubricant out of the top of the housing; closure means at the bottom of the housing below the flange provided with packing to retain lubricant in the housing; and a normally closed lubricant inlet in a wall of the housing.

THEODORE DE WITTE McCONAHEY.
FREDRICK CHARLES REDELL.

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