

Aug. 9, 1960

J. H. BOSTOCK ET AL

2,948,340

WELL TOOLS

Filed July 9, 1954

5 Sheets-Sheet 1

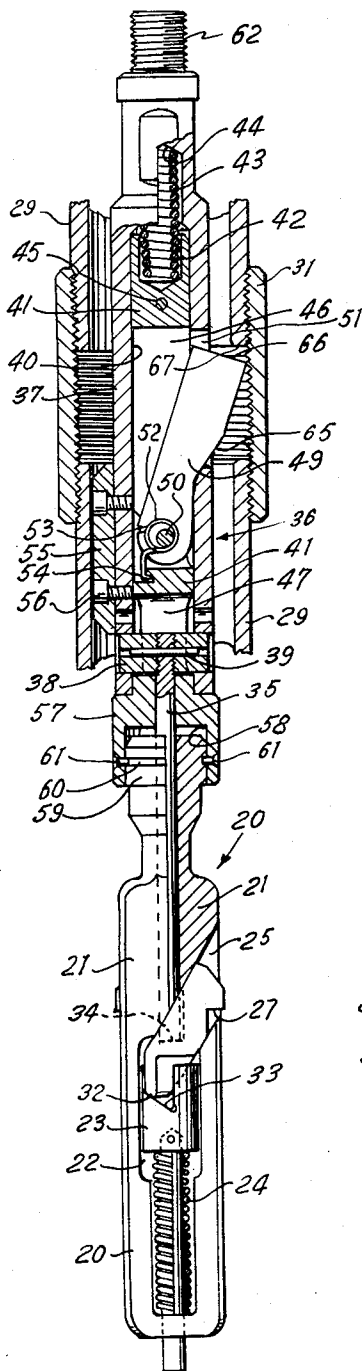


Fig. 1

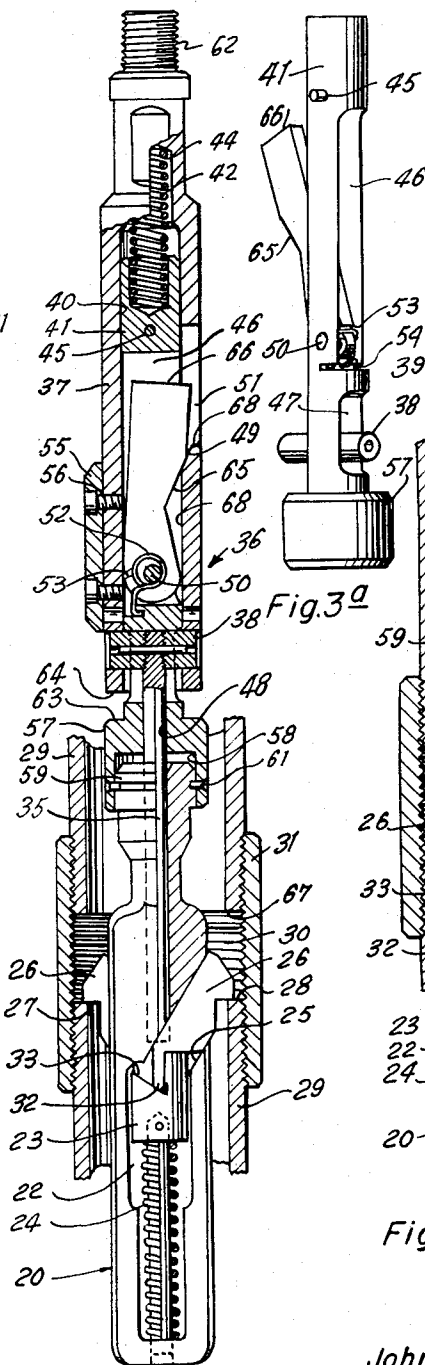


Fig. 2

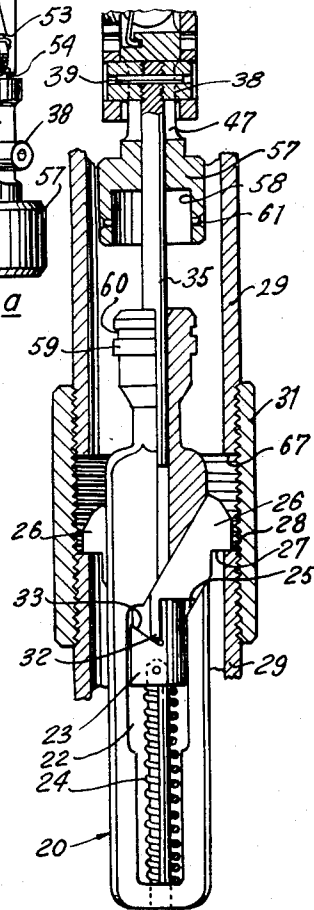


Fig. 3

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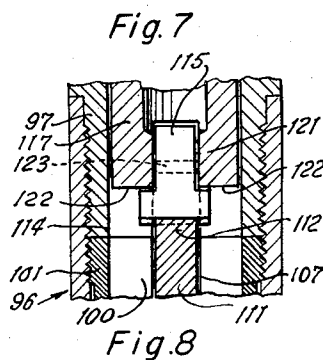
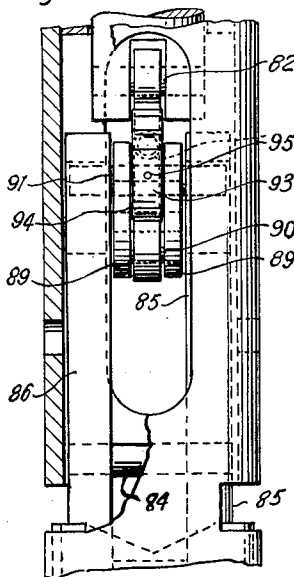
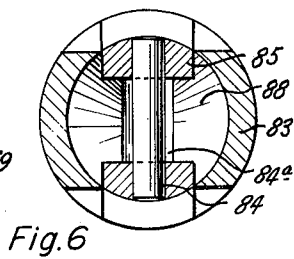
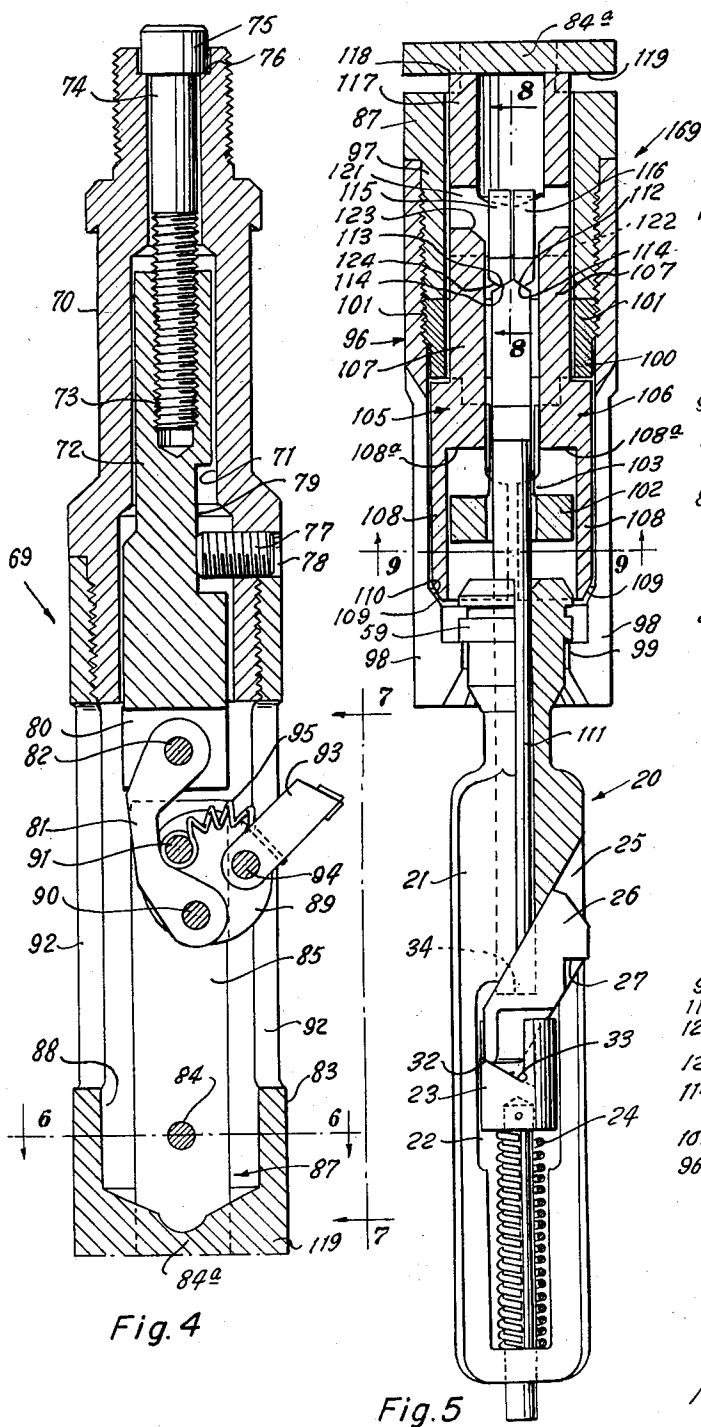
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WELL TOOLS

