Jan. 26, 1960 J. WALL, JR., ET AL 2,922,477

ANCHORING AND SEAL MECHANISMS FOR WELL TOOLS

Filed Jan. 9, 1958 2 Sheets-Sheet 1

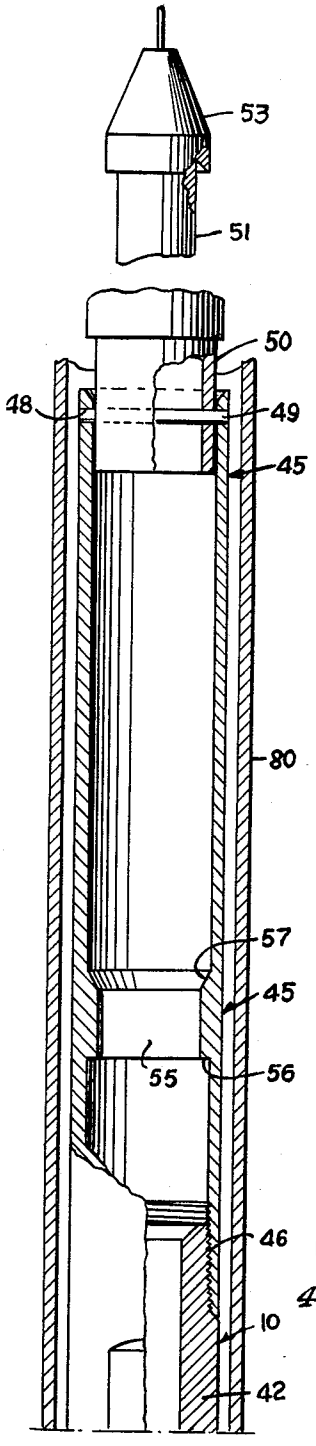


Fig.1

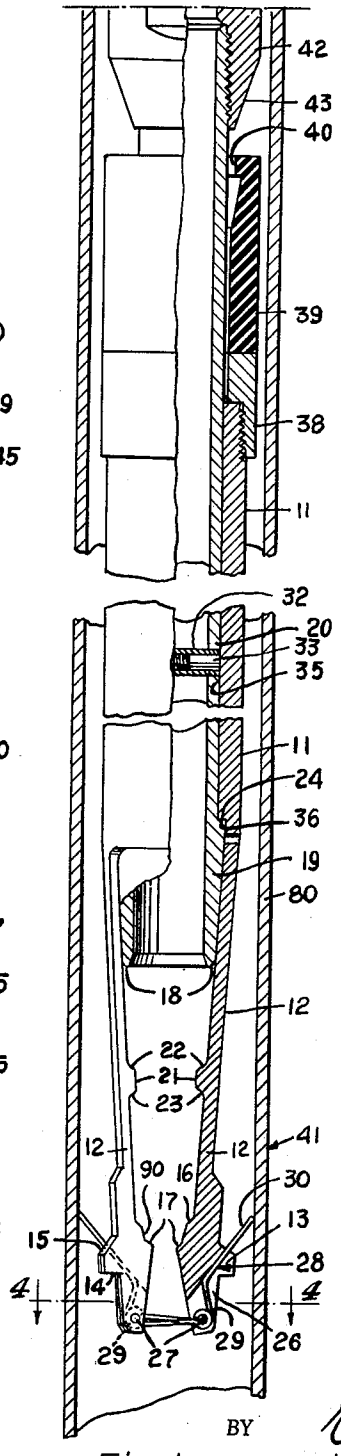


Fig 1a

BY

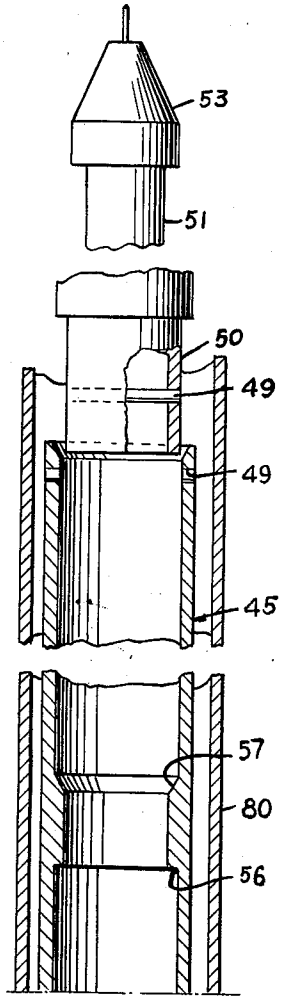


Fig.2

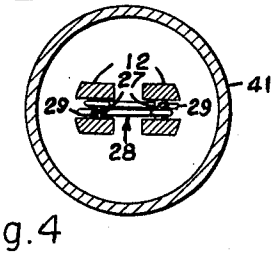


Fig.4

INVENTOR
John Wall, Jr.
William T. Mitchell

Cestastings Ackley

ATTORNEY

Jan. 26, 1960 J. WALL, JR., ET AL 2,922,477

ANCHORING AND SEAL MECHANISMS FOR WELL TOOLS

Filed Jan. 9, 1958 2 Sheets-Sheet 2

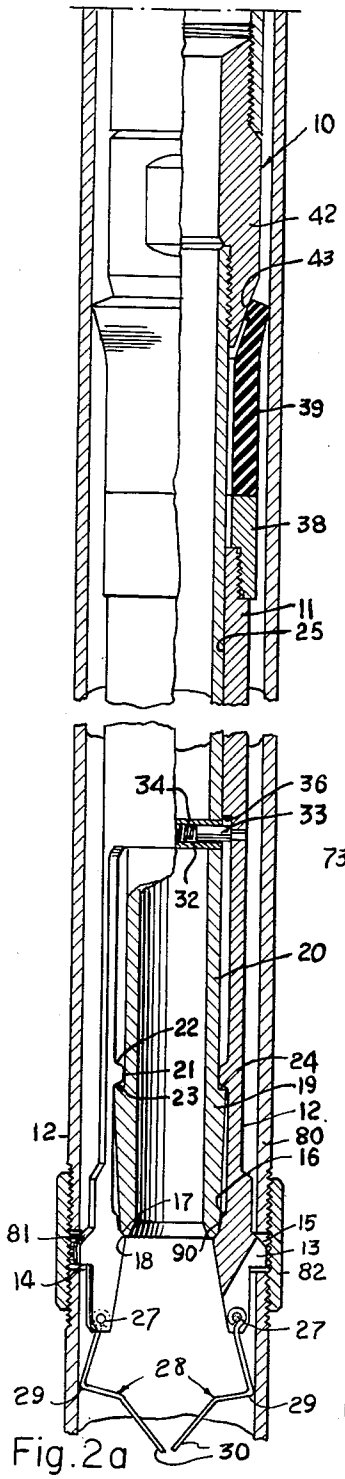


Fig. 2a

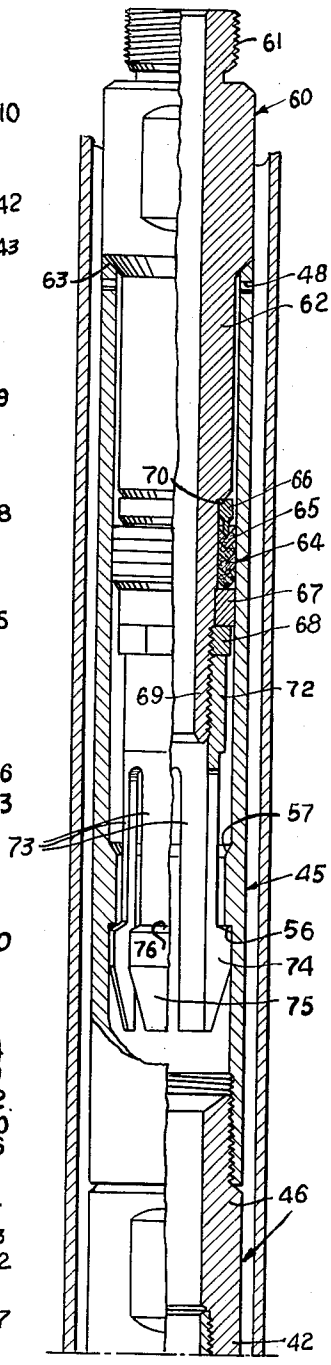


Fig. 3

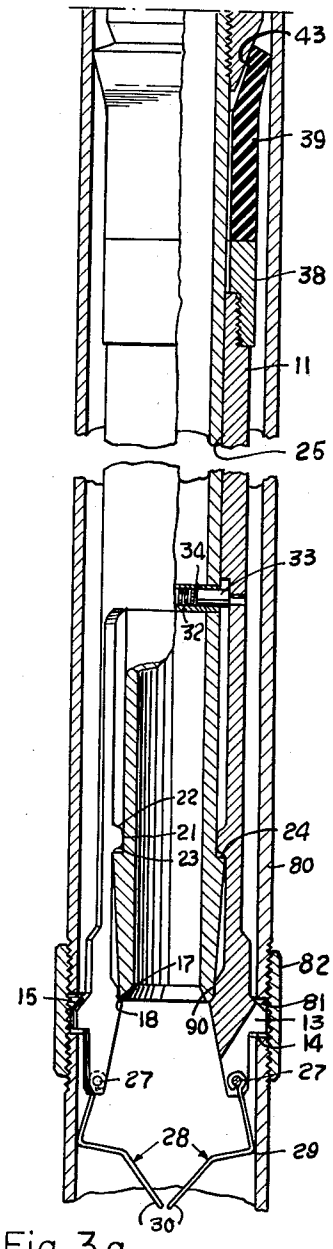


Fig. 3a

INVENTOR
John Wall, Jr.
William T. Mitchell

BY Cestastings Ackley

ATTORNEY

United States Patent Office

2,922,477

Patented Jan. 26, 1960

2,922,477

ANCHORING AND SEAL MECHANISMS FOR WELL TOOLS

John Wall, Jr., Odessa, Tex., and William T. Mitchell, New Iberia, La., assignors to Otis Engineering Corporation, Dallas, Tex., a corporation of Texas

Application January 9, 1958, Serial No. 708,023

14 Claims. (Cl. 166—136)

This invention relates to well tools and more particularly to an anchoring and sealing mechanism for a well tool positionable in a desired location in the well for anchoring the well tool, such as pump seating nipple, in operative position in the well at the desired location.

