Oct. 10, 1961 F. L. LE BUS, SR., ET AL 3,003,561

FREE WHEELING WASH-OVER SPEAR MECHANISM

Filed Nov. 21, 1957 3 Sheets-Sheet 1

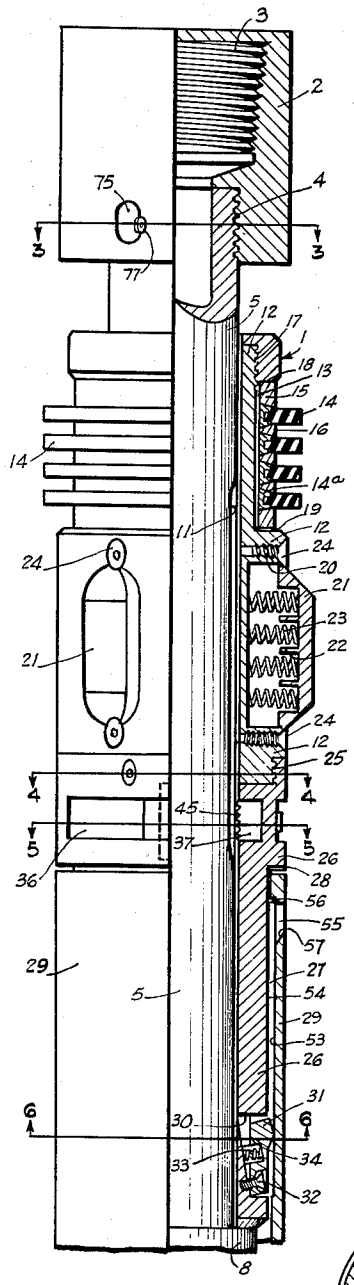


Fig. 1

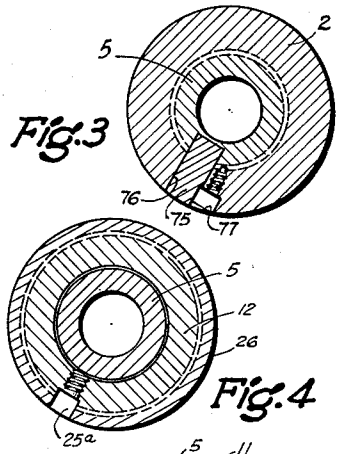


Fig. 3

Fig. 4

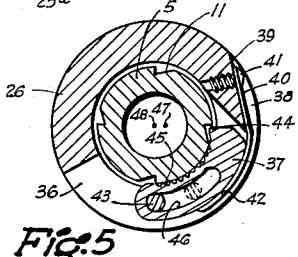


Fig. 5

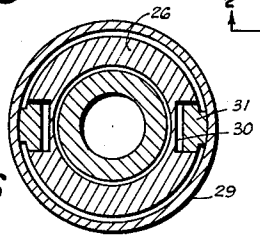


Fig. 6

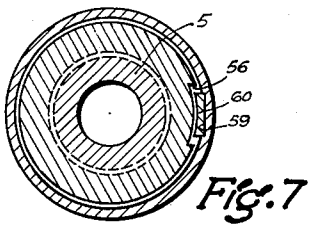


Fig. 7

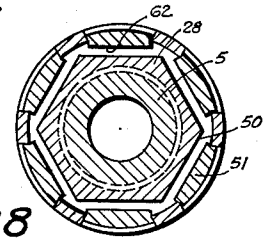


Fig. 8

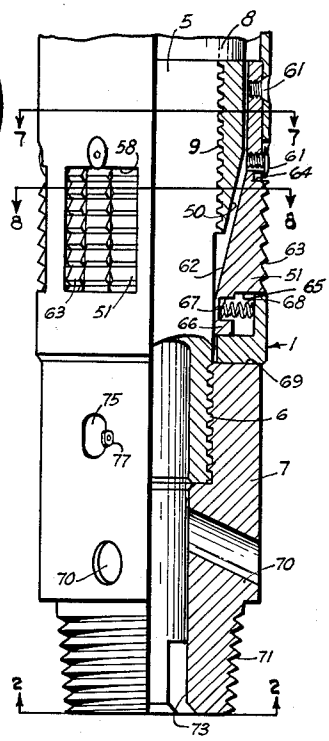


Fig. 1A

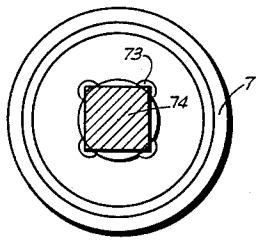


Fig. 2

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FREE WHEELING WASH-OVER SPEAR MECHANISM

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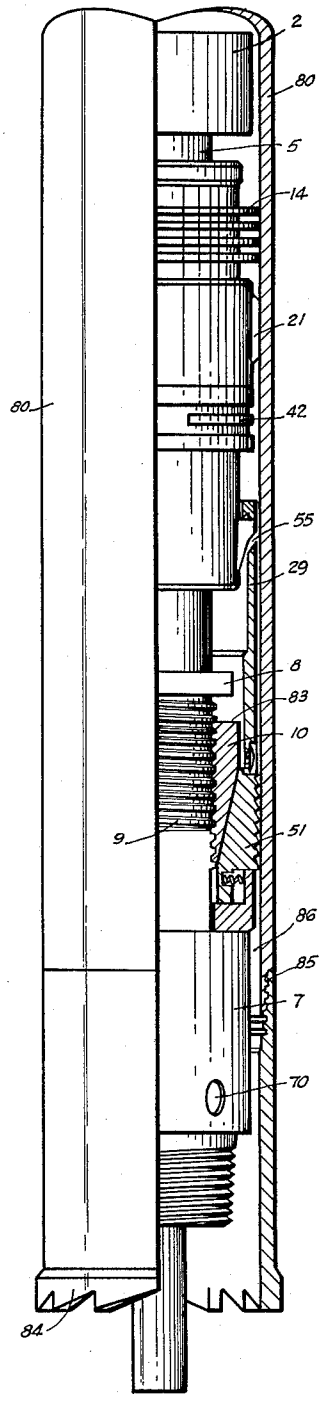


