

Jan. 18, 1955

F. C. REDELL
POLISH ROD CLAMP

2,699,589

Filed Aug. 23, 1952

2 Sheets-Sheet 1

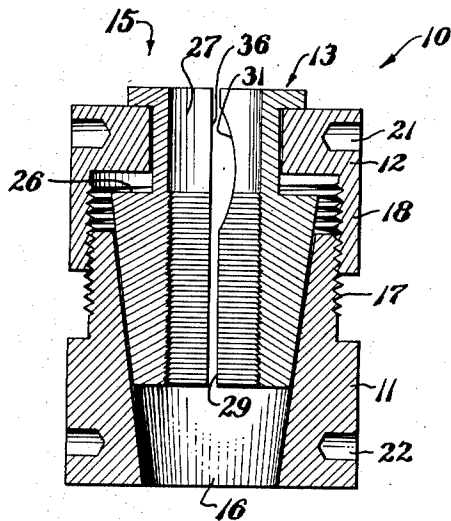


Fig. 4~

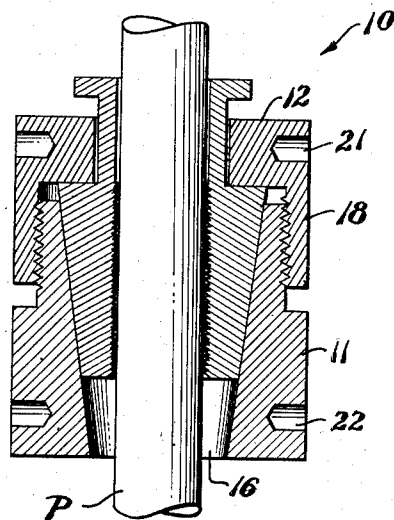


Fig. 3~

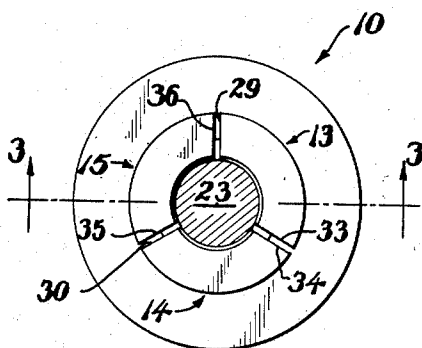


Fig. 2~

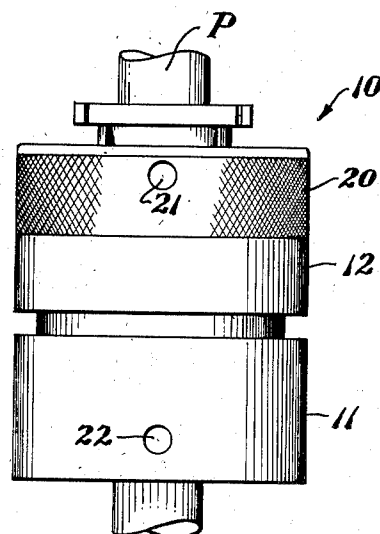


Fig. 1~

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2 Sheets-Sheet 2

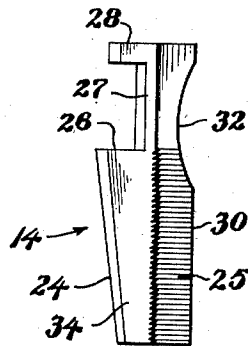


Fig. 6~

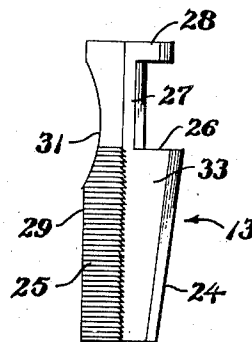


Fig. 5~

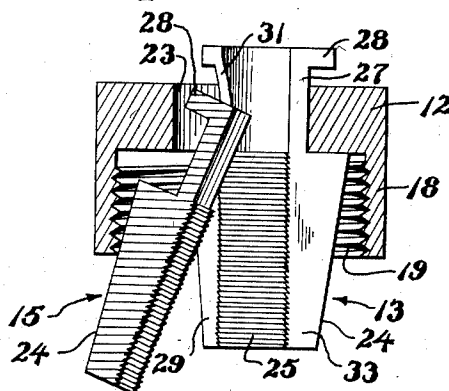


Fig. 8~

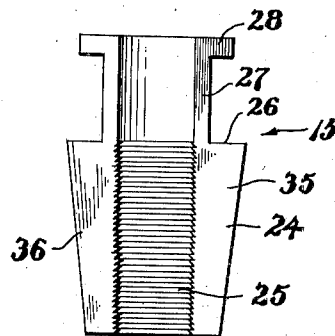


Fig. 7~

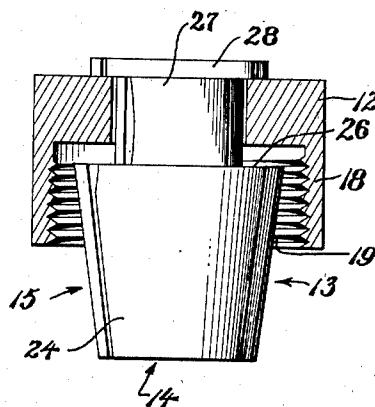


Fig. 9~

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2,699,589

POLISH ROD CLAMP

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5 Claims. (Cl. 24—263)

The present invention relates generally to devices for actuating the pumping equipment in oil wells, and is particularly directed to an improved polish rod clamp for supporting the polish rod in the hanger.

In the operation of an oil well, the pump at the bottom of the well is actuated by a reciprocating string of rods which, at the top, is connected to the oscillating walking beam of a suitable driving mechanism. In connecting the top rod, usually called the polish rod, to the walking beam of the driving mechanism, it is conventional to employ a polish rod hanger which supports the polish rod and is in turn suspended from the walking beam by cables. The more modern polish rod hangers often include slip means, in the form of wedges, which normally grip the polish rod but release the rod when there is relatively great resistance to the downward motion of the string, for example, as shown in United States Letters Patent No. 2,444,842 to McConahey and Redell, issued July 6, 1948.

Further, most hangers are equipped with mechanism for effecting a slow and intermittent rotation of the string of rods in response to oscillation of the walking beam. Such slow rotation is relied upon to prevent separation of the rods making up the string at the threaded joints or couplings therebetween, to actuate paraffin scrapers carried by the rods, and to equalize the wear at the points of contact of the rods with the pipe or casing in which