

Sept. 29, 1964

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3,150,718

SUBSURFACE RETRIEVING APPARATUS

Filed Oct. 13, 1960

3 Sheets-Sheet 1

FIG. 1.

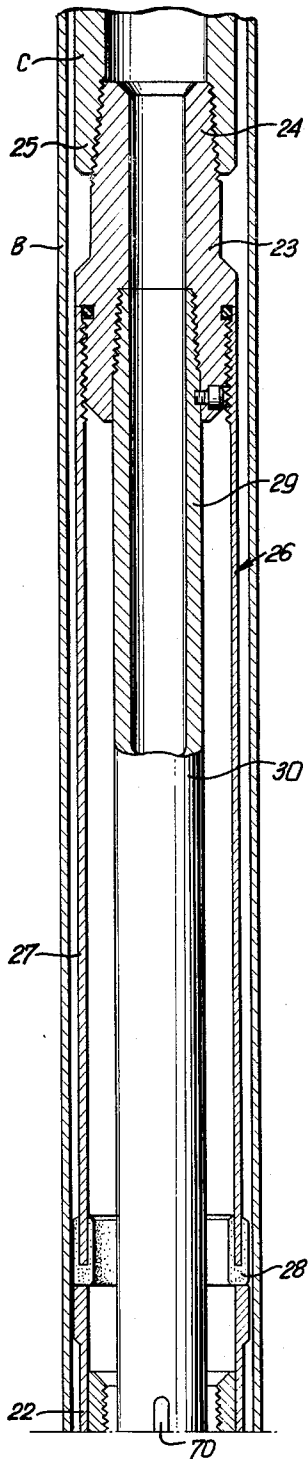
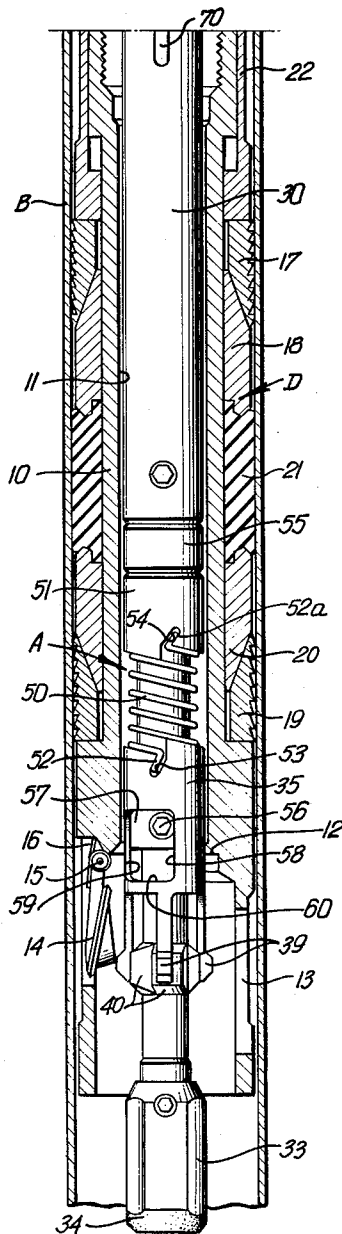


FIG. 1a.



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FIG. 2.