Fig. 9

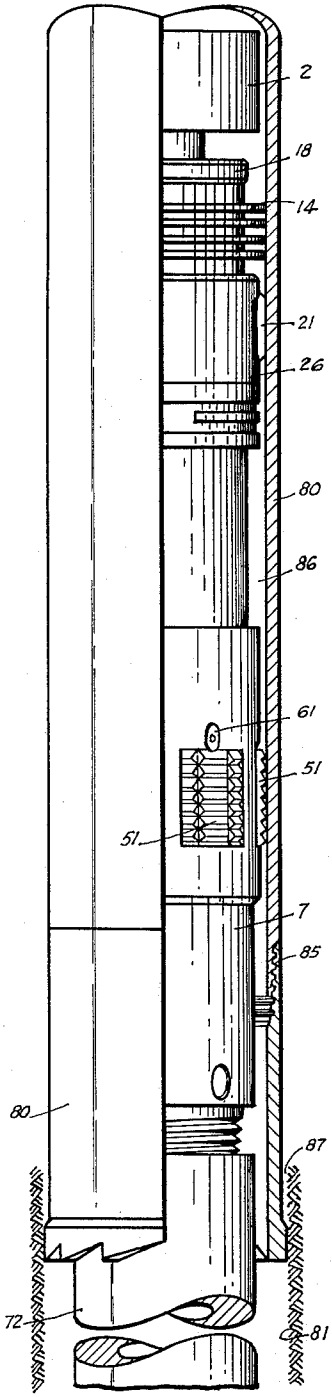


Fig. 10

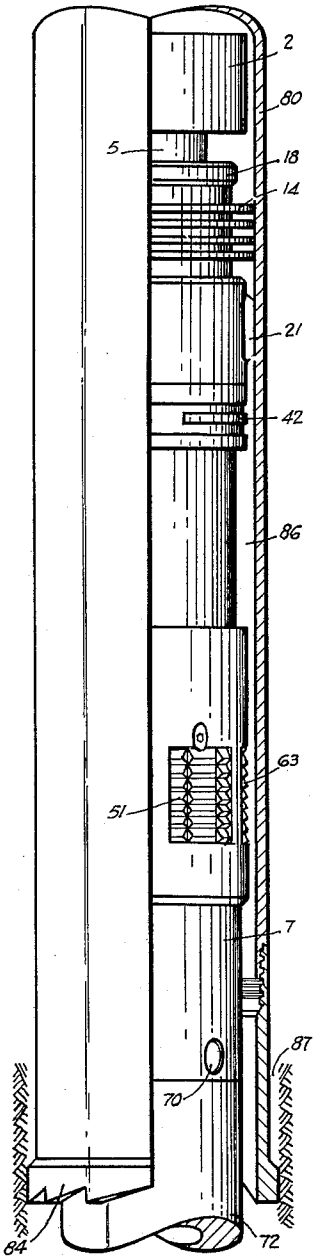


Fig. 11

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FREE WHEELING WASH-OVER SPEAR MECHANISM

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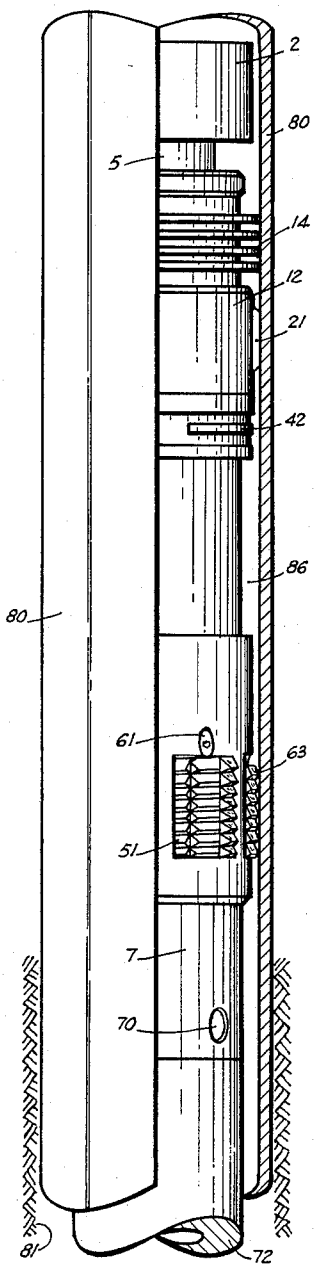


Fig. 12

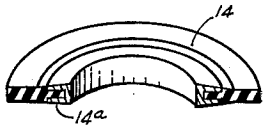


Fig. 14

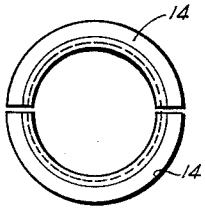


Fig. 15

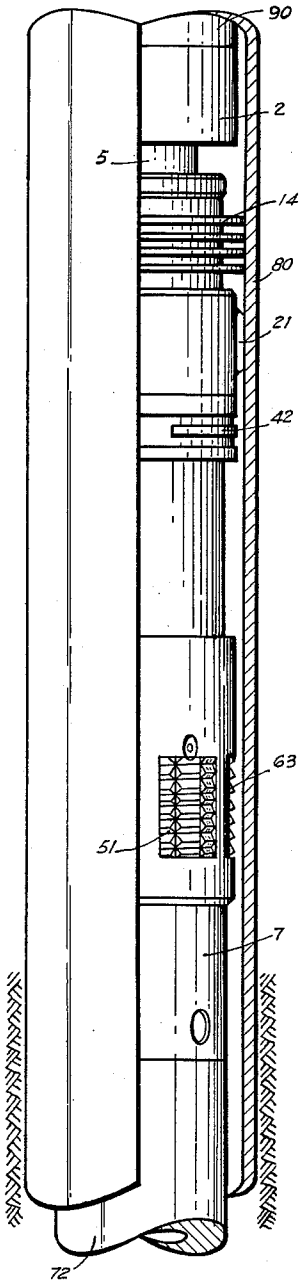


Fig. 13

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United States Patent Office 3,003,561 Patented Oct. 10, 1961

3,003,561 FREE WHEELING WASH-OVER SPEAR MECHANISM

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Filed Nov. 21, 1957, Ser. No. 697,861
9 Claims. (Cl. 166—99)

This invention relates to improvements in fishing tools and more particularly, but not by way of limitation, to a fishing tool apparatus for the catching of loosened pipe or drill collars that have become stuck in an off bottom position in the well bore. This application is an improvement over the prior pending applications filed by applicants, Serial No. 677,660 and Serial No. 678,215.

In the drilling of wells by the rotary drilling method, and particularly deep oil wells, the well bore frequently deviates from the true vertical. Such deviations are ordinarily caused by the drill bit contacting slanting geological structures and being forced from its true vertical course. When drilling a deep oil well by the rotary method, the drill bit is secured to the lower end of one or more drill collars and the drill collars are in turn suspended from a long string of drill pipe. The drill collars are tubular members, usually approximately thirty feet in length, and are substantially heavier and more rigid than the regular drill pipe. In the event the drill bit is forced from a true vertical direction during the drilling operation, the drill collars will contact the side of the well bore and tend to remain in a vertical position. When this occurs, continued rotation of the drilling string will cause the drill collars to rub the side of the well bore and form a smaller bore in the earth slightly off-set from the well bore formed by the drill bit. These off-set bores formed by the drill collars are commonly known as "key seats."

