March 8, 1927. 1,620,382

W. A. O'BANNON

MULTIPLE SUCKER ROD SOCKET

Filed Nov. 13, 1925 2 Sheets-Sheet 1

Fig. 1.

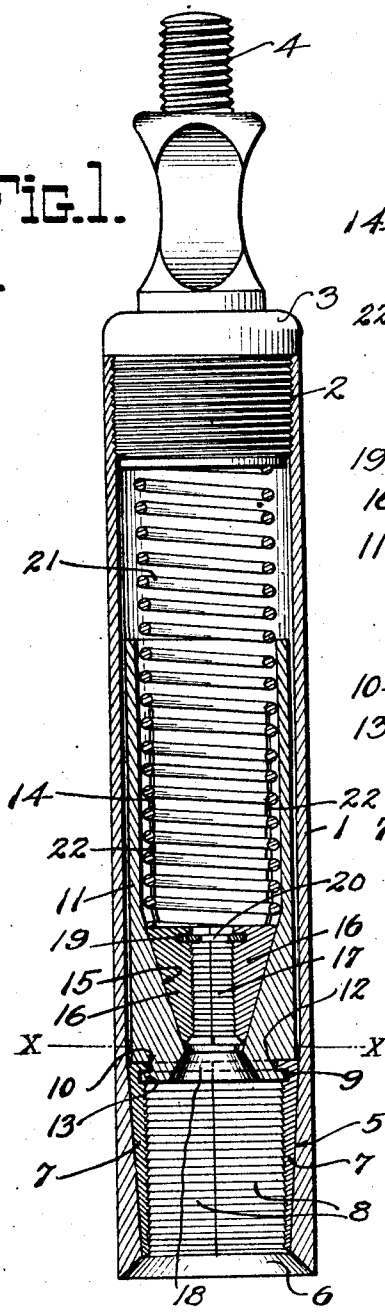
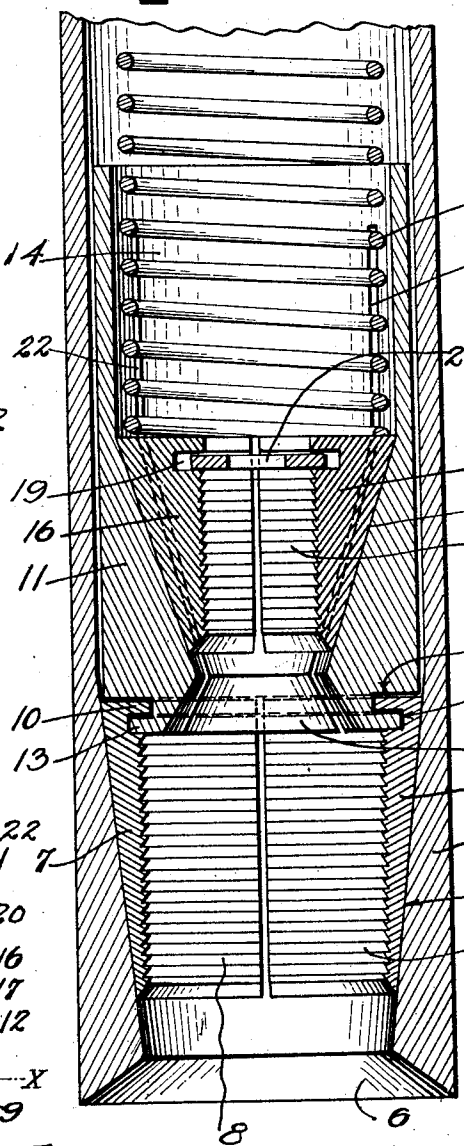


Fig. 2.