the rods are reciprocated. Since continued rotation of the rods, at a time when substantial resistance to such rotation is encountered, may cause injury to the rods, the driving connection between the rotating mechanism and the polish rod should be capable of slipping. Therefore, in a construction of the kind disclosed in the above mentioned patent, it is not desirable to have the wedges, which make up the slip means, held securely in position by pressure exerted against the tops thereof so that the wedges are free to slip within the bowl. However, when the slip means are arranged to release the polish rod in response to resistance to the downward motion of the string, temporary obstruction to the downward strokes causes the slip means to grip the polish rod at progressively lower points.

Heretofore, it has been suggested that a polish rod clamp be provided separate from the hanger and merely resting on top of the latter so that transmission of the rotational movement from the hanger to the polish rod results from the friction between the clamp and hanger. In that case, resistance to rotation of the string of rods merely causes rotation of the hanger relative to the polish rod clamp thereon, while resistance to the downward stroke of the rods merely lifts the polish rod clamp off the hanger without altering the position of the clamp on the polish rod. Several types of polish rod clamps have been used in arrangements of this type. Split clamps secured by bolts are not satisfactory because the constant vibration eventually loosens the clamp sufficiently to permit the polish rod to drop out of the clamp. Collars with set screws bearing on the rods are open to the same objection and, if the set screws are tightened sufficiently to mark or score the polish rod, the rod soon fails or breaks at this point. Polish rod clamps containing wedges which are securely held in engagement with the polish rods by mechanical hold down means usually become so tightened that it is difficult to move the clamps to new positions on the polish rods, while omission of the hold down means permits the clamp to work progressively lower on the polish rod when obstructions to the downward movement of the latter are encountered.