When a drill bit is being removed from a well bore containing one of these key seats, the bit frequently becomes lodged therein to prevent immediate removal of the complete drilling string from the well bore. The usual practice, when such a condition occurs, is to disjoint the drill pipe and a portion of the drill collars for removal from the well bore, leaving the drill bit and one or more drill collars lodged in the key seat. In some instances, the drill pipe or collars may become broken off and stuck off the bottom of the bore. Under either condition, it is customary for retrieving the lodged pipe to wash over and around the stuck portion of the pipe by the use of a wash-over pipe carrying a spear apparatus engageable with the upper end of the stuck pipe so that upon a loosening of the stuck pipe, the spear apparatus will be engaged with the wash-over pipe and prevent the loosened pipe from falling to the bottom and subsequently pulled out of the well bore. Furthermore, the wash-over pipe may be removed with the spear apparatus and the connecting stuck fish without performing a stripping operation during removal.

In fishing tools of this type, it is usually necessary to provide additional sections of drill pipe to the drilling string in order to continue the downward rotation and reaming of the wash-over pipe around the fish stuck in the well bore. In adding the extra sections, it is necessary to move the wash-over pipe vertically upward and where the retrieving tool is stationary with the stuck fish, such upward movement will usually cause a simultaneous vertical upward movement of the locking slips with the tapered faces of the operating bushing, thereby relocking the slips of the retrieving tool with the wash-over pipe. Consequently, during this upward movement of the wash-over pipe, it is necessary to maintain the slips in released

condition, or preclude any operation thereof during a vertical upward movement of the wash-over pipe.

This invention is generally concerned with a fishing tool apparatus having a wash-over pipe and reamer in which is disposed a spear retrieving tool in firm engagement therewith to permit a positive threading engagement of the retrieving tool with the stuck fish during a make up of the complete wash-over tool and retrieving tool. Further, the fishing tool provides for a released condition of the wash-over pipe with the retrieving tool after a make up of the tool with the stuck fish to permit a downward rotation and reaming of the wash-over pipe and to maintain the wash-over pipe in the released condition to permit vertical movement of the wash-over pipe without any re-engagement of the tool with the wash-over pipe during this operation. The lifting of the wash-over pipe vertically for the addition of the extra sections of drill pipe may be done by hydraulic pressure in a similar manner to that set out in the aforementioned co-pending patent applications. However, the complete free wheeling movement of the wash-over pipe may be accomplished by a simple rotation in one direction to actuate a rolling cam lock mechanism to maintain the released condition of the retrieving tool with the wash-over pipe. In the initial operation, the retrieving tool is lowered with the wash-over pipe into the well bore for engagement with the stuck fish, after which the locking slips are placed in a released condition to permit a continued downward movement of the wash-over pipe and reamer for clearing the well bore of the stuck fish therein.

It is an important object of the present invention to provide a spear unit adapted to cooperate with a wash-over pipe for retrieving stuck pipe wherein the spear unit may be alternately engaged or released with the wash-over pipe so that engagement will permit movement of the spear unit with the wash-over pipe, or in disengagement will permit movement of the wash-over pipe relative to the spear unit, thus providing vertical movement of the wash-over pipe if desired after connection of the spear unit with the stuck pipe, but leaving the spear unit in a position to engage the wash-over pipe in the event the stuck fish should become loosened and drop in the well bore.

A further object of this invention is to provide a well tool having a spear apparatus adapted to be supported in a wash-over pipe for rotation with the wash-over pipe in the well bore, and capable of engagement with a fish lodged in the bore, yet permitting continued downward movement and rotation of the wash-over pipe after engagement of the spear apparatus with the lodged fish.

Another object of this invention is to provide an improved retrieving tool for recovery of lodged drill collars in a well bore by catching the drill collars when they become dislodged from the bore.

And still another object of this invention is to provide a wash-over apparatus having a retrieving spear unit for retrieving stuck drill collars in a well bore and capable of releasable disconnection from the wash-over pipe to permit downward movement thereof, and subject to rotation of the wash-over pipe in one direction to permit independent vertical movement of the wash-over pipe relative to the spear unit for maintaining the releasable disconnection between the spear unit and the wash-over pipe so that additional sections of pipe string may be added to the wash-over pipe for a continued washing operation.

Still another object of this invention is to provide a well tool adapted to be alternately anchored and released relative to a wash-over pipe disposed in a well bore, and utilizing an application of hydraulic pressure in a manner to maintain the tool in a released position relative to the wash-over pipe.

And still another object of this invention is to provide

a wash-over tool apparatus for retrieving stuck drill collars in a well bore having a spear unit engaging the stuck fish in the well bore wherein said spear unit is normally anchored to the wash-over pipe for rotation therewith, yet may be releasably disconnected therefrom so that independent vertical movement of the wash-over pipe relative to the spear unit may be obtained and thereby providing variable movements or complete removal of the wash-over pipe leaving the spear unit engaged with the fish.

And still another object of this invention is to provide a fishing tool apparatus for retrieving drill collars stuck off bottom of a well bore including a spear unit alternately anchored and released relative to a wash-over pipe and reamer and engageable with the stuck collars in a released position to permit continued reaming of the wash-over pipe and reamer and provided with a rolling cam lock responsive to rotation of the wash-over pipe in one direction to maintain the spear unit in released position with the wash-over pipe.

And still another object of this invention is to provide a fishing tool apparatus for retrieving drill collars stuck off bottom of a well bore wherein the retrieving spear unit may be easily assembled and disassembled for replacement of the various elements thereof due to wear and necessity of larger sizes.

Other objects and advantages of the invention will be evident from the following detailed description, read in conjunction with the accompanying drawings, which illustrate our invention.

In the drawings:

FIGURE 1 is a vertical elevational view partly in section illustrating the upper portion of the retrieving tool prior to insertion in the wash-over pipe.

FIGURE 1A is a lower extension of FIG. 1.

FIGURE 2 is a view taken on lines 2—2 of FIG. 1A.

FIGURE 3 is a view taken on lines 3—3 of FIG. 1.

FIGURE 4 is a view taken on lines 4—4 of FIG. 1.

FIGURE 5 is a view taken on lines 5—5 of FIG. 1.

FIGURE 6 is a view taken on lines 6—6 of FIG. 1.

FIGURE 7 is a view taken on lines 7—7 of FIG. 1A.

FIGURE 8 is a view taken on lines 8—8 of FIG. 1A.

FIGURE 9 is an elevational view with certain parts in section for clarity showing the retrieving tool anchored in the wash-over pipe.

FIGURE 10 is a similar view to FIG. 9 showing the retrieving tool and wash-over pipe ready for a make up connection in the stuck fish.

FIGURE 11 is a view similar to FIG. 10 showing the tool made up in the stuck fish and the reaming operation in progress.

