

Sept. 12, 1961

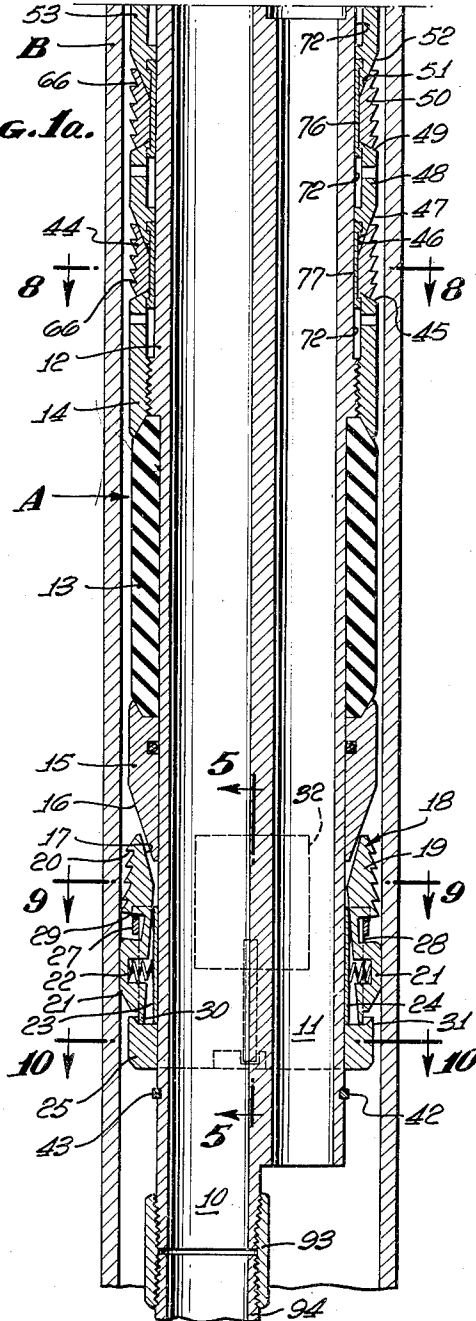
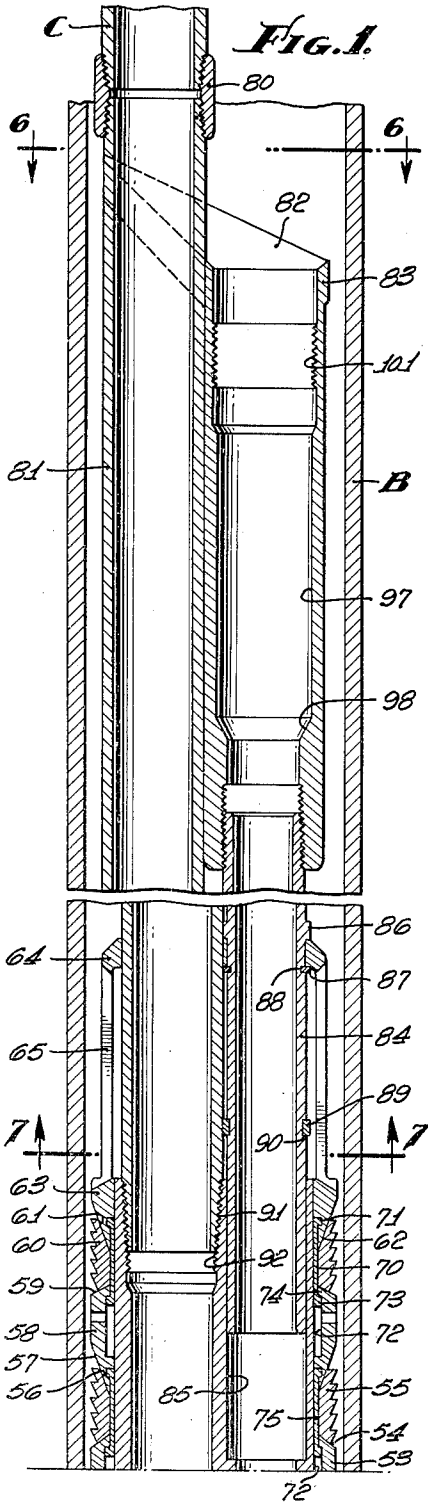
M. B. CONRAD ET AL

