Sept. 11, 1956 C. A. NAYLOR 2,762,438

WASH-OVER SPEAR APPARATUS

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Fig. 1

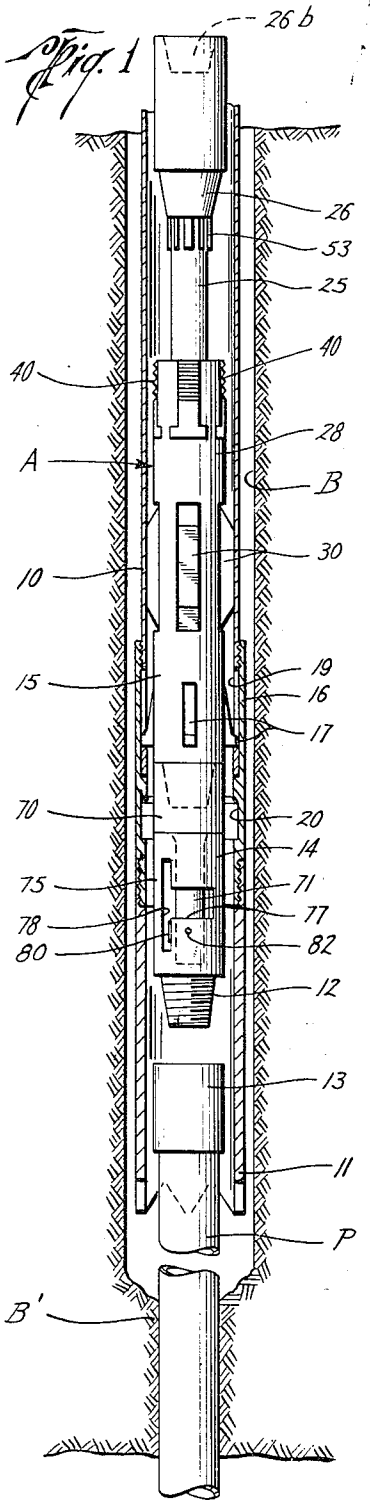
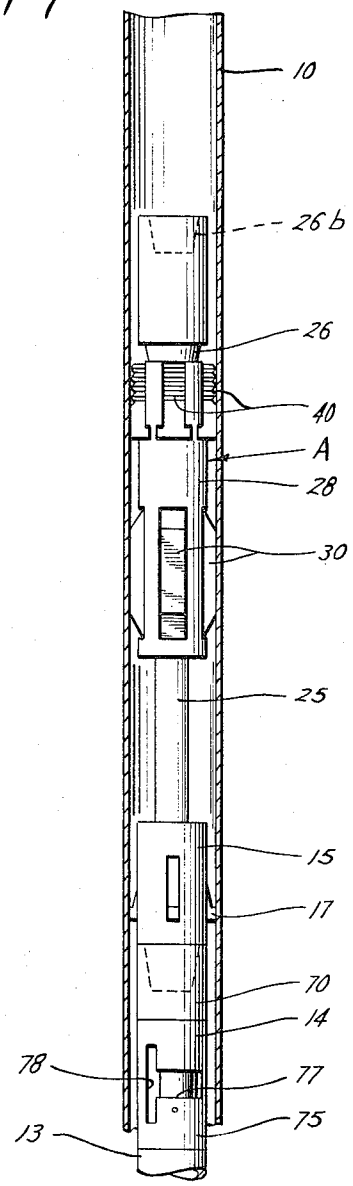


Fig. 2



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WASH-OVER SPEAR APPARATUS

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Fig. 3

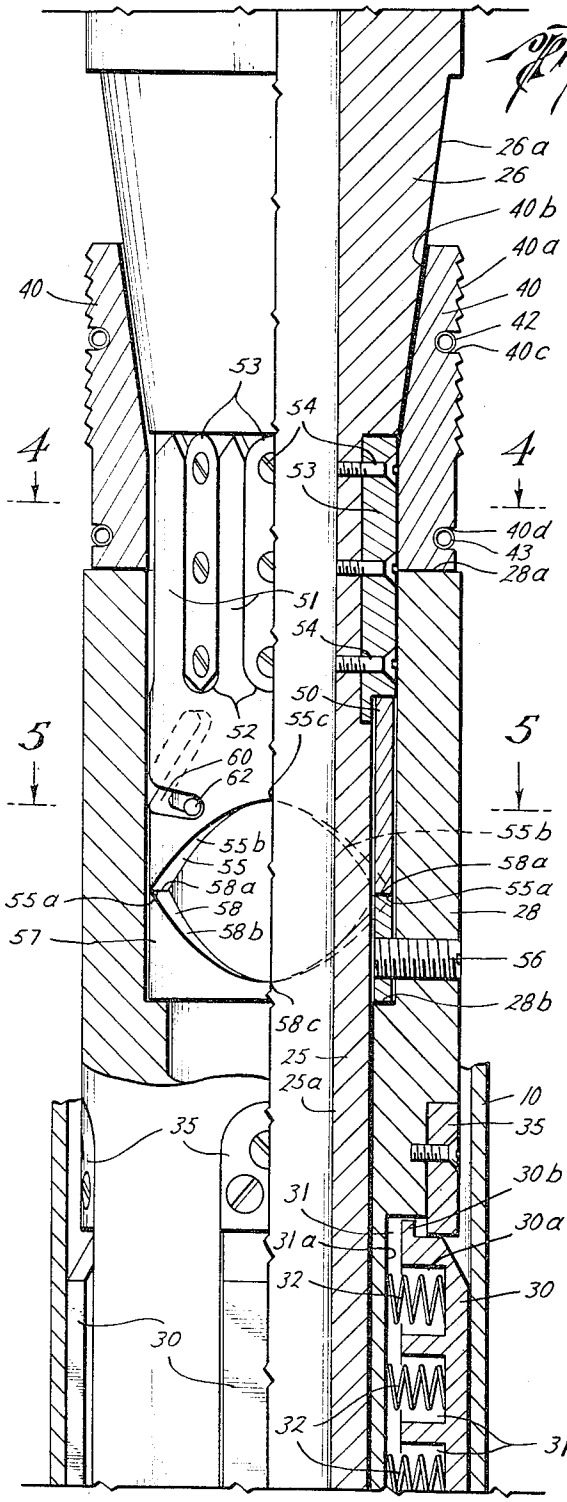


Fig. 4

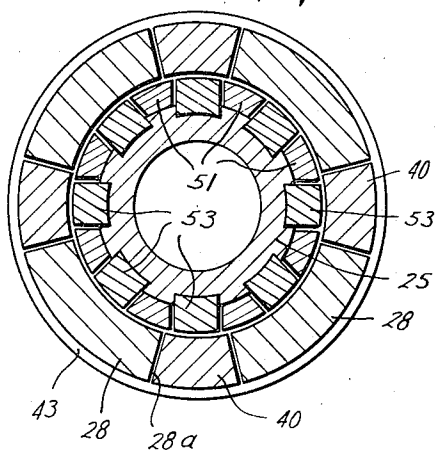
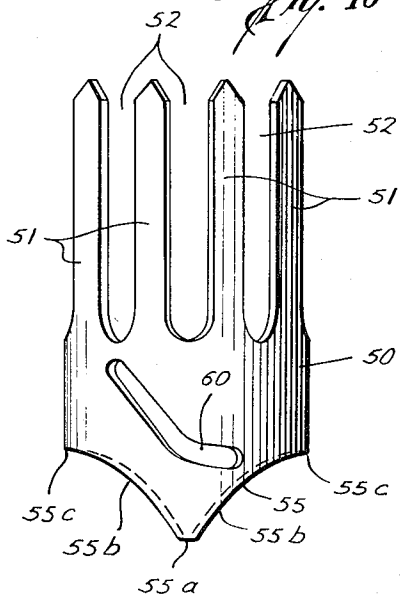


