

900,440.

Patented Oct. 6, 1908.

Fig. 1.

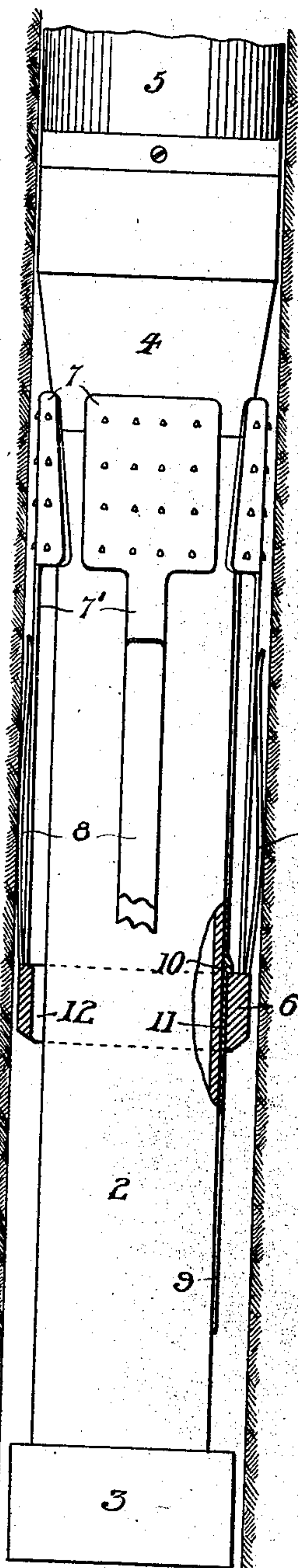


Fig. 2.

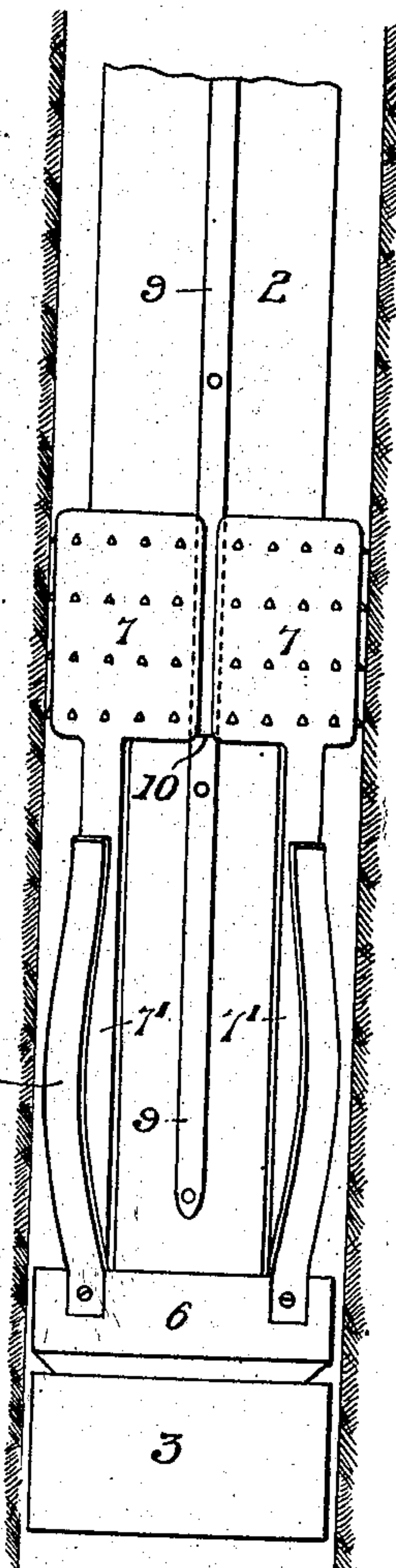


Fig. 4.

