Jan. 1, 1957 R. C. BAKER 2,776,012

APPARATUS FOR LOWERING AND ELEVATING TOOLS IN WELL BORES

Filed Oct. 4 1954

Fig. 1.

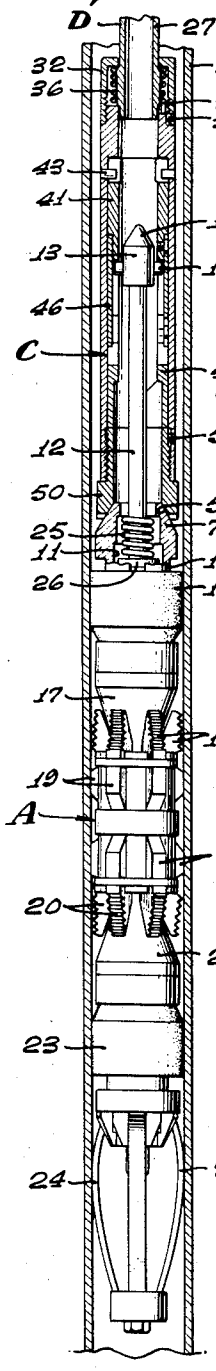


Fig. 2.

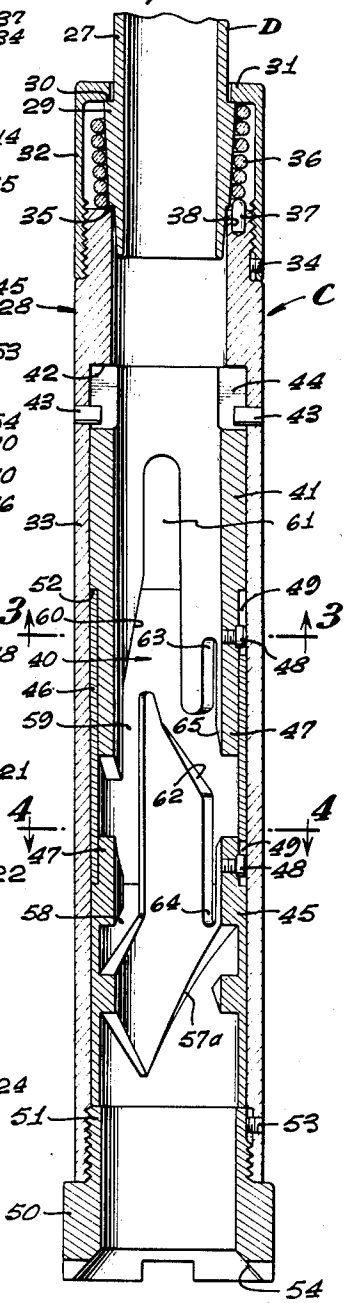


Fig. 3.

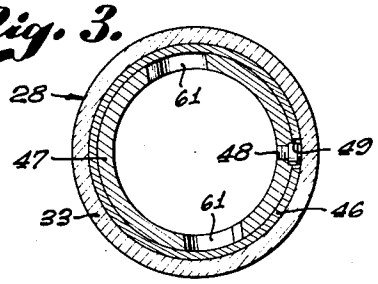


Fig. 4.

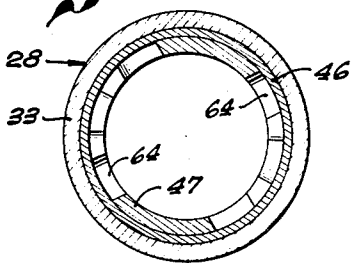
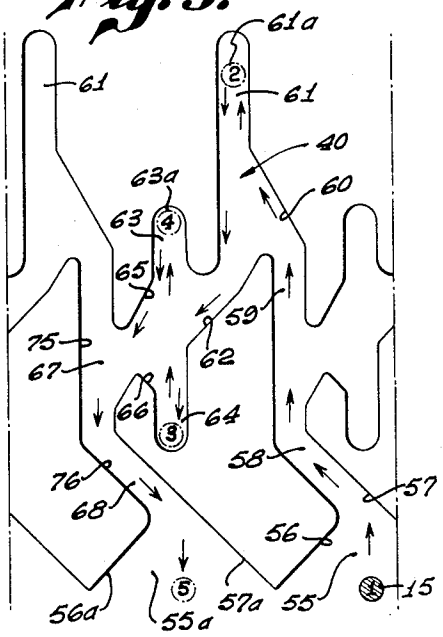


Fig. 5.