One object of the invention is to provide a new and improved anchoring tool which is positionable at a desired location in the tubing string of a well.

Still another object is to provide an anchoring tool, of the type described, which may be lowered to the desired location by use of a running tool suspended on a flexible line or member and anchored in the well tubing by jars imparted to the running tool.

A further object is to provide an anchoring tool, of the type described, having positively expansible sealing means for sealing between the anchoring tool and the well tubing when the anchoring tool is locked to the tubing string at the desired location.

Another object of the invention is to provide an anchoring tool, of the type described, having a pump seating nipple for receiving and engaging a pump hold down device of a pump assembly.

Still another object is to provide an anchoring tool, of the type described, having a locking means for releasably securing the anchoring tool in the well tubing.

A further object is to provide a well tool having a tubular member provided with outwardly movable members for engaging a downwardly facing shoulder of a well tubing for holding the tool in a desired position in the well tubing and a downwardly movable lock mandrel for maintaining the outwardly movable members in outer positions whereby the tool is held against movement in the well tubing when the lock mandrel is in a lower position in the tubular mandrel.

A further object is to provide a well tool, of the type described, having latch means for releasably holding the movable members in inner positions out of engagement with the well tubing while the well tool is being lowered to a desired position in the well tubing.

A still further object is to provide a well tool, of the type described, wherein frangible means are provided for releasably holding the lock mandrel in the lower position.

Another object is to provide a well tool, of the type described, wherein the tubular member is provided with a mechanically expansible sealing means and the lock mandrel is provided with an expander for moving the sealing means into sealing engagement with the well tubing when the lock mandrel is moved to the lower position.

Still another object is to provide a well tool, of the type described, wherein the lock mandrel is provided with an upwardly extending pump seating nipple for receiving the hold down device of a pump assembly.

A still further object is to provide a well tool, of the type described, wherein the pump seating nipple provides a seal surface engageable by the sealing means of the pump hold down device.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of a device constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

Figure 1 is a vertical sectional view of the upper portion of a well tool embodying the invention being lowered in a well tubing by a running tool suspended from a flexible line lowering mechanism.

Figure 1*a* is a view similar to Figure 1 and being a continuation thereof showing the lower portion of the well tool;

Figure 2 is a vertical sectional view of the upper portion of the well tool of Figure 1 showing it locked in position in the well tubing;

Figure 2*a* is a view similar to Figure 2 and being a continuation thereof showing the lower portion of the well tool;

Figure 3 is a vertical sectional view of the upper portion of the well tool, similar to Figure 2, showing a pump hold down device positioned in the pump seating nipple of the well tool;

Figure 3*a* is a view similar to Figure 3 and being a continuation thereof showing the lower portion of the well tool; and

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 1*a*.

Referring now to the drawings, the well tool **10** includes a tubular outer member **11** having a plurality of integral dependent resilient collet fingers **12**, preferably having a diametrically opposed pair of such fingers. Each of the fingers is provided at its lower end with an external boss **13** having a substantially horizontal downwardly facing lower stop shoulder **14** and a downwardly and outwardly beveled upper cam shoulder **15**.

The resilient fingers are also provided with internal downwardly and inwardly extending camming surfaces **16** and stop shoulders **17** disposed below the camming surfaces which are engageable by the downwardly and inwardly inclined annular shoulder **18** at the lower enlarged end portion **19** of a lock mandrel **20** telescoped in the tubular member **11**. The resilient fingers are also provided with internal bosses **21**, spaced above the stop shoulders **17**, and having upper inwardly and downwardly sloping shoulders **22** which are adapted to be engaged by the annular shoulder **18** of the lock mandrel when the latter is moved downwardly from the upper inoperative position in the tubular member, shown in Figure 1*a*, and lower inwardly and upwardly sloping shoulders **23** which are adapted to be engaged by the external upwardly facing annular shoulder **24** at the upper end of the enlarged portion **19** of the lock mandrel, when the lock mandrel is in the lower locking position, shown in Figure 2*a*.

The lower portions of the resilient fingers **12** are provided with vertical slots **26** through which extend latch retainer pins **27**. Spring latches **28** each have one end wrapped or bent about a pin **27** whereby they are pivotally mounted thereon. The spring latches **28** are formed with internal hook or latch portions **29** which are adapted to engage the latch pin **27** of the opposite resilient finger whereby the resilient fingers may be releasably held or latched thereby in the inner positions shown in Figure 1*a*. Each latch spring also has an outwardly extending straight catch portion **30** which is inclined outwardly and upwardly of the resilient fingers when the spring latches are in operative position (Figure 1*a*) holding the resilient fingers in their inner positions.

The catch portions **30** of the latch springs bend upwardly and inwardly as they encounter obstructions in the well tubing during downward movement of the tool and are thus positively held in engagement with the resilient fingers to retain the same in inner retracted posi-

tion. However, upon upward movement of the tool the ends of the catch portions engage the wall of the tubing or in coupling recesses and swing downwardly, disengaging the hook portions from the pins 27 of the opposite resilient fingers to release the fingers for movement to the expanded or outer anchoring position shown in Figure 2*a*.