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5 Sheets-Sheet 2



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WELL TOOLS

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5 Sheets-Sheet 3

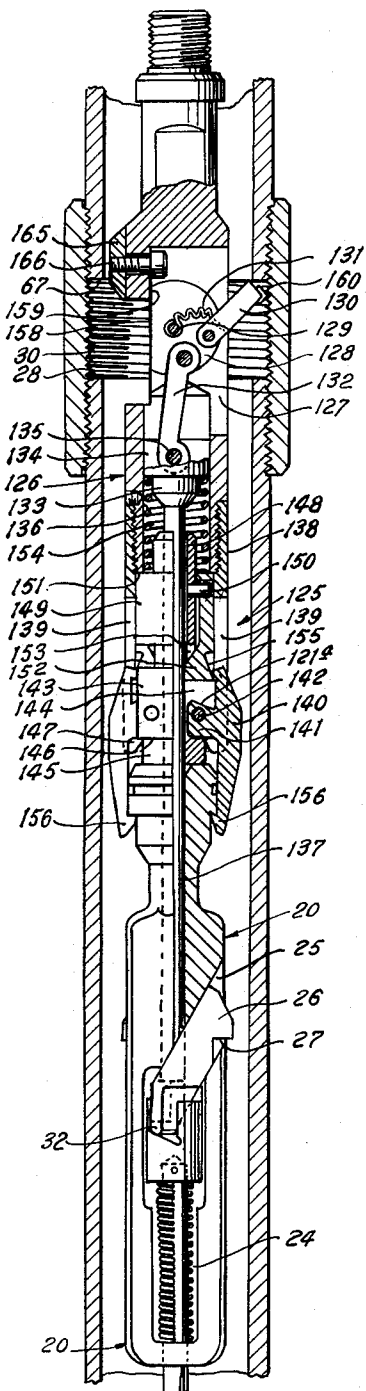


Fig. 12

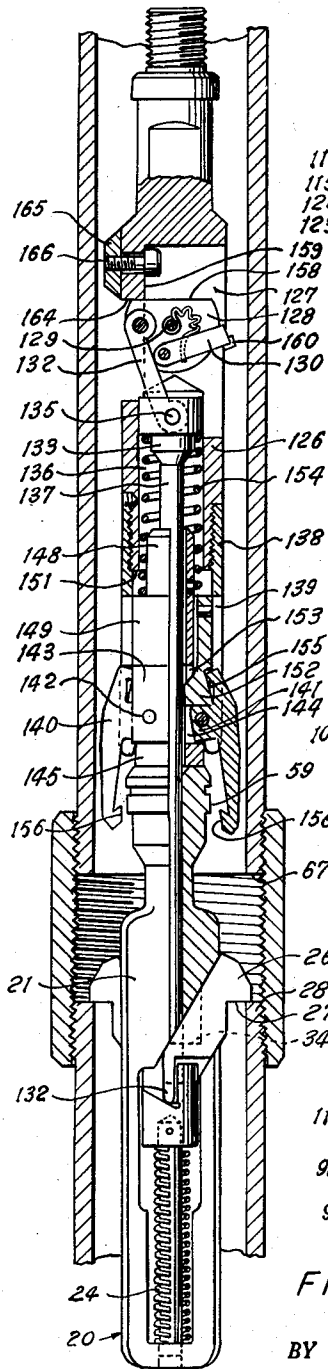


Fig. 13

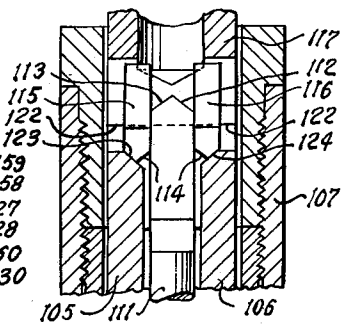


Fig. 11

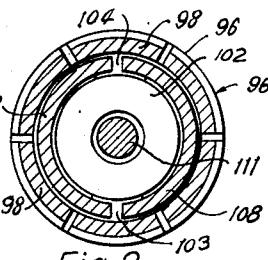


Fig. 9

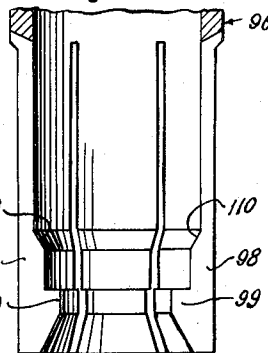


Fig. 10 INVENTORS
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2,948,340

WELL TOOLS

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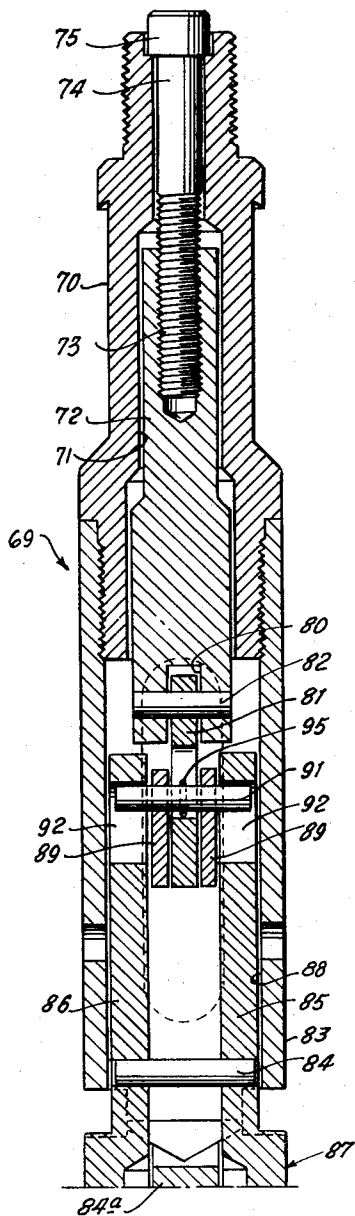


Fig. 14

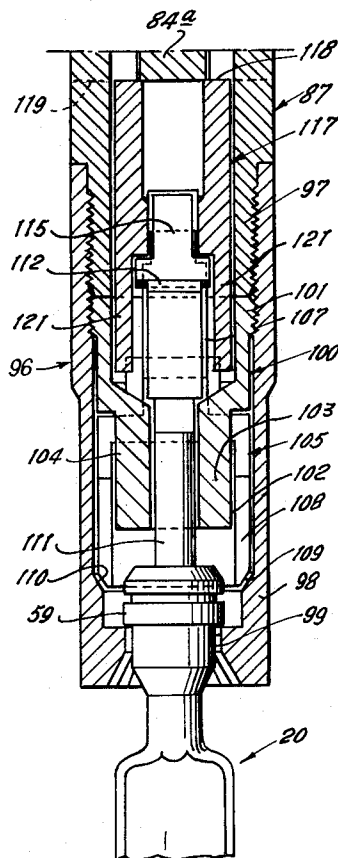


Fig. 15

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J. H. BOSTOCK ET AL

2,948,340

WELL TOOLS

Filed July 9, 1954

5 Sheets-Sheet 5

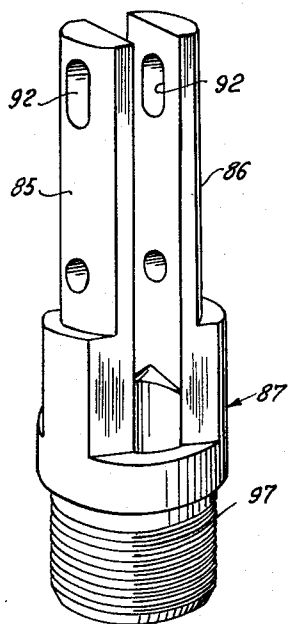


Fig. 16

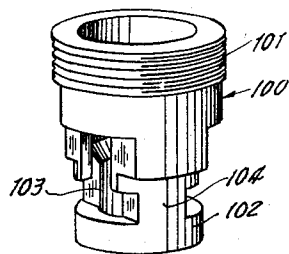


Fig. 17

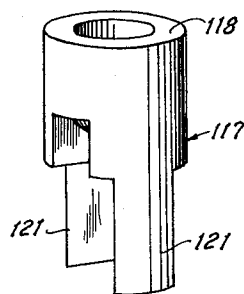


Fig. 19

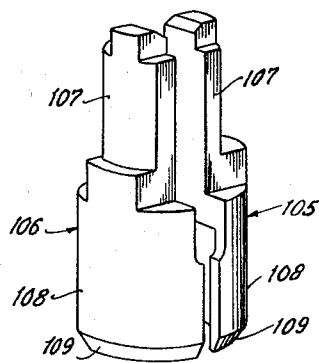


Fig. 18

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1

2,948,340

WELL TOOLS

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Filed July 9, 1954, Ser. No. 442,260

18 Claims. (Cl. 166—215)

This invention relates to well tools and more particularly to running tools for lowering collar stops and the like into wells.

Another object of the invention is to provide a running tool, of the type described, which may be lowered into a well and operated therein by a flexible line.

Another object of the invention is to provide a new and improved running tool for collar stops and the like having a prong for holding the stop dogs of the collar stop in retracted positions while the collar stop is being lowered into the well.

Still another object of the invention is to provide a new and improved running tool, of the type described, having means for releasing the prong to permit outward movement of the dogs to expanded operative positions when the collar stop is positioned at the desired location in the well.

A further object of the invention is to provide a new and improved running tool, of the type described, which may be easily detached from the collar stop by jars imparted by the flexible line after the stop dogs of the collar stop are in expanded operative positions.