2,999,544

RETRIEVABLE PARALLEL STRING WELL PACKER APPARATUS

Filed June 9, 1958

4 Sheets-Sheet 1



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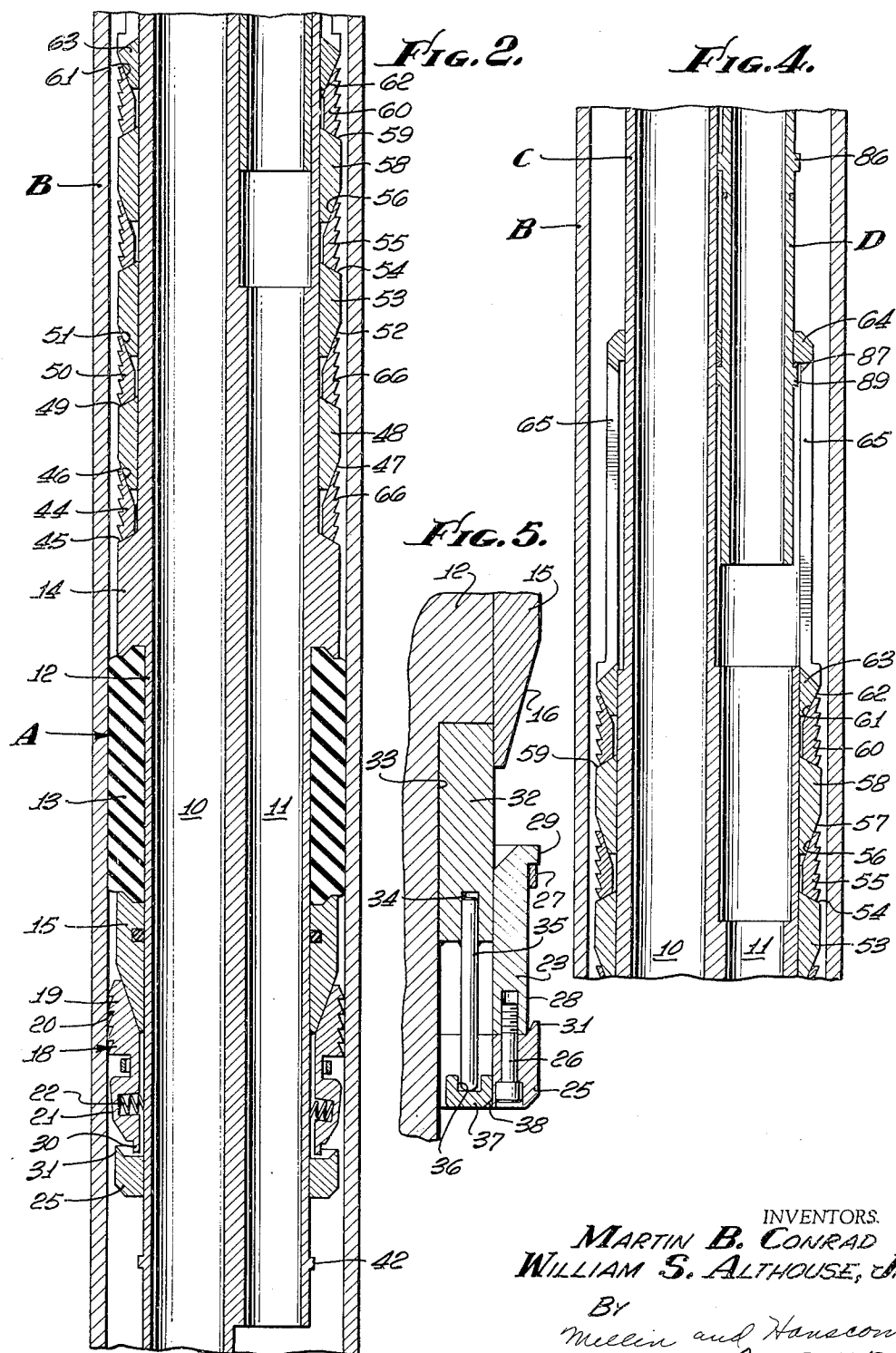
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RETRIEVABLE PARALLEL STRING WELL PACKER APPARATUS

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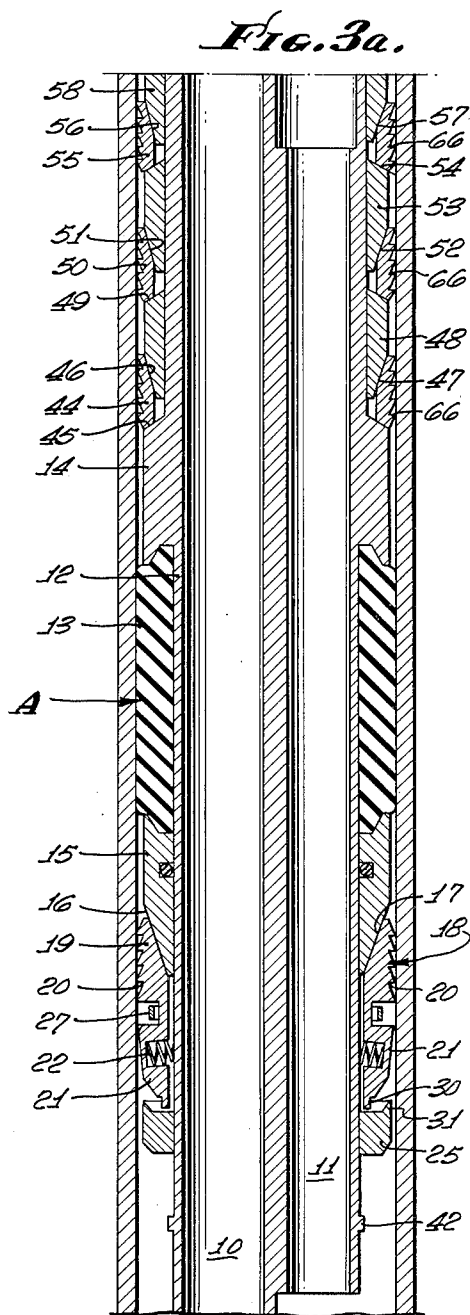
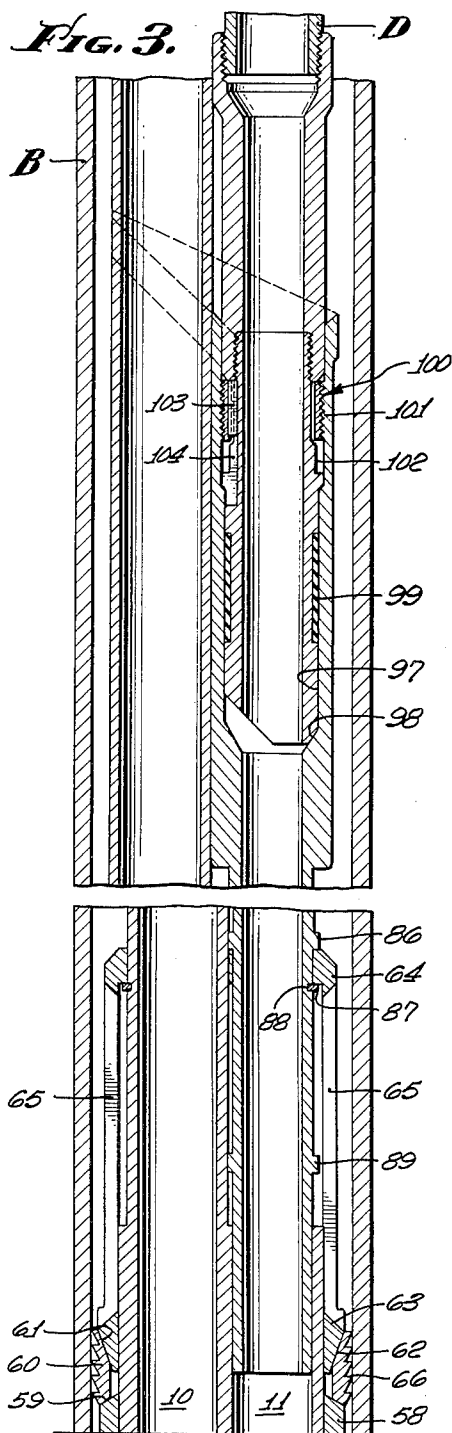
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RETRIEVABLE PARALLEL STRING WELL PACKER APPARATUS

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4 Sheets-Sheet 3



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RETRIEVABLE PARALLEL STRING WELL PACKER APPARATUS

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Fig. 6.