Fig. 10



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WASH-OVER SPEAR APPARATUS

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Fig. 3A

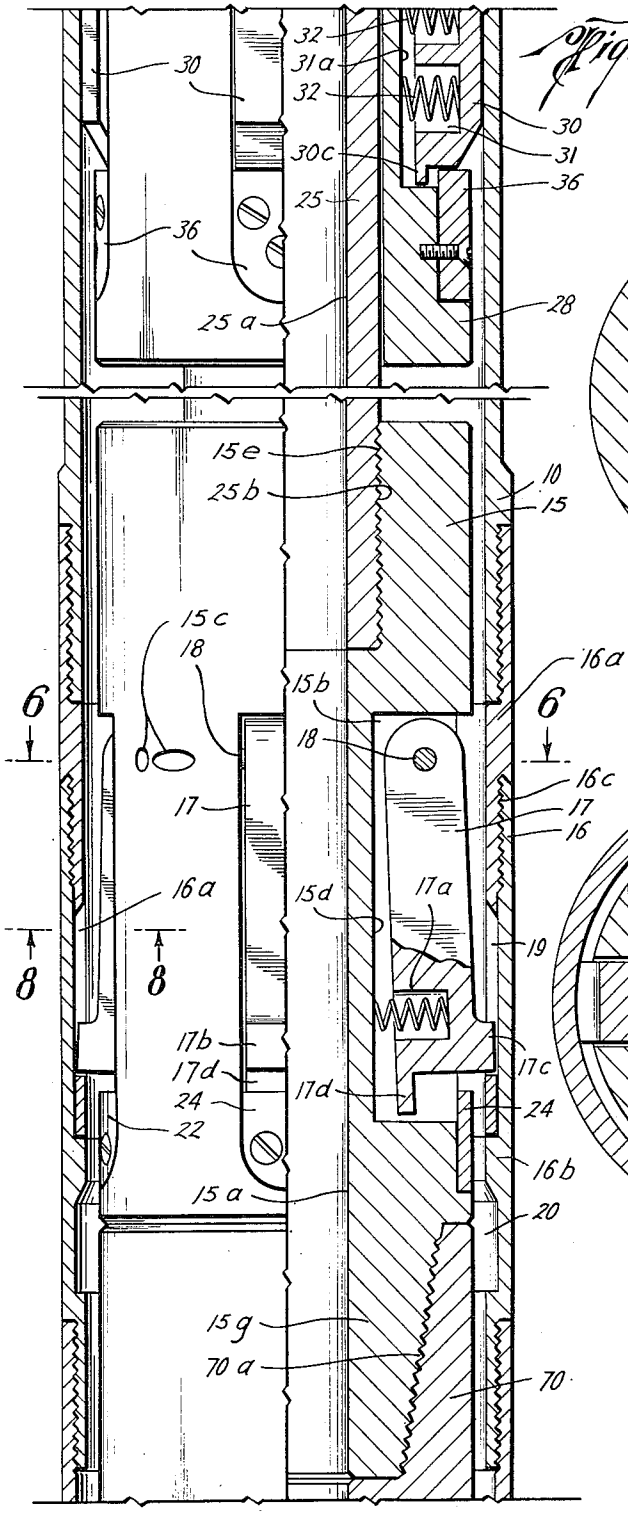


Fig. 5

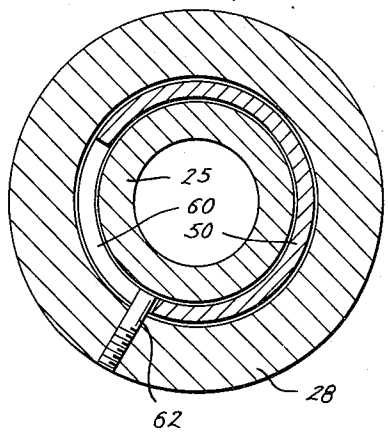
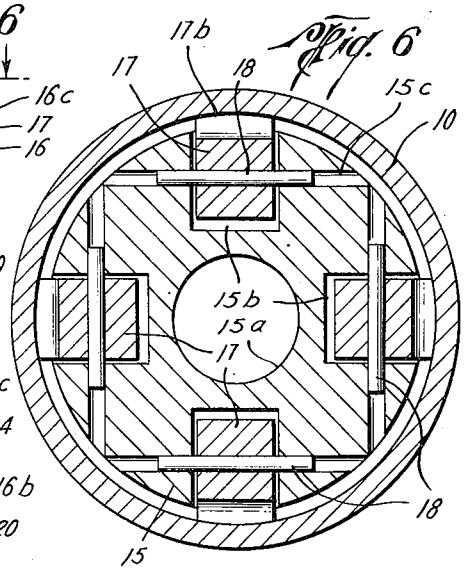


Fig. 6



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WASH-OVER SPEAR APPARATUS

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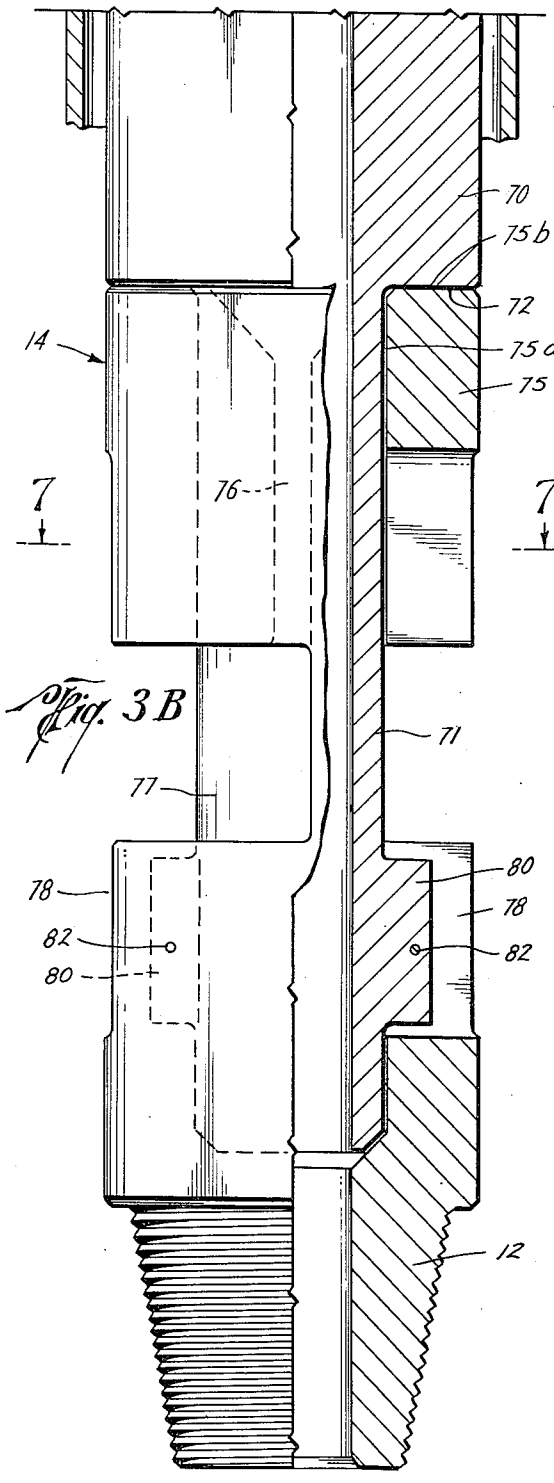