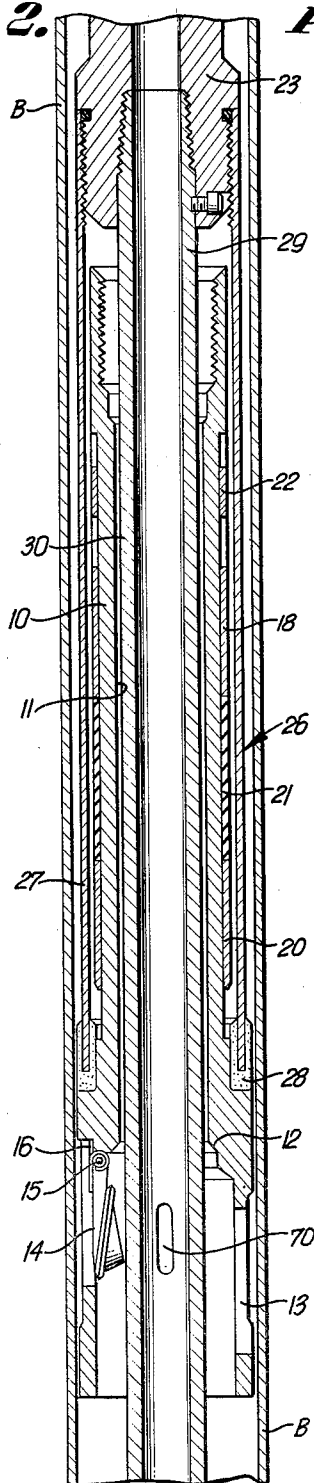
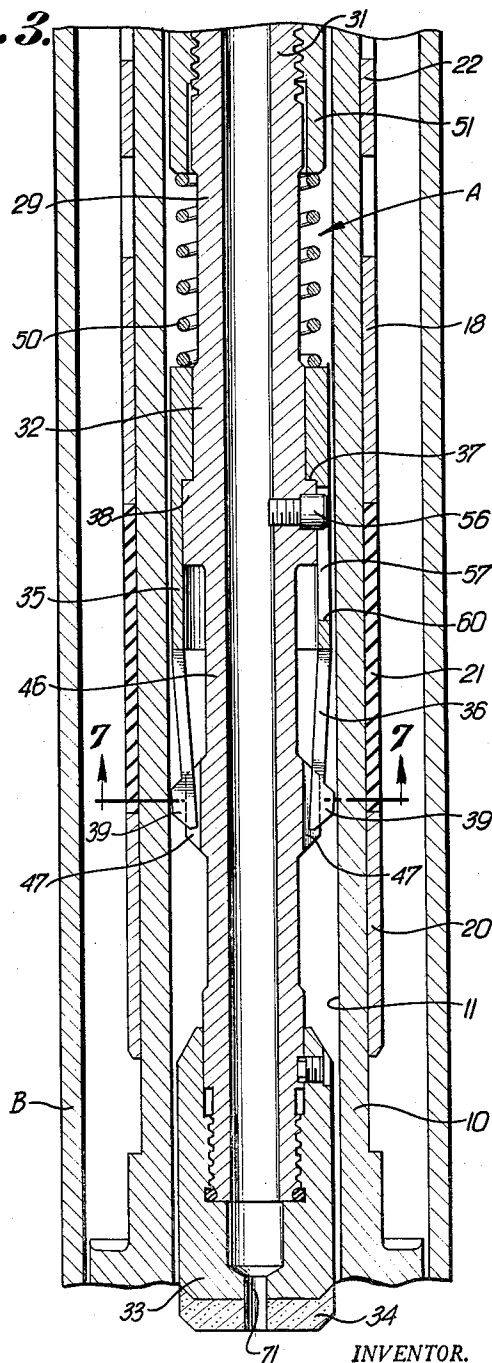


FIG. 3.



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Fig. 4.

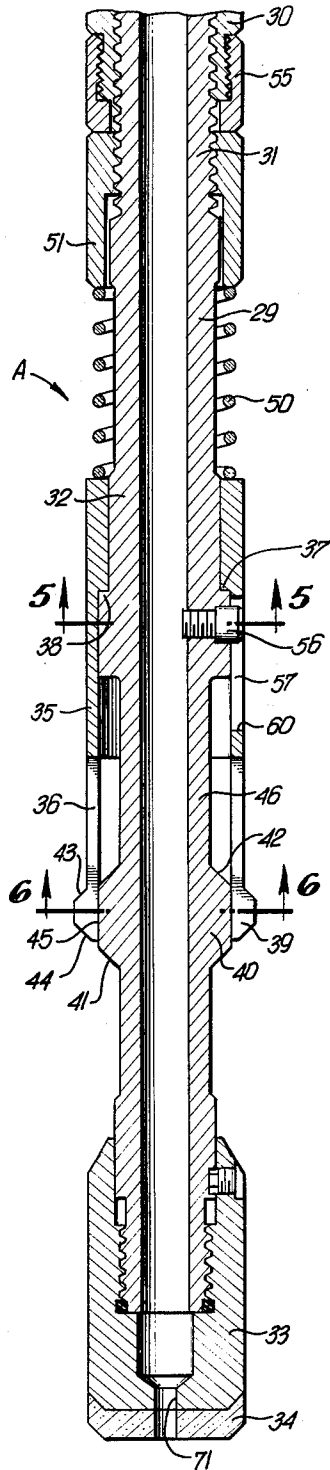


Fig. 5.

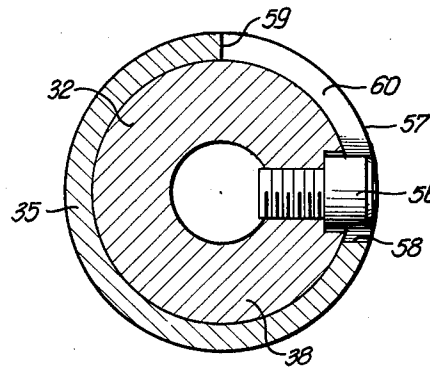


Fig. 6.