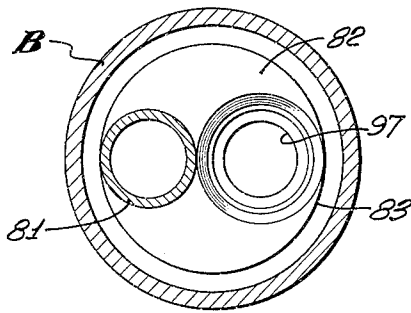


Fig. 7.

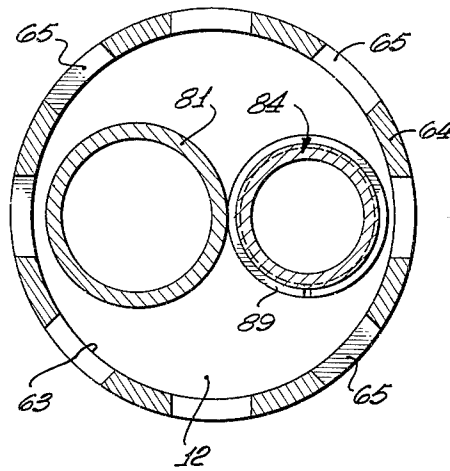


Fig. 8.

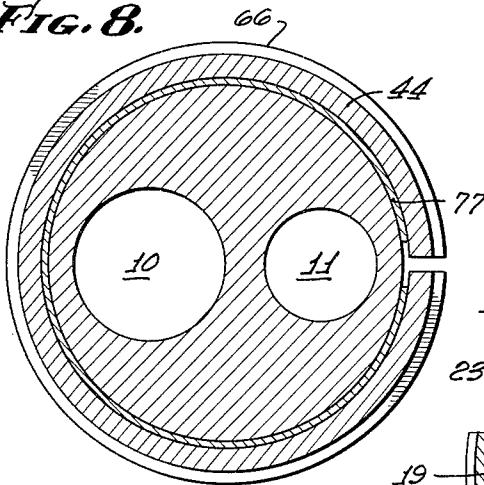


Fig. 9.

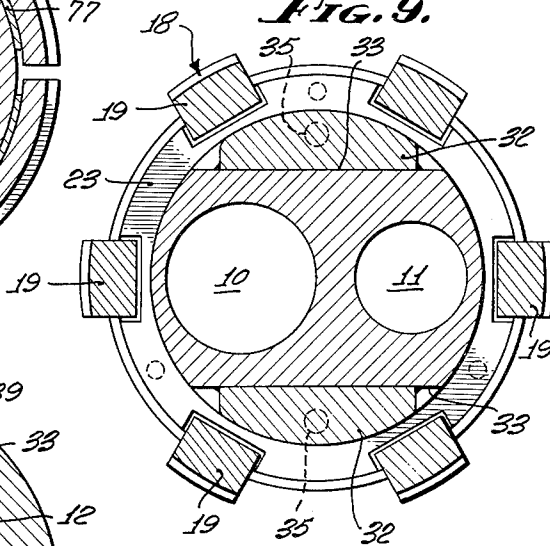
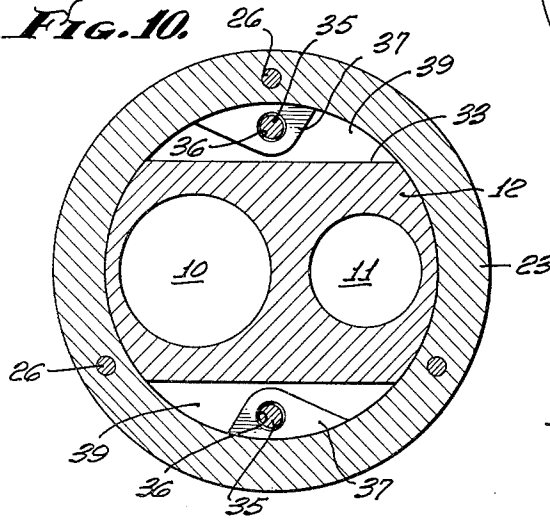


Fig. 10.



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RETRIEVABLE PARALLEL STRING WELL PACKER APPARATUS

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17 Claims. (Cl. 166—134)

The present invention relates to subsurface well bore equipment, and more particularly to well packers adapted to be set in well casings, and the like.

An object of the invention is to provide an improved retrievable well packer apparatus adapted to be anchored in packed-off condition in a well casing against movement in both longitudinal directions, and through which well bore fluid can be conducted along separate parallel paths into separate parallel tubular strings extending to the top of the well bore.

Another object of the invention is to provide a retrievable well packer apparatus having separate fluid conducting passages therethrough and capable of being anchored in a well casing against movement in both longitudinal directions, in which the well packer apparatus is readily released from the well casing whenever it is to be retrieved. Such release occurs simply by taking an upward pull on one of the tubular strings connected to the apparatus.