Fig. 3B

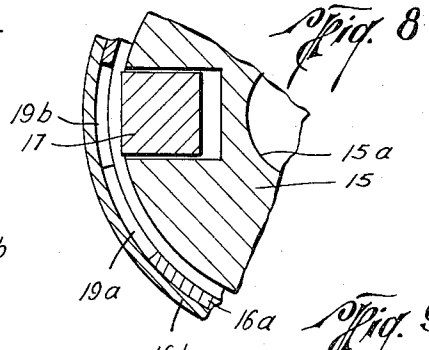


Fig. 8

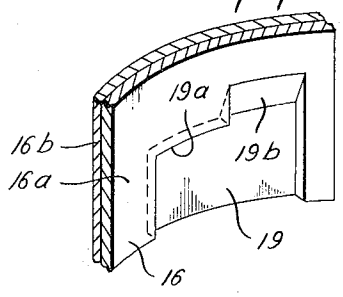


Fig. 9

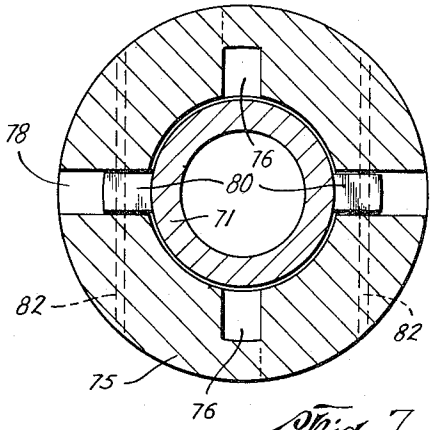


Fig. 7

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WASH-OVER SPEAR APPARATUS

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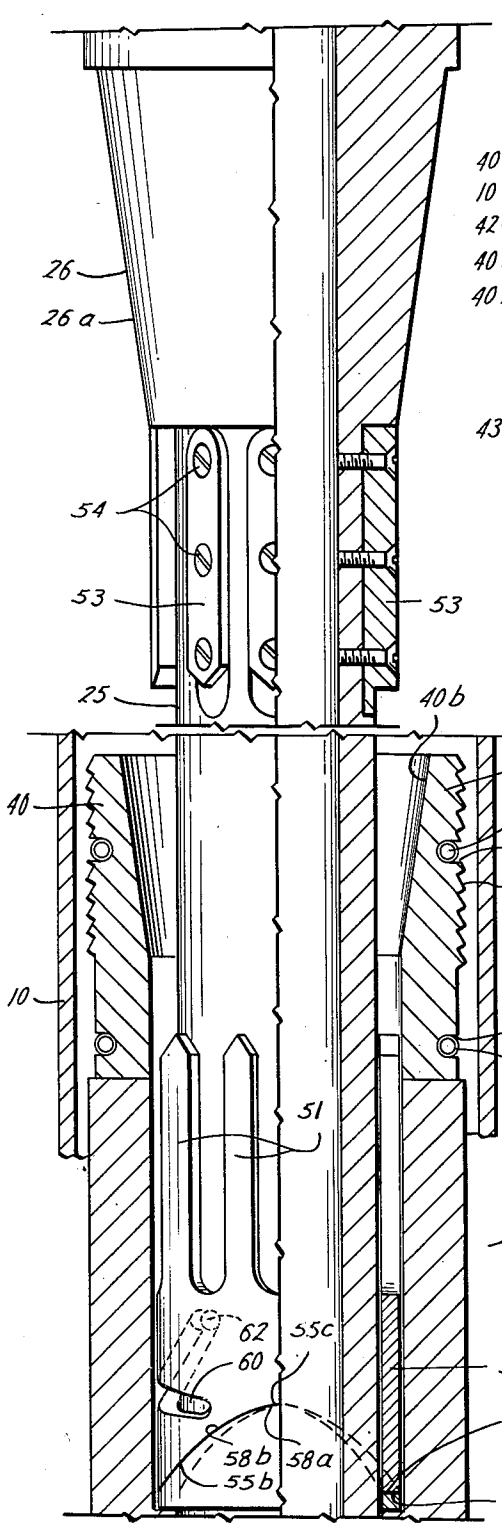


Fig. 11

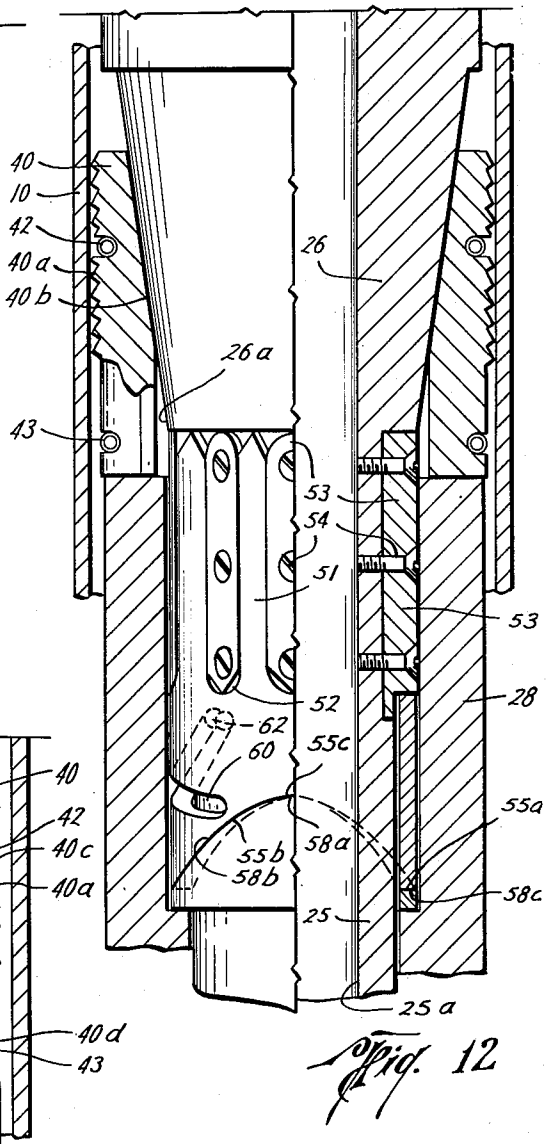


Fig. 12

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2,762,438

WASH-OVER SPEAR APPARATUS

Cecil A. Naylor, Shreveport, La.

Application June 1, 1954, Serial No. 433,575

22 Claims. (Cl. 166—103)

This invention relates to new and useful improvements in wash over spear apparatus.

An object of this invention is to provide a wash over spear apparatus for freeing a stuck pipe in a well bore, wherein after the stuck pipe is freed, it is prevented from falling in the well bore a sufficient distance to cause buckling or other damage to the stuck pipe or the pipe connected therebelow.

An important object is to provide an improved apparatus wherein a retrieving assembly is combined with a wash pipe in such manner that the wash pipe may be utilized to connect the retrieving assembly to a stuck pipe, after which said wash pipe may thereafter be employed in the usual manner to wash over the stuck pipe to effect its release; said apparatus including means for connecting the wash pipe and the retrieving assembly after the stuck pipe has been released, whereby said pipe may be retrieved with removal of the wash pipe from the well bore.

A particular object is to provide a wash-over spear apparatus having a wash pipe within which a retrieving assembly is adapted to be disposed, together with anchoring means forming part of said retrieving assembly and automatically operable to anchor the retrieving assembly within the pipe in the event the stuck well pipe being washed over suddenly falls downwardly during the wash-over operation whereby dropping of the well pipe due to release by said wash-over operation is prevented.

Another object is to provide an apparatus, of the character described, wherein the retrieving assembly may be selectively disconnected and re-connected from the wash pipe after the parts have been lowered into the well bore, which arrangement permits the wash pipe to be employed to first connect the retrieving assembly to the stuck pipe, then to function independently of the retrieving assembly while washing over the pipe and to thereafter, following loosening of the stuck pipe, to be re-connected with the retrieving assembly to be utilized in withdrawing the loosened pipe from the well bore.

A further object is to provide an apparatus, of the character described, wherein the retrieving assembly includes an anchoring means which, upon operation, connects the assembly to the wash pipe, together with a control means for said anchoring means which control means is operable by manipulation of the wash pipe; said control means functioning to prevent actuation of the anchoring means when in one position and permitting actuation of said anchoring means when in another position, whereby said anchoring means may be selectively rendered non-settable or settable at the operator's will.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a reading of the following specifications and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Figure 1 is a view, partly in elevation and partly in section, illustrating the wash over spear apparatus of this invention as it is lowered into the well bore.

Figure 2 is a view similar to Figure 1, but illustrating the wash over spear apparatus of this invention after it has been connected to the stuck pipe in the well bore.

Figures 3, 3A and 3B are detailed views, partly in elevation and partly in section, illustrating the upper, intermediate, and lower portions of the wash over spear apparatus of this invention, respectively, with the parts in a non-settable position for preventing the slips from setting.

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 3.

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 3.

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 3A.

Figure 7 is a horizontal sectional view taken on line 7—7 of Figure 3B.

Figure 8 is a horizontal sectional view taken on line 8—8 of Figure 3A.

Figure 9 is an isometric view illustrating the portion of the adapter latch sleeve shown in Figure 8.

Figure 10 is an elevation of the clutch ring which is illustrated in its assembled position in Figure 3.

Figure 11 is a view, partly in elevation and partly in section, of the upper portion of the wash over spear apparatus of this invention, illustrating the retrieving assembly or spear device in an anchorable position but prior to the time that the device is actually set in the anchored position.

Figure 12 is a view similar to Figure 11, but illustrating th apparatus in the anchored position.

In the drawings, the numeral **10** designates a wash pipe or tubular support of the wash over apparatus of this invention which is suspended from a drill pipe or support pipe (not shown) for lowering the wash over apparatus into the well bore B wherein a section of stuck pipe P is located in a keyseat B′ or similar obstruction in the well bore B. A conventional annular drill bit or rotary shoe **11** is mounted at the lower end of an adapter **16** which is connected to the lower end of the wash pipe **10**. The wash pipe **10**, adapter **16** and drill bit **11** are all of a sufficient internal diameter to pass around the stuck pipe P, whereby the drill bit **11** can be lowered down below the upper end of the stuck pipe P for surrounding such pipe P to drill the keyseat B′. Retrieving assembly or spear device A of the wash over spear apparatus of this invention is lowered with the wash pipe **10** and the drill bit **11** into the well bore B. After the drill bit **11** has passed below the upper end of the stuck pipe P and surrounds same, a threaded pin **12** at the lower end of the retrieving assembly or spear device A is connected to the threaded box **13** at the upper end of the stuck pipe P. Thereafter, the drill pipe is rotated to rotate the wash pipe **10** and the drill **11** to drill the keyseat B′ of the well bore B so as to release the stuck pipe P. During such drilling, the retrieving assembly A is not anchored to the wash pipe **10**, but when the stuck pipe P is loosened sufficiently to move downwardly by reason of the drilling with the bit **11** or otherwise, the retrieving assembly or spear device A is automatically actuated to anchor same in the wash pipe or tubular support **10**, whereby the downward movement of the stuck pipe P is limited to such an extent that buckling or other damage to the stuck pipe P from hitting on the bottom of the well bore B is prevented.