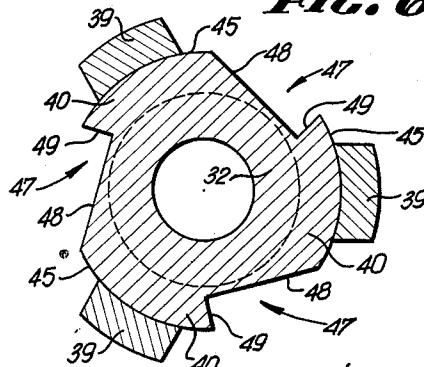
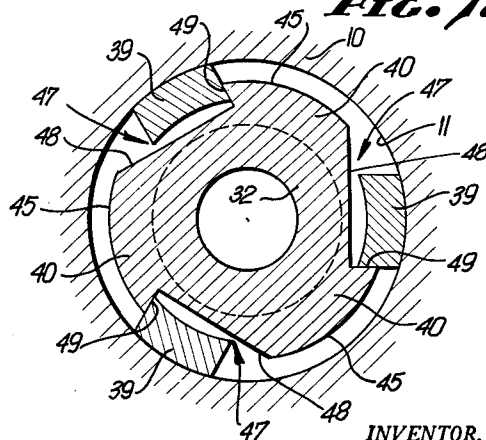


Fig. 7.



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SUBSURFACE RETRIEVING APPARATUS

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8 Claims. (Cl. 166-99)

The present invention relates to apparatus for removing objects from well bores, and more particularly to apparatus for removing obstructions in well bores, such as well packers, and the like.

An object of the invention is to provide an apparatus adapted to be lowered in a well bore and latched or coupled to an object to be removed therefrom, the apparatus being readily released from the object, if desired, and subsequently relatched or recoupled thereto without removing the apparatus from the well bore.

Another object of the invention is to provide an apparatus adapted to be lowered in a well bore and capable of being repeatedly latched and released from an object in the well bore, repeated relatching being obtainable without removing the apparatus from the well bore following each release from the object.

A further object of the invention is to provide combined milling and retrieving apparatus adapted to be lowered in a well bore to at least partially mill away an object therewithin, such as a well packer, the apparatus being capable of coupling or latching onto the object to effect its removal from the well bore after a portion has been milled away, and of being repeatedly released from and coupled or related to the object without withdrawing the apparatus from the well bore.

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 of an apparatus disposed in a well bore and in association with a well packer therewithin, FIG. 1a constituting a lower continuation of FIG. 1, parts of the apparatus being shown in side elevation;

FIG. 2 is a longitudinal section through the apparatus disclosed in FIGS. 1 and 1a after a portion of the well packer has been milled away;

FIG. 3 is a longitudinal section, on an enlarged scale, through a portion of the apparatus, illustrating it in a released condition for removal from the well packer or other object in the well bore;

FIG. 4 is a longitudinal section through the latching portion of the apparatus in its condition for being coupled to an object in the well bore, such as the well packer disclosed in FIG. 1a;

FIG. 5 is an enlarged cross-section taken along the line 5-5 on FIG. 4;

FIG. 6 is an enlarged cross-section taken along the line 6-6 on FIG. 4;

FIG. 7 is an enlarged cross-section taken along the line 7-7 on FIG. 3.

The apparatus illustrated in the drawings is a combined milling and retrieving tool A adapted to be lowered in a well casing B by means of a tubular running-in string C, such as a string of drill pipe or tubing, for the purpose of milling away a portion of a well packer D, or similar apparatus, set in the well casing, a major portion

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of the well packer then being removable from the well bore after the milling tool has released the latter from the well casing. The retrieving portion of the apparatus can be used generally for retrieving purposes without the milling tool, but it also coacts therewith to facilitate the removal of the obstructing object in the well bore or well casing.

As specifically disclosed, it is desired to remove the well packer D from the well bore. This packer is of any known type and includes a main body 10, having a central passage 11 therethrough surrounded by a lower valve seat 12, which may taper in an upward and inward direction, to function as a catch shoulder in conjunction with the retrieving portion of the apparatus. The lower end of the body 10 is constituted as a junk pusher 13. There is a flapper valve member 14 pivotally mounted on a hinge pin 15 suitably secured to the body, a coil spring 16 surrounding the hinge pin and adapted to urge the flapper valve upwardly into engagement with its companion seat 12, to prevent upward passage of fluid through the body of the well packer, in the absence of any objects disposed in the passage 11 and tending to hold the flapper valve to the open position.

The packer D includes an upper set of segmental slips 17 held and anchored in relation to the well casing B by an upper expander 18, there being a lower set of segmental slips 19 coacting with a lower expander 20 for preventing downward movement of the well packer in the well casing. Between the expanders in a packing structure 21, such as a rubber or rubber-like packing sleeve, which has been expanded into sealing engagement with the well casing B, and which also seals with the body 10 of packer. As specifically disclosed, the slips 17, 19 and packing 21 may be expanded through use of an upper setting sleeve 22 slidable along the body 10 and adapted to engage the upper set of slips 17.

It is desired to remove the well packer from the well bore. Since the packer is of the permanently anchored type, such removal is effected by washing over and away a portion thereof sufficient to release the slips 17, 19 from the well casing, after which the remainder of the packer can be coupled to the apparatus A and elevated in the well casing to the top of the hole. As shown, an upper tubular sub 23 is connected to the lower end of the string of drill pipe C, or other tubular running-in string, as by threading the upper pin end 24 of the sub into the lower box 25 of the drill pipe. Threadedly attached to the lower end of the sub is a drill bit or milling tool 26 consisting of a tubular shank 27 that has a suitable washover shoe 28 secured to its lower end. This washover shoe may have suitable cutting elements, such as tungsten carbide or diamonds embedded therein, for the purpose of disintegrating the outer portions of the well packer D.

The milling tool portion of the apparatus is held in appropriate centered relation with respect to the well packer by a mandrel or body 29, the upper section 30 of which is threadedly attached to the sub 23 and which extends downwardly within the tubular shank 27 of the milling tool 26. With the washover shoe 28 of the milling tool initially engaging the upper end of the well packer D, the mandrel or body 29 extends completely through the body passage 11, thereby centering the washover shoe with respect to the packer. It is noted that the milling tool 26 is spaced laterally from the mandrel or body 29 of the apparatus, causing the washover shoe 28 to mill away only the outer portion of the well packer.

The mandrel or body 29 of the apparatus A may be made in a plurality of sections. As disclosed, the upper section 30 is threadedly attached to the sub 23, and its lower portion is threaded over an externally threaded part 31 of a lower mandrel or body section 32. Secured to the lower end of this lower section is a bottom sub, pilot

or guide 33, which preferably has hard facing material 34 on its lower end in the event that difficulty is encountered in entering the central passage 11 through the body 10 of the well packer. Rotation of the drill string C and mandrel 29 will result in the pilot 33 drilling away, or otherwise removing, obstructions in the passage 11 of the packer D.

Surrounding the lower body or mandrel section 32 of the retrieving apparatus is a latch or coupling sleeve 35 having circumferentially spaced depending spring-like latch legs 36 that tend to remain in the position disclosed in FIGS. 1a and 4, but which may be deflected inwardly when permitted to do so. The latch sleeve 35 normally occupies a lower position on the mandrel 29, limited by engagement of a downwardly facing shoulder 37 at the upper portion of the sleeve with a companion shoulder or flange 38 on the lower mandrel section 32. When these shoulders are so engaged, the lower feet 39 of the latch legs are adapted to engage circumferentially spaced retainer or holding portions 40 of the mandrel, which will retain the latch legs 36 and feet 39 in the outer position illustrated in FIGS. 1a and 4, and prevent their inward movement or deflection.

The lower ends 41 of the retainer or holding portions 40 are tapered in a downward and inward direction to facilitate their movement into and through the body passage 11, whereas the upper ends 42 are tapered in an inward and upward direction to facilitate the sliding of the foot portions 39 of the latch legs therealong, as described hereinbelow. The upper portions 43 of the latch feet are tapered in an inward and upward direction for engagement with the companion tapered valve seat and catch shoulder 12 of the packer body 10, the lower ends 44 of the latch feet being tapered in a downward and inward direction to facilitate their insertion within the packer body passage 11.

When the latch legs 36 and feet 39 are in the position illustrated in FIGS. 1a, 4 and 6, the foot portions 39 extend outwardly to an effective diameter greater than the inside diameter of the central body passage 11, so that the latch feet engage the catch shoulder 12 of the body. By virtue of their contact with the outer longitudinal surfaces 45 of the retainer or holding portions 40, they are prevented from moving inwardly from engagement with the seat and catch shoulder 12. When removed from engagement with the holding portions 40 of the mandrel 29, the latch legs 36 can be deflected inwardly, such movement being permitted by the fact that the mandrel portion 46 above the holding portions 40 has an external diameter substantially less than the effective external diameter of the holding portions, the portion 46 providing a relieved region into which the latch feet 39 can move.

Between the holding portions 40 of the mandrel, the latter is provided with relieved portions or recesses 47. The base 48 of each recess commences at the periphery 45 of a holding portion 40 and extends from such holding portion inwardly toward a longitudinal abutment 49 arranged generally radially or laterally of the axis of the mandrel 29. When the foot portions 39 of the latches are disposed opposite the recesses 47, they can be shifted inwardly so that their effective external diameter is less than the inside diameter of the central passage 11 of the packer body 10, thereby permitting the mandrel 29 and the latch mechanism to move therethrough. Such location of the foot portions 39 opposite the recesses 47 occurs as a result of a relative turning of the mandrel 29 and the latch or coupling sleeve 35. Similarly, relative lowering of the mandrel 29 with respect to the sleeve 35 will bring the smaller diameter portion 46 of the mandrel opposite the foot portions 39, permitting the latter to be sprung inwardly to an effective diameter less than the inside diameter of the packer body passage 11.

The latch sleeve 35 is urged in a downward direction, to engage its shoulder 37 with the mandrel shoulder 38, and to place the foot portions 39 of the latches on top of the holding portions 40 of the mandrel, by a torsion

and compression spring 50 surrounding the mandrel above the sleeve. This spring tends to urge the sleeve 35 downwardly of the mandrel, and also tends to turn the sleeve in a clockwise direction on the mandrel, as seen from the top of the well bore, so as to position the foot portions 39 of the sleeve on top of the retainer or holding portions 40 of the mandrel. As stated above, the spring exerts a combined torsion or twist and compressive force, being compressed between the upper end of the sleeve 35 and a torsion nut and spring seat 51 threadedly secured on the upper threaded end 31 of the lower mandrel section 32. The spring is given a torsion or twist, tending to rotate the sleeve 35 on the mandrel 29 in the clockwise direction described above, by inserting the lower terminus 52 (FIG. 1a) of the spring in a generally longitudinal slot 53 in the sleeve, and by inserting the upper terminus 52a of the spring in an upper slot 54 within the upper spring seat and torsion nut 51. By turning the torsion nut 51 on the mandrel portion 31, the appropriate torsion or twist is imparted to the spring 50 in the proper direction. The torsion nut 51 is prevented from threading along the mandrel by a lock nut 55 threaded on the upper body 30 and adapted to be forced against the upper end of the torsion nut and spring seat.

Downward movement of the sleeve 35 on the mandrel 29 under the influence of the spring 50 is limited by engagement of the sleeve shoulder 37 against the mandrel flange 38. However, the sleeve can shift relatively upwardly on the mandrel, to remove the latching or coupling dogs 39 from the retainer or holding portions 40 of the mandrel. The relative arcuate position of the sleeve 35 on the mandrel 29 is determined by a stop element 56, in the form of a screw, threaded into the flange portion 38 of the mandrel and disposed within a generally rectangular opening or window 57 in the sleeve above the latch legs 36. The spring 50 normally shifts the sleeve arcuately of the mandrel to its position determined by engagement of one side 58 of the window or opening with the screw 56 (FIG. 1a), in which position the latch feet 39 are disposed upon the holding portions 40 of the mandrel. Assuming the sleeve 35 to be prevented from turning, and that the mandrel is turned to the right, the latter can only move relative to the sleeve until the stop screw 56 engages the opposite side 59 of the sleeve opening, in which position the mandrel 29 will be turned to place its recesses 47 behind the latch feet, thereby permitting the latter to be sprung inwardly and from engagement with the seat and catch shoulder 12 of the packer body 10. The stop element 56 may also engage the lower end 60 of the sleeve opening 57 to limit the extent of upward shifting of the sleeve on the mandrel 29 against the compressive force of the spring 50, in which position the latch feet 39 are disposed above the holding portions 40 of the mandrel, again permitting the latch legs and feet to be shifted inwardly.