The lock mandrel 20 is also provided with a latch pin housing 32 in which is disposed a frangible latch pin 33 biased outwardly by a spring 34. The latch pin is held in the retracted position shown in Figure 1*a* by engagement with the upper internal wall 35 of the tubular member 11 when the lock mandrel is in its upper position therein, and is moved outwardly to the extended position shown in Figure 2*a* when the lock mandrel is moved to its lower position. In this lower position the latch pin prevents upward movement of the lock mandrel by engaging the downwardly facing annular shoulder 36 of the tubular member and thus locks or latches the resilient fingers in expanded locking position.

The upper end of the tubular member is externally threaded to receive an internally threaded retainer ring 38 to which is bonded a resilient cup or sleeve seal member 39 having a slightly outwardly flared upper end provided with an annular internal flange 40. The seal member is positively mechanically expanded outwardly into sealing engagement with the well tubing 41 by an expander 42 threaded on the upper end of the lock mandrel and having a frusto-conical lower surface 43 which telescopes into the upper portion of the seal member when the lock mandrel is moved to the lower position shown in Figures 2*a* and 3*a*.

A pump seating nipple 45 is threaded on the upper reduced portion 46 of the expander 42. The pump seating nipple is provided with a plurality of apertures 48 adjacent its upper end, and a suitable running tool 51 having a prong 50 adapted to telescope in the upper end of the nipple may be secured to the nipple by means of shear pins 49 extending through the apertures 48 and similar apertures in the prong of the running tool. The running tool is secured in the usual manner to the customary flexible line operating tools 53.

The nipple is formed with an internal annular flange 55 which provides a downwardly facing horizontal annular lower shoulder 56 and a downwardly and inwardly sloping camming shoulder 57.

The nipple receives a pump assembly hold down device or mechanism 60 which is secured to the lower end of a suitable pump (not shown) by means of the upper threaded end portion 61. The hold down device includes a tubular body or mandrel 62 having an annular stop shoulder 63 for engaging the upper end of the seating nipple 45 and a seal or packer assembly 64 for sealing between the mandrel and the seating nipple. The seal assembly may include resilient seal members 65 of the chevron or V type held in place by and between an upper retaining ring 66 and a lower retaining ring 67. A lock nut 68 is threaded on the lower reduced end portion 69 of the mandrel to abut the lower retaining ring and thus hold the seal member in place on the mandrel, the upper retainer ring 66 abutting a downwardly facing external annular shoulder 70 of the mandrel.

A collet 72 is threaded on the lower end of the mandrel 62 and its resilient dependent fingers 73 are provided with external bosses 74 each having an upwardly and outwardly sloping upper shoulder 76. The lower shoulders 75 cam the collet fingers inwardly upon engaging the upper cam shoulder 57 of the flange 55, when the hold down device moves downwardly in the seating nipple, to enable the bosses 74 to move to the lower position shown in Figure 3 wherein their upper shoulders 76 engage the lower shoulder 56 of the flange 55 and thus lock or hold the hold down device 60 in place in the seating nipple against upward movement. An intentional strong upward pull on the hold down device, however, as will be explained hereinafter, will cause the upper shoulders 76 to cam the collet fingers inwardly whereby the hold down device may be released from the landing nipple when desired. The resiliency of the fingers therefore restrains the hold down mechanism in place in the seating nipple.

The well tool 10 is used in oil wells whose tubing has not been provided with pump seating nipples originally because the oil wells flowed naturally upon completion. When such wells cease to flow naturally, it is often necessary to install pumping equipment in the well tubing. Such pumping equipment must be anchored within the tubing and sealed in place to prevent leakage therebetween. The well tool is lowered into the well tubing 41, with all operative elements thereof in the positions shown in Figures 1 and 1*a*. The outer portions 30 of the spring latches 28 engage the inner wall of the well tubing and, since they are resilient and extend angularly upwardly, flex upwardly upon meeting obstructions such as the upper ends of the tubing sections 80 at each coupling recess 81 formed at the couplings 82 which connect adjacent sections of the well tubing. The spring latch, of course, holds the lower ends of the resilient fingers 12 in the inner or retracted positions of Figure 1*a* to prevent engagement of the bosses 13 thereof with any obstructions of the well tubing during downward movement of the well tool in the well tubing. The seal member 39 is also in retracted or non-expanded position during such downward movement of the well tool.

When the well tool reaches the desired position in the well tubing the tool is moved upwardly, by means of the running tool, and the outer ends of the spring latches engage the lower end of a tubing section so that continued upward movement of the well tool causes the latch springs to pivot downwardly about the pins 27 of the resilient fingers 12 on which each is mounted and out of engagement with the pins of the opposite resilient fingers, whereby the resilient fingers are freed to move toward expanded positions. The bosses 13 then engage the inner wall of the well tubing and, as the well tool is moved upwardly, enter into the coupling recess, whereupon a downward movement of the well tool causes the downwardly facing stop shoulders 14 thereof to engage the upper end of the lower tubing section to prevent further downward movement of the well tool.

Downward jars are then imparted to the running tool and thus to the lock mandrel. This jarring or downward force causes the lock mandrel to cam the resilient fingers outwardly, by the action of the cam shoulders 18 and 22 of the lock mandrel and of the resilient fingers, to permit the lower end of the lock mandrel to move past the internal bosses 21 of the resilient fingers.