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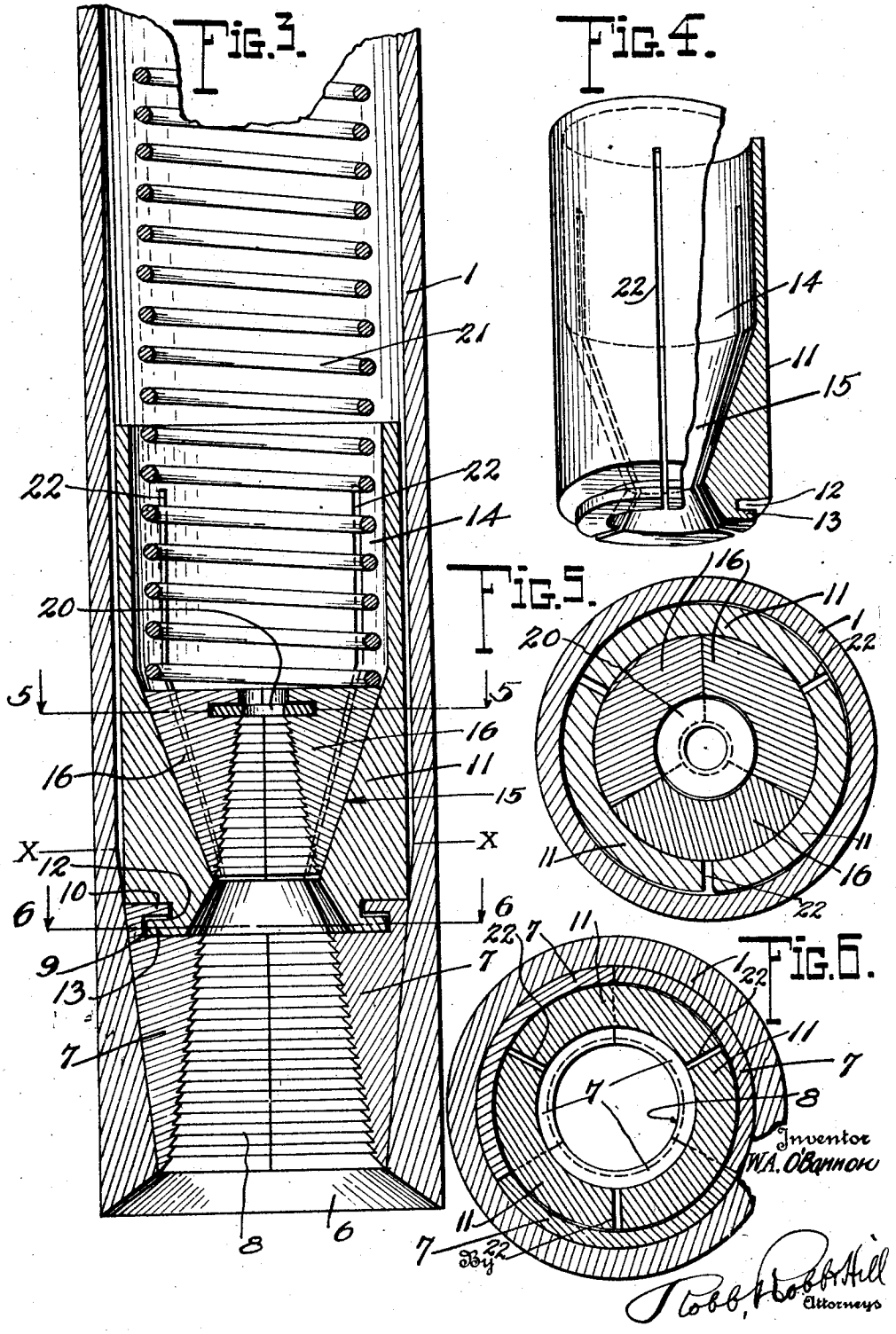
Attorneys

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MULTIPLE SUCKER ROD SOCKET

Filed Nov. 13, 1925 2 Sheets-Sheet 2



Patented Mar. 8, 1927. 1,620,382

UNITED STATES PATENT OFFICE.

WALTER A. O'BANNON, OF TULSA, OKLAHOMA.

MULTIPLE SUCKER-ROD SOCKET.

Application filed November 13, 1925. Serial No. 68,845.

The present invention relates to improvements in fishing tools for pumping wells, and in particular to that type commonly known as sucker rod sockets.

The invention comprehended herein embodies a novel form of holding means designed to prevent accidental "dumping" of the slip wedges which constitute the gripping means for engaging and pulling a broken sucker rod, and broadly this holding means comprises what, for the purpose of this description, I term a follower having a peculiar interlocking engagement with the slip elements such that the sections of the slip body are free to open and close in their gripping functions but are at all times precluded from displacement one with relation to the other longitudinally of the barrel or bowl in which they are customarily mounted.

One of the primary objects in view is to provide the holding means above referred to with yieldable elements which in the functioning of the device frictionally engage the walls of the barrel and thereby permit a material increase in the pulling stresses which may be applied to the sucker rod socket.