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

Figure 1 is a view, partly in elevation and partly in section, of the running tool and a collar stop carried thereby showing the operative components thereof as they appear while the collar stop is being lowered in the tubing of a well;

Figure 2 is a view similar to Figure 1, showing the operative components of the running tool as they appear after the stop dogs of the collar stop have been moved to expanded positions in the well tubing while the collar stop is still attached to the running tool;

Figure 3 is a similar view of the collar stop and the lower portion of the running tool showing the operative elements thereof as they appear immediately after the running tool is detached from the collar stop;

Figure 3A is a perspective view of the latch carrier and trip latch of the tool of Figure 1;

Figure 4 is a longitudinal sectional view of the upper portion of a modified form of the running tool;

Figure 5 is a continuing longitudinal sectional view of the lower portion of the running tool of Figure 4 and of a collar stop carried thereby;

Figure 6 is a horizontal cross-sectional view taken on the line 6—6 of Figure 4;

Figure 7 is a fragmentary side view taken on the line 7—7 of Figure 4;

Figures 8 and 9 are sectional views taken on the lines 8—8 and 9—9, respectively, of Figure 5;

Figure 10 is a longitudinal sectional view of the lower portion of the collet of the tool shown in Figure 5;

Figure 11 is a fragmentary view of the pawls section

2

of the tool of Figure 5 showing the pawls in separated positions;

Figure 12 is a longitudinal view, partly in elevation and partly in section, of another form of the running tool and of a collar stop attached thereto, showing the operative components thereof as they appear while the running tool and collar stop are being lowered through well tubing;

Figure 13 is a similar view of the running tool and collar stop of Figure 12, showing the operative components thereof as they appear after the stop dogs of the collar stop have moved to expanded positions and the running tool has been detached from the collar stop;

Figure 14 is a longitudinal sectional view of the upper portion of the modified form of the running tool illustrated in Figure 4 taken at a right angle to the sectional view of Figure 4;

Figure 15 is a continuing longitudinal sectional view of the lower portion of the running tool of Figure 14;

Figures 16, 17, 18 and 19 are perspective enlarged views of different elements of the running tool illustrated in Figures 4 and 5.

Referring now particularly to Figures 1, 2 and 3 of the drawings, the collar stop 20 is of the general type disclosed in the co-pending application of John V. Fredd, Ser. No. 385,248, and includes a body 21 having a central longitudinal bore 22 in which is mounted a plunger 23 which is biased upwardly by a spring 24. The collar stop body 21 is also provided with a pair of upwardly and outwardly extending ways or slots 25 in which stop dogs 26 are slidably mounted. The stop dogs have downwardly facing stop shoulders 27 which are adapted to engage the upwardly facing upper shoulders or ends 28 of tubing sections 29 at the coupling recesses 30 formed in the tubing string wherever a coupling collar 31 joins a pair of tubing sections.

The stop dogs have cam shoulders 32 at their lower ends which abut the cam surfaces 33 of the plunger so that the stop dogs are urged upwardly and outwardly to expanded positions when the plunger moves upwardly in the body 21. The stop dogs are also provided with lock shoulders 34 on their inner upper surfaces which may be engaged by the holding means or prong 35 of a running tool 36 to hold the stop dogs retracted. It will be apparent that the spring 24 biases the stop dogs from retracted positions within the slots 25 of the body 21 toward expanded positions, and that the prong 35 of the running tool when engaged in the lock shoulders 34 locks the stop dogs in the retracted positions.

The prong 35 of the running tool 36 is secured to the body 37 of the running tool by means of a pin 38 which extends transversely through the body. The upper end of the prong is threaded transversely into the pin, and a latch pin 39 extends through the prong and the pin 38 to prevent accidental separation of the prong from the pin.

The body 37 of the running tool has a central bore 40 in which is slidably mounted a latch carrier or plunger 41. The latch carrier has a bore 42 in its upper end which receives the lower end of a biasing spring 43 whose upper end bears against the shoulder 44 of the body, whereby the spring 43 biases the latch carrier downwardly of the body. A shear pin or releasable connecting means 45 extends through the latch carrier and the body and holds the latch carrier in its upper position, shown in Figure 1, while the tool is being lowered through the well tubing.

The latch carrier has a pair of longitudinally spaced slots 46 and 47, and the lower slot 47 receives the pin 38 which thus serves to limit downward movement of the latch carrier in the body. The prong 35 is slidable

3

through a longitudinal bore 48 in the lower end of the latch carrier.

Release means including a trip latch 49 is disposed in the upper slot of the latch carrier and said latch is pivotally secured thereto at its lower end by a pivot pin 50 so that the upper end of the latch may swing outwardly through a window 51 of the body into engagement with the well tubing. The latch is biased for outward movement about the pivot pin 50 by a double coil spring 52 disposed about the pivot pin, whose center portion is disposed in a notch 53 of the trip latch and whose ends are disposed in a notch 54 in the latch carrier.

A wedge or shoe 55 may be secured to the body by screws 56 on the side opposite the window 51 for a purpose to be hereinafter described.

The lower enlarged end 57 of the latch carrier extends below the body and is provided with a bowl or socket 58 which receives the head 59 at the upper end of the collar stop body 21. The head of the stop has an external annular groove 60 into which the inner ends of shear pins 61 extend to detachably secure the collar stop to the running tool.

In use, the running tool is attached to the end of a flexible line lowering and manipulating mechanism by means of any suitable coupling or socket which receives the pin 62 at the upper end of the running tool body. The collar stop body is secured to the latch carrier by the shear pins 61 and the whole assembly is then lowered into the well tubing.

The operative components of the running tool and the collar stop are then in the positions shown in Figure 1. The latch carrier is held in its upper position against the resistance of the spring 43 by the shear pin 45 and the latch is biased outwardly through the window 51 of the running tool body against the well tubing by the spring. The spring 24 biases the plunger 23 upwardly in the collar stop body but it is held in its lower position by the prong 35 engaging the stop shoulders 34 in the upper inner surfaces of the stop dogs. The dogs 26 are therefore held in their retracted position.

The collar stop and the running tool are lowered through the well tubing until a desired depth is reached. During this movement, the trip latch 49 enters into each coupling recess as it is pivoted outwardly by the spring 52 and then swings inwardly as its side 65 contacts the upper end of each tubing section. When the desired depth is reached, the running tool and the stop are raised until the trip latch 49 enters the next higher collar recess 30 and its end 66 contacts the lower end or shoulder 67 of the next higher tubing section. This engagement of the latch with the shoulder 67 stops further upward movement of the latch carrier 41 so that upward jars imparted to the flexible line mechanism will tend to raise the running tool body relative to the latch carrier and thus shear the pin 45, freeing the latch carrier for downward movement relative to the running tool body. The wedge or shoe 55 prevents misalignment of the running tool and collar stop during this operation, and in tubing of smaller internal diameter the wedge is omitted. The spring 43 then moves the latch carrier downwardly relative to the running tool body, causing the latch 49 to pivot inwardly into the slot 46 due to the camming action between the side 65 of latch and the lower edge or shoulder 68 of the window 51 of the running tool body.

When the latch carrier is moved to its lower position on the running tool body, the collar stop body 21 is simultaneously moved downwardly relative to the prong 35 so that the lower end of the prong no longer locks the dogs 26 against upward and outward movement. The spring 24 acting on the plunger 23 moves the dogs toward expanded positions until their outer ends abut the inner walls of the adjacent tubing section.