INVENTOR.
REUBEN C. BAKER,
BY
Mellin and Hanscom
ATTORNEY.

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2,776,012

APPARATUS FOR LOWERING AND ELEVATING TOOLS IN WELL BORES

Reuben C. Baker, Coalinga, Calif., assignor to Baker Oil Tools, Inc., Los Angeles, Calif., a corporation of California

Application October 4, 1954, Serial No. 460,116

8 Claims. (Cl. 166—123)

The present invention relates to subsurface well bore apparatus, and more particularly to apparatus for lowering other tools or devices in the well bore and elevating or retrieving such devices from the well bore.

An object of the present invention is to provide improved apparatus adapted to lower and elevate a well device in a well bore, the apparatus being easily coupled to the well device while the latter is in the well bore and easily released from the well device, whenever desired.

Another object of the invention is to provide an improved apparatus capable of lowering a well packer, and the like, to a desired location in the well bore without anchoring the packer in the well bore, the apparatus being capable of being released from the well packer, and of then being coupled thereto when it is desired to reshift the packer to another location in the well bore, or to remove the packer from the well bore.

A further object of the invention is to provide an apparatus capable of lowering a well device in a well bore, of being released from the well device, and of then being reconnected to the well device for the purpose of either lowering or raising the latter in the well bore, the apparatus being comparatively simple in construction and in mode of operation.

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:

Figure 1 is a side elevation, partly in longitudinal section, of a well packer being lowered in a well casing disposed in a well bore;

Fig. 2 is an enlarged longitudinal section of the running-in and retrieving tool, by means of which the apparatus is lowered and raised in the well bore;

Fig. 3 is a cross-section, on an enlarged scale, taken along the line 3—3 on Fig. 2;

Fig. 4 is a cross-section, on an enlarged scale, taken along the line 3—3 on Fig. 2;

Fig. 4 is a cross-section, on an enlarged scale, taken along the line 4—4 on Fig. 2;

Fig. 5 is a diagrammatic representation, shown in a single plane, of the development of the slotted portion of the retrieving tool, and the various operative positions of the pin movable in the slot.

The invention is illustrated in the drawings in association with a well packer A, which is specifically designed to function as a bridge plug to be anchored in a well casing B in packed-off condition against longitudinal movement in both an upward and a downward direction. The well packer is lowered in the well casing by a running-in tool C secured to the lower end of a tubular

running-in string D extending to the top of the well bore.

The specific well packer or bridge plug A disclosed, by itself, forms no part of the present invention and is fully described in my joint application with Martin B. Conrad, for "Well Packer Apparatus," Serial No. 425,646, filed April 26, 1954. In that application, the well packer A is described as being run in the well casing B to the desired setting point merely by pushing it down the casing. During such pushing action, fluid in the well casing is capable of by-passing around the packer. Following its arrival at the desired setting location in the casing, the running-in string D can be released from the packer and pressure either from above or below the packer, as the case may be, is effective to anchor the packer to the well casing against downward or upward movement, the packer also being sealed against the casing to prevent leakage of fluid thereby. After the well packer has performed its function in the well casing, it can be retrieved by means of the running-in and retrieving tool C, or shifted to another location in the well casing. The well packer can be pulled in an upward direction, if it is to be elevated to a new location in the latter, or it can be pushed downwardly to a new location below its initial setting point.

In general, the well packer A includes a tubular body **10** having a passage **11** therethrough that is valve controlled, as well as a control rod **12** which extends through the body to substantially its lower end, the control rod projecting upwardly above the body to a substantial extent and terminating in an enlarged head **13** having a tapered upper guiding end **14**. One or more pins **15** may project laterally from the enlarged head **13** for cooperation with the outer portion of the running-in and retrieving tool C.

Secured to the body **10** is an upwardly facing generally cup-shaped packing member **16** sealingly engaging the well casing B, as well as an upper expander **17** that tapers in a downward direction for cooperation with an upper set of circumferentially spaced slips **18** having friction drag portions **19** adapted to frictionally engage the wall of the well casing. The upper expander **17** and upper set of slips **18** coact with each other to anchor the well packer A to the casing B against downward movement therewithin.