When it is desired to remove the well packer D from the well casing B, the apparatus A is lowered within the latter by means of the tubular running-in string C. When the well packer is reached, the pilot 33 enters the upper end of the packer body passage 11, the latch feet 39 engaging the packer body 10 at the entrance to the minimum diameter portion of the passage 11. Such engagement of the latch feet will prevent downward movement of the latch sleeve 35 until the mandrel is moved downwardly within the latch sleeve to lower the holding portions 40 below the latch feet, whereupon the tapered ends 44 of the latter engage the body 10 and are cammed inwardly into a position in which the latch feet can enter the passage 11. Downward movement of the apparatus A is then continued, the latch feet 39 sliding along the inner wall of the packer body passage 11 until the lower pilot 33 engages the flapper valve 14 and shifts it from its valve seat 12 to an open position, the flapper valve being held in such open position by the other portions of the apparatus that might engage it. The parts are so proportioned that the latch legs 36 and feet 39 are disposed below the

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packer body catch shoulder 12 at the time the washover shoe 28 engages the upper end of the well packer. When this occurs, further downward movement of the apparatus is prevented.

The washover shoe 28 is centered by the mandrel 29 relative to the well packer D and the well casing B. Rotation of the apparatus and the imposition of appropriate drilling weight on the washover shoe 28 can now occur to commence the disintegrating of the outer portion of the well packer. During such disintegrating or milling away operation, circulating fluid is pumped down the tubular running-in string C, the fluid flowing through the mandrel 29 and discharging through ports 70 in the mandrel below the washover shoe, the fluid then flowing upwardly around the shoe to carry the cuttings around the exterior of the milling tool 26 and the tubular running-in string C to the top of the well bore. Some fluid may be permitted to pass through a lower relatively small diameter axial port 71 in the pilot 33, in the event that the pilot is required to remove obstructions in the body of the well packer, so that the cuttings produced by the pilot can also be flushed away. However, the main volume of fluid will discharge through the port or ports 70 to carry the cuttings away from the washover shoe. Milling will continue until the setting sleeve 22 and at least the outer portions of the slips 17, upper expander 18, packing 21, lower expander 20 and lower slips 19 have been disintegrated, which should free the well packer. The remaining portion of the well packer (FIG. 2) then drops down along the mandrel 29, or it may remain in the position illustrated in FIG. 2. If it remains in the position illustrated in FIG. 2, the apparatus A can be raised in the well casing carrying the well packer upwardly with it. However, should the remaining portion of the well packer become free from the milling shoe 28, it drops down the mandrel 29 until the catch shoulder 12 of the body of the well packer engages the latch feet 39, which are held in their outward position. The well packer is then elevated with the apparatus A through the casing B, and removed to the top of the well bore.

If the latch legs 36 are disposed below the catch shoulder 12, and it is desired to withdraw the apparatus A through the well packer passage 11, such withdrawal can occur readily. The apparatus A is elevated in the well casing until the latch or coupling feet 39 engage the catch shoulder 12 of the packer body 10. A strain is maintained on the tubular running-in string C at this time so as to create substantial friction between the latch feet and the catch shoulder, sufficient to resist turning of the latch sleeve 35. The running-in string C and mandrel 29 can now be turned to the right, the latch feet 39 remaining in a fixed position against the catch shoulder 12 of the packer body, until the mandrel recesses 47 are disposed opposite the latch feet 39, whereupon the upward force or strain on the running-in string and mandrel, which is being transmitted to the latch sleeve 35 by means of the mandrel flange 38 engaging the sleeve shoulder 37, will cause the tapered upper ends 43 of the feet to be cammed by the companion tapered catch shoulder 12 on the body in an inward direction and into the recesses 47, such as shown in FIGS. 3 and 7. The feet 39 can shift inwardly within the recesses 47 sufficiently to pass into the packer body passage 11. In fact, if sufficient strain is imposed on the tubular running-in string C, with the feet 39 engaging the catch shoulder 12, when the running-in string is turned to turn the mandrel 29 and locate the recesses 47 opposite the latch legs and feet 39, as soon as the latch legs can move into the recesses, the entire mandrel 29 will jump upwardly to shift the latch feet within the packer body passage 11, such as shown in FIG. 3. The entire mandrel 29 can now be elevated through the packer body 10 to its upper end.

When the latch sleeve 35 moves out of the packer body passage 11, the helical compression spring 50, which has been twisted or coiled to a further extent as a result of

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arcuate movement of the mandrel 29 within the latch sleeve 35, will expand and reshift the latch sleeve on the mandrel 29 to the right. If the latch feet 39 have not sprung outwardly to their initial position, the inclined base portions 48 of the recess will engage the feet and shift them outwardly, and then place the holding portions 40 fully behind the latch feet, such as disclosed in FIGS. 1a, 4 and 6.

The apparatus is now in position for reinsertion through the packer body 10, if desired, for the purpose of placing the catch or latch portions 39 of the apparatus again below the seat and catch shoulder 12 of the packer body. The foregoing operation need only be repeated, which is the lowering of the mandrel 29 through the packer body 10, the lower ends 44 of the latch feet again engaging the packer body to shift the sleeve 35 upwardly along the mandrel against the force of the compression spring 50, which will remove the latch feet from the holding portions 40 and allow them to be cammed inwardly. The latch sleeve 35 is then shifted downwardly with the mandrel 29 through the passage 11 until the latch feet are disposed therebelow, whereupon the compression spring 50 will expand and reshift the latch sleeve 35 downwardly along the mandrel, the latch feet moving along the tapered upper ends 42 of the holding portions 40 and back into full engagement with the longitudinal surfaces 45 of the holding portions. Upward movement of the tubular string C and mandrel 29 will again bring the latch feet 39 into engagement with the catch shoulder 12 of the packer body, the latch feet being prevented from moving inwardly by the solid backing afforded by the holding portions 40 of the mandrel.

If a sufficient part of the well packer had been milled away before such upward movement occurred, the entire apparatus A can be elevated to remove the packer D and the apparatus A as a unit from the well casing B. If, for some reason, upward movement of the well packer does not occur, then the apparatus A can again be released therefrom merely by holding an upward strain on the tubular running-in string C with the latch feet 39 engaging the catch shoulder 12 on the packer body 10, and by turning the tubular running-in string and mandrel 29 again to the right, which will again remove the holding portions 40 from behind the latch feet 39 and place the recesses 47 in alignment therewith, allowing the latch feet to again be forced inwardly to a position in which they can move upwardly within the packer body passage 11 to a position above the packer body. Upon being disposed above the packer body passage, the torsion spring 50 will again return the latch sleeve 35 on the mandrel to its position in which the latch feet 39 are disposed upon the holding portions 40 of the mandrel. The apparatus can now be removed from the well casing, if desired, or it can again be reinserted in the packer body passage 11, to dispose the latch feet 39 below the catch shoulder 12.

Repeated location of the latch elements 39 below the catch shoulder 12, or release of the latch elements to permit passage of the latch legs and feet upwardly through the packer body passage, can occur as often as desired without removing the apparatus from the well bore or well casing.

I claim:

1. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in the bore hole on a running-in string; releasable means longitudinally movable and rotatable relative to said mandrel and adapted to be coupled to the well tool; retainer means on said mandrel having a holding portion projecting laterally beyond another portion of said mandrel thereabove and engageable with said releasable means, when said releasable means is in a lower position on said mandrel, to hold said releasable means coupled to the well tool to enable the running-in string to elevate the well tool in the bore hole; said retainer means having a recess circumferentially adjacent to said holding portion whereby

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rotation of said retainer means with respect to said releasable means shifts said holding portion circumferentially from engagement with said releasable means and places said recess behind said releasable means permitting uncoupling of said releasable means from the well tool; said releasable means being shiftable upwardly on said mandrel from engagement with said holding portion to a position confronting said another portion of said mandrel to permit uncoupling of said releasable means from the well tool; and means on said mandrel engaging said releasable means to shift said releasable means downwardly on said mandrel into engagement with said holding portion.

2. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in the bore hole on a running-in string; releasable means rotatable relative to said mandrel and adapted to be coupled to the well tool; retainer means on said mandrel having a holding portion engageable with said releasable means to hold said releasable means coupled to the well tool to enable the running-in string to elevate the well tool in the bore hole; said retainer means having a recess circumferentially adjacent to said holding portion whereby rotation of said retainer means with respect to said releasable means shifts said holding portion circumferentially from engagement with said releasable means and places said recess behind said releasable means permitting uncoupling of said releasable means from the well tool and movement of said releasable means longitudinally in the passage; and means engaging said mandrel and releasable means for rotating said releasable means relative to said mandrel to replace said releasable means in engagement with said holding portion.

3. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in the bore hole on a running-in string; releasable means rotatable on said mandrel and adapted to be coupled to the well tool; retainer means fixed to said mandrel and engageable with said releasable means to hold said releasable means coupled to the well tool to enable the running-in string to elevate the well tool in the bore hole; said mandrel having a relieved portion adapted to be placed in a position confronting said releasable means; said retainer means being rotatable by said mandrel in one direction relative to said releasable means from holding relation to said releasable means, whereby said relieved portion confronts said releasable means and permits uncoupling of said releasable means from the well tool; and spring means connected to said mandrel and releasable means for relatively rotating said retainer means and releasable means in the opposite direction to replace said retainer means in holding relation to said releasable means.

4. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in the bore hole on a running-in string; releasable means rotatable and longitudinally movable on said mandrel and adapted to be coupled to the well tool; retainer means fixed to said mandrel and engageable with said releasable means to hold said releasable means coupled to the well tool to enable the running-in string to elevate the well tool in the bore hole; said mandrel having relief means thereon adapted to confront said releasable means to permit uncoupling of said releasable means from the well tool; said releasable means being movable upwardly on said mandrel from holding relation to said retainer means and to confronting relation with said relief means; said retainer means being rotatable by said mandrel in one direction relative to said releasable means from holding relation to said releasable means, whereby said relief means confronts said releasable means and permits uncoupling of said releasable means from the well tool; and spring means engaging said mandrel and releasable means for relatively rotating said retainer means and releasable means in the opposite direction to replace said retainer means in holding relation to said releasable means.

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5. In apparatus for removing a well tool disposed in a borehole: a mandrel adapted to be run in a bore hole on a running-in string; a latch sleeve longitudinally movable and rotatable on said mandrel and having laterally movable elements adapted to be coupled to the well tool; retainer means fixed to said mandrel and having holding portions projecting laterally beyond another portion of said mandrel thereabove and engageable with said elements, when said latch sleeve is in a lower portion on said mandrel, to hold them outwardly in coupled relation to the well tool to enable the running-in string to elevate the well tool in the bore hole; said retainer means having recesses circumferentially adjacent to said holding portions whereby rotation of said retainer means with respect to said latch sleeve shifts said holding portions circumferentially from engagement with said elements and places said recesses behind said elements permitting inward shifting of said elements from coupling relation to the well tool; said latch sleeve being shiftable upwardly on said mandrel from engagement with said holding portions to position said elements in confronting relation to said another portion of said mandrel to permit uncoupling of said elements from the well tool; and means on said mandrel engaging said latch sleeve to shift said latch sleeve downwardly on said mandrel and its elements into engagement with said holding portions.

6. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in a bore hole on a running-in string; a latch sleeve rotatable on said mandrel and having laterally movable elements adapted to be coupled to the well tool; retainer means fixed to said mandrel and having holding portions engageable with said elements to hold them outwardly in coupled relation to the well tool to enable the running-in string to elevate the well tool in the bore hole; said retainer means having recesses circumferentially adjacent to said holding portions whereby rotation of said retainer means with respect to said latch sleeve shifts said holding portions circumferentially from engagement with said elements and places said recesses behind said elements permitting inward shifting of said elements from coupling relation to the well tool; and means engaging said mandrel and sleeve for rotating said sleeve on said mandrel to place said elements in engagement with said holding portions.

7. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in a bore hole on a running-in string; a latch sleeve rotatable on said mandrel and having laterally movable elements adapted to be coupled to the well tool; retainer means fixed to said mandrel and engaging said elements to hold them outwardly in coupled relation to the well tool to enable the running-in string to elevate the well tool in the bore hole; said mandrel having a relieved portion adapted to be placed in a position confronting said elements; said retainer means being rotatable by said mandrel relative to said latch means from holding relation to said elements whereby said relieved portion confronts said elements and said elements are shiftable inwardly from coupling relation to the well tool; and spring means secured to said mandrel and sleeve for rotating said sleeve on said mandrel to a position in which said retainer means holds said elements outwardly.

8. In apparatus for removing a well tool disposed in a bore hole: a mandrel adapted to be run in the well bore on a running-in string; a latch sleeve rotatable and movable longitudinally on said mandrel and having laterally movable elements adapted to be coupled to the well tool; retainer means fixed to said mandrel and engaging said elements to hold them outwardly in coupling relation to the well tool to enable the running-in string to elevate the well tool in the bore hole; said mandrel having relief means thereon adapted to confront said elements to permit uncoupling of said elements from the well tool; said latch sleeve being movable upwardly on said mandrel to a position to which its elements are disengaged from said re-

tainer means and confront said relief means to permit lateral inward movement of said elements on said mandrel; said retainer means being rotatable by said mandrel relative to said latch sleeve from holding relation to said elements whereby said relief means confronts said element and said elements are shiftable inwardly from coupling relation to the well tool; and spring means engaging said mandrel and latch sleeve for urging said latch sleeve downwardly on said mandrel to a position in which said retainer means holds said elements outwardly and for rotating said latch sleeve on said mandrel to a position in which said retainer means hold said elements outwardly.

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