Continued downward movement of the lock mandrel, caused by such jars, continues until the shoulder 18 of the lock mandrel engages the stop shoulders 17 of the fingers. In this lower position, the lock mandrel engages the inner surfaces 90 of the fingers and holds them locked in expanded position, wherein the bosses 13 thereof are disposed in the coupling recess 81, anchoring the well tool in the well tubing against movement either upwardly or downwardly therein.

The shoulders 23 and 24 of the lock fingers and of the lock mandrel are now in engagement and tend to prevent accidental upward movement of the lock mandrel from its lower locking position. The latch pin 33 now also serves this function since it is in extended position below the shoulder 36 of the tubular member 11.

Simultaneously with the downward movement of the lock mandrel, the expander 42 moved into the seal member 39 and its lower frusto-conical portion caused the upper end of the seal member to expand outwardly into engagement with the well tubing to seal between the well tool and the well tubing.

The shear pins 49 are of such strength that upward jars now imparted to the running tool will cause the pins to

shear to disconnect the running tool from the seating nipple 45, leaving the lock mandrel in the lower position shown in Figure 2*a*. The pump seating nipple is now anchored in place and is ready to receive the hold down device 60 of a pump, not shown.

The hold down device is connected to the lower end of the pump assembly by means of its threaded upper end portion 61, and as the pump assembly is lowered into the well tubing the collet fingers 73 enter into the seating nipple and are cammed inwardly by engagement of the shoulders 75 of the collet fingers with the shoulder 57 of the flange 55 to enable the bosses 74 of the collet fingers to move past the flange. The collet fingers then move resiliently outwardly whereupon the engagement of the shoulders 76 and 56 resists upward movement of the pump hold down device from the seating nipple 45. The packing or seal members 65 now seal between the mandrel 62 of the hold down device 60 and the seating nipple 45 of the well tool 10.

The pump, not shown, may then be placed into operation in the usual manner to pump well fluid from below the well tool 10 to the surface through the well tool and the hold down device.

When it is desired to remove the pump assembly, it is merely pulled upwardly with sufficient force to cause the cam shoulders 76 to move the collet fingers 73 inwardly of the internal flange of the seating nipple 45, whereupon the pump hold down device 60 is freed from the seating nipple for upward movement through the well tubing, the well tool being left in place, in the position shown in Figures 2 and 2*a*. The well tool may be again used to receive a pump hold down device if the removal of the pump assembly was merely temporary, as for repairs, or it may then be removed.

The well tool may be removed by the use of a suitable retrieving tool or spear (not shown) having a prong telescopable into the seating nipple 45 provided with means for engaging the downwardly facing shoulder 56 of the internal flange 55 of the seating nipple 45. An upward pull or jars imparted to the seating nipple cause the pin 33 to shear, whereby the lock mandrel is freed to move upwardly in the tubular mandrel. Further jars then cause the shoulders 24 and 23 of the bosses 21 and the lock mandrel, respectively, to cam the resilient fingers 12 outwardly to permit the lower enlarged portion of the lock mandrel to move upwardly past the internal bosses 21 of the resilient fingers. Simultaneously, the expander 42 moves upwardly from the seal member 39 which then moves back to its retracted non-sealing position.

The engagement of the shoulders 24 and 36 of the lock mandrel and the tubular member then causes the tubular member to be moved upwardly with the lock mandrel, the upper cam shoulders 15 of the bosses camming the resilient fingers inwardly upon encountering obstructions during the upward movement of the well tool to the surface.

It will thus be seen that a new and improved well tool has been illustrated and described, which has a tubular member 11 provided with stop means 13 biased outwardly for limiting downward movement of the tool and latched by means 28 in retracted position. It will also be seen that the tubular member is provided with a seal member at its upper end and that a hollow member 19 is mounted for longitudinal limited movement in the tubular member, the hollow member including a lock mandrel 20 for locking the stop members in expanded or outer position, an expander 42 for expanding the seal member 39 into sealing position, and a seating nipple 45 for receiving a pump hold down device 60.

It will also be seen that the hollow member is provided with a releasable means, the shear pin 33, for holding the hollow member in its lower position relative to the tubular member whereby the seal member and the stop members are positively held in their expanded or operative positions. Likewise, it will be seen that the well tool 10 may be removed from the well tubing by imparting upward jars to the hollow member 19 which actuate the releasable means to free the hollow member for limited upward movement relative to the tubular member.

The foregoing description of the invention is explanatory only, and changes in the details of the construction illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. A well tool including: an outer tubular member having a pair of diametrically opposed downwardly extending arms having their lower ends resiliently outwardly biased and each arm having on its lower end outwardly projecting stop means for anchoring said tubular member in a well conductor when in an outer position; pivotally mounted latch means on the lower end of one of said arms engaging the other of said arms for releasably securing said projecting stop means in retracted position; expansible seal means on said tubular member above said arms; and a hollow tube member slidable longitudinally in said outer tubular member and having a lock means thereon engageable with the lower free end portion of said arms for locking said projecting stop means in said outer position, an expander on said hollow tube member engageable with said seal means for expanding said seal means into sealing position when said hollow member is moved downwardly in said outer tubular member; and shoulder means in said hollow member engageable by a well device telescopable into said hollow tube member for holding said device in said hollow tube member.