Similarly, a set of circumferentially spaced lower slips **20** is disposed around the body **10** of the tool, having friction drag portions **21** to frictionally engage the wall of the well casing, these slips **20** being cooperable with a lower upwardly tapering expander **22** secured on the body. A downwardly facing lower packing cup **23** is also adapted to sealingly engage the well casing B. The lower slips **20** and lower expander **22** coact with each other to anchor the well packer to the casing against upward movement therewithin.

The upper and lower packing cups **16, 23** frictionally engage the wall of the well casing B, and, since these packing cups are secured to the tubular packer body **10**, the control rod **12** can be shifted longitudinally within the body, to determine the ability of the upper and lower expanders **17, 22** to anchor their respective slips **18, 20** against the wall of the well casing. In the event that the packing members **16, 23** provide insufficient friction for securing the relative movement of the control rod **12** within the packer body, a friction drag device **24** may be secured to the lower end of the body, this friction drag device frictionally engaging the wall of the well casing B.

Further details of the well packer are unnecessary to an understanding of the present invention, and may be found in the above-identified patent application. It is sufficient to state, at this point, that when the control rod **12** is disposed in a central or neutral longitudinal position

within the body 10, to which position it is normally urged by springs 25 engaging valve members 26 within the packer body adapted to engage the rod (of which only an upper valve head is disclosed), pressure on the packer imposed from above can shift the upper packing member 16, packer body 10 and upper expander 17 in a downward direction relative to the slips 18, to cause the upper expander to expand and hold the upper set of slips in anchoring engagement with the well casing B. By the same token, with the control rod 12 in its neutral position, pressure from below the well packer will urge the lower packing cup 23, body 10 and lower expander 22 in an upward direction relative to the slips 20, the lower expander shifting the lower slips outwardly into anchoring engagement with the wall of the well casing B, to prevent upward movement of the well packer within the casing. When in such neutral position, the control rod allows the upper and lower valves 26 (of which only the upper valve is disclosed in the drawings, there being a lower valve in the packer body) to prevent flow of fluid in both longitudinal directions through the packer body 10.

As further explained in the above-identified patent application, the shifting of the control rod 12 in a downward direction relative to the packer body 10 will cause it to open the lower valve in the packer body and allow fluid to by-pass around the well packer by flowing through the packer body. At the same time, such downward shifting of the control rod 12 within the body 10 will serve the purpose of holding the slips 18, 20 in a central or neutral position with respect to the expanders 17, 22 preventing relative movement between the body and expanders with respect to the slips, so as to prevent the upper expander 17 from being wedged within the upper slips 18. Similarly, the control rod 12 can be shifted upwardly with respect to the body 10 from its neutral or central position, to open the upper valve member 26 and allow fluid to by-pass through the body passage 11 and around the well packer. When in this upper position, the control rod 12 will again hold the slips 18, 20 in a central or neutral position with respect to the expanders 17, 22 and will prevent the lower expander 22 from moving upwardly with respect to the lower slips 20 to expand and anchor the latter outwardly against the wall of the well casing.

As explained above, when the control rod 12 is allowed to occupy a neutral or central position within the body 10, then the body 10 and the expanders 17, 22 can shift longitudinally with respect to the slips 18, 20, longitudinal movement of the latter being resisted by the frictional engagement of their drag block portions 19, 21 against the wall of the well casing B. Accordingly, the running-in and retrieving tool C constitutes a device for shifting the control rod 12 downwardly within the body 10, when the well packer A is being lowered within the well casing B, in order to prevent the upper slips 18 from being anchored against the casing. The tool C can also become coupled or connected to the control rod 12, for the purpose of elevating the latter within the body of the tool, to prevent the lower expander 22 from being wedged upwardly within the lower slips 20, to anchor the latter against the well casing. When the tool C is connected to the well packer A, to shift the control rod 12 in the upward direction just described, the entire apparatus can be elevated in the well casing to the desired location in the latter, or may be removed completely from the well casing.