The running tool and collar stop are then raised or lowered until the dogs enter the collar recess 30 of the

4

tubing thereabove or therebelow and move outwardly thereinto. The stop shoulders 27 of the dogs then abut the upper end 28 of the lower tubing section upon downward movement and thus prevent further downward movement of the collar stop in the tubing.

Downward blows or jars imparted to the running tool will then shear the pins 61 which connect the latch carrier to the collar stop body and thus detach the running tool from the collar stop. The running tool may then be raised to the surface, leaving the collar stop in position in the tubing. The trip latch 49, of course, remains in retracted position in the slot 46 of the latch carrier during such upward movement of the running tool, being resiliently held in such position by the action of the spring 43 biasing the latch carrier in its lower position, but if the spring is omitted the weight of the latch carrier will hold the same in such lower position.

It will be apparent that a new and improved running tool for collar stops or the like has been provided which includes a means or prong 35 for holding the stop dogs of the collar stop in retracted positions and a means or trip latch 49 for moving the prong out of dog locking position when the collar stop is at a desired position in the well tubing. Likewise, it will be seen that the stop dogs are freed for movement to expanded positions while the stop is still detachably connected to or carried by the running tool, and that disconnection of the running tool from the stop is effected only after the stop shoulders of the stop dogs are in supporting or stopping engagement with the shoulder at the upper end of a joint of tubing in the collar recess. It will also be seen that the running tool may be lowered, raised and operated by means of a flexible line to locate and set a collar stop in a desired position in the well tubing and to detach the running tool from the collar stop after it has been set in position.

Figures 4 to 11 illustrate another form of running tool 69, having a top sub 70 with a central bore 71 in which a pull rod 72 is slidably mounted. The upper end of the pull rod is provided with a threaded bore 73 which receives an adjusting screw 74 provided with a flange 75 which abuts the annular shoulder 76 at the upper end of the top sub. It will be evident that the longitudinal position of the pull rod in the top sub may be adjusted by rotation of the adjusting screw. A set screw 77 is threaded in a lateral bore 78 and extends into the bore of the top sub and is adapted to bear against the flat surface 79 of the pull rod to lock the pull rod in any adjusted position in the top sub.

The pull rod extends downwardly beyond the lower end of the top sub into the bore 88 of an elongate body member 83 which is threaded on the lower end of said top sub. The lower end of the pull rod has a transverse slot 80 formed therein and the upper end of an angular link member 81 is disposed in said slot and is pivotally secured to the pull rod by a pivot pin 82.

Opposite sides of the lower end of the body 83 are cut away to provide openings in the lower end of the body on opposite sides of the web or cross member 84a, and the parallel legs 85 and 86 of a plunger 87 extend through such openings slidably into the longitudinal bore 88 of the body. The lower end of the link 81 is pivotally connected between a pair of discs 89 by a pivot pin 90, the lower end of the link and the discs being disposed between the legs 85 and 86 of the plunger. The discs are pivotally secured to the legs by a pin 91 which extends through aligned transverse openings 92 in the legs of the plunger. A trip latch 93 is pivotally secured to the discs by a pin 94 and is biased outwardly through a window 92 in the body member by a spring 95 whose opposite ends are secured to the pin 91 and the trip latch.

A collet supporting member 96 is threaded on the lower annular end 97 of the plunger 87, and the depend-

5

ent fingers 98 of the collet are provided with internal bosses or hooks 99 which engage under the flange 59 on the upper end of the collar stop body 21 to secure the collar stop body to the running tool.

A plunger stop 100 has an annular upper portion 101 which is threaded in the upper end of the collet and which abuts the lower end of the plunger and an annular lower portion 102 of smaller outer diameter than the upper portion and spaced therefrom by a pair of parallel spaced legs 103 and 104. A pair of matched expander members 105 and 106 have upper portions 107 which are disposed inwardly of the upper portion 101 of the plunger stop and have lower portions 108 which are disposed outwardly of the lower portion 102 of said plunger stop. The lower ends of the expander members are provided with downwardly and inwardly extending wedge or cam shoulders 109 adapted to engage upwardly facing cam shoulders 110 of the collet fingers 98 to move the lower ends of such collet fingers outwardly upon downward movement of the expander sections relative to the collet.

The prong 111 which holds the stop dogs 26 of the collar stop in retracted positions has an upper end provided with wedge or camming surfaces 112 and 113 which extend divergently downwardly and outwardly from a common edge and which are adapted to abut similarly inclined inner camming surfaces 114 of a pair of pawls 115 and 116 which normally are disposed between the two expander sections 105 and 106. The pawls are of substantially T-shape and are held in place by a pawl holder 117 disposed within the lower annular portion 97 of the plunger and having its upper end 118 abutting the lower end 119 of the body. The pawl holder has a pair of dependent legs 121 between which the pawls are movably held.

In use, the operative elements of the running tool and the collar stop are in the positions illustrated in Figures 4 and 5 while the collar stop is being lowered through a well tubing. The spring 24 of the collar stop biases the stop dogs upwardly with the stop shoulders 34 engaging the lower end of the prong 111 which is in turn held down by the engagement of its upper end with the pawls 115 and 116 which are held inwardly by the upper ends of the expander members and thus limit upward movement of the prong. The head 59 of the collar stop is supported on the bosses 99 of the collet fingers, whereby the plug is connected to and supported by the running tool. In this position, the plunger 87 is held upwardly by the discs 89 and linkage 81, and the trip latch 93 is biased outwardly through the window 92 to engage the wall of the well pipe.

As the running tool descends through the well tubing, the trip latch 93 enters into the collar recesses of the tubing but is free to pivot inwardly of the body to move out of these collar recesses as the downward travel is continued. During such movement, the stop dogs are held in retracted positions by the prong 111.

When the desired depth is reached, the running tool and the collar stop are raised until the trip latch 93 enters the next higher recess and engages the lower end or shoulder of a tubing section. Further upward movement of the running tool will now cause the discs 89 to rotate in a clockwise direction about their pin 91 against the resistance of the spring 24 until the pin 90 moves in a clockwise direction past the centers of the pins 82 and 91, such movement of the disc resulting in downward movement of the plunger collet and collar stop body relative to the prong 111. Thus, the stop dogs 26 are released for upward and outward movement toward expanded positions wherein they may engage the inner walls of the tubing. The running tool and collar stop are then raised or lowered until the stop dogs enter the next higher or lower collar recess of the tubing and move outwardly therein to fully expanded position; and upon downward movement of the assembly their stop

6

shoulders 27 engage the upper end of the adjacent tubing section to prevent further downward movement of the collar stop in the tubing.