2. A well tool for use in a well conductor having an internal recess including: a tubular member having diametrically opposed downwardly extending resilient arms having their lower ends outwardly biased and each of said arms having on its lower end outwardly projecting stop means for entering into the recess in said well conductor to prevent longitudinal movement of the tubular member in the well conductor; hinged latch means on said lower end of one of said resilient arms engaging the opposite arm for holding said stop means in retracted position to permit the tubular member to be lowered in the well conductor, said latch means having a portion extending upwardly and outwardly therefrom and engageable with a downwardly facing obstruction in the well conductor upon upward movement of the tubular member in the well conductor to move said latch means downwardly out of engagement with said opposite arm to release said stop means from said retracted position; expansible seal means carried by said tubular member above said arms for sealing between the well conductor and the tubular member; and a hollow tube member longitudinally movable in said tubular member, said hollow tube member having a lock means thereon engageable with the lower free end portion of said resilient depending arms for locking said stop means against inward movement toward said retracted position when said hollow tube member is in a lower position in the tubular member, means on said hollow tube member movable therewith into engagement with said seal means for expanding said seal means when said hollow tube member is in said lower position, and shoulder means on said hollow tube member engageable by a well device telescopable into said hollow tube member for holding said device in said hollow member.

3. A well tool for use in a well conductor having an internal recess including: a tubular member having diametrically opposed downwardly extending resilient arms having their lower ends outwardly biased and each of said arms having on its lower end outwardly projecting stop means for entering into the recess in said well conductor to prevent longitudinal movement of the tubular member in the well conductor; hinged latch means on

said lower end of one of said resilient arms engaging the opposite arm for holding said stop means in retracted position to permit the tubular member to be lowered in the well conductor, said latch means having a portion extending upwardly and outwardly therefrom and engageable with a downwardly facing obstruction in the well conductor upon upward movement of the tubular member in the well conductor to move said latch means downwardly out of engagement with said opposite arm to release said stop means from said retracted position; expansible seal means carried by said tubular member above said arms for sealing between the well conductor and the tubular member; a hollow tube member longitudinally movable in said tubular member, said hollow tube member having a lock means thereon engageable with the lower free end portion of said resilient depending arms for locking said stop means against inward movement toward said retracted position when said hollow tube member is in a lower position in the tubular member, means on said hollow tube member movable therewith into engagement with said seal means for expanding said seal means when said hollow tube member is in said lower position, and shoulder means on said hollow tube member engageable by a well device telescopable into said hollow tube member for holding said device in said hollow tube member; and cooperating oppositely facing shoulder means on said hollow tube member and on said tubular member for releasably holding said hollow tube member in said lower position in said tubular member.

4. A well tool for use in a well conductor having an internal recess including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms having their lower ends outwardly biased and each of said arms having on its lower end outwardly projecting stop means for entering into the recess in said well conductor to prevent longitudinal movement of the tubular member in the well conductor; hinged latch means on said lower end of one of said resilient arms engaging the opposite arm for holding said stop means in retracted position to permit the tubular member to be lowered in the well conductor, said latch means having a portion extending upwardly and outwardly therefrom and engageable with a downwardly facing obstruction in the well conductor upon upward movement of the tubular member in the well conductor to move said latch means downwardly out of engagement with said opposite arm to release said stop means from said retracted position; expansible seal means carried by said tubular member above said arms for sealing between the well conductor and the tubular member; an elongate tubular mandrel longitudinally movable in said tubular member, said mandrel having a lock means for locking said stop means against inward movement toward said retracted position when said mandrel is in a lower position in the tubular member, means on said mandrel movable therewith into engagement with said seal means for expanding said seal means when said mandrel is in said lower position, and shoulder means on said mandrel engageable by a well device telescopable into said mandrel for holding said device in said mandrel; and means on said resilient arms engageable with the lower end of said mandrel for limiting downward movement of said mandrel in said tubular member.

5. A well tool for use in a well conductor having an internal recess including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms having their lower ends outwardly biased, each of said arms having on its lower end outwardly projecting stop means for entering into the recess in said well conductor to prevent longitudinal movement of the tubular member in the well conductor; latch means hingedly connected on the lower end of one of said resilient arms and swingable to position engaging the opposite arm for holding said stop means in retracted position to permit the tubular member to be lowered in the well conductor, said latch means having a portion extending upwardly and outwardly therefrom and engageable with a downwardly facing obstruction in the well conductor upon upward movement of the tubular member in the well conductor to move said latch means downwardly out of engagement with said opposite arm to release said stop means from said retracted position; expansible seal means carried by said tubular member above said arms for sealing between the well conductor and the tubular member; an elongate tubular mandrel longitudinally movable in said tubular member, said mandrel having a lock means thereon engageable with the lower free end portion of said resilient depending arms for locking said stop means against inward movement toward said retracted position when said mandrel is in a lower position in the tubular member, means on said mandrel movable therewith into engagement with said seal means for expanding said seal means when said mandrel is in said lower position, and shoulder means on said mandrel engageable by a well device telescopable into said mandrel for holding said device in said mandrel; means on said resilient arms engageable with the lower end of said mandrel for limiting downward movement of said mandrel in said tubular member; and cooperating oppositely facing shoulder means on said mandrel and on said tubular member for releasably holding said mandrel in said lower position.