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Accordingly, it is an object of the present invention to provide a polish rod clamp for disposition atop the hanger and in frictional engagement with the latter, wherein the clamp contains wedges held firmly in gripping engagement with the polish rod, but capable of being readily released for adjustment of the position of the clamp on the polish rod.

Another object is to provide a polish rod clamp of the described character wherein the wedges are formed for easy assembly and disassembly with respect to the housing or casing of the clamp.

A further object of the present invention is to provide a polish rod clamp of the described character which is simple and sturdy in construction, comprises a minimum of separate parts, and is easy to install and maintain.

In accordance with this invention, the above objects are accomplished by providing a polish rod clamp comprising a housing having a lower cup member and a cap member which are threaded externally and internally, respectively, for threaded engagement with each other. The lower cup member is provided with a central axial bore which is conical, decreasing in diameter from the top to the bottom thereof, while the cap member has a central opening in the top thereof. Three wedge members are provided, each formed to extend around slightly less than one-third of the circumference of the polish rod and having a sloping outer surface to fit the taper of the conical bore formed in the lower cup member. The top of each wedge defines a shoulder to underlie the top of the cap member so that the latter can press downwardly on the wedges, and a neck extends upwardly from the top of each wedge to pass through the central opening of the cap member. Further, a rim extends outwardly from the top of the neck of each wedge to overlie the top of the cap member, with the distance between the shoulder and the rim of each wedge being greater than the thickness of the top of the cap member, so that the cap member may act upwardly against the rims of the wedges in releasing the latter from engagement with the polish rod.

Another feature of the construction embodying the present invention resides in the shaping of the opposite edges of two of the wedges so that the neck and rim of the third wedge may pass through the central opening of the cap member with the necks of said two wedges disposed in the central opening, whereby the wedges may be assembled in and removed from the cap member even though the combined diameter of the rims of the three wedges is greater than the diameter of the central opening in the top of the cap member.

The above and other objects, features and advantages of the present invention will be apparent in the following detailed description of an illustrative embodiment thereof when such description is read in connection with the accompanying drawings forming a part hereof, and wherein:

Fig. 1 is a side elevational view of a polish rod clamp embodying the present invention and shown in operative position on a length of a polish rod;

Fig. 2 is a top plan view of the polish rod clamp;

Fig. 3 is an axial sectional view of the polish rod clamp taken along the line 3—3 of Fig. 2 and showing the clamp in secure engagement with a polish rod;

Fig. 4 is an axial sectional view similar to Fig. 3, but showing the clamp disposed for release of the polish rod and with the polish rod removed;

Fig. 5 is an elevational view of a wedge member included in the clamp;

Fig. 6 is an elevational view of another wedge member included in the clamp;

Fig. 7 is an elevational view of a third wedge member included in the clamp;

Fig. 8 is an axial sectional view illustrating the assembly or disassembly of certain parts included in the illustrated embodiment of the invention; and

Fig. 9 is an elevational view, partly broken away and in section, of the parts of Fig. 8 shown in assembled position.

Referring to the drawings in detail, a polish rod clamp embodying the present invention is there illustrated and indicated generally by the reference numeral 10. The

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clamp 10 includes a housing, formed by a lower cup member 11 and a cap member 12, and a series of wedge members, three wedge members generally indicated by the numerals 13, 14 and 15 being provided in the illustrated embodiment.

The lower cup member 11 is formed with a central axial bore 16 which is of conical configuration (Figs. 3 and 4) and tapers from a maximum diameter at the top of the cup member to a minimum diameter at the bottom thereof. Further, adjacent the upper portion thereof, the lower cup member is provided with external threads 17 and the threaded portion of the cup member is preferably of a reduced outer diameter for a purpose hereinafter set forth.