It is further contemplated to provide gripping means auxiliary to the main slips and by arranging such secondary gripping means to coact with the follower before mentioned, to produce a very strong gripping action which is the result of the direct contraction of the secondary gripping means incident to the tapered formation of its seat in the follower plus the contraction of the yieldable elements of the follower itself by the tapered formation of the socket barrel. By such an arrangement the device becomes more universal in its use for pulling rods of various sizes and in reality a combination fishing tool capable of catching both tubing and sucker rods of wide ranges in sizes.

Other objects and advantages of the invention will be hereinafter set forth and the novel features thereof defined by the appended claims.

In the drawings:

Figure 1 is a vertical sectional view of a sucker rod socket constructed in accordance with this invention;

Figure 2 is an enlarged sectional view of the lower portion of the sucker rod socket and showing the gripping elements in opening position;

Figure 3 is an enlarged fragmentary sectional view of a sucker rod socket embodying a slightly modified construction of slips;

Figure 4 is a detail perspective, partly in section, of the follower or holding means for the slips;

Figure 5 is a sectional view on the line 5—5 of Figure 3; and

Figure 6 is a sectional view on the line 6—6 of Figure 3.

Like numerals designate corresponding parts throughout the several figures of the drawings.

Referring to the drawings, the numeral 1 designates the barrel usually of such material as steel and of a length and diameter which varies according to the size of the well casing in which it is used or the size of the rod or tube for which it is to fish. In practice these sizes are more or less standardized but are here immaterial. At the top, the barrel is internally threaded to receive the plug 2 of the head 3 which is formed as usual with the pin 4. At its lower end of the barrel is tapered from approximately the line x—x to the mouth, as indicated at 5, the mouth being reamed out to form a bevel 6 which materially assists in "finding" the rod as the socket is dropped downwardly into the well casing, tending to guide the rod into the gripping means. As thus described, the construction is typical of the sucker rod socket disclosed in the patent to Neilson No. 1,382,602 of June 21, 1921.

The gripping means referred to above comprises the slip body formed of a plurality of sections 7, as illustrated three in number, which body exteriorly tapers conformably to the taper 5 of the interior of the barrel before mentioned, each section being thus wedge shaped. Interiorly the slip body is provided with wickers 8 which bite into and thereby positively engage the object which is to be pulled by the socket. At the top of the slip body a groove 9 is provided, leaving an overhanging inwardly extending lip 10 surrounding the top. It will be noted here that the construction of the slip body illustrated in the modification of Figure 3 differs from that disclosed in Figure 1 mainly in that in the latter the bore thereof tapers upwardly, while in the former the walls do not so taper. In the use of slip sockets which do not specifically provide against the same, there is a tend-

ency for one slip section to be displaced longitudinally of the barrel with relation to another by virture of the contact of the rod at one side of the slip body, and to prevent this means have heretofore been proposed for loosely holding the slips together, such for example as a sectional ring surrounding the slips, as disclosed in the Neilson patent hereinbefore mentioned.

There are certain disadvantages attaching to the use of holding means of this character, such as the likelihood of misplacement or loss of the small ring sections in the handling of the device, the inconvenience of assembly of such parts, etc., all of which are eliminated by the construction herein provided which consists of the follower 11. In this form of the device the follower is sleeve-like in form and provided at its lower end with an exterior annular groove 12 and an outwardly extending lip 13 into and over which, respectively, the lip 10 of the slips 7 extend and overhang, respectively. This forms a positive interlock with the slips, allowing perfect freedom of movement of the slips laterally with respect to the barrel, while preventing relative displacement of the slips longitudinally with respect to each other.

I thus consider this construction of holding means as above given of primary importance and so conceive that holding means having as its sole feature the interengaging groove- and-flange connection sufficient to adequately perform the pulling function for which these devices are designed, but in order that the device may have a greater utility and effectiveness in operation I have given to this follower a special construction as will later be set forth.

For a substantial portion of its length, the bore of the follower 11 is straight, as indicated at 14, and then the bore tapers toward the lower end. as indicated at 15, to form a seat for secondary gripping means in the form of an exteriorly tapered slip body 16. This body is also sectional in construction, having a straight wall bore formed with wickers 17. To facilitate the passage of the object to be pulled into this upper slip bore which is of substantially smaller diameter than the bore of the lower or main slip body and concentric with its axis, the follower 11 is reamed out at its lower end to form the upwardly tapering passage 18. To prevent the longitudinal displacement of the slips 16 this auxiliary slip body is formed with an internal groove 19 in which is seated the ring or washer-like member 20, permitting free opening and closing movements of the slips. Thus the present construction of socket is provided with main gripping means for use in pulling rods or tubes of relatively large diameter and with secondary gripping means for pulling rods of smaller diameter. Where the break in the sucker rod occurs adjacent to the joint, there may be even a double gripping action of both of the gripping means simultaneously. that is, a portion of the joint being held by the lower or main slip body while the rod just above the joint extends into and is engaged by the upper slip body.