In Figures 3, 3A and 3B, the wash over spear apparatus of this invention is illustrated in detail with the parts in the position they assume during the lowering of the apparatus into the well bore. The connecting pin **12**

is secured to the lower end of a safety joint coupling **14** (Figure 3B) which is connected to the lower end of an annular latching body **15** (Figure 3A) having a longitudinal bore **15***a* therethrough. Latching arms **17** are pivotally mounted in longitudinal recesses **15***b* on pivot pins **18**, each of which extends laterally through one of the latching arms **17** and the latching body **15**. Each pin **18** is preferably inserted through a lateral opening **15***c* in the body **15** and is held therein by a friction fit or by other suitable securing means. Each arm **17** is formed with a socket **17***a* which receives a spring **20** having contact with the arm **17** and with the longitudinal rear wall **15***d* of the slot **15***b* to urge each of the latching arms **17** radially outwardly into one of the longitudinal latch slots **19** formed in the tubular adapter **16** connected between the tubular support **10** and the drill bit **11**. With the latching arms **17** so extended, the retrieving assembly or spear device A is connected to the tubular support **10** so that upon rotation of the support **10**, adapter **16** and drill bit **11**, the anchoring device A is also rotated. The bore of the adapter **16** is also provided with an annular recess or groove **20** below the slots **19** so that if the latching arms **17** do not align with the slots **19** as the anchoring device is lowered into the tubular support **10**, the latching arms **17** will catch in the annular groove **20**. If the latching arms **17** do enter the groove **20**, upon a raising of the anchoring device A the projections **17***c* will slide out of the groove **20** and upon a slight rotation of the anchoring device A, the arms **17** will enter the slots **19**. Once the arms **17** engage within the slots **19** then further upward movement of the device A relative to the support **10** is prevented by the engagement of the projections **17***c* with the upper ends **19***a* of the slot **19**. The particular construction of the slots **19** is illustrated in Figures 8 and 9 wherein it can be seen that the slots **19** are actually formed in an upper tubular adapter section **16***a* which extends within a lower tubular adapter section **16***b*. It will be appreciated, however, that the sections **16***a* and **16***b* could be formed integrally if so desired, but as shown the sections **16***a* and **16***b* are threaded together by threads **16***c* to form the complete adapter **16** (Figure 3A). The upper end of each slot **19** is provided with a laterally extending shoulder **19***a* and an inclined or tapered surface **19***b* adjacent thereto which are adapted to be contacted by the latching arms **17** upon a downward movement of the adapter **16** relative to the arms **17**. When the upper edges of the projections **17***c* contact the lateral shoulders **19***a*, the arms **17** cannot move upward relative to the adapter **16**, but when the adapter **16** is rotated to the left or counterclockwise (as viewed from top of Figure 3A) the projections **17***c* contact the inclined surface **19***b* and the arms **17** are forced radially inwardly so that the arms **17** can be moved upwardly relative to the slots **19** for thereby releasing the non-rotative latched connection of the arms **17** in the latch slots **19**.

Stop segments **24** are mounted on the body **15** at the lower end of the longitudinal recesses **15***b* to limit the outward movement of the latching arms **17** by the contact of the depending projections **17***d* therewith when the retrieving assembly A is not positioned in the support **10** or the adapter **16**.

A mandrel **25** having a longitudinal bore **25***a* therethrough has at its lower end threads **25***b* which are connected to threads **15***e* on the upper inner enlarged bore of the latching body **15**. The mandrel **25** extends upwardly from the latching body **15** and it has formed on its upper end (Figure 3) a slip expander or cone **26** which has an outer downwardly and inwardly inclined surface **26***a*, the purpose of which will be hereinafter explained.

A slip body **28** which is annular in construction surrounds the mandrel **25** and is longitudinally movable with respect to the mandrel **25**. Near the lower end of the slip body **28**, a plurality of friction or drag shoes **30** are mounted in longitudinal recesses **31** formed in the slip body **28**. Each friction shoe **30** has a plurality of sockets **30***a* in the rear wall thereof in which coiled springs **32** are positioned. The inner portions of the springs **32** contact the longitudinal inner wall **31***a* of the groove **31** and are confined under compression to urge the friction shoes **30** radially or laterally outwardly into contact with the inner surface of the tubular support **10**. Each shoe **30** has an upper stop lug **30***b* and a lower stop lug **30***c* which are adapted to contact stop plates **35** and **36**, respectively, which are mounted on the slip body **28** at the upper and lower ends of the longitudinally formed slot **31**, whereby the shoes **30** are limited in their outward movement.

Slips or slip segments **40** which preferably have downwardly extending gripping teeth **40***a* thereon are positioned near the upper end of the slip body **28** within longitudinal slots **28***a* formed in the wall of the body **28** at the upper end thereof. Each of the slips or slip segments **40** has a downwardly and inwardly inclined surface **40***b* which has substantially the same inclination as the inclined surface **26***a* on the expander or cone **26**. The slips or slip segments **40** are urged to a retracted position (Figures 3 and 4) by annular springs **42** and **43** which fit within recesses **40***c* and **40***d*, respectively. As will be explained, the slip expander or cone **26** is in an upper position (Figure 1) during the lowering of the overshot apparatus into the well bore, and the retrieving assembly or spear device is in the non-settable or non-anchorable position (Figure 3), but after the threaded pin **12** has been connected to the stuck pipe P, the anchoring apparatus A is moved to a settable or anchorable position (Figure 11) so that it will automatically effect a setting or anchoring of the slips **40** in gripping contact with the tubular support **10** upon a downward movement of the stuck pipe P (Figure 12).

Whether the slips of the retrieving assembly or spear device are in a non-settable position or a settable position is determined by the position of a clutch sleeve or ring **50** (Figures 3 and 11) which is slidably mounted around the upper end of the mandrel **25** and below the slip expander or cone **26**. The clutch sleeve **50** has longitudinal clutch fingers **51** which are circumferentially disposed with longitudinal openings **52** therebetween. Longitudinal clutch fingers **53** are located on the mandrel **25** at its upper end and below the cone **26** and are formed integrally with the mandrel **25** or are held thereon by screws **54** or other suitable securing means. Relative rotation between the clutch sleeve **50** and the mandrel **25** is prevented when the fingers **53** on the mandrel **25** are positioned in the longitudinal openings or slots **52** between the longitudinal fingers **51** on the clutch sleeve **50** (Figure 3).

The lower end of the clutch sleeve **50** is formed with a cam surface **55** having two diametrically opposed lower cam surfaces **55***a* each of which extends laterally and is relatively narrow in width. The lower lateral surfaces **55***a* are connected by two upwardly curved cam surfaces **55***b*, each of which has an upper surface **55***c* at its midportion extending laterally. Since the surfaces **55***a* and **55***c* are lateral, the cam surfaces **55***b* are inclined upwardly and inwardly (as indicated by the dotted lines in Figure 10). A cam sleeve **57** supports and is positioned below the clutch sleeve **50** on an annular inwardly extending radial shoulder **28***b* within the bore of the slip housing or body **28** and is retained in position by a locking screw **56** or other suitable securing means so that the cam sleeve **57** is rotatable with the body **28**. A cam surface **58** is formed on the upper surface of the cam sleeve **57** and is adapted to co-act with the cam surface **55** to effect a rotational and longitudinal movement of the clutch sleeve **50** from a raised or non-settable position (Figure 3) to a lowered position (Figure 11). It is noted that when the clutch sleeve **50** is raised, the relative movement of the cone **26** with respect to the slips **40** is limited in a direction which will prevent the slips from setting; however, when the sleeve is in lowered position, sufficient

downward movement of the cone relative to the slips can be effected to set said slips. The cam surface **58** of the cam sleeve **57** has upper lateral surfaces **58***a*, which are connected by two downwardly curved cam surfaces **58***b* which are complementary to the upwardly curved cam surfaces **55***b* of the cam surface **55** and each surface **58***b* has a lateral surface **58***c* at its mid-portion. When the clutch member **55** is in its raised position, the lower lateral surfaces **55***a* rest upon the upper lateral surfaces **58***a* (Figure 3) but when the clutch member **55** is in its lowered or anchoring position, the surfaces **55***a* are disposed in contact with the lower mid-portions **58***c* of the cam surface **58** (Figures 11 and 12).