The cap member 12 includes a circular top having a cylindrical wall 18 depending from the periphery thereof and formed with internal threads 19 (Figs. 8 and 9) for engagement with external threads 17 on the lower cup member. The wall 18 of cap member 12 preferably has a thickness substantially equal to the difference between the radii of the large and small diameter parts of the lower cup member 11 so that the outer surfaces of the cup member and cap member are substantially flush when the parts are assembled as in Fig. 1. The outer surface of cap member 12 may be milled or knurled, as at 20, to facilitate gripping thereof in effecting rotation of the cap member relative to the lower cup member. Further, the cap member and lower cup member are preferably formed with radially opening blind bores 21 and 22, respectively, to accommodate suitable wrenches for starting the relative rotation of the cap member and lower cup member.

The circular top of cap member 12 is formed with a central opening 23 (Fig. 8) for receiving portions of wedge members 13, 14 and 15, which are now to be described in detail. Each of the wedge members is formed to encompass slightly less than one-third of the polish rod P which is to be clamped so that small radial spaces are defined between the confronting edges of the wedge members when the latter are arranged around the polish rod, as shown in Fig. 2. Each of the wedge members includes a body 24 having an inner surface which is formed as a section of a right cylindrical surface of revolution and is provided with a series of right angle teeth 25 for better gripping of the polish rod during upward movement of the hanger (not shown). The outer surface of body 24 of each wedge member is tapered, at the same angle as the surface of bore 16, so that wedge members 13, 14 and 15 may fit into bore 16 and be urged radially inward to clamp upon a polish rod in response to downward movement of the wedge members relative to lower cup member 11.

The body 24 of each wedge member defines a shoulder 26 at the top thereof having a greater radius at the outer edge than that of the central opening 23, so that the shoulders on the wedge members underlie the circular top of cap member 12 when the parts are assembled, as in Fig. 4. Therefore, when cap member 12 is screwed onto lower cup member 11, the top of the cap member bears downwardly on shoulders 26 of the wedge members to displace the latter into gripping engagement with a polish rod P extending axially through the clamp, as in Fig. 3.

In order to provide for release of the wedge members, each of wedge members 13, 14 and 15 is formed with a neck portion 27 extending axially upward from the top of body 24 and dimensioned to pass loosely through central opening 23 of the cap member. Each neck portion 27 has an axial length greater than the thickness of the top of cap member 12, for a purpose hereinafter fully set forth, and at the top is formed with a radial, outwardly extending rim 28 having an outer edge radius greater than the radius of opening 23 so that rims 28 of the wedge members are adapted to overlie the upper surface of the cap member, as in Figs. 3, 4 and 9. Therefore, when cap member 12 is rotated relative to cup member 11 in the direction effecting upward movement of the cap member, the upper surface of the cap member bears against rims 28 of the wedge members to displace the latter out of gripping engagement with the polish rod for permitting adjustment of the clamp along the rod.

In accordance with a feature of the present invention, wedges 13, 14 and 15 are formed so that the same may be assembled with, or disassembled from, cap member

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12 even though shoulders 26 and rims 28 limit the displacement of the wedge members relative to the cap member when the parts are assembled, as in Fig. 9.

In order to permit such assembly and disassembly of the wedge members and cap member, the opposite or remote longitudinal edges 29 and 30 of two adjacent wedge members, wedge members 13 and 14, respectively, in the illustrated embodiment, are cut away, as at 31 and 32, respectively (Figs. 5 and 6). Thus, wedge members 13 and 14 are mirror images of each other. The cut away sections 31 and 32 are of arcuate configuration, and each has a radius of curvature which is substantially twice the thickness of the top of cap member 12 and a depth which is approximately 9 to 10% of the above defined radius of curvature. Further, each of neck portions 27 of the wedge members has an axial length which is 15% longer than the thickness of the top of cap member 12 and the cut away sections 31 and 32 commence, at the top, immediately adjacent the lower surfaces of the related rims 28.

The confronting longitudinal edges 33 and 34 of wedge members 13 and 14, respectively, and both longitudinal edges 35 and 36 of wedge member 15 are flat (Figs. 5, 6 and 7).