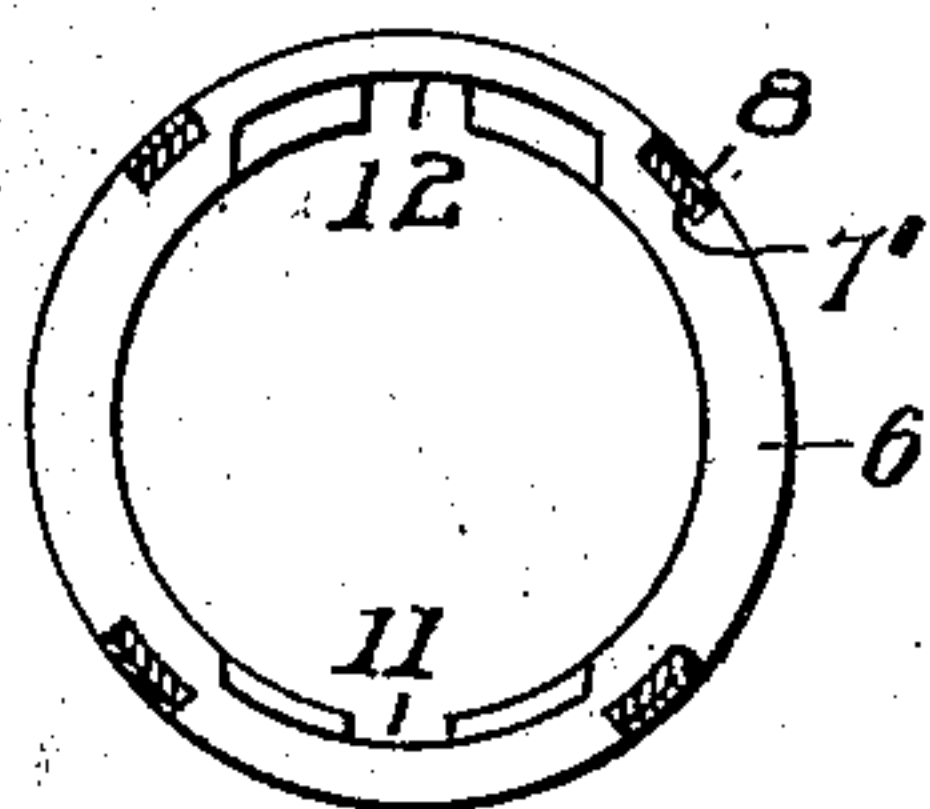


Fig. 5.

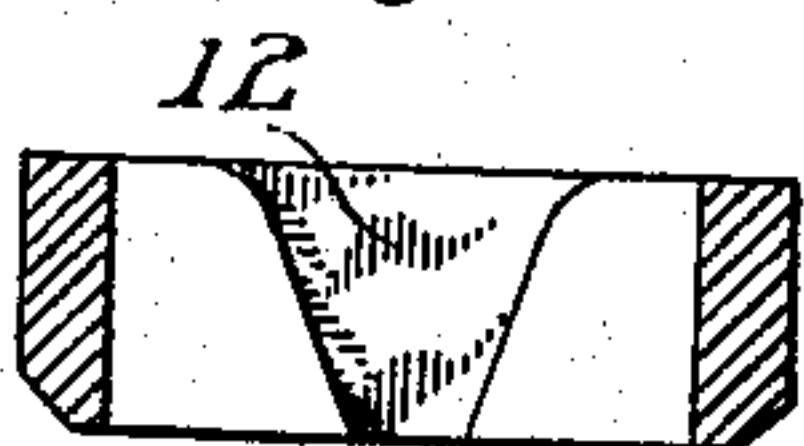
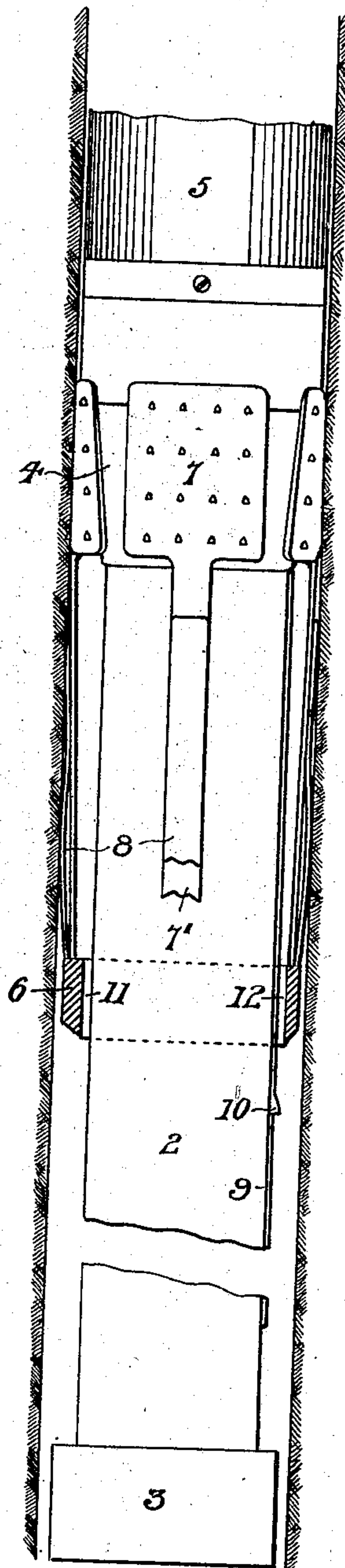