6. A well tool for use in a well conductor having an internal recess including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms having their lower ends outwardly biased, each of said arms having on its lower end outwardly projecting stop means for entering into the recess in said well conductor to prevent longitudinal movement of the tubular member in the well conductor; latch means hingedly connected on the lower end of one of said resilient arms and swingable to position engaging the opposite arm for holding said stop means in retracted position to permit the tubular member to be lowered in the well conductor, said latch means having a portion extending upwardly and outwardly therefrom and engageable with a downwardly facing obstruction in the well conductor upon upward movement of the tubular member in the well conductor to move said latch means downwardly out of engagement with said opposite arm to release said stop means from said retracted position; expansible seal means carried by said tubular member above said arms for sealing between the well conductor and the tubular member; and an elongate tubular mandrel longitudinally movable in said tubular member, said mandrel having a lock means thereon engageable with the lower free end portion of said resilient depending arms for locking said stop means against inward movement toward said retracted position when said mandrel is in a lower position in the tubular member, means on said mandrel movable therewith into engagement with said seal means for expanding said seal means when said mandrel is in said lower position, and shoulder means on said mandrel engageable by a well device telescopable into said mandrel for holding said device in said mandrel, said mandrel providing an internal surface for engagement by a sealing means of the device to prevent fluid flow therebetween.

7. A well tool including: a tubular member having a plurality of resilient integral dependent finger members spaced circumferentially of the lower end of said tubular member, each of said dependent members having laterally outwardly extending bosses near their lower ends; said bosses having outwardly and downwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other of said finger members for releasably holding said dependent finger members in

inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the dependent finger members from said retracted position; an outwardly expansible seal carried on the upper end of said tubular member; and an elongate tubular mandrel slidably mounted in said tubular member for limited longitudinal movement beween upper and lower positions in said tubular member; said mandrel having an enlarged lower end portion engageable wtih the lower end portions of said dependent finger members when said mandrel is in said lower position to prevent inward movement of said dependent finger members toward said retracted position, said mandrel having a wedge expander means movable downwardly into said seal means for expanding said seal means when said mandrel is moved from said upper position to said lower position.

8. A well tool including: a tubular member having a plurality of resilient integral dependent finger members spaced circumferentially of the lower end of said tubular member, each of said dependent members having laterally outwardly extending bosses near their lower ends; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other end of said finger members for releasably holding said dependent finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the dependent finger members from said retracted position, said bosses having downwardly and outwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; an outwardly expansible seal carried on the upper end of said tubular member; an elongate tubular mandrel slidably mounted in said tubular member for limited longitudinal movement between upper and lower positions in said tubular member; said mandrel having an enlarged lower end portion engageable with the lower end portions of said dependent finger members when said mandrel is in said lower position to prevent inward movement of said dependent finger members toward said retracted position, said mandrel having a wedge expander means movable downwardly into said seal means for expanding said seal means when said mandrel is moved from said upper position to said lower position; and cooperating oppositely facing shoulders on each said mandrel and said dependent finger memebrs for releasably holding said mandrel in said lower position in said tubular member.

9. A well tool including: a tubular member having a plurality of resilient integral dependent finger members spaced circumferentially of the lower end of said tubular member, each of said dependent members having laterally outwardly extending bosses near their lower ends; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other end of said finger members for releasably holding said dependent finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the dependent finger members from said retracted position, said bosses having downwardly and outwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; an outwardly expansible seal carried on the upper end of said tubular member; and an elongate tubular mandrel slidably mounted in said tubular member for limited longitudinal movement between upper and lower positions in said tubular member; said mandrel having an enlarged lower end portion engageable with the lower end portions of said dependent finger members when said mandrel is in said lower position to prevent inward movement of said dependent finger members toward said retracted position, said mandrel having a wedge expander means movable downwardly into said seal means for expanding said seal means when said mandrel is moved from said upper position to said lower position, mandrel having its upper end open and adapted to receive a well device; and internal downwardly facing shoulder means in said mandrel disposed for engaging the well device to hold it against upward displacement in the hollow member.

10. A well tool including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms, each of said arms having laterally outwardly extending bosses on their lower ends; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other end of said finger members for releasably holding said finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the finger members from said retracted position, said bosses having downwardly and outwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; an outwardly expansible seal carried on the upper end of said tubular member; and an elongate tubular mandrel having a lower end portion telescoped in said tubular member, said mandrel being slidably mounted on said tubular member for limited longitudinal movement between an upper position and a lower position; upwardly facing shoulder means on said finger members for engaging the lower end of said mandrel to hold said mandrel in said upper position when said finger members are in said retracted position, said mandrel being disposed between the lower end portions of said finger members when in said lower position to prevent inward movement thereof toward said retracted position, said mandrel having an enlarged expander member thereon movable downwardly therewith into said seal means for expanding said seal means upon movement of said mandrel from said upper to said lower position.