In assembling the wedge members and the cap member, the rims and necks of wedge members 13 and 14 are extended upwardly, either separately or together, through opening 23 in the top of cap member 12. Wedge members 13 and 14 are then arranged with their flat edges 33 and 34 together in confronting relationship, and wedge members 13 and 14 are lifted to engage shoulders 26 thereof against the lower surface of the top of cap member 12 with neck portions 27 thereof bearing against the cylindrical surface of opening 23, as in Fig. 8. With wedge members 13 and 14 arranged as above, the neck portion and rim of the third wedge member 15 may be passed upwardly through the remaining open portion of the opening 23 by a rocking motion as the upper ends of the longitudinal edges 35 and 36 of wedge member 15 ride upon the cut away edge sections 31 and 32 of wedge members 13 and 14. When rim 28 of wedge member 15 has reached a position overlying the top surface of cap member 12, the wedge members may be released and the same will be suspended from the cap member by the respective rims, as shown in Fig. 9. Since cut away edge sections 31 and 32 terminate substantially at the lower surfaces of rims 28, the wedge members will not be capable of sufficient radial contraction, when positioned and suspended as in Fig. 9, to permit the rims to slip through opening 23, and the associated cap member and wedge members provide a convenient sub-assembly to prevent the inadvertent loss of any of the wedge members when the cap member and lower cup member are separated. The assembly of clamps 10 is completed by threading cap member 12 onto lower cup member 11 with bodies 24 of the wedge members being received in the conical bore 16 of the lower cup member. The assembled clamp may be installed on a polish rod merely by extending the latter through the central passage defined by the inner surfaces of the wedge members, and the wedge members are clamped on the polish rod by continuing to thread the cap member onto the lower cup member until the desired clamping action is obtained.

In disassembling the parts of clamp 10, the assembling procedure given above is reversed. After cap member 12 has been threadedly separated from lower cup member 11 and the polish rod removed from between the wedge members, wedge members 13 and 14 are lifted relative to the cap member and wedge member 15 is removed downwardly with a rocking motion displacing the upper and lower ends thereof radially inward and outward, respectively. After wedge member 15 has been removed, rims 28 of the other two wedge members 13 and 14 may be passed through opening 23 of the cap member.

In use, clamp 10 is arranged at a suitable location on the polish rod above a conventional hanger (not shown) so that the lower surface of cup member 11 bears on the top of the hanger and thereby supports the string of rods. As the hanger is rotated, the frictional contact between cup member 11 and the hanger causes clamp 10 and the polish rod gripped by the clamp to rotate with the hanger. If excessive resistance to the downward movement of the string of rods is encountered, the

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clamp 10 is merely lifted on its seat on the hanger and no change in the position of the clamp on the polish rod occurs. Further, if excessive resistance to the rotation of the string of rods is encountered, the clamp is merely slips relative to the hanger so that no injury to the rods can result.

The arrangement and construction of the various parts of the clamp embodying the present invention, as described above, provide a clamp in which the cap member is effective to positively move the wedge members both into and out of clamping engagement with the polish rod, while permitting the assembly and disassembly of the several parts and utilizing a minimum number of parts, namely, only a cap member, a lower cup member and wedge members. Thus, there is no possibility that the clamping or gripping hold of the clamp upon the polish rod may be inadvertently relaxed to permit the string of rods to fall to the bottom of the well, and yet the polish rod may be released merely by manipulation of the cap member. Further, while obtaining the economy inherent in the manufacture of only a relatively few parts, there is no sacrifice of the advantages derived from being able to replace the wedge members when the same become damaged or when rods of different diameters are to be accommodated.

While an illustrative embodiment of this invention has been shown and described in detail, it is to be understood that the invention is not limited to precisely that structure and that many changes and modifications may be effected therein without departing from the scope of the invention.