When this occurs, the expander sections 105 and 106 will have moved downwardly with respect to the pawls and the prong so that the pawls are free to move laterally outwardly over the upwardly and outwardly extending wedge surfaces 123 of the expander sections which now abut the similarly extending wedge or cam surfaces 124 of the pawls.

A downward force is then imparted to the top sub and transmitted through the body 83 to the pawl holder 117, which by engagement of its downwardly facing shoulders 122 with the arms of the pawls moves the pawls downwardly and drives the expander sections downwardly relative to the collet to expand the collet fingers to release the head of the collar stop body, the lower end 102 of the plunger stop engaging the upper end of the collar stop to limit downward movement of the running tool with respect to the collar stop. The lower end of the plunger stop is also engaged by the downwardly facing shoulders 108a of the expander sections, which thus limits downward movement of said expander sections with respect to the collet. The running tool is then raised to the surface leaving the collar stop set in the tubing.

It will now be apparent that in this form of the running tool, the stop dog biasing spring of the collar stop is used not only to bias the stop dogs toward expanded positions, but also to bias other elements of the running tool.

Still another form of the running tool is illustrated in Figures 12 and 13, wherein the running tool 125 includes a body 126 whose upper end is threaded so that it may be easily attached to a flexible line lowering and operating mechanism by any suitable fitting or coupling. The running tool body is provided with an elongate transverse slot 127, having a pair of plates 128 rotatably mounted therein on a pin 129 which extends transversely through the slot. A trip latch 130 disposed between such plates has one end pivotably secured to the plates and is adapted to extend laterally outwardly of the slot beyond the body. A spring 131 has its opposite ends rigidly secured to the pivot pin 129 and to the latch and urges the trip latch outwardly in a clockwise direction.

A link 132 has its opposite ends pivotally secured to the plates 128 and to a plunger 133, and the end of the link secured to the plunger is disposed in a transverse slot 134 in the upper end of the plunger and pivots about a pin 135 which extends transversely through the slot 134. This plunger 133 is slidably inserted in a longitudinal cylindrical bore 136 of the body 126 which communicates at its upper end with the slot 127 in the body. The plunger has a dependent integral prong 137 which extends axially through a skirt 138 threaded on the lower end of the body. The lower portion of the skirt is provided with radially spaced longitudinal slots 139 in which are disposed the upper portions of the supporting dogs or hooks 140. Intermediate their ends, the hooks have inwardly extending lugs 141 which are pivotally connected by means of pivot pins 142 on a hook holder 143 slidably mounted in the bore of the skirt, the lugs extending into lateral slots 144 formed in the hook holder.

The hook holder has a reduced lower end portion 145 which extends downwardly beyond the lower end of the skirt 138 and the downwardly facing annular shoulder 146 formed at the upper end of the reduced portion of the hook holder abuts the upwardly facing shoulder of an internal flange 147 on the lower end of the skirt to limit downward movement of the hook holder in the skirt. Upward movement of the hook holder is restrained by a shear pin sleeve 148 whose lower end abuts the upper end of the hook holder. The shear pin sleeve is releasably connected to a hook expander 149 by a shear pin 150 and the upper end of the hook expander abuts

the lower end 151 of the body 126 which thus prevents upward movement of the hook expander.

The hook expander has dependent expander members 152 which are disposed in registering slots 153 and 144 of the shear pin sleeve 148 and the hook holder 143, respectively. The lugs 141 of the hooks being also disposed in the slots 144, the expander member will contact the inwardly and upwardly inclined upper surfaces 121a of the hook lugs and cause the lower ends of the hooks to swing outwardly when the hook expander is moved downwardly by the spring 154 which biases the running tool plunger 133 upwardly and the hook expander downwardly.

The hook expander members 152 have downwardly and outwardly beveled cam surfaces 155 which contact the upper ends of the hooks 140 to hold the hooks in the position shown in Figure 12 until the pin 150 is sheared. As the hook expander moves downwardly in the skirt 138 after the pin is sheared, the cam surfaces permit the upper ends of the hooks to move inwardly so the lower ends of the hooks can swing outwardly.

The hooks 140 have inwardly extending flanges or catches 156 which are adapted to engage under the lower undercut shoulder of the head 59 of the collar stop body 21 whereby the collar stop is connected to and supported by the running tool.

In use, the collar stop 20 is lowered into the tubing by means of the running tool 125, whose threaded upper end is secured to the lower end of a flexible line lowering and operating mechanism by means of a suitable fitting. The various elements of the collar stop and running tool are in the positions shown in Figure 12, with the running tool plunger 133 held in lowered position against the resistance of the spring 154 by the link 132 and plates 128, the planar edges 158 of the plates 128 abutting the inner wall 159 of the body 126 to limit counterclockwise rotation of the plate. The trip latch 130 extends upwardly and outwardly from the slot 127 of the running tool body, and its outer end is yieldingly biased outwardly by the spring 131 to contact the inner wall of the tubing as the tool is lowered therethrough. The latch may be provided with a hardened metal inset or shoe 160 to protect the tip against excessive wear.

The collar stop is secured to the running tool by the hooks 140, and the prong 137 holds the stop dogs 126 in their retracted positions against the resistance of the spring 24 of the collar stop.

As the running tool and collar stop are lowered through the tubing, the outer end of the latch slides along the tubing, pivoting in a counterclockwise direction against the resistance of the spring 131 upon meeting obstructions.

When the collar stop has been lowered to the particular location at which it is to be anchored or located, the running tool is raised until the latch 130 enters into the first collar recess 30 it encounters during such upward movement. Further lifting then causes the outer end of the latch to contact the lower end 67 of the upper tubing section and, as the lifting movement is continued, the latch causes the plates 128 to rotate in a clockwise manner. This causes the point of pivotal attachment of the link 132 to the plates 128 to move to the left of the first pin 129, or past dead center, so that the upward force of the spring 154 acting on the plunger 133 moves the plunger upwardly and rotates the plates 128 to the position shown in Figure 13, wherein further clockwise rotation of the plates 128 is prevented by the engagement of the planar edges 158 of the plates with the stop surfaces 164 of the running tool body and the latch 130 is retracted into the slot 127 of said body.

The shoe 165 secured to the running tool body by a screw 166, abuts the tubing on the side opposite the latch to prevent undue lateral displacement of the tool while the latch is in engagement with the lever end of

the tubing section and is being pivoted downwardly. In tubing of smaller diameter the shoe may be omitted.

When the prong 133 moves upwardly, the stop dogs 26 are freed for upward and outward movement. The spring 24 then moves the dogs 26 outwardly into engagement with the walls of the lower tubing section below the collar recess into which the latch 130 had entered.