Fig. 3.



Witnesses:

J. B. Hoffman,
Alberta Beach

Inventor

Geo. A. Spang,
By J. W. Nesbit atty.

UNITED STATES PATENT OFFICE.

GEORGE A. SPANG, OF BUTLER, PENNSYLVANIA, ASSIGNOR TO SPANG & COMPANY, OF BUTLER, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ANCHOR MECHANISM FOR WELL-PACKERS.

No. 900,440.

Specification of Letters Patent.

Patented Oct. 6, 1908.

Application filed April 7, 1908. Serial No. 425,609.

To all whom it may concern:

Be it known that I, GEORGE A. SPANG, a resident of Butler, in the county of Butler and State of Pennsylvania, have invented certain new and useful Improvements in Anchor Mechanism for Well-Packers, of which the following is a specification.

The object of this invention is to provide packer anchoring means of improved construction wherein no trip or other movable or threaded parts are employed in the operation of setting the packer, the anchoring thereof being accomplished wholly by rotation of the packer with relation to the anchor and by a vertical movement therethrough, fixed means of improved construction being applied for positively limiting the downward movement of the packer tube through the anchor when being inserted in a well, which means is rendered inoperative by a partial turn of the packer when the anchor is to be set, thus permitting the packer to so lower as to expand the anchor into holding engagement with the well wall.

The invention consists in the novel features of construction, and in the combination of parts, hereinafter fully described and claimed, and illustrated by the accompanying drawings, wherein—

Figure 1 is an elevation of the lower portion of a packer equipped with the improved anchor mechanism, the latter being shown partly in section and in the position it maintains with relation to the packer body when being lowered in a well. Fig. 2 is an elevation of the anchor mechanism, showing the packer body at the upper limit of movement with relation to the anchor, as when the anchor has been lowered the required distance and is to be set. Fig. 3 is a view similar to Fig. 1, showing the mechanism in set position. Figs. 4 and 5 are detail views of the ring-like body of the anchor.

Referring to the drawings, 2 designates the tubular body of a packer of usual construction, having the stop-forming collar 3 at its lower end, and at its upper end the downwardly tapered anchor expanding member 4, which also forms the lower abutment for the rubber sleeve or annulus 5 which is pressed and expanded into engagement with the well wall when the packer is anchored and collapsed, all as well known in the art.

The anchor consists of ring-like member 6,

which comprises the lower end of the anchor structure and which fits snugly on tube 2 and is capable of vertical movement thereon. Projecting upwardly from ring 6 are the spring slip arms 7', carrying at their upper ends upwardly tapered slips 7. The slips are normally out of wall-engaging position but are adapted to be expanded and tightly grip the wall by the tapered expanding member 4. Coincident with each of spring arms 7' is an outwardly bowed leaf spring 8, these springs being compressed by the well wall and opposing downward movement of the packer and at the same time preventing the anchor from rotating.

9 is a strip-like rib extending longitudinally of body 2 with its lower end stopping short of collar 3, while at a suitable point between its ends is shoulder 10.

The inner face of anchor ring 6 is formed with two vertical grooves or depressions 11 and 12, preferably though not necessarily arranged diametrically opposite each other. Both grooves are of sufficient width to receive rib 9 and permit the anchor ring to move upwardly when either groove is in register therewith. The grooves are, however, of different depth. Groove 11 is only deep enough to accommodate rib 9, and hence shoulder 10 engages the upper end of the ring and prevents the packer body from moving further downward, with expander 4 above slip-expanding position, all as shown in Fig. 1. This is the position the parts maintain as the packer is being lowered and until it reaches the point where it is to be set. It will be understood that springs 8 oppose downward movement of the anchor, so that while thus moving, the packer body lowers as far through the anchor as shoulder 10 will permit. At the same time the interlocking connection of rib 9 and groove 11 prevent the parts from turning independently of each other.

When the packer has been lowered to position, the movement is reversed and the packer body raised in the frictionally held anchor until collar 3 strikes the anchor ring 6, thereby moving the lower end of rib 9 above the plane of the ring. The packer body is then free to turn in the anchor and is turned sufficiently to place the deeper groove 12 in register with rib 9 and the packer body is again lowered. As groove 12 is of sufficient depth to permit shoulder

10 to pass therethrough, the downward movement continues until member 4 moves between and expands slip heads 7 into engagement with the well wall, thus permanently anchoring the packer, as shown in Fig. 3. With the packer thus securely fixed it is manipulated in the usual manner for expanding the rubber into engagement with the wall. Grooves 11 and 12 are preferably formed with rounded or inclined edges so as to receive the lower end of rib 9 even though the latter may not be in exact alignment with the through portions thereof.

To release the packer, it is only necessary to raise the anchor body, thus withdrawing expander 4 from between the slips, and with the body thus raised it is turned sufficiently to place rib 9 in register with groove 11, whereupon the packer may be lowered still further if desired, the engagement of shoulder 10 with rib 6 preventing the slips from being expanded, or the packer may be freely raised in the well, as circumstances may require.

It is the usual practice to use a wire line for lowering the casing or tubing to which the packer is attached. In this operation the line frequently becomes twisted, causing the casing or tubing and packer to swirl in the hole. This movement would release the anchor mechanism of many forms of packers and cause them to set prematurely. With the present improvement this is impossible as the parts are positively locked against lateral movement one on the other while being lowered and cannot so move as long as the packer body remains depressed in the anchor mechanism. Hence, any swirling resulting from the twisting of the line must move the packer as a whole and without changing the relative positions of the parts.

It is characteristic of the invention that the means employed for determining the relative positions of the anchor and packer body are all positively fixed, there being no movable trips, screw threads or other parts to get out of order. Furthermore, the parts are so nonrotatably connected in the different positions as to prevent accidental turning of one with relation to the other, so that whatever the position of the parts may be they are fixed in such position.

I claim:—

1. The combination of a tube, an expandable anchor through which the tube is movable vertically and in which it is rotatable when fully raised with relation to the anchor, the anchor having two vertical

grooves—one larger than the other, two lateral projections on the tube at different elevations thereon and both adapted to pass through the larger groove, the upper projection being larger than the lower projection—too large to pass through the smaller groove, and anchor expanding means carried by the tube and operative when the upper projection and larger groove are in register.

2. The combination of a tube, an expandable anchor through which the tube is movable vertically and in which it is rotatable when fully raised with relation to the anchor, a rib disposed longitudinally of the tube with a shoulder on the rib, the anchor having two vertical passageways for the rib—one deeper than the other and adapted to pass the shoulder therethrough, said shoulder adapted to engage the anchor when in register with the shallower passageway and stop downward movement of the tube through the anchor, and anchor-expanding means movable with the tube and operative when the shoulder and deeper passageway are in register.

3. In a packer, the combination of a tube, an anchor through which the tube is movable vertically and in which it is rotatable when fully raised in relation to the anchor, the anchor consisting of a base ring and upwardly projecting laterally expandable slips carried by the ring with means on the anchor for frictionally engaging the well wall, a stop on the tube for engaging the lower end of the anchor, a laterally projecting rib extending longitudinally of the tube, the lower end of the rib being above said stop and a shoulder on the rib above the lower end of the latter, the anchor ring having two depressions in its inner face—one deeper than the other—and through each of which the rib is adapted to move, said shoulder engaging the anchor ring when the rib is in register with the shallower depression and thus limiting the downward movement of the tube in the packer, and means carried by the tube for expanding said slips and operative when the rib is in register with the deeper ring-depression through which said shoulder is adapted to move downward.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE A. SPANG.

Witnesses:

JANE CORNELIUS,
L. F. PORTER.