

Aug. 9, 1960

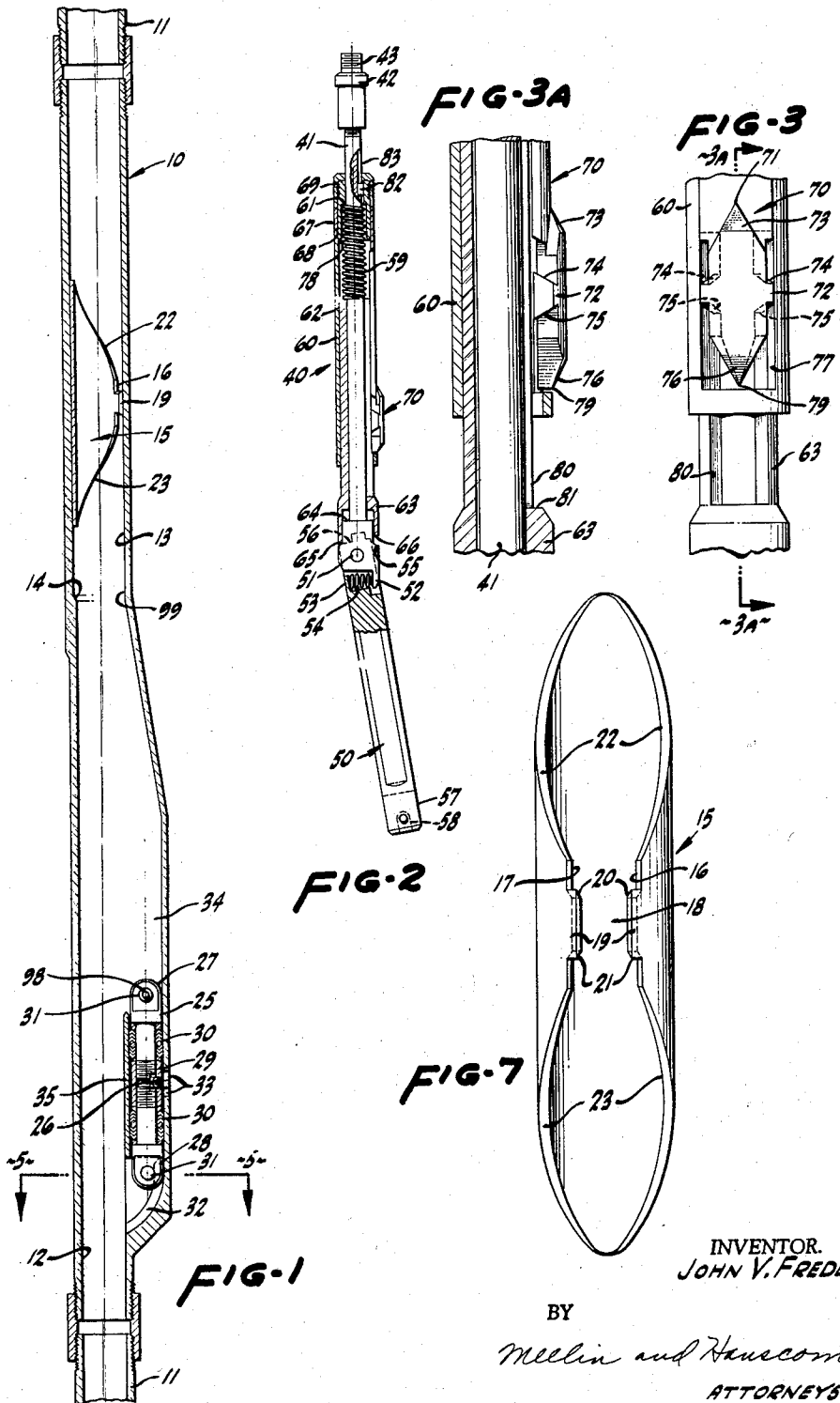
J. V. FREDD

2,948,341

OFFSET CIRCULATING NIPPLE AND TOOLS

Filed June 2, 1958

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG-4

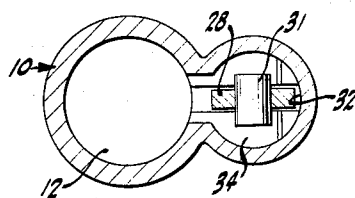
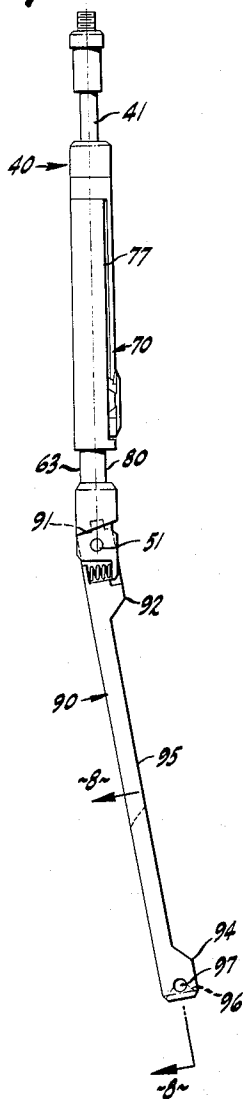


FIG-5

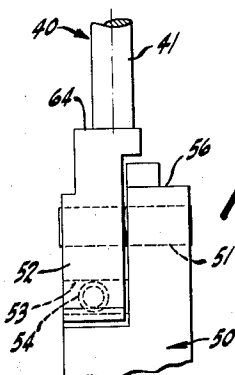
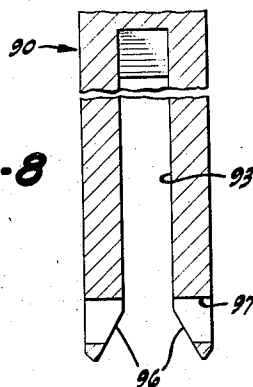


FIG-6

FIG-8



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1

2,948,341

OFFSET CIRCULATING NIPPLE AND TOOLS

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14 Claims. (Cl. 166—218)

This invention relates to means for installing and removing a plug, gas lift valve, or like tool in and from, respectively, a circulating nipple or offset mandrel laterally of the main bore of the nipple made up in a well tubing string.

A principal object of this invention is to provide new and improved means for so installing and removing such gas lift valves, tools, and the like.

Another object is to provide such means for so installing and removing such tools, which means are pre-set at the surface of the well so that they will direct a tool into or remove it from the desired circulating nipple without the necessity of other equipment other than the conventional wire line and associated tools.

Another object is to provide such means which cooperate with the peculiarly internally configured mandrel to so install the tool.

Another object is to provide such means which remain in the main bore of the offset mandrel while the gas lift valve is being so installed or removed.