A further object of the invention is to provide a retrievable well packer apparatus having separate fluid conducting passages therethrough and capable of being anchored in a well casing against movement in both longitudinal directions, the packer apparatus being ordinarily releasable from the well casing merely by taking an upward pull on a tubular string connected to the apparatus, in which fluid circulation around part of the apparatus can be established to remove foreign substances from the packer in the event it cannot be freed from the casing in the ordinary manner.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURES 1 and 1a together constitute a longitudinal section through a well packer apparatus, with parts in retracted position for lowering the apparatus in a well casing, FIG. 1a constituting a lower continuation of FIG. 1;

FIG. 2 is a somewhat diagrammatic view of the apparatus anchored in packed-off condition against downward movement in the well casing;

FIGS. 3 and 3a constitute a somewhat diagrammatic section through the well packer apparatus anchored in packed-off condition against movement in both longitudinal directions therewithin, FIG. 3a constituting a lower continuation of FIG. 3;

FIG. 4 is a view of an upper portion of the packer apparatus, illustrating an emergency release position of certain of the parts for facilitating removal of the apparatus from the well casing;

FIG. 5 is an enlarged longitudinal section taken along the line 5—5 on FIG. 1a;

FIG. 6 is a cross-section taken along the line 6—6 on FIG. 1;

FIG. 7 is an enlarged cross-section taken along the line 7—7 on FIG. 1;

FIG. 8 is an enlarged cross-section taken along the line 8—8 on FIG. 1a;

FIG. 9 is an enlarged cross-section taken along the line 9—9 on FIG. 1a;

FIG. 10 is an enlarged cross-section taken along the line 10—10 on FIG. 1a.

The well packer apparatus A is adapted to be run in a well casing B, or similar conduit string, disposed in a well bore for the purpose of conducting separate fluids through separate parallel tubular strings C, D to the top of the well bore. The well packer may be set in the well casing above a lower packer (not shown) for the purpose of conducting well production from a lower zone through one passage 10 in the well packer and into the first tubular string C extending to the top of the hole. Fluid from another formation zone between the lower and upper well packers passes through another passage 11 in the well packer A and through a second tubular string D extending to the top of the well bore. The well packer apparatus can be anchored in a well casing, one type of fluid, such as oil, passing through one passage 10 and the first tubular string C to the top of the well bore, another type of fluid, such as gas, passing through the second passage 11 and the second tubular string D to the top of the well bore.

The well packer apparatus A includes a main body 12 having a packing structure 13, such as a rubber or rubber-like packing sleeve thereon, the upper end of which engages an upper body abutment 14 threadedly secured to the body, and the lower end of which engages the upper end of a lower expander 15 slidable relative to the body. This lower expander has a downward and inwardly tapering external expander surface 16 adapted to engage companion inner tapering surfaces 17 on a lower set of slips 18 disposed around the body of the tool. These slips include upper anchoring portions 19 having downwardly facing wickers or teeth 20 adapted to engage the wall of the well casing B to anchor the well packer against downward movement therewithin. The slips also include lower drag portions 21 urged into frictional engagement with the wall of the well casing by helical compression springs 22 in order to resist movement of the slip structure within the well casing. The slips 18 are carried by a slip supporting sleeve 23 slidably mounted on the body 12 and having circumferentially spaced, longitudinally extending grooves 24 therein receiving the slips. Each spring 22 bears against the base of a groove 24 and against the drag portion 21 of a slip, tending to hold the drag portion out against the casing and rocking the anchoring portion 19 inwardly away from the well casing. The slips 18 are confined for joint longitudinal movement by virtue of their lower ends engaging a stop ring 25 secured to the slip sleeve 23 by one or more longitudinally extending screws 26, and by a retaining ring 27 disposed within an external groove 28 in the slips between their anchor portions 19 and drag portions 21. This ring 27 is engageable with the lower sides of the slip grooves 28, upward movement of the ring being prevented by its engagement with an external upper flange 29 projecting from the slip sleeve 23.

When the apparatus is out of the well casing, outward ward movement of the slips 18 under the influence of the helical compression springs 22 is limited by their engagement with the retaining ring 27 and also by engagement of their lower foot portions 30 with the upwardly extending rim portion 31 of the stop ring 25.

The anchoring portions 19 of the lower slips 18 and the packing sleeve 13 can be expanded into engagement with the well casing B whenever the body 12 is permitted to move downwardly relative to the lower slips.

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Initially, such relative downward movement is prohibited by a releasable lock device. As disclosed, the lock device includes a pair of opposed blocks 32, welded or otherwise secured to opposed flat sides 33 of the body 12 of the tool. Mounted in a bore 34 in each block is a stop pin 35 (see particularly FIG. 5), the pin being welded to the block 32. The pins depend from the blocks, with their lower ends received within recesses 36 in lock lugs 37 secured to the stop ring 25 in any suitable manner, as through use of welding material 38. On each side of each stop lug 37 there is a substantial space 39 into which the pins 35 can enter, as described hereinbelow.

With the pins 35 received in the lug sockets 36, downward movement of the body 12 is transferred through the pins 35 to the stop ring 25 and slip sleeve 23, resulting in movement of the slip structure down along the casing B with the body 12. When the slips are to be anchored against the casing, the body 12 is elevated with respect to the slips 18, which will occur inasmuch as the drag portions 21 of the slips are frictionally engaging the wall of the well casing and are resisting longitudinal movement of the entire slip structure. The body need merely be elevated a short distance to pull the lock or coupling pins 35 out of the sockets 36, whereupon the body is turned in either direction a portion of a revolution, to the extent at which the pins are aligned with the spaces 39 to one side of the lugs 37. The body 12 can now be lowered, which will effect a lowering of the packing sleeve 13 and expander 15 relative to the slips 18, which are still prevented from lowering by the frictional engagement of the drag portions 21 against the wall of the well casing. Such lowering movement will first shift the lower expander 15 within the slips 18, rocking their anchoring portions 19 into anchoring engagement with the wall of the well casing. A continuation of the lowering movement of the body 12 will then move the upper body abutment 14 toward the lower expander 15 to foreshorten and compress the packing sleeve 13 and effect its expansion into firm sealing engagement with the wall of the well casing B (FIG. 2).

When the packing sleeve 13 and slips 18 are to be retracted, the body 12 need merely be moved upwardly, which will effect elevation of the upper body abutment 14 from the lower expander 15, allowing the packing sleeve 13 to retract inherently to its original position. A continuation of the upward movement will then cause the body blocks 32 to engage the lower end of the expander 15 and elevate it from the anchor portions 19 of the slips, allowing the springs 22 to rock the drag portions 21 of the slips back into full surface engagement with the well casing B and the anchoring portions 19 inwardly away from the well casing. The upward movement of the body 12 relative to the slip structure is limited by engagement of a stop ring 42, in the form of a split snap ring contained within a peripheral groove 43 in the body, with the lower end of the stop ring 25.

After the lower slips 18 and the packing sleeve 13 have been expanded against the well casing B, an upper series of slip members is set against the well casing to anchor the well packer against upward movement in the well casing. A lower split contractile slip ring 44 encompasses the body 12, with its lower end engaging the upper abutment 14. Preferably, the upper end 45 of the body abutment 14 is tapered in an upward and inward direction and engaging a companion taper at the lower end of the ring 44. This ring has an inner expander surface 46 engaging a companion tapered surface 47 on a lower expander 48 which is inclined in a downward and inward direction, this lower expander being slidable along the body of the tool. The upper end 49 of this expander 48 is tapered in an upward and inward direction and engaging a companion lower surface on an intermediate inherently contractile slip ring 50, which has an upper inner expander surface 51 engaging an

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external expander surface 52 on an intermediate expander 53 slidable along the body. This intermediate expander, in turn, has an upper surface 54 tapering upwardly and inwardly and engageable with a companion lower surface on another intermediate inherently contractile slip ring 55 having an upper tapered surface 56 engaging a companion tapered surface 57 inclined in a downward and inward direction on a second intermediate expander 58 slidable along the body 12 of the tool. This second intermediate expander 58 has an upper surface 59 inclined in an upward and inward direction engaging a companion tapered surface on an upper inherently contractile slip ring 60 which has an upper inner expander surface 61 engaging a companion surface 62 tapering in a downward and inward direction of an upper expander 63 slidable on the body of the tool. The upper expander 63 constitutes the lower end of a thrust sleeve 64 which extends above the upper end of the tool body. This thrust sleeve may have circumferentially spaced, longitudinal slots 65 therethrough to permit fluid to be circulated through the sleeve for the purpose described hereinbelow.

All of the upper expander members 48, 53, 58, 63 have their expander surfaces tapering in a downward and inward direction, whereas all of the inherently contractile slip rings or sleeves 44, 50, 55, 60 have external wickers or teeth 66 facing in an upward direction. In view of their inherent contractability, the slip rings 44, 50, 55, 60 tend to remain in a retracted position. However, upon downward movement of the upper thrust sleeve 64 and upper expander 63 toward the upper body abutment 14, all of the expanders and slip sleeves are moved in a downward direction, the lower expander 48 being forced behind the lower slip ring 44 to engage its wickers 66 with the wall of the casing, whereupon the first intermediate slip sleeve 50 is urged by the first intermediate expander 53, that moves downwardly therebehind, into anchoring engagement with the well casing, followed by movement of the second intermediate expander 58 down within the second slip sleeve 55 to expand the latter into anchoring engagement with the well casing, followed, finally, by movement of the upper expander 63 within the upper slip sleeve 60 to expand the latter into anchoring engagement with the wall of the well casing (FIGS. 3 and 3a). The maintenance of a sufficient downward load on the thrust sleeve 64, as explained hereinafter, will insure the wedging of the various expanders behind the several slip sleeves and will hold the upwardly facing wickers or teeth 66 of the latter in anchoring engagement with the wall of the well casing.

The aforementioned expansion of the slip sleeves into anchoring engagement with the well casing occurs after the lower expander 15 and the lower packing sleeve 13 have been expanded into engagement with the well casing B. Thus, the lower slips 18 will prevent downward movement of the well packer A in the well casing, whereas the upwardly facing wickers 66 of the slip sleeves 44, 50, 55, 60 will prevent upward movement of the well packer A and its body 12 within the well casing B.

When the upper slip rings 44, 50, 55, 60 are to be released from the well casing B, the thrust sleeve 64 need merely be shifted upwardly. Such upward movement will allow the upper slip sleeve 60 to retract inherently. The upward movement of the upper expander 63 is transferred through a split retrieving sleeve 70 that is connected to the upper expander 63 by means of the upper sleeve flange 71, this sleeve flange being slidable behind the intermediate expander 58 and in a counter-bore 72 of the latter. The lower end of the retrieving sleeve has an outwardly directed flange 73 adapted to engage an inner shoulder 74 on the intermediate expander. Thus, when the upper expander 63 moves upwardly, the retrieving sleeve flange 73 will engage the intermediate expander 58 and pull the latter upwardly

with respect to the intermediate slip sleeve 55, the latter then retracting inherently from the well casing. Similarly, a continuation of the upward movement of the upper expander 63 and first intermediate expander 58 will be transferred through an intermediate retrieving sleeve 75, which interconnects the two intermediate expanders 58, 53 to pull the lower intermediate expander 53 upwardly from behind the lower intermediate slip ring 50, allowing the latter to retract inherently from the well casing. This lower intermediate expander 53 is connected through a retrieving sleeve 76 slidable on the body 12 with the lower expander 48, the movement of the three upper expanders 63, 58, 53 then pulling the lower expander 48 upwardly relative to the lower slip ring 44, allowing the latter to retract inherently from the well casing. Finally, the lower expander 48 may be connected to the upper body abutment 14 by a retrieving sleeve 77 slidable on the body.

In all cases, it is to be noted that the retrieving sleeves can move downwardly within a counterbore 72 in the several expanders and the counterbore 72 in the upper body abutment 14, the lower inverted expander 48 being movable toward the upper body abutment 14, the first intermediate expander 53 toward the lower expander 48, the second intermediate expander 58 toward the first intermediate expander 53, and the upper expander 63 toward the second intermediate expander 58. The movement of the inverted expanders toward each other and of the lower expander 48 toward the upper body abutment 14 will result in the expansion of all of the split slip rings into anchoring engagement with the wall of the well casing. The movement of the upper expander 63 in an upward direction will progressively cause its retrieving sleeve 76 to contact the first intermediate expander 58 to pull it upwardly, the latter then pulling upwardly on the lower intermediate expander 53, which will then exert its pull through the intermediate sleeve 76 on the lower expander 48, which will, in turn, exert a pull on the upper body abutment 14 through the lowermost retrieving sleeve 76.

The well packer A illustrated in the drawings has been particularly designed to be used in conjunction with the first and second tubular strings C, D, which are disposed in side-by-side or parallel relation within the well casing B and which extend to the top of the well bore. The apparatus is lowered in the well casing by means of the first tubular string C which is connected, through a coupling 80, to an upper tubing 81 that extends downwardly through the upper guide portion 82 of a head 83 threadedly secured to a second tubing 84 which projects through the upper end of the thrust sleeve 64 and which extends into a counterbore 85 in the upper end of the body 12, this counterbore constituting the upper portion of the second body passage 11 extending completely through the body. The second thrust tubing 84 has an external flange 86 thereon engageable with the upper end of the thrust sleeve 64, as well as a shear ring 87 engaging the lower surface of the thrust sleeve 64, this shear ring being split and disposed within an external groove 88 in the second tubing 84. Below the shear ring 87 and well above the upper end of the body 12, the second tubing 84 carries a split stop ring 89 which is disposed within a peripheral groove 90 in the tubing 84, and which is adapted to engage the upper portion of the thrust ring 64, as explained hereinbelow.

The lower end of the first tubing 81 extends through the thrust sleeve 64, its terminal portion being constituted as a threaded pin 91 threadedly connected to a threaded box portion 92 at the upper end of the body 12, which constitutes the upper end of the first body passage 10 extending completely through the body of the tool and substantially parallel to the second body passage 11. A coupling 93 may be threaded to the lower end of the body 12, this coupling then also being threadedly attached to a lower tubing 94 that may extend a

substantial distance below the packer apparatus and which may be placed in appropriate sealing relation to a lower packer (not shown) anchored in packed-off condition in the well casing.

Production from the lower zone may pass through the lower packer (not shown), up through the lower tubing 94, then passing through the first body passage 10 and into the first tubing 81 for continued upward flow through the first tubular string C to the top of the well bore. Fluid from an intermediate zone between the lower packer and the packer apparatus illustrated may pass into the well casing B and thence upwardly through the second body passage 11 into the second tubing 84, and thence into a second passage 97 in the head, which is adapted to receive the lower portion of the second tubular string D when it is lowered down the well casing. The lower end of this second tubular string D will engage the frusto-conical guide surface 82 at the upper end of the head 83, which tapers toward the second passage 97, to guide the second tubing into the second passage until its lower end engages a stop shoulder 98 formed in the head. This second tubing has a suitable side seal 99 thereon engaging the wall of the second passage 97 and preferably also has a threaded latch 100 thereon, of the ratchet type, adapted to ratchet along internal threads 101 in the head passage 97 until it is disposed opposite such threads, whereupon a holding surface 102 on the second tubular string D will move upwardly behind the latch 100, upon slight upward elevation of the second tubular string, to hold the latch threads in engagement with the internal threads 101 in the head. The split threaded latch sleeve 100 may have a key 103 thereon slidable in a longitudinal keyway 104 in the second tubular member D to allow rotation of the second tubular string, as to the right, to unscrew the left-hand threads of the latch from the companion left-hand threads 101 in the head 82, in the event it is desired to remove the second tubular string D from the well bore without removing the apparatus.

In one mode of use of the apparatus illustrated, the parts are initially in the retracted positions disclosed in FIGS. 1 and 1a, and the first tubular string C is connected through the first tubing 81 to the body 12 of the tool, the first tubing being threaded within the threaded box 92 of the body. The apparatus is run in the well casing to the desired setting location in the well bore, which, for example, may be determined by engagement of the lower tubing 94 with a lower packer (not shown). When this position is reached, the first tubular string C is elevated a short distance, as, for example, about one foot, which elevating movement will lift the lock or coupling pins 35 from the sockets 36. The first tubular string may now be turned in the proper direction, as to the left, to align the coupling pins with the spaces 39 to one side of the lock lugs 37, and the first tubular string C can now be lowered. Such downward movement is transferred through the first tubing 81 to the body of the tool and through the upper abutment 14 and packing sleeve 13 to the lower expander 15, shifting the lower expander downwardly within the lower slips 18, which are prevented from moving downwardly by the frictional engagement of the drag portions 21 against the wall of the well casing B. The lower expander moves down behind these slips and rocks the slips about their drag portions to place their anchoring portions 19 into firm engagement with the wall of the well casing. When this occurs, the lower expander 15 can move downwardly no longer, whereupon a continuation of the downward movement of the body 12 moves the upper abutment 14 toward the expander 15 to foreshorten the packing sleeve 13 and expand it outwardly against the wall of the well casing. The parts now occupy the position illustrated somewhat diagrammatically in FIG. 2. At this time, however, the upper slip and expander members still occupy their retracted positions on the apparatus.

Following the setting of the lower slips and packing structure against the well casing, the second tubular string D is run in the well casing B alongside the first tubular string C. When its lower end engages the frusto-conical guide surface 82 it is steered or guided toward the second passage 97 in the head 82 and will enter this head until its lower end engages the head shoulder 98. Weight is now set down on the second tubular string D, which is transferred through the shoulder 98 to the second tubing 84, which telescopes down within the counterbore 85. The downward movement is transferred through the thrust flange 86 to the thrust sleeve 64, which then shifts the reverse cone expanders 63, 58, 53, 48 and the companion slip rings 60, 55, 50, 44 downwardly, to progressively expand the slip rings outwardly into anchoring engagement with the wall of the well casing, in the manner described hereinabove. These slips will then prevent upward movement of the body 12 of the tool within the well casing, particularly as a result of imposing adequate down weight on the second tubular string D, which is transmitted to the upper expanders and slip structures through the head 83, second tubular string 84, and the thrust sleeve 64. After the upper slip members have been anchored against the well casing, the downward strain on the first tubular string C can be removed, if desired. In fact, the first tubular string C can be placed in tension, provided the amount of tension is not excessive, and the packer A will still remain anchored in packed-off condition against longitudinal movement in both an upward and a downward direction.