The running tool is then lowered until the stop dogs 26 enter into the next lower collar recess 30, the stop dogs sliding along the walls of the tubing until reaching this collar recess. Lowering of the running tool will then cause the stop shoulders 27 of the stop dogs to contact the upper end 28 of the adjacent tubing section to prevent downward movement of the collar stop and running tool in the tubing.

When the stop dogs prevent further downward movement, the lower end of the hook holder 143 rests upon the upper end of the collar stop. Downward jarring imparted to the running tool through the flexible line will soon cause the pin 150 to shear, and thus free the hook expander for downward movement relative to the hook holder and the hooks. Further downward jars will positively move the hook expander 149 downwardly to cause said member to engage the inclined surfaces 121a on the hook lugs to pivot the hooks about their pivot pins and swing the hooks outwardly from supporting engagement with the flange 59 of the collar stop.

The spring 154 is under sufficient compression, after the running tool plunger has been moved upwardly, to move the hook expander downwardly and cause the hook expander member to engage the inclined surfaces 121a on the hook lugs to hold the hooks in such disengaged position.

It will now be seen that each of the running tools includes a means for detachably securing a collar stop to the running tool whereby the running tool may be employed to lower the collar stop to a desired position in well tubing, a prong for holding the stop dogs of the collar stop in retracted positions while the collar stop is being lowered into the tubing, a release mechanism for releasing the prong to permit movement of the stop dogs from retracted toward expanded positions, and a means for freeing the collar stop from the running tool when it has been positioned in the well tubing against further downward movement therein.

It will be further seen that each of the running tools also includes an elongate body having a longitudinal cavity wherein extends a longitudinally slidable member such as the plunger 87 of Figures 4 and 5, or the plunger 133 of Figures 12 and 13 which is secured to the elongate body in a locking position by a suitable mechanism having a trip latch engageable with a downwardly facing obstruction of the well tubing, upon upward movement of the running tool in the well tubing, to free the plunger for longitudinal movement to unlocked position relative to the elongate body; a prong held in lowered position by the slidable member or plunger to hold the stop dogs in retracted positions while the plunger is held in its locking position; and a detachable securing means such as the shear pins 61 of Figure 1, the collet fingers 98 of Figure 4 or the hooks 140 of Figure 12 for securing the collar stop to the running tool, the securing means being operable to release the collar stop only after the stop dogs are in expanded positions preventing further downward movement of the collar stop in the tubing.

The foregoing description of the invention is explanatory only, and changes in the details of the constructions 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 secure by Letters Patent is:

1. A running tool for a collar stop positionable in a well tubing and having a body, a plurality of stop dogs and means biasing said dogs for upward movement

toward expanded positions, said running tool including: an elongate body having a longitudinal cavity therein; a plunger slidable longitudinally in said cavity; holding means in said running tool body engageable with said plunger to hold said plunger in an upper locked position in said running tool body; release means connected with said plunger and having a portion extending outwardly from said running tool body disposed to engage a downwardly facing obstruction in a well tubing upon upward movement of the running tool in the well tubing for releasing said holding means to free said plunger for movement from said upper locked position to a lower unlocked position in said running tool body; a prong carried by said running tool body and adapted to engage stop dogs of a collar stop to hold said stop dogs in retracted positions; said prong being held in a lowered position with respect to said plunger when said plunger is in upper locked position and adapted to engage stop dogs of the collar stop when in such lowered position to hold said stop dogs in retracted position on the stop body; said prong being movable upwardly from said lowered position with respect to said plunger when said plunger is freed for movement from upper locked position to lower unlocked position, whereby said prong is moved upwardly with respect to the stop dogs to free said stop dogs for movement toward expanded position; securing means carried by said plunger adapted to engage a collar stop for detachably securing said collar stop to said running tool, said securing means being operable to release said collar stop from said running tool, said securing means comprising means for engaging a downwardly facing shoulder of the stop body.

2. A running tool for a collar stop positionable in a well tubing and having a body, a plurality of stop dogs and means biasing said dogs for upward movement toward expanded positions, said running tool including: an elongate body having a longitudinal cavity therein; a plunger longitudinally slidable in said cavity; holding means in said running tool body releasably holding said plunger in an upper locked position in said running tool body; release means connected with said plunger and having a portion extending outwardly from said running tool body disposed to engage a downward facing obstruction of a well tubing upon upward movement of the running tool in such well tubing for releasing said holding means to free said plunger for movement from said upper locked position to a lower unlocked position; a prong carried by said running tool body and projecting therebelow, said prong being disposed to engage stop dogs of a collar stop to hold said stop dogs in retracted position when said plunger is in upper locked position; said prong being held in a lowered position with respect to said plunger when said plunger is in upper locked position and adapted to engage stop dogs of the collar stop when in such lowered position to hold said stop dogs in retracted position on the stop; said prong being movable upwardly from such lowered position upon release of said plunger from said locked position, whereby said prong is moved from a position wherein it holds said stop dogs in retracted position to a position permitting said stop dogs to move from retracted toward expanded position; and securing means carried by said plunger disposed to engage said collar stop for detachably connecting said collar stop to said running tool, said securing means being operable to release said collar stop from said running tool.

3. A running tool for a collar stop insertable in a well tubing and having a body, a plurality of stop dogs and means biasing said dogs for upward movement toward expanded position, said running tool including: an elongate body; first means carried by said running tool body for releasably securing said collar stop body to said running tool body; second means carried by said running tool body and adapted to engage said stop dogs to hold said stop dogs in retracted positions upon the collar stop

body, said first and second means being movable longitudinally with respect to each other between locked and released positions, one of said first and second means being movable longitudinally with respect to said running tool body and the other of said first and second means being secured against longitudinal movement relative to said running tool body, said second means when said first and second means are in said locked positions engaging said stop dogs to hold said stop dogs in retracted positions, said second means when said first and second means are in said released positions being movable longitudinally with respect to said first means to permit movement of said stop dogs to expanded positions; and holding and release means operatively connected with said body and with one of said first and second means for initially releasably holding said first and second means in said locked positions, said holding and release means comprising a portion extending outwardly from said running tool body disposed to engage a downwardly facing obstruction of the well tubing upon upward movement of the running tool in the well tubing for releasing said first and second means for movement from said locked positions to said released positions.

4. A running tool of the character set forth in claim 3, wherein said holding and release means includes: a shear pin connecting said first means to said running tool body to hold said first means in locked position.

5. A running tool as set forth in claim 3 including: biasing means carried by said running tool body operatively associated with one of said first and second means for biasing said first and second means toward said released positions.