The running-in and retrieving tool C is connected to the lower end of the tubular running-in string D that may consist of tubing extending to the top of the well bore. The lower end of the running-in string may be constituted by a tubular sub 27 piloted within the tubular housing 28 of the retrieving apparatus. The sub 27 has an enlarged portion 29 providing an upper shoulder 30 engageable with an inwardly directed flange 31 of a one-way or overrunning clutch housing portion 32 of the housing 28. The lower end of the housing 32 is threaded onto the upper end of the main housing portion 33 of the running-in and retrieving tool C. Inadvertent disconnection between the clutch housing 32 and the main housing 33 may be prevented by one or more set screws 34. A lower shoulder 35 of the enlarged sub portion 29 is adapted to engage the upper end of the housing 33, so that downward movement of the sub 27 will cause corresponding downward movement of the housing 28.

The upper sub 27 is capable of rotating in one direction with respect to the housing 28, but not in the opposite direction. To accomplish this objective, a one-way clutch element 36 is interposed between the sub 27, which actually constitutes an inner clutch member, and the housing 28, which constitutes another portion of the clutch, or an outer clutch member. The connection between the sub and housing in one direction may be effected by a one-way helical clutch spring 36 which is disposed around the enlarged portion 29 of the sub and is adapted to engage its periphery, the lower end 37 of the spring 36 being secured to the upper end of the housing 33 by disposing the lower end of the spring in a companion bore or socket 38 in the upper end of the housing.

Specifically, it is preferred that rotation of the tubular running-in string D and sub 27 in a right-hand direction be permitted without corresponding rotation of the housing 28, whereas left-hand movement of the running-in string and sub will cause the clutch spring 36 to engage and connect the sub 27 to the housing 28. Thus, left-hand or counter-clockwise rotation of the sub 27 can cause corresponding rotation of the housing 28, for a reason that will appear. In view of the one-way characteristic of the clutch, it is evident that left-hand rotation of the housing 28 can occur free of the sub 27 and tubular running-in string D.

The housing 28 has a slotted portion therewithin in which the transverse pin or pins 15 on the tapered head 13 may move, for the purpose of controlling the position of the control rod 12 within the body 10 of the well packer. For convenience of manufacture, the slot 40 is formed within a composite sleeve structure contained within the housing member 33. Thus, there is an upper sleeve 41 whose upper end engages a downwardly facing shoulder 42 in the housing and which is prevented from rotating with respect to the housing by one or more transverse pins 43 secured to the housing 33 and extending into longitudinal slots 44 in the upper end of the upper sleeve 44. A lower sleeve 45 is disposed in the housing, being held in spaced relation with respect to the upper sleeve by an intervening spacer sleeve 46 encompassing the confronting reduced diameter portions 47, 47 of the upper and lower sleeves. For the purpose of preventing rotation of the lower sleeve 45 with respect to the housing 33 and the upper sleeve 41, and to maintain the proper orientation between the upper and lower sleeves 41, 45, the intermediate sleeve 46 is rotationally connected to the upper and lower sleeves by pins 48 on the latter extending within longitudinal slots 49 in the intermediate sleeve.

A lower guide 50 is threaded into the lower end of the housing 33, its upper end 51 engaging the lower end of the lower sleeve 45, forcing the latter against the spacer sleeve 46, which is, in turn, urged against a shoulder 52 on the upper sleeve 41, to hold the latter against the housing shoulder 42. Inadvertent unthreading of the guide 50 from the housing 33 may be prevented by one or more set screws 53. This guide has a lower flaring end 54 to facilitate its movement over the enlarged head 13 of the control rod 12.

The slot 40, which is formed in the housing 28 between the confronting portions of the upper and lower sleeves 41, 45, is disclosed most clearly in the diagrammatic view of Fig. 5. A pin 15 on the control rod head 13 can move

into a lower entrance portion 55 of the slot, the lower end of the sleeve 45 on both sides of the slot having inclined guide surfaces 56, 57 that flare in a downward direction, to guide the pin 15 into a portion 58 of the slot which is inclined in an upward direction to the left, as seen in Fig. 5. This inclined slot portion 58 merges into a vertical slot portion 59 terminating at another inclined guide surface 50 in the upper sleeve 41, which slopes to the left, as seen in Fig. 5, this surface guiding the pin 15 into another vertical or locating slot portion 61 in the upper sleeve.

