To all whom it may concern:

Be it known that I, Albert H. Neilson, a citizen of the United States, and a resident of Tulsa, in the county of Tulsa and State of Oklahoma, have invented certain new and useful Improvements in Reversible-Slip Sucker-Rod Sockets, of which the following is a specification.

My invention relates to improvements in sucker rod sockets, and it consists in the constructions, combinations and mode of operation herein described and claimed.

One of the foremost objects of the invention is to provide a socket having reversible slips for the obvious purpose of enabling the gripping of any size sucker rod or other object within the range of the socket itself, the toothed bores of the respective sides of the slips being arranged on a continuous taper.

A further object of the invention is to provide an improved type of gripper wherein a greater number of teeth will come into play in holding the object to be drawn out, said gripper being composed of a plurality of reversible slips, which, when the larger toothed bore is adjacent, the barrel inlet enables the reception of not only a sucker rod box but a broken section of rod as well.

A further object of the invention is to provide an improved sucker rod socket with slips adapted to at once grip a box and rod.

A further object of the invention is to provide means for so holding a plurality of slips together as to enable dropping the assembled slip-body into the tapered bore of the barrel without danger of the slips falling apart.

A further object of the invention is to provide such holding means as just described, enabling a wider separation of the slips at the top than at the bottom, thereby enabling the production of a clamping action on an upward movement of the socket in respect to a caught sucker rod or its part.

A further object of the invention is to produce a new combination in sucker rod sockets, comprising a barrel with a tapered bore and a slip-body tapered in opposite directions for reversible insertion in said bore, the two-diameter toothed bores of the slip-body being arranged on slight tapers, the means which hold the slips from dropping apart being loose enough to enable a wider separation at the top than at the bottom.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawings, in which:

Figure 1 is a longitudinal section of the improved sucker rod socket, the reversible slip-body being shown in place in the tapered bore at the bottom of the barrel.

Figure 2 is a detail longitudinal section showing how the slips rise and separate wider at the top than at the bottom when a broken sucker rod is projected into the toothed bores.

Figure 3 is a detail side elevation of the slip-body, showing how the loose play between parts of the sectional keys and the adjacent slips enable the latter to separate wider at the top than elsewhere.

Figure 4 is a plan view of the slip-body as it appears in Figure 3.

Figure 5 is a view somewhat similar to Figure 2 but showing how the slip-body can be reversed in the tapered bore of the barrel.

Figure 6 is a horizontal section on the line 6—6 of Figure 5, showing the triple key arrangement.

Figure 7 is a detail perspective view of two of the slips, illustrating how it would be impossible to assemble the slips incorrectly for the reason that the keys of adjacent slips would abut instead of enter an adjacent part of the groove.

Figure 8 is a detail perspective view of one of the triple keys.

Figure 9 is a detail horizontal section, similar to Figure 6, illustrating the use of a two-piece ring for holding the slips together.

Figure 10 is a detail perspective view of a part of the two-piece ring.

Figure 11 is a horizontal section similar to Figure 6, illustrating the use of dowel pins instead of keys, and

Figure 12 is a longitudinal section of a modification wherein one of the toothed bores has a convex formation instead of being on a straight taper.

This invention is an improvement on the sucker rod socket disclose in my co-pending application for Letters Patent filed June 28, 1920, Serial No. 392,701, and consists principally of a reversible slip-body, which, as the name implies, can be inserted either end down in the tapered bore of the barrel so as to catch any size object within the range of the barrel.

The barrel 1 is made of any suitable ma-
terial, preferably steel tubing, in any desired length and corresponding diameter whatever. The bore of the barrel is straight or uniform to the point 2, thereafter tapering at 3 to the beveled inlet 4, which in turn produces a sharp edge insuring the guiding of the broken sucker rod or other object into the socket. The threads 5 at the top are quite fine and are cut into the bore 2.

The plug 6 of the head 7 is screwed in at this place. The rather fine threads 5 extend far enough into the barrel to produce an absolutely strong attachment for the head without requiring the removal of very much metal from the barrel and so (what would otherwise be the consequence) avoid weakening the structure.

Consider now the construction of the slips. Generally there are three of these, as shown in Figure 4, although undoubtedly there may be a variation in the number of slips employed without in any way affecting the spirit or mode of operation of the invention. The slip-body, shown for example in Figure 3, results upon assembling the three slips. The slip body is of largest diameter in the middle and from there tapers to the opposite end, making the slip body reversible, or in other words, the slip body can be dropped into the tapered bore 3 either end down.

There is a groove 9 around the middle. This groove receives either the keys 10 or the two-piece ring 11 in Figure 9, or a simple split ring, and it is easily conceivable that when the slip body is made up of a greater number of individual slips other arrangements of rings or keys may be evolved.

In any case the purpose of the keys, two piece ring, etc., is to hold the slips together in the shape of a body so that that body can be dropped into the tapered bore 3 from the top of the barrel without danger of the slips falling apart and out at the bottom. With the retaining means shown in the various illustrations of the drawings, it would be quite difficult, if not impossible, to get the slips into the tapered bore in the positions they ought to occupy during a fishing operation. Furthermore, the keys hold the slips together when the slip body is made to ride up in the tapered bore 3 by virtue of striking either the box B or a part of the broken sucker rod R in Figure 2. Were it not for the keys 10, a side blow on one of the slips would serve to loosen and dislodge that slip, in turn loosening the other slips and letting them fall out of the inlet 4 into the bottom of the casing. Under all circumstances, the keys hold the slips in their proper operative positions.

While holding the slips in this manner, still the keys 10 permit sufficient loose play of the slips to enable a wider separation at the top as indicated by the printed legend in Figure 3, than elsewhere. This loose play is produced by slightly beveling the projecting ends of the keys as at 12. The main body of the key (shown for example in Figure 3) is firmly fixed at 13 in one end of the groove 70 in the right slip 8.

The free beveled end of the key fits into the adjacent end of the groove in the left slip 8, and in turn, the main body of the key of the left slip 8 is firmly fixed in the other end of its groove so that the companion free end of that key can enter the adjacent part of the groove of the next slip. This fitting together of keys and grooves results in producing a means which at once holds the slips together as stated above, and at the same time permits a rocking of the slips when the widest separation occurs at the top, on the pivotal point indicated at the bottom in Figure 3.

Referring now to the inner structure of the slips: Each has two series of teeth 14 and 15 forming toothed bores respectively of a small and large diameter when the slips are fitted together. The points of the teeth are directed toward the middle, in each case so as to secure a sharp and firm hold on the object gripped (for example the box B in Figure 2) when the pump rod socket is drawn up and the slip-body closes against the object by virtue of riding downwardly in the tapered bore 3. In machining the slip, the edges adjacent the teeth may be slightly beveled as at 16 to remove the rough edges.

Each toothed bore is made on a slight taper toward the middle, but the taper is not too pronounced; nevertheless it is a taper. In each instance, the taper is continuous from its origin at the entrance end of the slip body, to the medial point 17 where the two bores merge. It is important to observe that this type of slip body produces a very solid and substantial structure, and such it must be to meet the requirements of the use to which it is put.

It may be said in elaboration of the use of the sucker rod socket illustrated in Figure 2, that when the slip-body is inserted in the position there shown, the instrument is adapted to grip not only the box B of the sucker rod, but also the broken part of the rod R projecting above the box. In the event such an object is to be caught, the upper part of the broken rod extends into the bore 14 and the result is that a double gripping action is exerted when the socket is withdrawn from the well casing.

When the slip body is reversed from the position shown in Figure 2 to that illustrated in Figure 3, only the broken end of a sucker rod may be gripped because of the presentation of the smaller bore 14. In either case, the same and peculiar function of the slips obtains, i.e., widest separation at the top when the slip-body is made to
tremities.

of the improved sucker rod socket as herein described and claimed, is that of a generally preferred form, obviously modifications and changes may be made without departing from the spirit of the invention or the scope of the claims.

1. A slip-body comprising a plurality of separate slips, and means for confining the separate slips to enable placing the slip-body into the tapered bore of a rod socket either end first and keeping it there in operative position.

2. A sucker rod socket, comprising a barrel, and reversible slips in the barrel.

3. A sucker rod socket, comprising a barrel, and slips with plural-diameter bores, reversible in the barrel to dispose any bore adjacent to the inlet of the barrel.

4. A rod socket, comprising a barrel, and slips with a plurality of bores in communication with each other, the slips being reversible to either bring the smallest bore next the barrel inlet or the largest next to the barrel inlet.

5. A rod socket, comprising a barrel with a tapered bore, and slips with bores of different diameters tapered from opposite ends, said slips being tapered on the outside from the middle toward the ends to reversibly fit the tapered bore of the barrel.

6. A rod socket, comprising a barrel with a tapered bore, slips with bores of different diameters tapered from opposite ends, said slips being tapered on the outside from the middle toward the ends to reversibly fit the tapered bore of the barrel, and means disposed in the region of the middle of the slips to hold them together in said tapered bore.

7. A rod socket, comprising a barrel with a tapered bore, slips with different diamater toothed bores continuously tapered from each end, the outside of the slips being double-tapered from the middle to the respective ends so that the slip body may be reversed in the barrel; and means carried by one slip in loose engagement with the next to hold the slips together in the barrel but permit wider separation at the top of the slip body than elsewhere.

8. A rod socket, comprising a barrel with a tapered bore, slips with different diameter toothed bores continuously tapering from the opposite ends, the outside of the slip body tapering from the middle toward each end, and having said removed portions to hold the slips together either when dropping the slip body into the tapered bore of the barrel or when said body is in operative position in said bore.

9. A rod socket, comprising a barrel with a tapered bore, slips with different diameter toothed bores continuously tapering.
from the opposite ends, the outside of the slip body tapering from the middle toward each end, and having portions removed from the region of the middle; and means fixed in part of each removed portion with a loose connection to a part of the removed portion of an adjacent slip, to hold the slips together while in either of their reversible positions in the tapered bore of the barrel and enable wider separation of the slips at the top than elsewhere.

10. A rod socket, including slips with a groove around the middle of the body when the slips are assembled, and pieces occupying the groove to hold the slips together against relative axial movement but permitting radial movement.

11. A set of slips with a groove around the body when the slips are assembled, and a key fixed in the end of the groove of each slip with a projecting end to enter a part of the groove of the adjacent slip, said ends being beveled to provide loose play for relative movement.

12. A rod socket, including slips with abutting enclosed spaces, and a piece fixed in one space to fit into the adjacent enclosed space, to prevent relative axial movement but permit slight radial movement of the slips.

13. A rod socket, including slips, with a toothed bore convexly formed to produce a medial constriction.

14. An article of manufacture consisting of a set of slips constructed to reversibly fit a rod socket.

15. A set of slips constructed to edge-separate at one end while the other ends remain in engagement to provide pivotal points when displaced in a rod socket, by an object to be gripped, and medially located means which allows sufficient relative movement of said slips to accomplish said functions.

16. A slip-body, double taper-bored on the inside, each slip having a groove; and a key protruding from each groove to enter a part of an adjacent groove when companion taper bores are assembled, but abut an adjacent key when reversely and improperly assembled.

ALBERT H. NEILSON.