What is claimed is:

1. In a polish rod clamp, a cap member having a circular top wall formed with a central opening and a depending side wall, and a radially contractible series of three circularly arranged wedge members each including a downwardly tapering body portion having a radial surface at the top formed to underlie said top wall, a neck portion extending upwardly from said top of the body portion radially inward of said surface to pass loosely through said central opening and an outwardly directed radial rim at the top of said neck portion to overlie the upper surface of said top wall, the longitudinal edges of two of said wedge members confronting the longitudinal edges of the third of said wedge members having arcuate cut away sections to permit radially inward displacement of the top part of said third wedge member so that said rim of the third member passes through said central opening in effecting downward removal of said third wedge member from said cap member wherein each neck portion has a length at least 15 percent longer than the thickness of said top wall of the cap member, and said arcuate cut-away sections each have a radius of curvature approximately equal to twice said thickness of the top wall and a depth approximately equal to 10% of said radius of curvature, with each of said arcuate cut-away sections terminating at the top substantially in horizontal alignment with the under surface of the related rim.

2. In a polish rod clamp the combination of a lower cup member having an axial, downwardly tapering through bore, a cap member removably threaded on said cup member and having a top wall to extend across the large diameter upper end of said bore and formed with a central opening aligned with said bore, and a circularly arranged and radially contractible series of wedge members having body portions fitting into said tapered bore and defining a central space for the reception of a polish rod, said wedge members including upper portions extending upwardly through said central opening and each having a peripheral groove in the outer surface thereof to define confronting upper and lower radial seats engaging above and below said top wall so that said wedge members are normally constrained to follow the axial movements of said cap member relative to said cup member, the longitudinal side edges of at least two of said wedge members confronting the opposite axial edges of a third of said wedge members having cut away edge sections of sufficient depth to permit radially inward movement of said third wedge mem-

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ber to the extent necessary to pass the upper radial seat or said third wedge member through said central opening in the top wall of the cap member, wherein said peripheral grooves each have a width substantially greater than the thickness of said top wall so that said wedge members are relatively displaceable in the vertical direction, and wherein said cut away edge sections terminate at the top substantially in horizontal alignment with said upper radial seats, so that said third wedge member is capable of radially inward movement only when said two wedge members are elevated with respect to said third wedge member.

3. In a polish rod clamp or the like, comprising a cup having a bore in the form of a tapering surface of revolution, a cap having an annular side wall to engage said cup and a top wall formed with an opening coaxial with said bore, and cooperating means on said cap and said cup to effect relative axial displacement thereof upon relative rotation thereof, a plurality of wedge members each having a body portion formed with a tapering outer surface to fit said bore and with an inner surface to engage a polish rod or the like, a restricted neck portion to extend through said opening, a radial rim beyond said opening to overlie said top wall, and two substantially oppositely facing longitudinal side edges, the wedge members being arranged circularly about the axis of said bore with their adjacent side edges in confronting relation, said rims in normal alignment being irremovable through said opening, two of said side edges respectively confronting the opposite side edges of one of said members having recesses therein sloped away from the latter in the region of said neck portions and said recesses being displaceable axially relative to said one member and into alignment with the rim of said one member to render the latter removable through said opening.

4. A polish rod clamp or the like as described in claim 3, said cap engaging said cup at the larger end of said bore, the body portions of said wedge members forming radial seats to underlie said top wall so that the latter may thrust said wedge members axially into said bore, each of said recesses being a concave groove extending at least from the rim of the corresponding wedge member to the radial seat thereof, the axial length of said neck portions between said rims and said radial seats being substantially greater than the thickness of the top wall.

5. In a polish rod clamp or the like, comprising a cup having a bore in the form of a tapering surface of revolution, a cap having an annular side wall to engage said cup and a top wall formed with an opening coaxial with said bore, and cooperating means on said cap and said cup to effect relative axial displacement thereof upon relative rotation thereof, three substantially similar wedge members each having a body portion formed with a tapering outer surface to fit said bore and with an inner surface to engage a polish rod or the like, a restricted neck portion to extend through said opening, a radial rim beyond said opening to overlie said top wall, and two substantially oppositely facing longitudinal side edges, the wedge members being arranged circularly about the axis of said bore with their adjacent side edges in confronting relation, said rims in normal alignment being irremovable through said opening, those side edges of two of said members which confront the opposite side edges of the third of said members having recesses therein sloped away from the latter in the region of said neck portions and said two members being displaceable axially relative to said third member and into alignment with the rim of said third member to render the latter removable through said opening.

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