It is evident that the locating slot portion 61 is displaced to the left of the intermediate vertical slot portion 59. Such displacement is provided to preclude the downward and return movement of the pin 15 into the slot portion 59, 59. Instead, relative downward movement of the pin 15 in the slot 61 will result in the pin engaging a guide surface 62 on the upper end of the lower sleeve 45, which is inclined in a downward direction toward the left, as seen in Fig. 5, this guide surface 62 causing the pin to shift relatively to the left and into alignment with opposed upper and lower vertical slot portions 63, 64 in the upper and lower sleeve members, respectively, that enable the well packer A to be either lowered in the well casing B or elevated in the well casing by shifting the control rod 12 downwardly with respect to the packer body 10 or upwardly with respect to the packer body.

Adjacent the upper lowering slot portion 63 is a guide surface 65 that is inclined downwardly to the left, whereas adjacent the elevating slot portion 64 is a guide surface 66 that is inclined upwardly to the left. These opposed inclined guide surfaces 65, 66 merge into a departing vertical slot portion 67, the lower end of which communicates with an exiting slot portion 68 which is inclined in a downward direction toward the right. Actually, this exiting slot portion 68 may also operate as the entrance portion of another set of slots identical to the set previously described. As an example, there may be two of the slotted paths that have just been described disposed 180 degrees apart around the circumference of the sleeves 41, 45, in order to accommodate diametrically opposed pins 15 on the control rod 12. However, only one pin 15 may be used, if desired, and this pin can enter into one or the other of the two sets of slotted paths provided. Thus, the exiting slot 68 will also have inclined guide surfaces 56*a*, 57*a* that flare with respect to each other, in order that the lower part 55*a* of this slot portion may function as an entrance slot for the pin 15, as a result of the lowering of the housing 28 over the control rod 12.

The housing 28 and its guide 50 are of such length with respect to the slot provided within the housing that the lower end 54 of the guide will engage the upper end 70 of the body 10, to bear thereagainst, at the time that the pin 15 is disposed within the upper running-slot portion 63 and the rod 12 pushed downwardly within the body to the position in which it prevents relative longitudinal movement between the body 10 and its expanders 17, 22, on the one hand, and the slips 18, 20, on the other hand. However, the control rod 12 may be shifted downwardly within the body 10 to the extent preventing the slips 18 from being expanded out against the casing B in the absence of the guide 50 engaging the upper end of the body 10, inasmuch as the control rod 12 itself, as explained in the above-identified patent application, may be shifted to a position in which it exerts a downward force on the body 10, to preclude relative downward movement between the rod 12 and body 10, and between the expanders and the slips.

In the use of the running-in and retrieving tool C, in connection with the retrievable bridge plug A, it is first desired to lower the plug to a specific location in the well casing B in which it is to be set. The retrieving housing 28 is disposed over the control rod 12 at the top of the hole, the pin 15 being moved in the slot 40 from the No. 1 position, shown in Fig. 5, to the No. 2 position, and thence to the No. 3 position. At the top of the well bore, it is easily ascertainable that the pin 15 is properly located in the slot 64, inasmuch as an upward movement of the housing 28 will be accompanied by upward movement therewith of the control rod 12. The apparatus is then lowered in the well casing B. As the well packer or bridge plug enters the casing, the drag block portions 19, 21 of its slips will engage the wall of the casing, whereupon the downward weight imposed on the tubing D will shift the housing 28 and its sleeves 41, 45 downwardly, causing the pin 15 to move from the lower elevating slot portion 64 into the running-in slot portion 63 aligned therewith (No. 4 position in Fig. 5). When the upper end 63*a* of the running-in slot portion 63 engages the pin 15, it will shift the rod 12 downwardly within the packer body 10 to the extent determined by engagement of the lower end 54 of the guide 50 with the upper end 70 of the body 10. When in this position, as explained above and in the aforementioned patent application, further relative downward movement between the rod 12 and body 10 cannot occur, which, by virtue of an interconnection between the rod 12 and the slips 18, 20, also precludes relative movement between the slips 18, 20 and the expanders 17, 22, the slips occupying the neutral position disclosed in Fig. 1. The apparatus can then be run in the wall casing B on the lower end of the string of tubing D, pushing the bridge plug A downwardly with the tubing, without anchoring the slips against the casing, the pin 15 occupying the No. 4 position disclosed in Fig. 5.