A further object is to provide an offset mandrel which can be employed as a circulating member when not being used as a receptacle for a plug, gas lift valve, or other such tools.

Yet another object is to provide such an offset mandrel which cannot prevent passage of the installing and removing means therethrough.

Other objects and advantages will become apparent in the course of the following detailed description.

In the drawings, forming a part of this application, and in which like parts are designated by like reference numerals throughout the same.

Fig. 1 is an elevational sectional view of an offset mandrel constructed in accordance with the invention, shown with a plug installed therein.

Fig. 2 is an elevational sectional view of a running tool constructed in accordance with the invention, with a running attachment connected thereto, and illustrating the arrangement of parts in an offsetting operation.

Fig. 3 is a fragmental elevational view of the running tool of Fig. 2 illustrating the guide key details.

Fig. 3A is a sectional view, taken on line 3A—3A of Fig. 3.

Fig. 4 is an elevational view of a pulling attachment for use with the running tool of Fig. 2.

Fig. 5 is a sectional view of the mandrel and plug therein, taken on line 5—5 of Fig. 1.

Fig. 6 is an elevational detail of the connection between the running tool and running attachment.

Fig. 7 is a perspective view of the guide shoe.

Fig. 8 is an enlarged sectional view of the pulling attachment, taken on line 8—8 of Fig. 4.