FIGURE 12 is a view similar to FIG. 9 showing the retrieving tool anchored in the wash-over pipe after a loosening of the fish in the well bore.

FIGURE 13 is a view similar to FIG. 9 showing the retrieving tool made up with a drill string in the top thereof for lowering the tool in the wash-over pipe for re-anchoring.

FIGURE 14 is a detail view in sectional perspective of one of the flow restriction members.

FIGURE 15 is a plan view of the flow restriction members.

Referring to the drawings in detail, and more particularly FIGS. 1 to 9, inclusive, reference character **1** indicates generally a retrieving tool apparatus having an upper sub member **2** provided with upper threads **3** for connection to the drill string or the like (not shown). The lower portion of the sub **2** is threadedly connected at **4** to a tubular mandrel **5** extending downwardly therefrom and its lower end is threadedly connected at **6** with a lowermost circulating sub member **7**. The outer periphery of the mandrel **5** is provided with an outwardly extending flange or boss **8** and immediately below the boss, the mandrel is provided with a plurality of left hand threads **9** cooperating with a complementary threaded bushing **10** for a purpose as will be hereinafter set forth. The mandrel is provided with a plurality of circumferentially spaced axial slots or key ways **11**.

An upper sleeve **12** is slidably disposed on the upper portion of the mandrel **5** and the sleeve is cut away or recessed at **13** for receiving a plurality of sectional flow restriction members **14** (FIGS. 14 and 15) maintained in vertical spaced relationship by an upper spacer ring **15** and intermediate tapered spacer rings **16**. The upper end of the sleeve **12** is threaded at **17** for reception of a hold down nut **18** maintaining the flow restriction members on the sleeve **12** between the nut **18** and a shoulder **19** provided by the recess **13**. The slidable sleeve **12** is provided with a plurality of cut out portions or windows **20**, each of which is adapted to receive a friction block **21** therein. The inner periphery of the friction blocks **21** are provided with a plurality of pockets **22** in which are disposed helical spring members **23** anchored at one end in the pockets **22**, and at the opposite end against the sleeve **12** for providing an outward thrust on the friction blocks **21**. The blocks are secured to the sleeve **12** at the upper and lower portions by screws **24**.

The lowermost portion of the sleeve **12** (FIG. 1) is provided with suitable threads **25** to which is threadedly secured a lower sleeve **26** slidable on the mandrel **5** with the upper sleeve **12**. The sleeve **26** is recessed or cut away at **27** to provide a shoulder portion **28** around which is disposed a slip cage **29**. The outer periphery of the sleeve **26** is provided with a plurality of circumferentially spaced cut-out portions or recesses **30**, and in each recess a spring urged latch **31** is provided. The latches **31** are held in the recesses by screws **32**. Suitable helical springs **33** are secured in pockets **34** provided on the inner face of the latches **31** to maintain the outward thrust of the latches for a purpose as will be hereinafter set forth.

The sleeve **26** in proximity of the threaded connection **25** is cut out to provide a recess **36** (FIG. 5) for receiving an elongated rolling cam lock member **37**. The recess **36** extends into a narrower recess portion **38** having a flat wall **39** against which is disposed a spring **40** secured to the sleeve **26** by the screw **41**. The spring **40** is provided with an arcuate end portion **42** disposed adjacent the outer periphery of the arcuately shaped cam lock member **37**. The member **37** is held in the recess **36** by a floating pin or stud **43** provided in the sleeve **26**. The cam lock **37** at one end is provided with a pointed boss member **44** adapted to cooperate with one of the longitudinal key ways **11** as will be hereinafter set forth. The inner face of the cam lock **37** is provided with a plurality of serrations or teeth **45** for engagement with the outer periphery of the mandrel **5** as will be hereinafter set forth. The cam lock **37** is provided with an arcuately shaped slot **46** cut vertically through the lock for receiving the pin **43**. From FIG. 5, the slot **46** is shown slightly off-set with respect to the axial center of the tubular mandrel **5** and sleeve **26**, such as the off-set center **47** relative to the center **48**, so that in operation, the pin **43** may move the cam lock **37** in a wedging or cam action, thereby thrusting the teeth **45** into engagement with the outer periphery of the mandrel as will be hereinafter set forth.

The bushing **10** on the lower end of the mandrel is provided with a plurality of inwardly tapered faces **50** adapted to cooperate with the slips **51**. The upper end of the bushing **10** is provided with a key way **52** (FIG. 7) for a purpose as will be hereinafter set forth. The slidable slip cage **29** disposed around the mandrel **5** is counterbored or undercut at **53** to leave an annulus **54** between the outer periphery of the sleeve **26** and the slip cage **29**, thereby providing sufficient space for telescopically receiving the lower end of the sleeve **26**. A plurality of circumferentially spaced slots **55** are provided in the upper end of the slip cage **29**, and the top face of the slots **55** is provided with a plurality of notches or grooves **56** in axial alignment with and adapted to cooperate with the latches

31 as will be hereinafter set forth. The slots 55 are provided with a downwardly sloping or tapered face 57.

The slip cage 29 is cut away to provide a plurality of circumferentially spaced windows 58 into which are disposed the slips 51. One of the windows 58 is provided with a key way 59 (FIG. 7), and a key 60 secured therein by suitable screws 61. The outer faces of the slips 51 are provided with a plurality of teeth or serrations 63 to provide locking engagement with the wash-over pipe as will be hereinafter set forth. A semi-circular recess 64 is cut into the upper end of each of the slips 51 for assisting in holding the slips in the windows 58 underneath the screw head 61. The lower end of each of the slips 51 is cut away at 65 to provide for a lower extension 66 having a recess 67 into which is anchored one end of a helical spring 68 with its opposite end anchored against the inner face of the slip cage 29. The slip extension 66 rests on an inwardly directed shoulder 69 of the cage 29.

A plurality of circumferentially spaced apertures 70 are provided in the circulating sub member 7 to permit limited fluid circulation through the tool to be discharged from out the lower end for a purpose as will be hereinafter set forth. The sub 7 is provided with male threads 71 acting as a pin member adapted to be threaded into the female box (not shown) in the upper end of the stuck drill pipe or fish 72 (FIG. 10). The bore of the sub 7 is provided with four circumfrentially spaced longitudinally extending grooves 73 for receiving any substantially square shaped wrench 74, such as shown in FIG. 2, for a purpose as will be hereinafter set forth. The upper sub member 2 and the lower sub member 7, after being made up on the upper and lower ends of the mandrel 5, respectively, are prevented from further rotation by substantially similar locking means comprising a locking stud 75 (FIG. 3) adapted to be disposed in an aligned bore 76 between the sub 2 and the mandrel 5 and held in the aligned bore or key way 76 by a locking stud 77. It will be apparent that the type of locking means for both the upper sub 2 and the lower sub 7 are the same for a purpose as will be hereinafter set forth.