When the location in the well casing B has been reached at which the well packer A is to be anchored, the running-in and retrieving tool C is released from the rod 12. A left-hand torque is taken on the tubular running-in string D, which shifts the housing 28 and the sleeves 41, 45 to the left, in view of the action of the one-way clutch 36, which couples the tubular sub 27 to the housing 28 when the sub is turning in the left-hand direction. With such left-hand torque imposed on the tubing string D and the housing 28, the tubing string is elevated slowly, to raise the running-in slot portion 63 with respect to the pin 15. Inasmuch as the slotted sleeves 41, 45 are being urged to the left (actually to the right in Fig. 5) as the pin 15 comes out of the running-in slot portion 63, the pin will engage the inclined guide surface 65 and move over against the left wall 75 of the vertical slot 67, the pin following the relative movement indicated by the arrows in Fig. 5. As the tubing string D, housing 28, and the sleeves 41, 45 are elevated to a further extent, the pin will move down within the inclined slot portion 68 and will exit from the lower end 55*a* of the lower sleeve portion 45, whereupon the tubing string D and the running-in and retrieving tool may be raised in the casing B, or can be removed completely from the well casing. Following removal of the running-in and retrieving tool C from the well packer A, the springs 25 of the latter can close the valves 25 and the passage 11 through the packer body 10, and also shift the control rod 12 to the neutral position within the body, permitting relative longitudinal movement between the body 10 and expanders 17, 22, on the one hand, and the slips 18, 20, on the other hand, so as to anchor the plug against the well casing, depending upon the existence of a pressure differential above or below the location of the bridge plug or well packer A.

During the elevation of the running-in and retrieving tool C, and with the continued imposition of left-hand torque thereon, the operator is advised of the fact that the pin 15 has entered the exiting slot portion 68, inasmuch as additional resistance to turning of the tubing string D to the left will be noted during the time that the pin is riding along the wall 76 of the exiting slot portion 68, which is inclined in a downward direction toward the right. Of course, when the housing 28 has ele-

vated sufficiently, so that the pin **15** leaves the slotted portion **40** contained therein, the operator will be advised of the release of the tool C from the control rod **12** because of the diminution of torque in the tubular running-in string D.

To retrieve the well packer or bridge plug A, the tubular running-in string D is lowered in the well casing B, the flaring end **54** of the guide **50** insuring the movement of the housing **28** and the sleeves **41**, **45** therein over the control rod **12** and its head **13**. The tubular string and the housing connected thereto are turned slowly to the left, during the lowering movement, and when the rod head **13** has entered the guide **50**, the pin **15** moving into the slotted portion **40** of the sleeve **41**, **45** through the entrance portion **55**. If the pin **15** engages the inclined surface **57** at the right of the entrance portion to the slot (as seen in Fig. 5), it will tend to rotate the housing **28** to the left, and such rotation relative to the tubular sub **27** will be permitted in view of the automatic release of the one-way clutch **36**. Accordingly, during the lowering action, the pin will move easily into the slot portion **58**. If the pin **15** were to engage the other inclined guide surface **56** at the entrance portion **55** of the slot, it will be lifted toward the other inclined surface **57** and into the slot portion **58**, whereupon the downweight imposed on the housing **28** by the tubular string D will cause the pin **15** to enter the intermediate vertical slot portion **59**.

With the left-hand torque imposed on the tubular running-in string D and housing **28**, they are lowered slightly, the pin **15** moving relatively upward until it is disposed in the upper portion of the locating slot **61** (position No. 2), which is disaligned with the slot portion **59**. The pin **15** will not engage the end **61***a* of this upper slot **61** since, before that occurs, the lower end **54** of the guide will have engaged the body **10** and will have shifted the latter downwardly, so as to expand the upper slips **18** against the casing. The fact that the well packer A is taking weight will advise the operator that the pin **15** is in the locating slot portion **61**.

While continuing the left-hand torque on the tubular running-in string D and the housing **28**, the operator will now elevate them slowly, causing the inclined guide surface **62** in alignment with the upper vertical slot portion **61** to engage the pin **15**. The left-hand or counterclockwise movement of the housing **28** will then urge the pin relatively into alignment with the retrieving slot **64**, the upward movement of the housing insuring the disposition of the pin in that slot (position No. 3). Continued upward movement of the tubing string D and housing **28** will now shift the control rod **12** upwardly with respect to the body **10** or to a neutral position, which will prevent the slips **18**, **20** from being set against the well casing B, during upward movement of the packer in the latter. With the pin in the position just described, the well packer A can be elevated in the casing B to a new setting location, or it can be removed completely from the well casing.