Referring now to the drawings, the elongated offset mandrel or circulating nipple 10 shown in Fig. 1 is made up in a tubing string 11 so that its vertical main bore 12 is in alignment with and forms a continuation of the main bore of the tubing string. The upper portion of

2

the offset mandrel has a bore 13 greater in diameter than the main bore 12, which larger bore terminates with the shoulder 14. A guide shoe 15 is fixedly and concentrically inserted in the bore 13.

The tubular guide shoe 15 mounted in the upper end of the main bore 12 and concentric therewith, as best seen in the perspective view of Fig. 7, has spaced apart vertical side walls 16 and 17 forming a longitudinal slot 18 therebetween extending from the upper to the lower surfaces of the guide shoe. Projections 19, integral with the guide shoe, extend from each of the side walls 16 and 17 horizontally into the slot, and are provided with upwardly and outwardly sloping cam surfaces 20 on the upper surfaces thereof, and with downwardly and outwardly sloping cam surfaces 21 on the lower surfaces thereof. The upper surface 22 of the guide shoe extends helically upwardly from each side of the slot 18, and the lower surface 23 of the guide shoe extends helically downwardly from each side of the slot.

Referring again to Fig. 1, the plug 25 is symmetrical about a plane through the longitudinal axis of setscrew 26. Two subs 27 and 28 are threadedly inserted in a sleeve 29 until setscrew 26 can be inserted in the sleeve and seated in notches on the end of each of the subs. Packing assemblies 30, which may be of the V type, encircle each of the subs 27 and 28 and are maintained in this position by a flange near the ends of the plugs and the ends of sleeve 29. The lower portion of the lower sub 28 is shown in cross section in Fig. 5 as inserted in a longitudinal groove 32 formed in the mandrel. The upper portion of the upper sub 27 is identical to that of the lower sub. Also, the upper portion of the upper sub contains a pin 31 which protrudes from each side of the upper sub. The lower sub may or may not contain such a pin 31, as desired, and is illustrated with such a pin. The upper portion of upper sub 27 and the lower portion of lower sub 28 are maintained in alignment by setscrew 26 in order that the lower sub may be inserted in the groove 32, as shown, and in order that the upper sub may be engaged by the running tool and the pulling tool. As shown installed, the plug 25 prevents communication through the ports 33 of the mandrel.

The open topped offset pocket portion 34 of the mandrel is formed partially by the wall 35 so as to be offset from the main bore 12 and is of such design that the plug 25 may be lowered thereinto from the bore 12 or may be removed therefrom. It is within the scope of this invention to modify the offset mandrel by increasing or decreasing the lengths of the offset pocket and mandrel, by rearranging the ports 33, or by otherwise modifying the mandrel to accommodate a gas lift valve or other tool currently known in the industry.

Referring now to the running tool 40 illustrated in Fig. 2, it is seen that the elongated cylindrical plunger 41 is threadedly connected at its upper end to sub 42 threaded at 43 and at its lower end to running attachment 50 by the pin 51. This connection of the plunger and the running attachment rotated 90 degrees is shown in Fig. 6. Particular features of this connection to be noted are that the plunger 41 and running attachment 50 can pivot about pin 51 with respect to each other, and that the longitudinal axes of the plunger and the running attachment are normally parallel due to the force exerted on surfaces 52 and 53 by spring 54. The lower portion of running attachment 50 is essentially a cylindrical member having a bifurcated lower portion 57 in which the upper portion of upper sub 27 (Fig. 1) may be inserted, and the bifurcated arms have grooves 58 therein in which the outwardly extending portions of pin 31 of the plug may be removably secured.

Spring 59, freely encircling a part of plunger 41, is

enclosed within the elongated body 60 and abuts on one end shoulder 61 and on its other end the upper end 62 of holder 63. Holder 63 slidably encloses a part of plunger 41 and is, in turn, slidably and partially enclosed within body 60. The lower portion of holder 63 is of enlarged external diameter and is drilled to receive the flanged portion of the plunger between shoulders 64 and 55. The surface 65 of the lower end of the holder extends below the surface 66. Tubular guide 67 encircles a portion of body 60 and is maintained in the position shown by abutment with shoulder 68 and the lower end of cap 69 which is threadedly connected to the body.