Retrieving tool setting operation

In order to set the retrieving tool, generally indicated at 1, in the wash-over pipe 80 prior to running the combined washing and retrieving unit to the well, the tool unit 1 is preferably disposed in the upper end of the wash-over pipe 80 so that the mandrel 5 may be held against rotation by suitable tongs (not shown). In this manner, rotation of the wash-over pipe 80 in a right hand direction will cause rotation of the slip cage 29 through engagement of the friction dogs 21 with the wash-over pipe, thereby rotating the bushing 10 in a right hand direction through the keys 60 for moving the bushing 10 downward on the left hand threads 9 until the tapered faces 50 of the bushing 10 come in contact with the tapered faces 62 of the slips 51 and start an outward movement of the slips for engagement with the wash-over pipe 80. As the initial outward movement of the slips is begun, the retrieving tool unit 1 is moved further into the wash-over pipe 80 for any desired location therein.

When the tool unit 1 reaches the desired location in the wash-over pipe 80, a vertical upward or picking up movement on the wash-over pipe 80 will cause the sectional connecting sleeve members 12 and 26 to move vertically upward therewith due to the contact of the friction dogs 21 with the wash-over pipe 80. However, the mandrel 5 and the slip cage 29 will not move upwardly, but will remain stationary until the latches 31 provided in the sleeve 26 have been moved upwardly into contact with the inclined grooves 56, whereby a continued upward movement of the wash-over pipe 80 and sleeve 26 will cause the latches 31 to carry and move the cage 29 upwardly with the tapered faces of the bushing 10 and forcing the slips outwardly into engagement with the wall of the wash-over pipe. In this operation, the retrieving tool 1 will be suspended in the wash-over pipe in partially locked condition, such as shown in FIG. 9.

A more positive locking engagement between the retrieving tool 1 and the wash-over pipe 80 through engagement of the slips 51 will permit a tighter connection of the pin threads 71 with the lost fish 72. In order to obtain a better slip bite, a suitable square shaped wrench 74 (FIG. 2) adapted to fit in the equally spaced key ways 73 in the bottom end of the sub 7 is inserted therein, and rotation of the sub 7 in a right hand direction as viewed in FIG. 2 will cause the mandrel 5 to rotate in a left hand direction as viewed in FIG. 5. The mandrel 5 will rotate in the bushing 10 held stationary by the wedging action of the tapered faces 50 and 62, and key 60 in key way 59, whereupon the left hand rotation of the mandrel 5 will force the bushing 10 to travel further downwardly or to make up on the left hand threads 9 more completely, thereby moving the slips 51 outward and into a more firmer locking engagement with the inner wall of the wash-over pipe 80. Disengagement of the sub 7 from the threads 6 of the mandrel 5 is prevented by the locking key 75. In this manner, the retrieving tool 1 is more firmly anchored in the wash-over pipe 80 and the complete unit is ready to be run into the well bore in the conventional manner.

Operation

The wash-over pipe 80 is run into the well bore 81 (FIG. 10) upon any suitable supporting string of pipe (not shown) and the retrieving tool mechanism 1 is supported therein by the slips 51 in a manner as has been heretofore set forth, such as shown in FIG. 9. As the lower end of the sub member 7 and the threads 71 approach the top of the stuck fish 72 water or mud circulation forces the sleeve assemblies 12 and 26 downwardly and the sleeve 26 telescopes into the sleeve cage 29 without effecting the position of the slips 51, a continued right hand rotation of the wash-over pipe 80 will cause the threads 71 to make up in the female box (not shown) of the stuck fish 72. This make up connection can be made up to whatever tightness the retrieving tool 1 was made up in the wash-over pipe 80 as has been heretofore explained, and the firm engagement of the slips with the wash-over pipe by rotation of the mandrel 5 as hereinbefore set forth, is to permit a tighter make up for the retrieving tool with the lost fish 72.

A continued right hand rotation of the combination wash-over pipe 80 and retrieving tool 1 will cause the bushing 10 to travel vertically upward on the left hand threads 9 to cause an unthreading of the bushing 10 until an upper shoulder 83 contacts the outward flange 8 provided on the mandrel 5 (FIG. 9) thereby placing the retrieving tool 1 in a released position relative to the wash-over pipe 80. The wash-over pipe is provided with any suitable reamer 84 connected thereto at 85. The reamer is provided with teeth 86 for reaming the well bore 81 as is well known in the art. With the bushing 10 moved upwardly, thereby moving the tapered faces 50 away from the tapers 62 of the slips 51, the slips are then automatically disengaged from the inner periphery of the wash-over pipe 80 by the springs 68. In this released condition, a slow movement upward of the wash-over pipe 80 will cause the friction dogs 21 which are frictionally gripping the inner wall of the wash-over pipe 80 to provide a simultaneous movement upward of the sleeve 12 and its connecting lower sleeve 26, which in turn picks up the slips cage 29 through the operation of the latches "31" as hereinbefore set forth, thereby moving the slips 51 outwardly into an engagement with the inner wall of the wash-over pipe so that rotation of the wash-over pipe in a right hand direction, the threads 71 may be further connected with the stuck fish 72 as tightly as desired. Upon release of the right hand torque, and a downward movement of the wash-over pipe 80, the slips 51 are moved downward away from the tapered faces 50, thereby plac-

ing the wash-over pipe in a released position for the wash-over operation in the well bore, such as shown in FIG. 11.

As the wash-over pipe **80** and its attendant reamer **84** move progressively downwardly in the well bore **81**, it may become necessary to add additional strings of pipe before the well bore is reamed sufficiently to loosen the stuck fish **72**. In some instances, the fish may be stuck in the bore through several hundred feet of strata. In order to complete the washing and reaming operation, it is necessary to move the wash-over tool downwardly through the bore a sufficient distance to loosen the stuck fish. It will be understood as the washing operation continues that the retrieving tool **1** is in released condition relative to the wash-over pipe **80**. Furthermore, since the tool is made up with the fish **72**, it is in a stationary condition as long as the fish is stuck or until the fish **72** is loosened by the reaming operation.

In order to add the additional sections of pipe string supporting the wash-over pipe **80**, it is not necessary to lock the retrieving tool **1** in the released position, but it is only necessary to move the wash-over pipe **80** vertically upward with a simultaneous increase on the pump pressure at the surface of the well, whereupon the increased pump pressure will provide a sufficient fluid pressure exerted on the flow restriction members **14** which is greater than the friction caused by the friction blocks **21** engaging the wash-over pipe **80**, thereby permitting movement of the wash-over pipe **80** in a vertically upward movement without movement of the sleeves **12**, **26** and attendant cooperation elements, such prevents the slips **51** from moving upward and into contact with the tapered faces **50** for any possible engagement with the inner periphery of the upwardly moving wash-over pipe **80**. This increased pump pressure will still permit the mandrel **5** to move down with the fish during the above operation and in turn moves the bushing **10** downwardly which sets the slips **51** to the wash-over pipe, so regardless of any operation, the fish **72** is prevented from falling downwardly in the bore any substantial distance at all times. When the additional string of pipe has been added to the wash-over string, it is only necessary to move the wash-over pipe **80** vertically downward and resume the wash-over operation.