Production can now flow from a lower zone through the lower tubing 94 and the first passage 10 in the body 12, up through the first tubing 81 and first tubular string C to the top of the hole. Production can also flow through a separate path from an upper zone into the second body passage 11, continuing on up through the second tubing 84 and passage 97 into the second tubular string D and to the top of the well bore. Thus, production from different zones or different types of fluid can be separately conducted through the parallel strings C, D to the top of the well bore.

In the event it is desired to release and retrieve the packer A, an upward pull is taken on the second tubular string D. Since such string is connected to the head 83 through the threaded latch 100, the upward pull is transferred through the head to the second tubing 84, and through the shear ring 87 to the thrust sleeve 64. This upward movement moves the upper expander 63 upwardly along the body 12, the upward movement of the upper expander being progressively imparted to the intermediate expanders 58, 53 and the lower expander 48 through the interconnecting retrieving sleeves 70, 75, 76, 77 to relieve the wedging action of the expanders behind the split slip sleeves 60, 55, 50, 44 and allowing the latter to retract inherently from the well casing, in view of the substantial retraction force that they inherently possess. Upward movement of the second tubular string D can be discontinued when it is pulled upwardly sufficient to enable the upper slip members to retract, whereupon an upward strain can be taken on the first tubular string C. If the upper slips have retracted, then the upward movement of the first tubular string will exert an upward pull on the body 12 of the tool to enable the packing sleeve 13 to retract, the block flanges 32 engaging the lower expander 15 and lifting it upwardly with respect to the lower slips 18, allowing the springs 22 to rock the slips on the casing to engage their drag portions 21 fully with the wall of the casing and remove their anchor portions 19 from engagement with the wall of the well casing. A continuation of the upward pull on the first tubular string C will effect free upward movement of the packer, which need only occur to a small extent. Prior to such upward movement, the second tubular string D is rotated to the right to unscrew its latch 100 from the left-hand threads 101 of the head, this second tubular string D

then being elevated above the head 83 for a substantial distance, as, for example, about ten feet. If the packer has moved up the hole freely upon the taking of an upward strain on the first tubular string C, then the second tubular string D can be removed completely from the well bore, after which the first tubular string C is elevated in the well casing to remove the apparatus A to the top of the hole.

In the event that the unscrewing of the second tubular string D from the head 83, following its manipulation to release the upper slip members, does not result in freeing of the packer A when an upward pull is taken on the first tubular string C, the emergency circulating and release portion of the apparatus can be placed in operation. The second tubular string D is reinserted into the head or receptacle and its threaded latch 100 replaced in threaded connection with the left-hand threads 101 in the head. An upward pull is then taken on the second tubular string D, which pulls upwardly on the head 83. When this upward pull exceeds the shear strength of the ring 87, the latter is disrupted, which then enables the second tubing 84 to be moved completely out of the counterbore 85 a short distance above the upper end of the packer body 12, such as shown in FIG. 4, this position being determined by engagement of the stop rings 89 with the upper end of the thrust sleeve 64, or of the outer portion of the sheared ring 87, which is engaging the upper portion of the thrust sleeve. Circulation can now be established down through the second tubular string D, this fluid discharging on top of the packer and passing out through the slots 65 in the thrust sleeve 64 to remove any sand, sediment or other material that may have accumulated on top of the well packer, and which is precluding its parts from being shifted to retracted position, or if such parts have been retracted, which is still preventing elevation of the well packer. Circulation can either be established down through the second D tubular string and then up around the second tubular string, or reverse circulation can be established down through the casing B around the tubular string D, the circulating fluid washing the upper portion of the well packer and then carrying the foreign material with it into the lower end of the second tubing 84, continuing on up through the second tubing and the second tubular string D to the top of the well bore. Such circulation will free the well packer A and enable it to be retrieved from the well bore. If an upward strain is now taken on the first tubular string C and the well packer has been released, then the second tubular string D is again released from the head by unthreading its latch 100 from its companion threaded box 101, the second tubular string D being removed completely from the well bore, followed by elevation of the first tubular string C to remove the well packer apparatus A completely from the well bore.

The inventors claim:

1. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body; normally retracted means on said body operable by manipulation of said body for anchoring said body to the well conduit against downward movement therewithin; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of sets of normally retracted slips engaging said expander surfaces; said expanders and slip sets being arranged in series and being interassociated; means for shifting said expanders and slips simultaneously longitudinally of each other to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

2. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body; normally retracted means on said body operable by manipulation of said body for anchoring said body to the well conduit

against downward movement therewithin; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of sets of normally retracted slips engaging said expander surfaces; said sets of slips being disposed between adjacent expanders; means for shifting said expanders downwardly along said body and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

3. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body; normally retracted means on said body expandible by downward movement of said body against the well conduit to anchor the body therewithin against downward movement; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of sets of normally retracted slips engaging said expander surfaces; said sets of slips being disposed between adjacent expanders; means for shifting said expanders downwardly along said body and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

4. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body; normally retracted means on said body operable by manipulation of said body for anchoring said body to the well conduit against downward movement therewithin; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of sets of normally retracted slips engaging said expander surfaces; said sets of slips being disposed between adjacent expanders; means for shifting said expanders downwardly along said body and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit; and retrieving means interconnecting said expanders to transmit upward motion of one expander to another expander.

5. In a well packer adapted to be set in a well conduit disposed in a well bore: a body; a first string extending to the top of the well bore and operatively associated with said body; a second string extending to the top of the well bore and operatively associated with said body; first normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against downward movement in the conduit; means for transmitting the manipulative movement of said first string to said normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against upward movement in the conduit; and means for transmitting the manipulative movement of said second string to said second normally retracted means to expand the same against the conduit.

6. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having passage means therethrough; a first tubular string operatively associated with said body and communicating with said passage means; a second tubular string operatively associated with said body and communicating with said passage means; first normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against downward movement in the conduit; means for transmitting the downward movement of said first tubular string to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against upward movement in the conduit; and means for

transmitting longitudinal movement of said second tubular string to said second normally retracted means to expand the same against the conduit.

7. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having passage means therethrough; a first tubular string operatively associated with said body and communicating with said passage means; a second tubular string operatively associated with said body and communicating with said passage means; first normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against downward movement in the conduit; means for transmitting the downward movement of said first tubular string to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into anchoring engagement with the conduit to hold the body against upward movement in the conduit; and means for transmitting downward movement of said second tubular string to said second normally retracted means to expand the same against the conduit.

8. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a plurality of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; a second tubular string operatively associated with said body and communicating with another of said passages; first normally retracted means on said body expandible into anchoring engagement with the conduit to hold said body against longitudinal movement in one direction in the conduit; means for transmitting the downward movement of said first tubular string and body to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into anchoring engagement with the conduit to hold said body against longitudinal movement in the opposite direction in the conduit; and means for transmitting movement of said second tubular string to said second normally retracted means to expand the same against the conduit.

9. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a plurality of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; a second tubular string operatively associated with said body and communicating with another of said passages; first normally retracted means on said body expandible into anchoring engagement with the conduit to hold said body against downward movement in the conduit; means for transmitting the downward movement of said first tubular string and body to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into anchoring engagement with the conduit to hold said body against upward movement in the conduit; and means for transmitting downward movement of said second tubular string to said second normally retracted means to expand the same against the conduit.

10. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; a second tubular string operatively associated with said body and communicating with another of said passages; normally retracted means on said body for anchoring said body to the well conduit against downward movement therewithin; means for transmitting the manipulative movement of said first string and body to said normally retracted means to expand said normally retracted means against the well conduit; expander means on said body having an expander surface tapering in a downward and inward direction; normally retracted slip means engaging said expander surface; and means responsive to longitudinal movement of said second tubular string for shifting said expander means and slip means longitudi-

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nally of each other to expand said slip means into engagement with the well conduit; said slip means having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

11. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; a second tubular string operatively associated with said body and communicating with another of said passages; normally retracted means on said body for anchoring said body to the well conduit against downward movement therewithin; means for transmitting the manipulative movement of said first string and body to said normally retracted means to expand said normally retracted means against the well conduit; longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of normally retracted slips engaging said expander surfaces; and means responsive to longitudinal movement of said second tubular string for shifting said expanders and slips longitudinally of each other to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

12. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; a second tubular string operatively associated with said body and communicating with another of said passages; normally retracted means on said body for anchoring said body to the well conduit against downward movement therewithin; means for transmitting the manipulative movement of said first string and body to said normally retracted means to expand said normally retracted means against the well conduit; longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of normally retracted slips engaging said expander surfaces; and means responsive to downward movement of said second tubular string for shifting said expanders downwardly along said body and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

13. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; tubular guide means communicating with another of said passages and having an upper guide surface tapered downwardly toward the passage through said tubular guide means; a second tubular string adapted to engage said guide surface and be guided into said tubular guide means passage; first normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against longitudinal movement therewithin in one direction; means for transmitting the manipulative movement of said first tubular string and body to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the conduit against longitudinal movement therewithin in the opposite direction; and means for transmitting the manipulative movement of said second tubular string and guide means to said second normally retracted means to expand the same against the conduit.

14. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said

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passages; tubular guide means communicating with another of said passages and having an upper guide surface tapered downwardly toward the passage through said tubular guide means; a second tubular string adapted to engage said guide surface and be guided into said tubular guide means passage; first normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against downward movement therewithin; means for transmitting the downward movement of said first tubular string and body to said first normally retracted means to expand the same against the conduit; second normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against upward movement therewithin; and means for transmitting the downward movement of said second tubular string and guide means to said second normally retracted means to expand the same against the conduit.

15. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; tubular guide means communicating with another of said passages and having an upper guide surface tapered downwardly toward the passage through said tubular guide means; a second tubular string adapted to engage said guide surface and be guided into said tubular guide means passage; normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against downward movement therewithin; means for transmitting the downward movement of said first tubular string and body to said normally retracted means to expand said normally retracted means against the well conduit; normally retracted slip means on said body engageable with the conduit to anchor said body to the conduit against upward movement therewithin; thrust means engaged by said guide means and movable downwardly in response to downward movement of said second tubular string and guide means for expanding said slip means against the well conduit; and means on said guide means engageable with said thrust means in response to upward movement of said second tubular string and guide means for retracting said slip means from the well conduit.

16. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; tubular guide means communicating with another of said passages and having an upper guide surface tapered downwardly toward the passage through said tubular guide means; a second tubular string adapted to engage said guide surface and be guided into said tubular guide means passage; normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against downward movement therewithin; means for transmitting downward movement of said first tubular string and body to said normally retracted means to expand the same; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of normally retracted slips engaging said expander surfaces; and thrust means shiftable downwardly in response to downward movement of said second tubular string and guide means for shifting said expanders downwardly along said body and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit.

17. In a well apparatus adapted to be set in a well conduit disposed in a well bore: a body having a pair of separate longitudinal passages; a first tubular string connected to said body and communicating with one of said passages; tubular guide means communicating with an-

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other of said passages and having an upper guide surface tapered downwardly toward the passage through said tubular guide means; a second tubular string adapted to engage said guide surface and be guided into said tubular guide means passage; normally retracted means on said body expandible into engagement with the conduit for anchoring said body to the well conduit against downward movement therewithin; means for transmitting downward movement of said first tubular string and body to said normally retracted means to expand the same; a plurality of longitudinally spaced expanders on said body, each expander having an expander surface tapering in a downward and inward direction; a plurality of normally retracted slips engaging said expander surfaces; thrust means shiftable downwardly in response to downward movement of said second tubular string and guide means for shifting said expanders downwardly along said body

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and slips to expand said slips into engagement with the well conduit; said slips having conduit engaging teeth facing in an upward direction to prevent upward movement of said body in the well conduit; and retrieving means interconnecting said expanders to transmit upward motion of one expander to another expander in response to upward movement of said thrust means for retracting said slips from the conduit.

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