Instead of elevating the well packer A in the well casing, if it is desired to lower it to a new location, all that need be done after the pin **15** has been located in the elevating slot portion **64** is to lower the tubing string D and housing **28** without any torque being imposed on the tubing string. Such lowering will shift the housing **28** and sleeves **41**, **45** downwardly until the pin **15** enters the running-in slot portion **63** (position No. 4), the upper end **63***a* of this slot portion engaging the pin and shifting the control rod **12** downwardly to its neutral position, the lower end **54** of the guide engaging the upper end **70** of the body **10**. The tubing string can now be lowered to carry the running-in and retrieving tool C and the well packer A down the casing to a new location. If it is again desired to release the tool C from the well packer A, a left-hand torque is taken on the tubing string and the latter elevated slowly, to elevate the housing **28**, which will cause the pin **15** to move relatively to the left of the slot **63** and against the vertical wall **75**. The elevating movement can now be continued, the pin **15** moving relatively out of the slot through the No. 5 position shown in Fig. 5.

It is to be noted that the upper end **63***a* of the running-in slot **63** is substantially lower than the upper end **61***a* of the locating slot portion **61**. The arrangement is provided so that the pin **15**, when in the running-in slot portion **63**, will be engaged by the sleeve **41** to effect downward shifting of the control rod **12** within the body **10** to the neutral and non-slip setting position. On the other hand, the locating slot portion **61**, by extending much higher in the sleeve **41**, allows the lower end **54** of the guide **50** to engage the body and anchor the upper slips **18** against the casing before the pin **15** can engage the upper end **61***a* of the locating slot, to shift the control rod **12** downwardly in the body **10** to a neutral position.

It is, accordingly, apparent that a relatively simple apparatus C has been provided which is capable of coacting with the well packer A for the purpose of running it in the well casing B to the desired setting point, being released from the well packer to secure the setting of the latter, and of then being reconnected to the well packer for the purpose of either elevating it in the well casing or for the purpose of lowering it in the well casing to another setting location. Not only is the running-in and retrieving tool C simple in construction, but it is easily cleaned. In the event any sand, or the like, might be deposited on top of the set well packer, such sand can be removed by circulating fluid down through the tubular string D and the housing **28**, with the guide **50** disposed adjacent the upper end of the sand accumulation. When the sand has been thoroughly removed, it is a simple matter for the housing **28**, and the slotted members **41**, **45** contained therein, to be disposed properly over the control rod **12** and its one or more lock pins **15**.

The one-way clutch **36** has the purpose of permitting the tubular running-in string D to be turned in one direction, as to the right, without correspondingly rotating the housing **28**. This is of advantage, not only in permitting relative motion between the parts so that the housing **28** can shift freely to the left with respect to the tubular string, to facilitate entry of the pin **15** into the slotted portion **40** but it also enables other apparatus that might be incorporated in the tubular running-in string D, such as a retrievable well packer (not shown) above the bridge plug, to be properly manipulated, as by turning the tubular string to the right without disposing any turning effort on the running-in and retrieving tool C and the bridge plug A.

The inventor claims:

1. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a member adapted to be connected to a running-in string and adapted to be moved over the device and its coupling pin; said member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentialy away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance slot portion; said structure having generally vertical upper and lower pin retaining slot portions above and below and communicating with said intervening inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion; said locating slot portion terminating a substantial distance above the upper end of said upper retaining slot portion; said structure further including

an exit slot portion communicating with said pin retaining slot portions and through which the pin can move relatively downward out of said structure.

2. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin; a member adapted to be connected to a running-in string and adapted to be moved over the device and its coupling pin; said member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentially away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance slot portion; said structure having a generally vertical pin retaining slot portion above and communicating with said intervening inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion, said structure closing the upper end of said pin retaining slot portion to confine the pin therein below the upper end of said locating slot portion; said locating slot portion terminating a substantial distance above said upper end of said pin retaining slot portion; said structure further having an exit slot portion communication with said pin retaining slot portion and through which the pin can move relatively downward out of said structure.

3. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a member adapted to be connected to a running-in string and adapted to be moved over the device and its coupling pin; said member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentially away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance slot portion; said structure having generally vertical upper and lower pin retaining slot portions above and below and communicating with said intervening inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion; said locating slot portion terminating a substantial distance above the upper end of said upper retaining slot portion; said structure further including an exit slot portion communicating with said pin retaining slot portions and through which the pin can move relatively downward out of said structure; said exit slot portion being inclined downwardly in a direction toward said entrance slot portion.

4. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a first member adapted to be connected to a running-in string; a second member operatively connected to said first member for movement longitudinally therewith and adapted to be moved over the device and its coupling pin; said second member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentially away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance slot portion; said structure having a generally vertical pin retaining slot portion communicating with said intervening inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion; said structure further having an exit slot portion communicating with said pin retaining slot portion and through which the pin can move relatively downward out of said structure; and a one-way clutch for transmitting rotation of said first member to said second member and to permit said second member to shift arcuately with respect to said first member in response to engagement of said inclined guiding wall with said pin.

5. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a first member adapted to be connected to a running-in string; a second member operatively connected to said first member for movement longitudinally therewith and adapted to be moved over the device and its coupling pin; said second member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentially away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance slot portion; said structure having generally vertical pin retaining slot portions above and below and communicating with said intervening inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion; said structure further including an exit slot portion communicating with said pin retaining slot portions and through which the pin can move relatively downward out of said structure; and a one-way clutch for transmitting rotation of said first member to said second member and to permit said second member to shift arcuately with respect to said first member in response to engagement of said inclined guiding wall with said pin.

6. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a first member adapted to be connected to a running-in string; a second member operatively connected to said first member for movement longitudinally therewith and adapted to be moved over the device and its coupling pin; said second member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; said structure having an exit slot portion through which the pin can move relatively downward out of said structure; said structure further having a transverse slot portion interconnecting said vertical and exit slot portions and extending circumferentially from said vertical slot portion to said exit slot portion in a direction leading away from said entrance slot portion; and a one-way clutch for transmitting rotation of said first member to said second member and to permit said second member to shift arcuately with respect to said first member in response to relative longitudinal movement of said pin in said inclined entrance slot portion.

7. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a first member adapted to be connected to a running-in string; a second member operatively connected to said first member for movement longitudinally therewith and adapted to be moved over the device and its coupling pin; said second member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a first generally vertical slot portion circumferentially above and offset from said entrance slot portion and communicating therewith; said structure having a second generally vertical slot portion below and communicating with said first generally vertical slot portion; said structure having an exit slot portion through which

the pin can move relatively downward out of said structure; said structure further having a transverse slot portion interconnecting said vertical and exit slot portions and extending circumferentially from said vertical slot portions to said exit slot portion in a direction leading away from said entrance slot portion; and a one-way clutch for transmitting rotation of said first member to said second member and to permit said second member to shift arcuately with respect to said first member in response to relative longitudinal movement of said pin in said inclined entrance slot portion.

8. In apparatus for moving a device in a well bore, the device having a laterally extending coupling pin: a first member adapted to be connected to a running-in string; a second member operatively connected to said first member for movement longitudinally therewith and adapted to be moved over the device and its coupling pin; said second member having a slotted structure therein including an inclined entrance slot portion to receive the pin and a locating generally vertical slot portion above and circumferentially offset from said entrance slot portion and communicating therewith; an inclined guiding wall below said locating slot portion to engage and guide the pin relatively circumferentially away from said entrance slot portion; said guiding wall defining the lower side of an intervening slot portion inclined in a downward direction circumferentially away from said entrance

slot portion; said structure having generally vertical upper and lower pin retaining slot portions above and below and communicating with said intermediate inclined slot portion and offset circumferentially from said locating slot portion in a direction away from said entrance slot portion; said locating slot portion terminating a substantial distance above the upper end of said upper retaining slot portion; said structure further including an exit slot portion communicating with said pin retaining slot portions and through which the pin can move relatively downward out of said structure; and a one-way clutch for transmitting the rotation of said first member to said second member and to permit said second member to shift arcuately with respect to said first member in response to engagement of said inclined guiding wall with said pin.

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