It has been found that in some instances of pump failure that the fluid pressure cannot be increased sufficiently to overcome the frictional engagement of the dogs **21** during a vertical upward movement of the wash-over pipe **80** and in such instances, in order to maintain a free wheeling of the vertical movement of the wash-over pipe **80**, it is only necessary to rotate the wash-over pipe **80** in a left hand direction whereupon the sleeves **12** and **26** will also rotate with the wash-over pipe **80** due to the frictional contact of the dogs **21**. In this left hand rotation, the cam lock **37** carried in the cut away recess **36** of the sleeve **26** will rotate in the same direction as the sleeve **26** (FIG. 5) until the locking tooth **44** on the cam **37** is brought into engagement with one of the longitudinal key ways **11** provided circumferentially on the mandrel **5**. The mandrel **5** being held stationary by connection with the stuck fish will stop further rotation of the cam **37**, and the floating pin **43** will be caused to move in the arcuately shaped off-set slot **46** to force the teeth **45** on the inner periphery of the lock **37** into engagement with the outer periphery of the stationary mandrel **5**, thereby locking the sleeve **26** with the mandrel **5** and prevent any further movement thereof. In this manner, the sleeves **12** and **26** are prevented from upward movement with the wash-over pipe **80**, thereby maintaining the slips **51** in a released condition relative thereto. After addition of the extra section of pipe to the wash-over string, the wash-over pipe **80** may be rotated in a right hand rotation which will move the pin **43** and cam **37** to permit release of the teeth **45** from the mandrel. The wash-over pipe **80** is then again moved downwardly in its released condition relative to the retrieving tool **1** to continue the washing operation.

It will thus be seen that the present apparatus provides for a free wheeling vertical movement of the wash-over pipe **80** when it is necessary to add extra sections to the pipe string for continued downward reaming. The resilient packer members **14** provide the necessary hydraulic pressure to preclude movement of the sleeves **12** **26** and any outward movement of the slips **51**. However, if such fluid pressure is not sufficient, it is not necessary to "yo-yo" the wash-over pipe string for cooperation with a suitable locking unit such as J-slot sleeve or the like for locking the sleeves **12** and **26** and the slips **51** to maintain them in a released position from the wash-over pipe, since a left hand rotation of the wash-over pipe will lock the sleeves **12** and **26** by the locking cam **37** as has been heretofore set forth.

As the wash-over operation continues and the fish **72** is washed and reamed loose and starts to fall, the retrieving tool **1** will prevent the fish **72** from any downward falling by automatically catching the loosened fish **72**. As the loosened fish **72** starts to move downwardly, the connected mandrel **5** will move downwardly simultaneous with the loosened fish **72**, however, the sleeves **12** and **26** will remain stationary in the wash-over pipe **80** due to frictional engagement of the dogs **21** as has been hereinbefore set forth. Furthermore, resistance to downward movement of the sleeve **12** is also offered by the flow restriction members **14** acting against the fluid in the annulus **86** between the retrieving tool **1** and the inner periphery of the wash-over pipe **80** and the annulus **87** between the wash-over pipe **80** and the well bore **81**. It being understood that the circulating fluid is present in the tool and discharges from the apertures **70** of the lower sub **7** around the reamer **84** and into the annulus **87**. As the loosened fish starts to fall, the connected retrieving tool and fish act as a piston to create a resistance of the fluid pressure in the annulus.

The flow restriction gaskets **14** as clearly shown in FIGS. 4 and 14 are preferably any suitable rubber pack ing material, but not limited thereto, and are molded in the metal ring members **14***a* in order to fit between the holding rings **15** and **16**. These restriction gaskets have to be replaced many times because of wear, and also because of insertion of the retrieving tool in larger size wash-over pipes for various sizes of well bores. The circular gaskets are split as clearly shown in FIGS. 14 and 15 and the rings **14***a* are provided with beveled shoulders cooperating with the bevels on the rings **15** and **16**. In order to replace the rings **14***a*, it is only necessary to unthread the nut **8** sufficiently to loosen up the metal portions **14***a* relative to the intermediate rings permitting the semi-circular gaskets to be removed and replaced with new ones. In this manner, the speed of the assembly of this portion of the tool is facilitated for replacement of these wearable parts without a complete knock-down or unthreading of the major sleeve portions of the tool.

The slips **51** are engaged with the wash-over pipe **80** substantially instantaneous with the loosening of the stuck fish and the fish drops only a very few inches to provide a biting engagement and prevent any further dropping of the loosened fish to the bottom of the well bore. In this condition, the loosened fish is ready to be removed from the well bore along with the combination washing unit. In order to preclude an expensive stripping operation of the complete unit, the removal of the loosened fish may be accomplished by moving the wash-over pipe **80** out of the well bore in any suitable manner until the section of the wash-over pipe **80** in which the retrieving tool **1** is anchored has reached the surface of the well. The wash-over pipe is then held by any suitable holding device, such as slips or the like (not shown), and then a letting in string of pipe **90** is made up securely in the top of the upper bushing **2** of the retrieving unit **1**. A pick up, or upward movement of the drill pipe **90** will simul-

taneously move the mandrel 5 upwardly, moving the bushing 10 and its complementary tapered faces 50 away from the tapered faces 62 letting the slips recede, thereby releasing the tool unit 1 from the wash-over pipe 80. A right hand rotation of the drill string 90 will rotate the mandrel 5 simultaneously until one of the grooves 11 comes into contact with the pointed boss 44 on the rolling lock member 37, thereby causing movement or rotation of the rolling lock member 37 simultaneous with rotation of the mandrel 5. Since the sleeve 26 is held firm with the wash-over pipe 80 by the friction dogs 21, the rotation of the lock member 37 and its floating pin 43 will remain stationary in the moving arcuate slot 46 until the lock cam 37 is forced inwardly to engage the teeth 45 against the outer periphery of the mandrel.