The clutch sleeve **50** has a guide slot **60** formed therein which is inclined upwardly and which receives a pin or lug **62** (Figures 3 and 5), which is mounted in the slip body **28** and extends into the slot **60**. When the lower lateral surfaces **55***a* of the cam surface **55** are in engagement with the upper lateral surfaces **58***a* of the cam surface **58**, the pin **62** is in the extreme lower or right end of the slot **60** (Figure 3). Upon a rotation of the body **28** to the right or clockwise relative to sleeve **50** (as viewed from the top of Figures 1 or 3) the pin or lug **62** moves therewith to the right or clockwise in the slot **60** toward the upper end thereof since the clutch sleeve **50** is held on the mandrel **25** against rotational movement by the engagement of the fingers **51** and **53**. As the pin **62** moves in the slot **60**, the cam sleeve **57** also is moved with the body **28** relative to the clutch sleeve **50** so that the lower lateral surfaces **55***a* on the clutch sleeve **50** slide from the lateral surfaces **58***a* along the inclined surfaces **58***b* of the cam sleeve **57** until the clutch sleeve **50** reaches its fully lowered or anchoring position (Figure 11), at which time the pin **62** has reached the upper end of the slot **60**. It will be evident that the configuration of the slot **60** can vary but the configuration should be such that the movement of the pin **62** in the slot **60** does not interfere with the cam action between cam surfaces **55** and **58** as the clutch sleeve **50** moves from its raised position to its lowered position.

In some cases, it may be necessary or desirable to remove the retrieving assembly A from the wash pipe or tubular support **10**; for example, such would be the case if the wash pipe **10** became stuck in the well bore B. The safety joint **14** (Figures 1, 2, 3B, and 7) is therefore provided for the purpose of permitting the removal of the retrieving assembly A from the wash pipe **10** and it has an inner safety joint member **70** connected to the lower end of the latching body **15** (Figure 3A) by the threaded connection of a threaded pin **15***g* on the body **15** with a threaded box **70***a* on the member **70**. The member **70** is tubular and has a lower tubular connecting section **71** which is of a reduced outer diameter as compared to the portion of the member **70** thereabove, whereby an annular lateral shoulder **72** is provided (Figure 3B). The connecting section **71** telescopes or fits within a bore **75**a of an outer safety joint member **75** having the connecting pin **12** therebelow. The outer member **75** is provided with one or more upper slots or grooves **76** which are open at their upper and lower ends, and the lower ends are aligned with a lateral leg **77** of a T-shaped slot or opening in the outer member **75** which includes a longitudinal leg **78**. The connecting section **71** has a lug **80** thereon for each of the grooves **76** and the T-slots **77**, **78** so that the safety joint **14** is initially made up by lowering the lugs **80** down through the grooves **76** and into the lateral leg **77**; then the inner member **70** is rotated to the right (as viewed from top of Figure 3B) relative to the outer member **75** to thereby move the lugs **80** in the lateral legs **77** until they reach the longitudinal legs **78**; then the inner member **70** is lowered relative to the outer member **75** until the shoulder **72** on the inner member **71** contacts the upper ends **75***b* of the outer member **75**, at which time the lugs **80** have moved into the lower portion of the longitudinal leg **78** below the lateral leg **77**. In such position, the lugs **80** are releasably connected to the outer member **75** by shear pins **82**. It will be evident that to effect a release of the lugs **80** from the member **75** when it desired to break the safety joint coupling, an upward force is first applied to shear the shear pins **82**, the lugs **80** are raised and aligned with the lateral legs **77** and moved therein until they are aligned with the grooves **76** at which time an upward movement of the lugs **80** in the grooves **76** completely releases the inner member **70** from the outer member **75**. It is pointed out that the upper portion of the longitudinal leg **78** is provided above the lateral leg **77** so that in the event the pins **82** are inadvertantly or prematurely sheared and the members **71** and **75** are extended relative to each other, the lugs **80** will move into the upper portions of the legs **78** so that the lugs **80** do not move into the lateral legs **77**. Thus, premature release of the safety joint **14** is prevented.

In the operation or use of the wash over spear apparatus of this invention, the apparatus is lowered as shown in Figure 1 with the latching arms **17** positioned in the latch slots **19** of the adapter **16** so that the anchoring device A is supported thereby and is therefore lowered with the wash pipe or tubular support **10**. During the lowering operation, the slip body **28** is in a lowered position (Figure 1) with respect to the mandrel and the clutch sleeve **50** is in a raised position by reason of the contact of the lower lateral cam surfaces **55***a* thereof with the upper lateral cam surfaces **58***a* of sleeve **27** (Figure 3). The slips or slip segments **40** are thus well below the slip expander **26** and are in their retracted position so that they do not engage the inner surface of the wash pipe **10**.

After the drill bit **11** has passed over the stuck pipe P, the wash over spear apparatus is lowered sufficiently to engage the connecting threaded pin **12** with the box **13** of the stuck pipe P. When such engagement occurs, the wash pipe **10** is rotated to the right or clockwise (as viewed from the top of Figure 1) by rotating the tubular support or drill pipe (not shown) which supports the pipe **10** from the surface of the well. The rotation of the wash pipe **10** is imparted to the threaded connecting pin **12** by reason of the engagement of the projections **17***c* of the latching arms **17** in the latch slots **19** of the adapter **16**. It will be noted that disconnection of the arms **17** from the slots **19** is prevented during such rotation even if slight relative longitudinal movement occurs between the wash pipe **10** and the anchoring assembly A, since the right hand rotation of the wash pipe **10** positions the projections **17***c* below the lateral shoulders **19***a* of the slots **19**.

After the connecting pin **12** is connected to the threaded box **13**, the wash pipe **10** is rotated to the left or counter-clockwise to move the projections **17***c* to a position below the inclined surfaces **19***b* of the slots **19**. Then the wash pipe **10** is slacked off or lowered. Since the retrieving assembly or spear device A is connected to the stuck pipe P, the wash pipe **10**, bit **11**, and adapter **16** are moved downwardly relative to the anchoring assembly and such lowering is continued until the bit **11** has moved downwardly from the latched position a distance slightly greater than the distance from the upper end of the slips **40** to the upper end of the slip expander **26**. Then, the wash pipe **10**, bit **11**, and adapter **16** are raised and during such raising the slip body **28** is moved upwardly with the wash pipe **10** and relative to the mandrel **25** due to the frictional engagement of the friction shoes **30** with the wash pipe **10**. The upward movement of the body **28** and wash pipe **10** is continued until the clutch fingers **51** on the clutch sleeve **50** slide between the clutch fingers **53** on the mandrel **25** so that the fingers **51** and **53** are interengaged (Figure 3). Then, the wash pipe **10** is rotated to the right or clockwise and the slip body **28** moves therewith due to the frictional engagement of the friction shoes **30** with the wash pipe **10**. As the body **28** is thus rotated to the right, the cam

sleeve 57 is rotated to the right since it is connected to the body 28, but the clutch sleeve 50 is held against rotation since the mandrel 25 is held against movement by reason of the connection of the connecting pin 12 to the stuck pipe P and the fingers 51 and 53 are interengaged. Therefore, rotation of the cam sleeve 57 relative to the clutch sleeve 50 is effected to move the clutch sleeve 50 from its raised or non-settable position to its lowered or settable position in which the lower lateral surfaces 55*a* of the cam surface 55 are moved to the mid-portions 58*c* of the cam surface 58 (Figure 11). It will be evident that as said cam sleeve 57 is rotated relative to said clutch sleeve 50, the pin 62 on the body 28 is rotated relative to the sleeve 50 and slides in the shaped slot 60. When the pin 62 reaches the upper end of the slot 60, further rotation of the slip body 28 to the right is prevented since then the body 28 is locked to the sleeve 50, and therefore even if right hand rotation of the wash pipe 10 is continued, the clutch sleeve 50 is not moved out of the lowered or settable position.

With the clutch sleeve 50 in the lowered or settable position, the wash pipe 10 is again lowered and upon such lowering, the slip body 28 is carried downwardly and away from the slip expander 26 until the lower end of the slip body 28 again rests upon the upper end of the latching body 15. The wash pipe is lowered until the bit 11 contacts the keyseat B′ and then the wash pipe is rotated to rotate the drill bit 11 to effect the drilling out of such keyseat B′. Washing fluid is circulated through the wash pipe 10 around the retrieving assembly or spear device A to the bit 11 during the rotary drilling.