It will be observed that the upper portion of the bore of the follower 11 serves as a socket into which the spring 21 is seated to rest upon the upper or secondary slip body. This spring thus serves a dual function of tending to maintain both slip bodies in their closed or gripping positions while permitting free functioning in this manner with respect to the upper slip body where this is brought into action alone.

I now draw attention to another important feature of construction of the follower 11. While this may be in the form of a solid sleeve and serve its primary functional objectives efficiently, I prefer to slit the sleeve longitudinally several times from the bottom a major portion of its length, as indicated at 22 and shown best in Figure 4 of the drawings. This results in the provision of what may be termed yieldable fingers which when operating in the tapered portion of the barrel are caused to contract about the upper slip body and consequently pressing the slips thereof so as to cause them to exert an increased gripping action, which is of great importance in fishing sucker rods of the smaller diameters.

I have already indicated that the construction of sucker rod socket shown in Figure 3 differs with respect to that shown in Figure 1 in that the bore of the main slip body tapers upwardly so as to enable the main gripping means to engage and hold rods or objects of varying diameters. It further differs from the modified form in a like manner with reference to the construction of the bore of the upper slip body which bore as shown in Figure 3 forms a continuation of the taper of the bore of the lower slip body and likewise permits of engagement with rods of varying diameters.

While the operation of the device as above described will be obvious to those skilled in the art to which this invention appertains, it is well to note that the rod socket is lowered into the well casing until the broken rod or tube to be pulled is engaged. As the latter passes into the socket it comes into contact with either the lower or upper slip body, depending upon its size. A continuation of the downward movement of the socket causes the gripping means together with the follower to move upwardly in the barrel and in this movement the gripping means, either the upper or lower or both, as the case may be, expands or opens more or less according to

the range of upward movement. In the event the gripping means are moved beyond the tapered portion in which they are seated the slips open to a greater degree at the bottom than at the top in view of the tapered formation of the slip bodies. As the downward movement of the socket is discontinued, followed by an upward pull upon the same, the gripping means move downwardly in their respective seats and close about the object which is engaged within the bores and the object is positively held by the gripping means with increasing effectiveness as the pulling stress is placed upon the rod socket. In this operation of opening and closing of the gripping means it should be understood that there is a looseness of fit with respect to the flange and groove interlocking connection to permit of the freedom of expansion and contraction in the manner hereinbefore set forth.

When the object to be gripped is of such a diameter as not to be grippingly engaged by the lower slip body it is caused to pass into the bore of the upper slip body through the instrumentality of the intervening passage 18 in the holding sleeve. Contact with the upper slips 16 and movement of the latter upwardly within the bore of the sleeve 11 permits of the necessary gripping engagement with the rod to be pulled. In the upward pull on the socket, under such conditions, the slips ride down the taper of the sleeve and engage the rod positively with a vise-like grip, this gripping action being considerably enhanced as the stress causes the sleeve 11 to move into the tapered portion of the barrel which acts to press the yieldable fingers of the sleeve inwardly.

It is to be understood that the lower slip and follower will function without the upper set of slips being in place but the advantage of the two sets is apparent where the operator does not know at what point the rod is broken.

Another distinct advantage resides in the fact that the upper slips when engaged with the rod cause the yieldable fingers of the follower to expand slightly and frictionally bind on the barrel as hereinbefore mentioned. The follower and lower set of slips will be wedged tightly in the bowl. Removal of the spring pressure, however, releases the wedging action on the follower and by driving back the lower slips into the the larger part of the barrel they will loosen their hold.

By virtue of this arrangement the operation of pulling rods of varying diameters is greatly facilitated because of the positive action of the gripping members and their inability to become displaced or dumped in the manner which has been referred to in the foregoing description.