As shown in Fig. 2, guide key 70 is an integral portion of the guide 67, extends downwardly therefrom on one side of the guide, and has the same external diameter as the guide down to the point 71. The guide has an outwardly extending portion 72 from the point 71 to its lower end, which raised portion has downwardly and outwardly extending sloped surfaces 73 and 74 and downwardly and inwardly extending sloped surfaces 75 and 76, as seen in Figs. 2 and 3.

When assembled, the guide key 70 is positioned in a window 77 in body 60 extending from shoulder 78 to the point 79. A window 80 in holder 63 is positioned inwardly of the window in the body 60 and extends from the shoulder 81 to the upper end 62 of the holder. As so assembled, the guide key 70 can be forced inwardly into the windows in the body and holder as the raised portion 72 of the guide encounters obstructions in the tubing string or in the offset mandrel.

Relative rotation between the plunger 41 and the body 60 is prevented by means such as the key 82 carried by the body 60 and extending into the longitudinal key groove 83 in plunger 41. Both the body member 60 and the holder or sleeve 63 telescopically surround the plunger 41.

When spring 59 is uncompressed, running attachment shoulder 56 and plunger shoulder 55 do not contact the lower end 65 of the holder, and spring 54 causes the longitudinal axis of the running attachment to be in alignment with that of the plunger 41. Now, if the assembly consisting of the guide key 70, guide 67, body 60, and cap 69 (fixedly connected to each other) be held stationary while the plunger 41 is forced upwardly, spring 59 will be compressed, and holder 63 will be forced downwardly with respect to the plunger so that its lower end 65 will abut shoulder 56, thus causing the running attachment 50 to pivot about pin 51 to the position, shown in Fig. 2. This situation will occur when guide key 70 is held downwardly by guide shoe 15, and plunger 41 is pulled upwardly with a wire line. In this position, the running attachment 50 will be directed toward the offset pocket 34 of the offset mandrel shown in Fig. 1.

The running tool of this invention illustrated in Fig. 4 is identical in every respect to the running tool shown in Fig. 2 except that the pulling attachment 90 of Fig. 4 is substituted for the running attachment 50 shown in Fig. 2. The portion of the pulling attachment 90 between the shoulder 91 and the point 92 is an exact duplicate of the portion of the running tool 40 shown in Figs. 2 and 6, and functions in combination with plunger 41 and holder 63 in exactly the same manner as does the running attachment.

While the running attachment 50 and pulling attachment 90 are similar in that each is a generally cylindrical member, and they are bifurcated on their lower ends 57 and 93, respectively, they differ in that: (1) the pulling attachment has a greater length; (2) a portion of the pulling attachment 90 from the point 92 to the point 94 is removed to produce surface 95 parallel to its longitudinal axis; and (3) each of the arms of the bifurcated lower end of the pulling attachment has a groove 96 machined in its lower end, having a bore 97 for engaging pin 31 (Fig. 1) of the plug 25 for removing the plug from the offset mandrel 10.

In the operation of the above described apparatus, and with the offset mandrel 10 made up in the tubing string without the plug 25 being installed therein, communication between the casing annulus and bore 12 of the mandrel is had through the ports 33. Should it be desired to close the ports, an assembly consisting of the running tool shown in Fig. 2 with plug 25 connected to the bifurcated lower portion of running attachment 50 by shear pin 98 and the conventional wire line and jars connected to sub 42 at 43 is made up at the wellhead and is inserted and lowered into the tubing string. Since spring 59 is uncompressed, spring 54 tends to keep the longitudinal axes of the plunger 41, running attachment 50, and plug 25 in alignment, as previously described. During this downward movement, the lower end of sub 42 abuts the upper end of cap 69, and the tool is forced downwardly past minor obstructions in the tubing string by jars applied to sub 42 which cause the guide key 70 to flex inwardly into the windows 77 and 80 in body 60 and holder 63.

When the running tool enters offset mandrel 10 and the lower end of the raised portion 72 of the guide key engages the helical surfaces 22 of the guide shoe 15, downward jars cause the raised portion 72 to move along the surface 22 and cause the running tool to be positioned properly within the offset mandrel. This alignment is obtained due to the fact that the width of the slot 18 between the slot walls 16 and 17 is just adequate to permit the main portion of the raised surface 72 between the inclined surfaces 74 and 75, on either side thereof, to pass through. Even when this alignment is acquired, downward movement of the running tool is temporarily stopped by engagement of the guide key surfaces 75 with the cam surfaces 20 of the guide shoe. Further downward jarring causes the raised surface 72 to flex inwardly and the running tool to pass downwardly through the guide shoe until the surfaces 74 are below the surfaces 21. The running tool is now pulled upwardly until the raised surface 72 thereon engages the guide shoe surface 21, at which time the lower end of plug 25 is disposed in the tubing bore below the pocket opening. An upward strain is taken on the wire line, to compress spring 59 so that the effect of spring 54 will be overcome. The running tool attachment 50 is not deflected, however, until plug 25 is raised high enough to clear the inner wall of the pocket, at which time the plug is snapped laterally into the offset above the pocket. Then, as the strain on the wire line is eased, spring 59 forces the plug downwardly into the pocket. This last action occurs before the effect of spring 54 can again be realized; hence, any tendency of spring 54 to deflect the plug from the pocket entrance, once it is positioned thereover, is eliminated. The running tool is now jarred downwardly to seat the plug and shear the shear pin 98. The ports 33 are now closed.

The running tool is raised until the upper end of raised portion 72 engages the downwardly facing helical surfaces 23 of the guide shoe. An upward strain on the wire line then causes the raised portion 72 to rotate the running tool until it is in the guide shoe slot 18 and the guide key surfaces 74 abut the surfaces 21 of the guide shoe. Upward jarring of the wire line causes the guide key to flex inwardly and to move above the guide shoe. The entire assembly of running tool jars and wire line may be retracted from the tubing string.

When it is desired to remove the plug 25 from the offset mandrel, the pulling attachment 90 is connected to plunger 41 of the running tool 40 in lieu of running attachment 50. A wire line and jars are connected to the sub 42 and the assembly is run into the tubing string, as was the running tool, until the raised surface 72 of the guide key is below the surfaces 21 of the guide shoe. An upward strain taken on the wire line causes the guide key surfaces 74 to abut surfaces 21, as before, and the pulling attachment is deflected about pin 51 until the

lower bifurcated end 93 is directed toward the upper sub 27 of the plug. The running tool is now jarred downwardly until the pin 31 of the plug enters the slot 96, and spreads the bifurcated attachment end slightly so that the pin 31 enters into the bores 97 to be supported therein. An upward strain on the wire line removes plug 25 from the offset pocket, the surface 95 permitting the pulling attachment to clear the surface 99 of the offset mandrel. The running tool 40 is now raised until the guide key surfaces 74 abut the guide shoe surfaces 21, as in the case with the running tool, and the running tool is jarred upwardly to cause the guide key to flex inwardly and pass above the guide shoe. The wire line, jars, running tool, pulling attachment and plug are then removed from the tubing string.

It is to be noted that in practice a number of offset mandrels 10 may be made up in the tubing string at various levels therein. Furthermore, these mandrels may be identical in size and construction; and yet, a plug 25 may be installed or removed from any one of the mandrels, as desired, with the same running and pulling attachments on the running tool 40. This is due to the fact that the running attachment 50 or pulling attachment 90 is normally maintained in alignment with the plunger 41 and hence with the tubing string unless purposely deflected about pin 51 by the operator at the wellhead.

It is also to be noted that when the running tool is being lowered into the tubing string, only two requirements are placed on the operator in order to install or remove a plug in or from a particular offset mandrel. First, he must know the location of the particular offset mandrel in the tubing string and the depth at which the running tool is located at any instant. Secondly, he must jar the running tool upwardly and downwardly, as necessary, when the running or pulling attachments are properly positioned in the offset mandrel in order to insert or remove plug 25 in or from the offset pocket.

It is further to be noted that a gas lift valve or other tool may be substituted for plug 25 merely by modifying the offset pocket portion of the offset mandrel, as is common knowledge within the industry.

It is to be realized that the form of the invention, herewith shown and described, is to be taken as a preferred embodiment of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the attached claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key projecting outwardly from said body member and having a width enabling it to fit within said guide shoe slot, an elongated plunger telescopically mounted in said body member for longitudinal movement relative thereto, means to prevent relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and spring means confined between

said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot will cause the lower end of said attachment member to move towards the open end of said offset pocket.

2. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, a projection formed on one of said guide shoe wall portions and extending horizontally into said slot; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key projecting outwardly from said body member and having a width enabling it to fit within said guide shoe slot, an upwardly facing surface of said guide key portion engageable with the lower surface of said guide shoe projection, an elongated plunger telescopically mounted in said body member for axial movement relative thereto, means restraining relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot with the upwardly facing guide key surface engaging the lower guide shoe projection surface will cause the lower end of said attachment member to move towards and over the open end of said offset pocket.

3. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key having a portion thereof normally projecting outwardly from said body member, said guide key being resiliently mounted on said body member for movement of said guide key portion towards and away from the vertical axis of said body member, said guide key portion having a width enabling it to fit within said guide shoe slot, interengageable cam surfaces on said guide key and guide shoe to restrain upward movement of said guide key through said guide shoe slot, an elongated plunger telescopically mounted in said body member for non-rotative longitudinal movement relative thereto, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end

for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot with said cam surfaces in engagement will cause the lower end of said attachment member to move towards and above the open end of said offset pocket.

4. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, said guide shoe having its lower surface extending helically downwardly from each side of said slot; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key having a portion thereof normally projecting outwardly from said body member, said guide key being resiliently carried by said body member for movement of said guide key portion towards and away from the vertical axis of said body member, said guide key portion having a width enabling it to fit within said guide shoe slot, interengageable cam surface means on said guide key and guide shoe for restraining upward movement of said guide key through said guide shoe slot, an elongated plunger telescopically mounted in said body member for axial movement relative thereto, means restraining relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring means confined between said plunger and said attachment member for normally maintaining said plunger and said attachment member in co-axial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot and said cam surface means are in interengagement will cause the lower end of said attachment member to move towards and above the open end of said offset pocket.

5. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, a projection formed on one of said guide shoe

wall portions and extending horizontally into said slot, said projection having a downwardly and outwardly sloping cam surface on the lower surface thereof, said guide shoe having its lower surface extending helically downwardly from each side of said slot; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key projecting outwardly from said body member and having a width enabling it to fit within said guide shoe slot, a downwardly and outwardly sloping cam surface on the upper surface of said guide key portion engageable with the lower surface of said guide shoe projection, an elongated plunger telescopically mounted in said body member for non-rotative longitudinal movement relative thereto, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring means for normally maintaining said plunger and said attachment member in coaxial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot with the cam surfaces of said guide key and guide shoe in abutting engagement will cause the lower end of said attachment member to move towards and over the open end of said offset pocket.

6. Apparatus of the character described comprising: an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, a projection formed on each of said guide shoe wall portions and extending horizontally into said slot, said projections having downwardly and outwardly sloping cam surfaces on the lower surfaces thereof and upwardly and outwardly sloping cam surfaces on the upper surfaces thereof, said guide shoe having its lower surface extending helically downwardly from each side of said slot and its upper surface extending helically upwardly from each side of said slot; a vertically disposed running tool comprising an elongated body member adapted to pass through said guide shoe, a guide key having a portion thereof normally projecting outwardly from said body member, said guide key being resiliently mounted on said body member for movement of said guide key portion towards and away from the vertical axis of said body member, said guide key portion having a width enabling it to fit within said guide shoe slot, downwardly and outwardly sloping cam surfaces on the upper surface of said guide key portion engageable with the lower surfaces of said guide shoe projections and upwardly and outwardly sloping cam surfaces on the lower surface of said guide key portion engageable with the upper surfaces of said guide shoe projections, an elongated plunger telescopically mounted in said body member for longitudinal movement relative thereto, means restraining relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably en-

gaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring means confined between said plunger and said attachment member for normally maintaining said plunger and said attachment member in co-axial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder, said guide key and plunger being angularly related to the angular relation of said guide shoe slot and said offset pocket whereby pivotal movement of said attachment member relative to said plunger when said guide key is in said guide shoe slot with the upper surfaces of the guide key in engagement with the lower surfaces of the guide shoe projections will cause the lower end of said attachment member to move towards and over the open end of said offset pocket.

7. Apparatus of the character described comprising an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, and a projection formed on one of said guide shoe wall portions and extending horizontally into said slot.

8. Apparatus of the character described comprising an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, a projection formed on one of said guide shoe wall portions and extending horizontally into said slot, said projection having a downwardly and outwardly sloping cam surface on the lower surface thereof, said guide shoe having its lower surface extending helically downwardly from each side of said slot.

9. Apparatus of the character described comprising an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, and a projection formed on one of said guide shoe wall portions and extending horizontally into said slot, said projection having a downwardly and outwardly sloping cam surface on the lower surface thereof and an upwardly and outwardly sloping cam surface on the upper surface thereof, said guide shoe having its lower surface extending helically downwardly from each side of said slot and its upper surface extending helically upwardly from each side of said slot.

10. Apparatus of the character described comprising an elongated offset mandrel having a vertical main bore therethrough, means forming an open topped, well tool receiving pocket in the lower end of said mandrel and offset from said main bore, a port through the side of said mandrel into said pocket, said mandrel having a longitudinal groove on its internal surface at the lower end of said pocket, a tubular guide shoe mounted in the upper end of said main bore concentric therewith, said guide shoe having spaced apart vertical wall portions

forming a longitudinal slot therebetween extending from the upper to the lower surface of said guide shoe, and a projection formed on each of said guide shoe wall portions and extending horizontally into said slot, said projections having downwardly and outwardly sloping cam surfaces on the lower surfaces thereof and upwardly and outwardly sloping cam surfaces on the upper surfaces thereof, said guide shoe having its lower surface extending helically downwardly from each side of said slot and its upper surface extending helically upwardly from each side of said slot.

11. A running tool comprising an elongated vertically disposed body member, a guide key projecting outwardly from said body member, an elongated plunger telescopically mounted in said body member for longitudinal movement relative thereto, means to prevent relative rotation between said body member and said plunger, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder.

12. A running tool comprising an elongated vertically disposed body member, a guide key projecting outwardly from said body member, an elongated plunger telescopically mounted in said body member for non-rotative longitudinal movement relative thereto, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring means for normally maintaining said plunger and said attachment member in co-axial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder.

13. A running tool comprising a vertically disposed, elongated body member, a guide key having a portion thereof normally projecting outwardly from said body member, said guide key being carried by said body member for movement of said guide key portion towards and away from the vertical axis of said body member, an elongated plunger telescopically mounted in said body member for longitudinal movement relative thereto, means restraining relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring means confined between said plunger and said attachment member for normally maintaining said plunger and said attachment member in co-axial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder.

14. A running tool comprising an elongated vertically disposed body member, a guide key having a portion

11

thereof projecting outwardly from said body member, said guide key being resiliently mounted on said body member for movement of said guide key portion towards and away from the vertical axis of said body member, a downwardly and outwardly sloping cam surface on the upper surface of said guide key portion and an upwardly and outwardly sloping cam surface on the lower surface of said guide key portion, an elongated plunger telescopically mounted in said body member for longitudinal movement relative thereto, means restraining relative rotation between said plunger and said body member, an elongated attachment member pivotally mounted at its upper end to the lower end of said plunger, said attachment member having means on its lower end for releasably engaging a well tool and a shoulder on its upper end offset from the axis thereof, first spring

12

means confined between said plunger and said attachment member for normally maintaining said plunger and said attachment member in co-axial alignment, a sleeve member surrounding said plunger and telescopically mounted thereon for longitudinal movement relative thereto, said sleeve member having a lower portion engageable with said attachment member shoulder, and a second spring means confined between said body member and said sleeve member for biasing said sleeve member downwardly against said attachment member shoulder.

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