6. A running tool for a collar stop positionable in a well tubing and having a body, a plurality of stop dogs and means biasing said stop dogs for lateral movement toward expanded position, said tool including: a body; means carried by said running tool body adapted for initially detachably connecting the running tool to the collar stop body; holding means carried by the running tool body adapted to engage the stop dogs of said collar stop to hold said stop dogs in retracted position when said running tool is connected to said collar stop, said holding means being movable longitudinally relative to said means for detachably connecting the running tool to the collar stop, whereby said holding means may be moved between a position holding the stop dogs of the collar stop in retracted position and a releasing position freeing said stop dogs for movement toward expanded position while said running tool body is connected with the collar stop by said connecting means; means carried by said running tool body initially releasably securing said holding means in position to engage said stop dogs to hold said stop dogs in retracted position when said running tool is connected to said collar stop; and release means connected with said securing means and having means engageable with the inner wall of the well tubing and actuatable upon upward movement of said running tool in the well tubing to release said holding means for movement to releasing position to permit said stop dogs to move toward expanded position.

7. A running tool of the character set forth in claim 6, wherein the holding means includes a plate rotatably connected to the body, and a link pivotally connected at opposite ends to the plunger and the plate; and wherein the release means comprises a latch pivotally connected at one end to said plate and extending upwardly and outwardly of said cavity in said body, and means biasing said latch outwardly.

8. A running tool for a collar stop positionable in a well tubing and having a body, a plurality of stop dogs, and means biasing said stop dogs for upward movement toward expanded position, said running tool including: an elongate body having a longitudinal cavity; a plunger slidable longitudinally in said cavity; holding means in said running tool body initially releasably holding said

plunger in an upper locked position in said running tool body; securing means carried by said plunger adapted to engage said collar stop for detachably connecting said collar stop to said running tool; a prong carried by said running tool body, said prong and said securing means being longitudinally movable with respect to each other, said prong being held in a lowered position with respect to said securing means when said plunger is moved longitudinally in said cavity to said upper locked position and adapted to engage the stop dogs of the collar stop when in such lowered position to hold the said stop dogs in retracted position on the stop; and release means connected with said plunger and having a portion extending outwardly from said running tool body disposed to engage said well tubing upon upward movement of the running tool in said well tubing for releasing said holding means to permit relative longitudinal movement between said prong and said securing means.

9. A running tool for a well tool positionable in a well tubing and having a body, a plurality of stop dogs, and means biasing said stop dogs for upward movement toward expanded position, said running tool including: an elongate body having a longitudinal cavity; a plunger slidable longitudinally in said cavity, said plunger being movable longitudinally between extreme positions in said cavity and locked in an extreme position in said running tool body; securing means carried by one of said plungers and said running tool body adapted to engage said well tool body for detachably connecting said well tool to said running tool; a prong carried by the other of said plungers and said running tool body, said prong and said securing means being longitudinally movable with respect to each other, said prong being held in a lowered position with respect to said securing means when said plunger is in said locked position and adapted to engage the stop dogs of the well tool when in such lowered position to hold said stop dogs in retracted position on the stop body; holding means in said running tool body connecting said plunger and said running tool body releasably holding said plunger in said locked position; and release means operatively connected with said holding means and having a portion extending outwardly from said running tool body disposed to engage a well tubing upon upward movement of the running tool in said well tubing for releasing said holding means to permit relative longitudinal movement between said prong and said securing means.

10. A running tool of the character set forth in claim 9, wherein said holding means comprises an over-center mechanism including a plate rotatably connected to the plunger and a link pivotally connected at opposite ends to the body and to the plate; and wherein said releasing means comprises a latch pivotally connected at one end to said plate and extending upwardly and outwardly of said cavity in said body, and means carried by said body and biasing said latch outwardly.

11. A running tool of the character set forth in claim 9, wherein said securing means comprises a collet carried by said plunger and having dependent resilient fingers adapted to engage a collar stop; a collet expander means longitudinally slidable in said collet and engageable with said collet fingers for expanding said fingers out of engaging position, and means engageable with said collet expander for moving said expander downwardly relative to said collet fingers to expand said fingers to expanded position.

12. A running tool of the character set forth in claim 9, wherein the holding means comprises an over-center mechanism including a plate rotatably connected to the plunger and a link pivotally connected at opposite ends to the body and to the plate; and said securing means comprises a collet carried by said plunger and having dependent resilient fingers adapted to engage a collar

stop, a collet expander longitudinally slidable in said collet and engageable with said fingers for expanding said fingers out of engaging position, and means engageable with said collet expander for moving said expander downwardly to expand said fingers out of engaging position.

13. A running tool of the character set forth in claim 9, wherein said securing means comprises: a hook carrier, a plurality of hooks pivotally secured to said hook carrier and adapted to engage a collar stop; expander means slidable in said body and engageable with said hooks for swinging said hooks out of engaging position; and means initially holding said expander means out of operative engagement with the said hooks and releasable to permit said expander means to move relative to said hooks to swing said hooks to non-engaging position.

14. A running tool of the character set forth in claim 9, wherein said holding means includes a plate rotatably connected to the plunger and a link pivotally connected at opposite ends to the body and the plate; said release means comprises a latch pivotally connected at one end to said plate and extending upwardly and outwardly of the cavity in said body, and means biasing said latch outwardly; and said securing means comprises a hook carrier carried by said body, a plurality of hooks pivotally secured to said hook carrier and adapted to engage a collar stop, expander means slidable in said body and adapted to engage said hooks to pivot said hooks out of engaging position, and releasable means carried by said body and engaging said expander means and initially holding said expander means out of operative engagement with said hook members, said means being releasable to permit said expander means to move into engagement with said hook members to swing said hook members to non-engaging position.

15. A running tool of the character set forth in claim 9, wherein said securing means comprises: shear means carried by said running tool body and adapted to engage said well tool to releasably connect said running tool to said well tool, said shear means being shearable to release said connection.

16. A running tool of the character set forth in claim 9, wherein said securing means comprises: a collet carried by the plunger and having resilient fingers depending therefrom and engageable with a well tool to connect said running tool with said well tool; and collet finger expanding means movable relative to said collet fingers and engaging said collet fingers to expand said fingers from engaging position whereby said collet may be detached from said well tool.

17. A running tool of the character set forth in claim 9 wherein said securing means comprises: depending hook members pivotally carried by said running tool body and adapted to engage a well tool to connect said running tool to said well tool, and hook pivoting means carried by said running tool body and movable relative to said hook member to engage the said hook members to pivot said hook members out of engagement with the well tool, whereby the running tool may be disconnected from said well tool.

18. A running tool of the character set forth in claim 9, wherein said holding means comprises: an over-center mechanism including a plate rotatably connected to the plunger; and a link pivotally connected at opposite ends to the running tool body and to the plate.

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