It may be noted here that one of the important advantages inherent in the construction of the gripping means which is disclosed in Figure 1 of the drawing resides in the fact that the slips 7 may be much shorter in length than those slips which are commonly used today as exemplified by the patent to Neilson hereinbefore mentioned. In other words, the slips used in my device are of a more uniform thickness and can therefore be more successfully treated so as to properly temper the metal for the work to be done with the gripping device. Where the thickness of the metal is considerable at the top of the slip as compared with that at the bottom the tempering of the material is quite difficult because of the fact that the upper portion requires a greater degree of tempering than the lower portion. If the slip is tempered according to the thickness of the lower portion it is insufficiently tempered at the top, and vice versa. By using a shorter slip with a more uniform thickness the tempering operation is much more readily accomplished and the durability or efficiency of the gripping device is greatly enhanced.

It will be obvious that the slips of the taper form of bore may be interchanged with slips of the straight bore and I desire it to be understood that other modifications may be made in the details of construction of the device without departing from the spirit of the invention and within the scope of the claims appended hereto.

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

1. In a socket of the class described, the combination with a barrel having a tapering bore and slips in said bore, of holding means having interlocking connection with the slips to hold them together free to open and close, said holding means having gripping means for engaging an object passing thereinto.

2. In a socket of the class described, the combination with a barrel having a tapering bore and slips in said bore, of holding means having interlocking connection with the slips and having a bore provided with gripping means.

3. In a socket of the class described, the combination with a barrel having a tapering bore and slips in said bore, of holding means having interlocking connection with the slips and having a longitudinal bore, and secondary gripping means movably mounted in the bore of said holding means.

4. A socket comprising a barrel, a main set of slips therein, holding means engaging and sustaining said slips and having a tapering bore, and gripping means in the tapering bore of the said holding means.

5. A socket comprising a barrel, a main set of slips therein, holding means engaging and sustaining said slips and having a tapering bore, a secondary set of slips mounted

in the tapering bore of said holding means, and means for holding the secondary slips against relative displacement.

6. A socket comprising a barrel, a main set of slips therein, a follower having interlocking engagement with the main slips, a second set of slips carried by the follower and freely movable relative thereto, and means intermediate the sets of slips for directing an object passing through the first set into the second set.

7. A socket comprising a barrel, a set of slips mounted therein, holding means disposed above said slips and having a flange and groove connection therewith for holding the slips against displacement one with respect to the other, gripping means mounted on said holding means, and a spring extending into the holding means aforesaid into cooperative relation to the gripping means thereof.

8. A socket comprising a barrel, a set of slips mounted in said barrel, and yieldable means coacting with said slips and adapted to engage the walls of the barrel incident to movement of the slips relative to the yielding means.

9. A socket comprising a barrel having a tapering bore, a set of slips mounted in said barrel, and yieldable means coacting with said slips and adapted to engage the walls of the barrel incident to movement of the yielding means into coacting relation with reference to the tapered bore of the barrel.

10. A socket comprising a barrel, a set of slips mounted within said barrel, means interposed between the slips and the barrel for sustaining the same in operative relation therein, and means in the barrel for imparting gripping movement to said supporting means and these slips.

11. A socket comprising a barrel having a tapering bore, a set of slips mounted in said barrel, and holding means for said slips, said holding means comprising yieldable elements adapted to impart compressive movement during their coaction with the tapering bore of the barrel.

12. A socket comprising a barrel, a set of slips mounted in said barrel, a follower having interlocking connection with the slips for loosely holding said slips together against displacement with relation to each other, said follower being formed with yieldable fingers adapted to coact with the bore of the barrel in movements of the follower upwardly and downwardly therein.

13. A socket comprising a barrel having a tapering bore, a main gripping device therein, a secondary gripping device, and means for holding the first gripping device and adapted to impart gripping action to the secondary gripping device, said holding means being operable by the barrel to impart additional gripping action to the secondary gripping device.

14. A socket of the class described comprising a barrel having a tapering bore, a main set of slips mounted in said barrel, a follower having interlocking connection with said slips and provided with yieldable elements, said follower having a tapering bore, a second set of slips mounted in the tapering bore of the follower, and means coacting with the second set of slips for holding them together against displacement one with respect to the other.

15. A socket of the class described comprising a barrel, a main set of slips mounted therein, holding means for said slips comprising a sleeve-like member having a series of slits extending the major portion thereof and dividing the same into yieldable members having interlocking engagement with said main slips, and a secondary set of slips carried by said holding means in superposed relation to the main slips and operable independently with relation thereto.

In testimony whereof I affix my signature.

WALTER A. O'BANNON.