It will thus be seen that the continued right hand rotation of the string 90 and mandrel 5 will tend to tighten the member 37 against the mandrel 5, thereby preventing the sleeve 26 from moving upwardly and causing engagement of the slips 51 against the wash-over pipe as the tool is lowered in the wash-over pipe. With the tool in this position, it is lowered to the lowermost section of the wash-over pipe 80 (FIG. 13) where a left hand rotation of the drill pipe 90 and mandrel 5 will cause the floating pin 43 to resume its original position and unlock the member 37 and permit the cage 29 to move downwardly as the drill pipe is moved downwardly with the sleeves 12 and 26 remaining stationary until the latch 31 comes in contact with the downwardly tapered face 57. At this point, the slip cage 29 is stationary, whereas the mandrel 5 and bushing 10 continue downwardly until the tapered faces 50 and 62 force the slips 51 outwardly into contact with the wash-over pipe 80. Any continued downward movement of the drill pipe 90 will set the slips 51 firmly in the wash-over pipe 80, thus leaving the tool 1 and fish 72 suspended in the lowermost section of wash-over pipe 80.

The drill pipe 90 is then unthreaded from the upper bushing 2 and removed from the wash-over pipe 80. The upper sections of the wash-over pipe 80 are removed from the well bore until the last joint or section is reached, from which the fish 72 will be extending. The fish 72 is then secured at the surface of the well with any suitable holding device, such as slips on a rotary table or the like (not shown), and after securement, the wash-over pipe 80 is moved downwardly for a release from the retrieving tool 1. After release, a rotation in a left hand direction will cause the lock member 37 to re-engage the mandrel 5 as hereinbefore set forth to prevent any engagement of the slips 51, thereby permitting the wash-over pipe 80 to be removed from the tool and leaving the retrieving tool made up in the top of the fish 72. The tool unit 1 and the sub member 7 may be unthreaded from the fish with removal of the fish in any conventional manner.

Referring further to FIG. 11 depicting the apparatus during the reaming operation, a short length for the mandrel between the sub 2 and the nut 18 is shown, however, this length or distance is usually greater than that shown since the sleeve 12 and assembled parts are telescoped downwardly during the wash-over operation by the mud pressure against the rubber rings 14. This greater length or spacing permits the wash-over pipe to be vertically reciprocated in order to free the reaming shoe 84 if it should become worn or stuck due to excessive binding.

From the foregoing, it will be apparent that the present invention provides for an efficient recovery of drill collars and the like which have been stuck in a well bore off the bottom thereof. The apparatus provides for a washing around the stuck portion of the drill collar with a wash-over pipe and reamer having a retrieving tool disposed in the lower end thereof and engaging the upper end of the stuck collar so that when it is washed free and becomes loosened, the drill collar is prevented from falling to the bottom of the well by engaging the retrieving tool to the wash-over pipe, after which it may be removed from the well bore, along with the wash-over pipe. The apparatus contemplates a release of the slips for a continued downward movement of the wash-over pipe and its reaming shoe for a complete washing and reaming operation and yet, permits unhindered vertical upward movement of the wash-over pipe for adding extra sections of the pipe string without any re-engagement of the slips during the vertical upward movement by effecting a locking of the slips in a released condition through a left hand rotation of the wash-over pipe.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

We claim:

1. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, means on the mandrel to provide for a make up connection with the stuck fish, means providing simultaneous movement of the sleeve on the mandrel with vertical movement of the wash-over pipe, means permitting release of the slips from a gripping engagement with the wash-over pipe upon a downward right hand rotational movement of the wash-over pipe relative to the retrieving unit after a connection of the mandrel to the stuck fish, means to maintain the slips in released condition during vertical upward movement of the wash-over pipe, said means comprising a recess provided in the slidable sleeve, a slotted lock member disposed in the recess and rotatable with the sleeve, means provided on the mandrel to limit rotation of the lock member upon rotation of the sleeve in one direction, and a pin carried by the sleeve and extending through the slotted member and responsive to rotation of the sleeve in said direction to move the lock member radially inward into locking engagement with the mandrel and prevent simultaneous movement of the sleeve with the wash-over pipe as it is moved vertically upward and thereby preclude actuation of the slips.

2. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, means on the mandrel to provide for a make up connection with the stuck fish, means providing simultaneous movement of the sleeve on the mandrel with vertical movement of the wash-over pipe, means permitting release of the slips from a gripping engagement with the wash-over pipe upon a continued downward right hand rotational movement of the wash-over pipe relative to the retrieving unit after the mandrel has been connected to the stuck fish, means responsive to a rotation of the wash-over pipe in one direction only for locking the slidable sleeve against the mandrel to thereby prevent actuation of the slips during vertical upward movement of the wash-over pipe by precluding relative movement between the mandrel and the sleeve.

3. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage tele-

scopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, means on the mandrel to provide for a make up connection with the stuck fish, means providing simultaneous movement of the sleeve on the mandrel with vertical movement of the wash-over pipe, means permitting release of the slips from a gripping engagement with the wash-over pipe upon a continued downward right hand rotationed movement of the wash-over pipe relative to the retrieving unit after the mandrel has been connected to the stuck fish, means responsive to a rotation of the wash-over pipe in a left hand direction only for locking the slidable sleeve against the mandrel to preclude release of the slips during vertical upward movement of the wash-over pipe.

4. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, means on the mandrel to provide for a make up connection with the stuck fish, means providing simultaneous movement of the sleeve on the mandrel with vertical movement of the wash-over pipe, means permitting release of the slips from a gripping engagement with the wash-over pipe upon a continued downward right hand rotational movement of the wash-over pipe relative to the retrieving unit after the mandrel has been connected to the stuck fish, means to preclude actuation of the slips during vertical upward movement of the wash-over pipe, said means comprising a rolling cam lock provided in the sleeve and rotatable therewith, means on the mandrel to limit rotation of the rolling cam lock upon rotation of the sleeve in one direction, and means cooperating with the rolling cam lock and responsive to rotation of the sleeve in said direction to move the cam lock radially into a locking engagement with the mandrel whereby movement of the sleeve simultaneous with vertical upward movement of the wash-over pipe is prevented.

5. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, a tapered bushing threadedly secured to the mandrel and disposed above the slips, means cooperating between the slip cage and the bushing for precluding rotation of the bushing whereby rotation of the mandrel in one direction will move the bushing in a longitudinal direction whereby the tapered portion thereof will contact complementary tapered portions of the slips to provide for radial outward movement of the slips into engagement with the wash-over pipe, said bushing responsive to rotation of the combined fishing and wash-over apparatus in an opposite direction for movement thereof in an opposite longitudinal direction for disengagement from the slips, means cooperating between the slip cage and the slips for disengaging the slips from the wash-over pipe when the tapered bushing is not engaging the slips, means connected to the mandrel for a make up connection with the stuck fish, friction means carried by the slidable sleeve and engageable with the wash-over pipe to provide for simultaneous movement therewith in an unlocked position between the sleeve and the mandrel, means carried by the slidable sleeve and responsive to rotation of the sleeve with the rotation of the wash-over pipe in one direction to lock the sleeve against the mandrel and prevent movement of the sleeve upon a simultaneous movement of the wash-over pipe.

6. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, a tapered bushing threadedly secured to the mandrel and disposed above the slips, means cooperating between the slip cage and the bushing for precluding rotation of the bushing whereby rotation of the mandrel in one direction will move the bushing in a longitudinal direction whereby the tapered portion thereof will engage tapered portions of the slips and provide for radial outward movement of the slips into engagement with the wash-over pipe, said bushing responsive to rotation of the combined fishing and wash-over apparatus in an opposite direction for movement thereof in an opposite longitudinal direction for disengagement from the slips, means cooperating between the slip cage and the slips for disengaging the slips from the wash-over pipe, means connected to the mandrel for a make up connection with the stuck fish, said wash-over pipe movable in a downward direction to permit release of the slips from engagement with the wash-over pipe after the make up with the fish, means carried by the slidable sleeve and responsive to rotation of the wash-over pipe in one direction to maintain the slips in disengagement during any upward vertical movement of the wash-over pipe when the tapered bushing, is out of engagement with the slips, said tapered bushing responsive to a downward movement of the mandrel upon loosening of the stuck fish to provide for an automatic engagement with the slips with the wash-over pipe to catch the loosened fish.

7. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, a tapered bushing carried by the mandrel and disposed above the slips, left hand thread means provided on the mandrel and the bushing, means cooperating between the slip cage and the bushing to preclude rotation of the bushing whereby rotation of the mandrel in one direction will move the bushing in a longitudinal direction whereby the tapered portion thereof will contact tapered portions of the slips and provide for radial outward movement of the slips into engagement with the wash-over pipe, said left hand thread means responsive to rotation of the combined fishing and wash-over apparatus in an opposite direction to move the bushing in an opposite longitudinal direction for disengagement from the slips, means cooperating between the slip cage and the slips for disengaging the slips from the wash-over pipe when the slips are not in engagement with the tapered bushing, means on the mandrel to provide for a make up connection with the stuck fish, friction means carried by the slidable sleeve and engageable with the wash-over pipe to provide for simultaneous movement therewith in an unlocked position between the sleeve and the mandrel, said wash-over pipe movable in a downward direction to release the slips from engagement with the wash-over pipe after the make up connection with the fish, a recess provided in the slidable sleeve, a slotted lock member carried in the recess and rotatable with the sleeve, means on the mandrel to limit rotation of the lock member upon rotation of the sleeve in one direction, a pin carried by the recess and extending through the slotted member and responsive to rotation of the sleeve in said

direction to move the lock member radially into locking engagement with the mandrel and prevent movement of the sleeve with vertical upward movement of the wash-over pipe.

8. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, a tapered bushing carried by the mandrel and disposed above the slips, cooperating left hand thread means provided on the mandrel and the bushing, means cooperating between the slip cage and the bushing to preclude rotation of the bushing whereby rotation of the mandrel in one direction will move the bushing in a longitudinal direction whereby the tapered portion thereof will contact similarly tapered portions of the slips and provide for radial outward movement of the slips into engagement with the wash-over pipe, said left hand thread means responsive to rotation of the combined fishing and wash-over apparatus in an opposite direction to move the bushing in an opposite longitudinal direction for disengagement from the slips, means cooperating between the slip cage and the slips for disengaging the slips from the wash-over pipe when the slips are not engaged by the tapered bushing, means connected to the mandrel for a make up connection with the stuck fish, friction means carried by the slidable sleeve and engageable with the wash-over pipe to provide for simultaneous movement therewith in an unlocked position between the mandrel and the sleeve, said wash-over pipe movable in a downward direction to release the slips from engagement with the wash-over pipe after the make up connection with the fish, said wash-over pipe movable in a vertical upward direction to permit insertion of additional sections of pipe string for continuing the downward direction of the wash-over pipe, means to maintain release of the slips during the vertical upward movement of the wash-over pipe, said means comprising a recess provided in the slidable sleeve, an arcuately shaped lock member carried in the recess and rotatable with the sleeve, a pointed boss on the sleeve adapted to cooperate with means on the mandrel limiting rotation of the lock member upon rotation of the sleeve in one direction, an arcuate slot provided in the lock member and off-set relative to the longitudinal axis of the sleeve member, a pin carried by the recess and extending through the slot member and responsive to rotation of the sleeve in said direction to bear against the walls of the off-set slot to move the lock member radially into locking engagement with the mandrel and prevent movement of the sleeve simultaneous with vertical upward movement of the wash-over pipe whereby the slips are maintained in a released engagement therewith.

9. In a combined fishing and wash-over apparatus for retrieving a stuck fish in a well bore comprising a wash-over pipe having a retrieving unit adapted to be positioned therein, said unit comprising an elongated mandrel having a slidable sleeve thereon, a slip cage telescopically arranged with the sleeve, a plurality of circumferentially spaced slips carried by the slip cage and alternately operable to a gripping and non-gripping engagement with the wash-over pipe, a tapered bushing carried by the mandrel and disposed above the slips, cooperating left hand thread means provided on the mandrel and bushing, means cooperating between the slip cage and the bushing to preclude rotation of the bushing whereby rotation of the mandrel in one direction will move the bushing in a longitudinal direction whereby the tapered portion thereof will engage similarly tapered portions of the slips to provide a radial outward movement of the slips into engagement with the wash-over pipe, said left hand thread means responsive to rotation of the combined fishing and wash-over apparatus in an opposite direction to move the bushing in an opposite longitudinal direction for disengagement from the slips, means cooperating between the slip cage and the slips for disengaging the slips from the wash-over pipe when the slips are not in engagement with the tapered bushing, means connected to the mandrel for a make up connection with the stuck fish, friction means carried by the slidable sleeve and engagable with the wash-over pipe to provide for simultaneous movement therewith in an unlocked position between the sleeve and the mandrel, said wash-over pipe movable in a downward direction to release the slips from engagement with the wash-over pipe after the make up connection with the fish, said wash-over pipe movable in a vertical upward direction to permit insertion of additional sections of pipe string for continuing the downward direction of the wash-over pipe, means to maintain release of the slips during the vertical upward movement of the wash-over pipe, said means comprising a recess provided in the slidable sleeve, an arcuately shaped lock member carried in the recess and rotatable with the sleeve, a locking dog on the sleeve and cooperating with means on the mandrel to limit rotation of the lock member upon rotation of the sleeve in one direction, an arcuate slot provided in the lock member and off-set relative to the longitudinal axis of the sleeve member, a pin carried by the recess and extending through the slot member and responsive to rotation of the sleeve in said direction to bear against the walls of the off-set slot to move the lock member radially into locking engagement with the mandrel to prevent movement of the sleeve simultaneous with vertical upward movement of the wash-over pipe whereby the slips are maintained in a release engagement therewith, and spring means engaging the lock member for maintaining the lock member in engagement with the mandrel.

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