After the drill bit 11 has drilled a sufficient amount of the keyseat B′ of the well bore B which is causing the pipe P to be stuck in the well bore, the well pipe P generally tends to fall downwardly and if such downward movement is not limited, the pipe below is apt to hit on the bottom of the well bore and be buckled or otherwise damaged. However, the apparatus of this invention prevents such buckling or other damage to the stuck pipe P or to the pipe therebelow because, as the stuck pipe P begins to fall in the well bore, the mandrel 25 is carried downwardly therewith from its normal operating position and the cone 26 is carried downwardly relative to the slips 40 because the slips 40 are held against downward movement by the frictional engagement of the drag or friction shoes 30 with the tubular support 10. As the cone 26 moves downwardly relative to the slips 40 the fingers 53 on the mandrel 25 move into the longitudinal openings 52 between the fingers 51 and since the clutch sleeve 50 is in its lowered or settable position (Figure 11), the cone 26 is permitted to move downwardly a sufficient distance to cause the outer tapered or inclined surface 26*a* of the cone 26 to engage the inner surfaces 40*b* of the slips 40 and by a wedging action, the slips 40 are moved outwardly into their anchored position in engagement with the inner surfaces of the wash pipe or tubular support 10 (Figures 2 and 12). Thus, the stuck pipe P and the pipe connected therebelow can only move downwardly a limited distance, which is determined by the distance from the slip expander 26 to the slips 40 when the body 28 is seated on the latching body 15 (Figure 1) and the pin 12 is connected to the stuck pipe P, which is the normal drilling position. Such limited amount of downward movement of the stuck pipe P prior to the setting of the slips 40 is not sufficient to damage the stuck pipe P or the pipe therebelow. After the slips 40 are set in the tubular support 10, the stuck pipe P is then, in effect, supported by the drill pipe connected to the tubular support 10, and the stuck pipe P then can be removed from the well bore by raising upwardly on the drill pipe and the tubular support 10.

It is noted that if the stuck pipe is resting on bottom and does not fall downwardly to cause the expander cone 26 to move downwardly relative to the slips 40, it is only necessary to pick upon the drill pipe to raise the wash pipe 10; this raises the slip body 28 and slips by reason of the frictional engagement between the friction shoes 30 and the wash pipe to thereby raise the slips relative to the cone and set said slips. Thereafter continued upward movement of the drill and wash pipe lifts the retrieving assembly and well pipe attached to the lower end of said assembly.

During the washing operation, that is, prior to the time that the stuck pipe is actually washed loose, it may become necessary to raise the wash pipe a distance upwardly with respect to the retrieving assembly which would cause setting of the gripping slips; for example, if another section of pipe is to be added to the wash pipe string, the wash pipe would necessarily have to be raised a considerable distance. If it is desired to move the wash pipe upwardly a substantial distance without setting the slips, the wash pipe is turned to the left which actuates the cam collar 57 and clutch sleeve 50 to raise the latter on the mandrel into non-settable position, after which the wash pipe may be raised relative to the retrieving assembly without setting the slips. Of course, after the wash pipe is again lowered to continue with the washing operation, said pipe is rotated to the right to again lower the clutch sleeve 50 and position the gripping slips in settable position, as hereinbefore described.

In the event the wash pipe or tubular support 10 becomes stuck in the well bore B after the retrieving assembly A has been connected to the stuck pipe P, a retrieving pipe (not shown) is lowered into the wash pipe 10 and the lower end of such retrieving pipe is threaded into the threaded tool joint box 26*b* (Figures 1 and 2) above the slip expander 26. Then an upward pull is applied to the retrieving pipe which moves the mandrel 25, latching body 15, and inner safety joint member 70 upwardly, whereby the lugs 80 are moved upwardly relative to the outer safety joint member 75 to shear the shear pins 82. A left hand torque is applied to the retrieving pipe and as it is raised, the lugs 80 move into the lateral leg 77 whereby further upward movement of the retrieving pipe moves the lugs 80 upwardly through the longitudinal grooves 76 so that a disconnection of the safety joint member 70 from the safety joint member 75 is effected. Thereafter, the entire retrieving assembly A is removed from the wash pipe 10 except for the outer safety joint member 75 which remains attached to the stuck pipe P. The usual fishing operations are then conducted to remove the wash pipe 10, if desired.

As described herein, the cam sleeve or collar 57 and the clutch sleeve 50 have been described as being positioned as shown in Figure 3, which is the position when the slips are prevented from setting, as the apparatus is initially lowered into the well bore. However, since the retrieving assembly is supported by the latches 17 as it is initially lowered into the well bore, it would make no difference what the position of the clutch sleeve to the cam collar might be during such lowering. Of course, subsequent to connecting the retrieving assembly to the stuck pipe, the wash pipe would be manipulated in the manner described to assure that the clutch sleeve is properly positioned to permit a setting of the slips upon any downward movement of the retrieving assembly with respect to the wash pipe.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. As a subcombination in a washover apparatus, a retrieving assembly adapted to be positioned in a tubular pipe for lowering into a well bore to effect the washing around and loosening of a stuck pipe, including a grapple means for engagement with the stuck pipe, coacting

means on the retrieving assembly and tubular pipe for connecting said assembly and tubular pipe so that manipulation of the tubular pipe will effect a connection of the grapple with the stuck pipe, a mandrel connected to said grapple means and extending upwardly therefrom, a sleeve on said mandrel movable longitudinally relative thereto, pipe gripping slips carried by said sleeve for gripping engagement with the inside of said tubular pipe, slip expander means on said mandrel positioned above said slips and adapted to be moved downwardly relative thereto and into engagement therewith for urging said slips outwardly into gripping engagement with the tubular pipe, friction means on said sleeve for engagement with said tubular pipe for holding said slips a predetermined distance below said slip expander as the tubular pipe is lowered around the stuck pipe to thereby normally prevent the setting of the slips, and said friction means also holding said sleeve against downward movement relative to said mandrel upon a lowering of the mandrel and the stuck fish so that the slip expander is lowered relative to the slips to set same in gripping engagement with the wash pipe upon a dropping of the stuck fish said predetermined distance.

2. A wash-over spear apparatus adapted to be lowered into a well bore comprising, a wash pipe adapted to be suspended in the well bore from a pipe string, an annular drill bit connected to the lower end of said wash pipe for drilling around a stuck pipe in the well bore, and a retrieving assembly slidably disposed in said wash pipe including, a mandrel extending longitudinally within said wash pipe, a connection means on said mandrel for connecting the retrieving assembly with the stuck pipe, a releasable latch means on said mandrel for initially releasably latching said retrieving assembly to said wash pipe whereby said wash pipe may be manipulated to connect the connection means on said mandrel to said stuck pipe, a slip expander secured to said mandrel, anchoring means including anchoring slips mounted on said mandrel below said slip expander adapted to move into anchoring engagement with said wash pipe upon downward movement of said expander relative thereto, said slip expander being movable downwardly relative to said slips to move said slips into anchoring engagement with said wash pipe when said stuck pipe becomes loosened and falls downwardly through a limited distance whereby the stuck pipe is prevented from falling in the well bore a distance sufficient to cause buckling or other damage thereto, said anchoring means including an annular slip body surrounding said mandrel, means connecting said anchoring slips to said slip body, said slip body and said slips being longitudinally movable relative to said mandrel, and friction means on said slip body engageable with said wash pipe for maintaining said slip body and said slips in position spaced below said slip expander and out of contact therewith to thereby prevent anchoring of said slips in the wash pipe until the loosened stuck pipe moves downwardly to move the slip expander downwardly for expanding the slips into their anchoring engagement with the wash pipe.

3. A wash-over spear apparatus as set forth in claim 2, wherein said releasable latch means includes a latching member on said mandrel, and a latch adapter engageable by said latching member and connected to said wash pipe above said drill bit for transmitting a rotation of said wash pipe to said mandrel and to said connection means to connect said retrieving assembly to the stuck pipe.

4. A wash-over spear apparatus as set forth in claim 2 wherein said releasable latch means includes a latching member on said mandrel, a latch adapter engageable by said latching member and connected to said wash pipe above said drill bit for transmitting a rotation of said wash pipe to said mandrel and to said connection means to connect said retrieving assembly to the stuck pipe, and means to release said latching member from said latch adapter upon a rotation of said wash pipe in the opposite direction from that required to connect the retrieving assembly and the stuck pipe whereby said wash pipe can be rotated relative to said retrieving assembly.

5. A wash-over spear apparatus adapted to be lowered into a well bore, comprising a wash pipe adapted to be suspended in the well bore from a pipe string, an annular drill bit connected to the lower end of said wash pipe for drilling around a stuck pipe in the well bore, and a retrieving assembly slidably disposed in said wash pipe including, a mandrel extending longitudinally within said wash pipe, a connection means on said mandrel for connecting the retrieving assembly with the stuck pipe, a releasable latch means on said mandrel for initially releasably latching said retrieving assembly to said wash pipe whereby said wash pipe may be manipulated to connect the connection means on said mandrel to said stuck pipe, a slip expander secured to said mandrel, anchoring means including anchoring slips mounted on said mandrel below said slip expander adapted to move into anchoring engagement with said wash pipe upon downward movement of said expander relative thereto, said slip expander being movable downwardly relative to said slips to move said slips into anchoring engagement with said wash pipe when said stuck pipe becomes loose and falls downwardly through a limited distance whereby the stuck pipe is prevented from falling in the well bore a distance sufficient to cause buckling or other damage thereto, and a safety joint between said mandrel and said connection means for permitting disengagement and removal of said retrieving assembly from said connection means.

6. A wash-over apparatus comprising, a wash pipe, a retrieving assembly slidably disposed in said wash pipe and including, connection means for connecting said assembly to the stuck pipe, means for releasably securing said retrieving assembly to said wash pipe so that said wash pipe and said assembly may be lowered together in the well bore and actuated to connect said connection means to the stuck pipe upon manipulation of said wash pipe, means on said wash pipe operable upon a manipulation of the wash pipe after the retrieving assembly has been connected to the stuck pipe for releasing said securing means to thereafter permit relative longitudinal movement between said wash pipe and said retrieving assembly, normally retracted anchoring means forming part of said retrieving assembly adapted to be expanded outwardly into gripping engagement with the bore of the wash pipe, said anchoring means being normally disengaged from said wash pipe when retracted to permit movement of said wash pipe relative to said retrieving assembly and to the stuck pipe to carry out a wash-over operation, and actuating means on said retrieving assembly movable downwardly with respect to the anchoring means for expanding said anchoring means outwardly into gripping engagement with the wash pipe when said stuck pipe becomes loosened and moves downwardly through a predetermined distance whereby damage to the stuck pipe from falling in the well bore is prevented.

7. A wash-over apparatus comprising, a wash pipe, a retrieving assembly slidably disposed in said wash pipe and including, connection means for connecting said assembly to the stuck pipe, means for releasably securing said retrieving assembly to said wash pipe so that said wash pipe and said assembly may be lowered together in the well bore and actuated to connect said connection means to the stuck pipe upon a manipulation of said wash pipe, means on said wash pipe operable upon a manipulation of the wash pipe after the retrieving assembly has been connected to the stuck pipe for releasing said securing means to thereafter permit relative longitudinal movement between said wash pipe and said retrieving assembly, normally retracted anchoring means forming part of said retrieving assembly adapted to be expanded outwardly into gripping engagement with the bore of the wash pipe, said anchoring means being normally disengaged from said wash pipe when retracted

to permit movement of said wash pipe relative to said retrieving assembly and to the stuck pipe to carry out a wash-over operation, and actuating means on said retrieving assembly and movable with respect to the anchoring means for expanding said anchoring means outwardly into gripping engagement with the wash pipe, said actuating means being operated upon relative movement between the wash pipe and retrieving assembly in opposite directions which in effect moves the retrieving assembly downwardly with respect to the wash pipe.

8. A wash-over spear apparatus including, a tubular wash pipe adapted to be lowered into a well bore for directing washing fluid around a stuck pipe in the well bore for loosening said stuck pipe, a retrieving assembly slidable in said wash pipe, means for positioning said assembly against downward movement in said tubular wash pipe, means on said retrieving assembly for attaching said assembly to said stuck pipe, coacting means on the pipe and retrieving assembly for non-rotatively connecting the pipe and assembly so that the pipe may be manipulated to attach the retrieving assembly to the stuck pipe, normally retracted anchoring means forming part of said retrieving assembly adapted to be expanded outwardly into gripping engagement with the bore of the wash pipe, said anchoring means being normally disengaged from said wash pipe when retracted to permit movement of said wash pipe relative to said retrieving assembly and to the stuck pipe to carry out a wash-over operation, and actuating means on said retrieving assembly movable downwardly with respect to the anchoring means for expanding said anchoring means outwardly into gripping engagement with the wash pipe when said stuck pipe becomes loosened and moves downwardly through a predetermined distance, whereby damage to the stuck pipe from falling in the well bore is prevented.

9. A wash-over spear apparatus as set forth in claim 8, together with a safety joint disposed between the retrieving assembly and the attaching means at the lower end thereof, whereby the retrieving assembly may be disconnected from the attaching means in the event the stuck pipe cannot be removed from the well bore after said attaching means has been connected with said stuck pipe.

10. A wash-over spear apparatus including, a tubular wash pipe adapted to be lowered into a well bore for directing washing fluid around a stuck pipe in the well bore for loosening said stuck pipe, a retrieving assembly slidable in said wash pipe, means for positioning said assembly against downward movement in said tubular wash pipe, means on said retrieving assembly for attaching said assembly to said stuck pipe, coacting means on the pipe and retrieving assembly for non-rotatively connecting the pipe and assembly so that the pipe may be manipulated to attach the retrieving assembly to the stuck pipe, normally retracted anchoring means forming part of said retrieving assembly adapted to be expanded outwardly into gripping engagement with the bore of the wash pipe, said anchoring means being normally disengaged from said wash pipe when retracted to permit movement of said wash pipe relative to said retrieving assembly and to the stuck pipe to carry out a wash-over operation, and actuating means on said retrieving assembly and movable with respect to the anchoring means for expanding the anchoring means outwardly into gripping engagement with the wash pipe, said actuating means being operated upon a relative movement between the wash pipe and retrieving assembly in opposite directions which in effect moves the retrieving assembly downwardly with respect to the wash pipe.

11. A wash-over spear apparatus including, a tubular wash pipe adapted to be lowered within a well bore to encircle a stuck pipe therein, a retrieving assembly slidably disposed in said wash pipe, means within the wash pipe for supporting said assembly within the bore of the wash pipe against downward movement therein, means at the lower end of the retrieving assembly for attaching said assembly to the stuck pipe, co-acting means on the wash pipe and retrieving assembly to non-movably connect said pipe and assembly whereby the assembly may be connected to the stuck pipe by manipulation of the wash pipe, said co-acting means being disconnectable and said wash pipe being movable downwardly relative to the retrieving assembly and stuck pipe when said assembly is attached to the stuck pipe, whereby the retrieving assembly and stuck pipe in effect may move upwardly with respect to said wash pipe and also whereby the wash pipe may be utilized to carry out a wash-over operation, said retrieving assembly including a mandrel having a slip expanded thereon, anchoring means including normally retracted gripping slips slidably mounted on the mandrel and movable outwardly into gripping engagement with the wash pipe upon a relative downward movement of the mandrel and expander with respect to the slips, and friction means connected with the gripping slips and engageable with the wash pipe, whereby, when the wash pipe is moved downwardly relative to the retrieving assembly, the gripping slips are also urged downwardly relative to the expander to maintain the slips in non-engaged position, a predetermined relative movement of the wash pipe upwardly with respect to the retrieving assembly resulting in a relative downward movement of the mandrel with respect to the slips to move the slips into gripping engagement with the wash pipe.

12. A wash-over spear as set forth in claim 11, together with a safety joint between the retrieving assembly and the means for attaching said assembly to the stuck pipe, whereby said assembly may be separated from said attaching means.

13. A wash-over spear apparatus as set forth in claim 11, together with means forming part of the retrieving assembly and comprising co-acting means on the mandrel and on said anchoring means for limiting relative movement between the mandrel and anchoring means to prevent the gripping slips from moving into engagement with the wash pipe, said co-acting means being actuatable by manipulation of said wash pipe.

14. A wash-over spear apparatus as set forth in claim 11, together with locking means forming part of the retrieving assembly and interposed between the mandrel and the anchoring means, said locking means being movable to one position to lock said mandrel and anchoring means to prevent setting of said gripping slips and being movable to a second position to release said mandrel and anchoring means to allow setting of said gripping slips upon predetermined relative movement of the wash pipe upwardly with respect to the retrieving assembly, said locking means being actuatable to selectively position the same in either of said positions by manipulation of the wash pipe.

15. A wash-over spear apparatus as set forth in claim 11, together with a projection on the mandrel, a clutch sleeve surrounding the mandrel and having its upper end recessed to receive said projection on the mandrel, said sleeve being movable longitudinally with respect to the gripping slips of the anchoring means and having a cam surface on its lower end, a cam collar secured to the anchoring means and located in surrounding relationship to the mandrel below the clutch sleeve, said cam collar having a cam surface on its upper end engageable with the cam surface on the clutch sleeve, means limiting turning movement between the cam collar and clutch sleeve in both directions, turning movement of the cam collar in one direction raising the clutch sleeve with respect to the anchoring means and turning movement of the cam collar in an opposite direction lowering said clutch sleeve, the position of the clutch sleeve with respect to the anchoring means controlling the relative movement between the mandrel and the gripping slips of said anchoring means, whereby when the clutch sleeve is in raised position relative to the anchoring means, the gripping slips cannot move to gripping position engaging

the wash pipe, and when the clutch sleeve is in lowered position relative to the anchoring means sufficient relative longitudinal movement between the mandrel and anchoring means may occur to move the gripping slips of said anchoring means into gripping engagement with the wash pipe.

16. A wash-over spear apparatus as set forth in claim 11, together with a plurality of longitudinally extending projections on the mandrel, a clutch sleeve movable longitudinally on the mandrel and having a plurality of longitudinally extending clutch fingers on its upper end which are adapted to interfit with said longitudinal projections to non-rotatively couple the sleeve to the mandrel, said sleeve being movable longitudinally with respect to the gripping slips of the anchoring means and having a cam surface on its lower end, a cam collar secured to the anchoring means and located in surrounding relationship to the mandrel below the clutch sleeve, said collar having a cam surface on its upper end engageable with the cam surface on the clutch sleeve, means limiting turning movement between the cam collar and clutch sleeve in both directions, turning movement of the cam collar in one direction raising the clutch sleeve with respect to the anchoring means and turning movement of the cam collar in an opposite direction lowering said clutch sleeve, the position of the clutch sleeve with respect to the anchoring means controlling the relative movement between the mandrel and the gripping slips of said anchoring means, whereby when the clutch sleeve is in raised position relative to the anchoring means, the gripping slips cannot move to gripping position engaging the wash pipe, and when the clutch sleeve is in lowered position relative to the anchoring means sufficient relative longitudinal movement between the mandrel and anchoring means may occur to move the gripping slips of said anchoring means into gripping engagement with the wash pipe.

17. A wash-over spear apparatus as set forth in claim 11, together with a projection on the mandrel, a clutch sleeve surrounding the mandrel and having its upper end recessed to receive said projection on the mandrel, said sleeve being movable longitudinally with respect to the gripping slips of the anchoring means and having a cam surface on its lower end, a cam collar secured to the anchoring means and located in surrounding relationship to the mandrel below the clutch sleeve, said cam collar having a cam surface on its upper end engageable with the cam surface on the clutch sleeve, means limiting turning movement between the cam collar and clutch sleeve in both directions, turning movement of the cam collar in one direction raising the clutch sleeve with respect to the anchoring means and turning movement of the cam collar in an opposite direction lowering said clutch sleeve, the position of the clutch sleeve with respect to the anchoring means controlling the relative movement between the mandrel and the gripping slips of said anchoring means, whereby when the clutch sleeve is in raised position relative to the anchoring means, the gripping slips cannot move to gripping position engaging the wash pipe, and when the clutch sleeve is in lowered position relative to the anchoring means sufficient relative longitudinal movement between the mandrel and anchoring means may occur to move the gripping slips of said anchoring means into gripping engagement with the wash pipe, said means for limiting turning movement between the cam collar and clutch sleeve comprising a pin and cam slot connection between the gripping slips and the clutch sleeve, said pin and slot also assisting in downward movement of the clutch sleeve when the cam collar is rotated in one direction relative to the clutch sleeve.

18. The combination with a wash-over pipe which is connected to a tubular conductor and adapted to be lowered within a well bore, of a retrieving assembly slidable within the wash pipe, releasable means for non-rotatably supporting said assembly in the wash pipe against downward movement within said wash pipe as the same is lowered within the well bore, connecting means on the lower end of the retrieving assembly for connecting said retrieving assembly to the stuck pipe, said connecting means being actuated by manipulating the wash pipe which imparts movement to the retrieving assembly to make said connection, said wash pipe being thereafter moved downwardly relative to the retrieving assembly and stuck pipe to disengage said releasable means whereby the retrieving assembly may subsequently move longitudinally relative to the wash pipe, anchoring means forming part of the retrieving assembly and including gripping slips, and an expander movable relative to the slips and connected with the stuck pipe, whereby the gripping slips are moved into engagement with the wash pipe to anchor the retrieving assembly to the wash pipe upon relative movement between the wash pipe and retrieving assembly in opposite directions which, in effect, moves the expander downwardly with respect to the gripping slips to expand the same whereby the wash pipe may be lifted to lift both the retrieving assembly and connected stuck pipe from the well bore.

19. A wash-over spear apparatus as set forth in claim 18, together with a safety joint between the lower end of the mandrel and the means for connecting said mandrel to a stuck pipe, whereby the retrieving assembly may be separated from said attaching means.

20. The combination with a wash-over pipe which is connected to a tubular conductor and adapted to be lowered within a well bore, of a retrieving assembly slidable within the wash pipe, releasable means for non-rotatably supporting said assembly in the wash pipe against downward movement within said wash pipe as the same is lowered within the well bore, connecting means on the lower end of the retrieving assembly for connecting said retrieving assembly to the stuck pipe, said connecting means being actuated by manipulating the wash pipe which imparts movement to the retrieving assembly to make said connection, said wash pipe being thereafter moved downwardly relative to the retrieving assembly and stuck pipe to disengage the releasable means whereby the retrieving assembly may subsequently move longitudinally relative to the wash pipe, said retrieving assembly including a mandrel having means at its lower end for connecting to the stuck pipe, a gripping slip unit slidably mounted on the mandrel and having gripping slips which are movable outwardly into gripping engagement with the wash pipe, expander means on the mandrel coacting with the gripping slips to move said members outwardly into gripping engagement with the wash pipe upon relative downward movement of the mandrel with respect to said slips, friction means between the gripping slip unit and the wash pipe which urges the gripping slip unit downwardly with respect to the mandrel so long as the wash pipe is moving downwardly relative to the expander means on the mandrel of the retrieving assembly to maintain the gripping slips of said unit in non-gripping position, said friction means also functioning to move said gripping slips upwardly relative to the expander means and into gripping position when the wash pipe is moved upwardly relative to the retrieving assembly.

21. As a subcombination in a wash-over spear apparatus, a retrieving assembly adapted to be positioned in a tubular pipe and including, a mandrel having means for connecting its lower end to a stuck pipe and having a slip expander thereon, a gripping slip unit slidable and rotatable on the mandrel and having gripping slips which are movable longitudinally relative to the mandrel and expander, the position of said slips longitudinally with respect to said expander controlling the movement of the slips to either a gripping or non-gripping position, frictional means on the gripping slip unit engageable with the bore of the tubular pipe in which the unit is

mounted, said frictional means urging the gripping slips downwardly to a non-gripping position when the tubular pipe is lowered with respect to the mandrel and the stuck pipe to which said mandrel is attached, said frictional means also functioning to urge the gripping slips in a direction which will cause their movement into a gripping position by the expander upon an upward relative movement of the tubular pipe with respect to the retrieving assembly, a projection on the mandrel, a clutch sleeve movable longitudinally on the mandrel below the projection so that it is movable longitudinally with respect to the gripping slip unit and having a recess in its upper portion adapted to be engaged by the projection to non-rotatively couple the sleeve to the mandrel, said clutch sleeve having a cam surface on its lower end, a cam collar surrounding the mandrel below the clutch sleeve and secured to the gripping slip unit, whereby the cam collar may be rotated relative to the clutch sleeve and mandrel when the gripping slip unit is rotated with respect to the mandrel, said cam collar having a cam surface on its upper end engageable with the cam surface on the clutch sleeve so that turning movement of the cam collar with respect to the clutch sleeve imparts a longitudinal movement to the clutch sleeve relative to the anchoring unit and gripping slips, and means for limiting the turning movement of the cam collar and clutch sleeve in both directions, the clutch sleeve being movable into an upper position relative to the gripping slips when the cam collar is at one limit of its turning movement and being movable to a lower position relative to the gripping slips when the cam collar at its opposite limit of turning movement, said clutch sleeve co-acting with the projection on the mandrel to restrict the relative movement of the gripping slips and mandrel to prevent setting of said slips when the clutch sleeve is in said upper position, the gripping slips being movable to a set position when the clutch sleeve is in said lower position.

22. The sub-combination set forth in claim 21, wherein the means for limiting the turning movement of the cam collar and clutch sleeve comprises a pin secured to the gripping slip unit and a slot formed in the clutch sleeve, said pin being engageable within said slot.

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