11. A well tool including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms, each of said arms having laterally outwardly extending bosses near their lower ends; said bosses having outwardly and downwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other of said finger members for releasably holding said finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the finger members from said retracted position; an outwardly expansible seal carried on the upper end of said tubular member; an elongate tubular mandrel having a lower end portion telescoped in said tubular member, said mandrel being slidably mounted on said tubular member for limited longi-

tudinal movement between an upper position and a lower position; upwardly facing shoulder means on said finger members for engaging the lower end of said mandrel to hold said mandrel in said upper position when said finger members are in said retracted position, said mandrel extending between the lower end portions of said finger members when in said lower position to prevent inner movement thereof toward said retracted position, said mandrel having an enlarged expander member thereon movable downwardly therewith into said seal means for expanding said seal means upon movement of said mandrel from said upper to said lower position, and cooperating oppositely facing shoulders on each said mandrel and said finger members engageable for releasably holding said mandrel in said lower position.

12. A well tool including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms, each of said arms having laterally outwardly extending bosses near their lower ends; said bosses having outwardly and downwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other of said finger members for releasably holding said finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the finger members from said retracted position; an outwardly expansible seal carried on the upper end of said tubular member; an elongate tubular mandrel having a lower end portion telescoped in said tubular member, said mandrel being slidably mounted on said tubular member for limited longitudinal movement between an upper position and a lower position; upwardly facing shoulder means on said finger members for engaging the lower end of said mandrel to hold said mandrel in said upper position when said finger members are in said retracted position, said mandrel extending between the lower end portions of said finger members when in said lower position to prevent inward movement thereof toward said retracted position, said mandrel having an enlarged expander member thereon movable downwardly therewith into said seal means for expanding said seal means upon movement of said mandrel from said upper to said lower position; and cooperating oppositely facing shoulders on each said mandrel and said finger members engageable for releasably holding said mandrel in said lower position, said mandrel having an upper portion extending above said tubular member open at its upper end for telescopically receiving a well device.

13. A well tool including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms, each of said arms having laterally outwardly extending bosses near their lower ends; said bosses having outwardly and downwardly sloping upper camming surfaces and outwardly extending lower stop surfaces; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other of said finger members for releasably holding said finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the finger members from said retracted position; an outwardly expansible seal carried on the upper end of said tubular member; an elongate tubular mandrel having a lower end portion telescoped in said tubular member, said mandrel being slidably mounted on said tubular member for limited longitudinal movement between an upper position and a lower position; upwardly facing shoulder means on said finger members for engaging the lower end of said mandrel to hold said mandrel in said upper position when said finger members are in said retracted position, said mandrel extending between the lower end portions of said finger members when in said lower position to prevent inward movement thereof toward said retracted position, said mandrel having an enlarged expander member thereon movable downwardly therewith into said seal means for expanding said seal means upon movement of said mandrel from said upper to said lower position, and cooperating oppositely facing shoulders on each said mandrel and said finger members engageable for releasably holding said mandrel in said lower position, said mandrel having an upper portion extending above said tubular member open at its upper end for telescopically receiving a well device, said upper portion having an internal surface engageable by a seal means of the well device.

14. A well tool including: a tubular member having a pair of diametrically opposed downwardly extending resilient arms, each of said arms having laterally outwardly extending bosses near their lower ends; said bosses having outwardly and downwardly sloping upper surfaces; latch means hingedly secured to the lower end of one of said finger members and swingable into engagement with the other of said finger members for releasably holding said finger members in inwardly retracted position, said latch means having trip means extending outwardly and upwardly from its point of engagement with said other dependent finger members sufficiently to engage the bore wall of a well conductor in which the well tool is inserted to move said latch means out of engagement with said other depending finger members on said tubular member to release the finger members from said retracted position; an outwardly expansible seal carried on the upper end of said tubular member; an elongate tubular mandrel having a lower end portion telescoped in said tubular member, said mandrel being slidably mounted on said tubular member for limited longitudinal movement between an upper position and a lower position; upwardly facing shoulder means on said finger members for engaging the lower end of said mandrel to hold said mandrel in said upper position when said finger members are in said retracted position, said mandrel extending between the lower end portions of said finger members when in said lower position to prevent inward movement thereof toward said retracted position, said mandrel having an enlarged expander member thereon movable downwardly therewith into said seal means for expanding said seal means upon movement of said mandrel from said upper to said lower position, and cooperating oppositely facing shoulders on each said mandrel and said finger members engageable for releasably holding said mandrel in said lower position, said mandrel having an upper portion extending above said tubular member open at its upper end for telescopically receiving a well device, said upper portion having an internal surface engageable by a seal means of the well device, and a downwardly facing lock shoulder in the bore of said mandrel disposed to be engaged by the well device to retain it in said upper portion.

References Cited in the file of this patent

UNITED STATES PATENTS

2,028,418	Smith et al.	Jan. 21, 1936
2,644,527	Baker	July 7, 1953
2,669,305	Condra	Feb. 16, 1954
2,671,512	Ragan et al.	Mar. 9, 1954

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,922,477 January 26, 1960

John Wall, Jr., et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 12, line 29, claim 14, for "surfaces; latch" read -- camming surfaces and outwardly extending lower stop surfaces; latch--.

Signed and sealed this 5th day of July 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents