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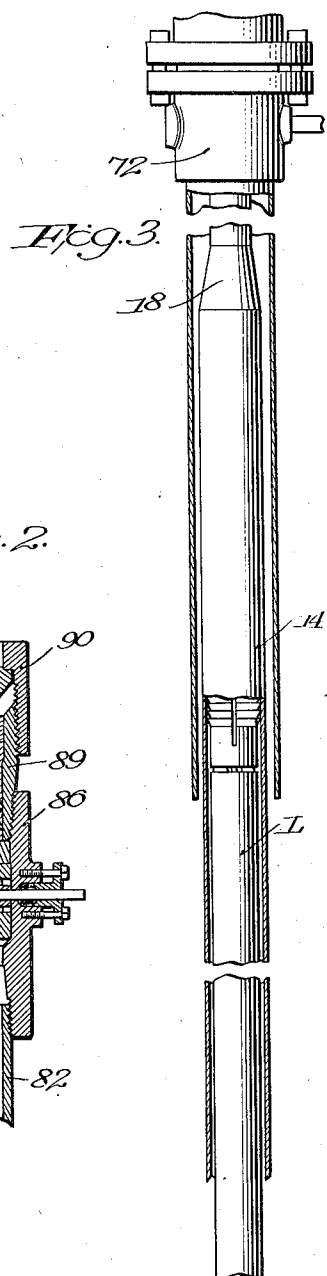
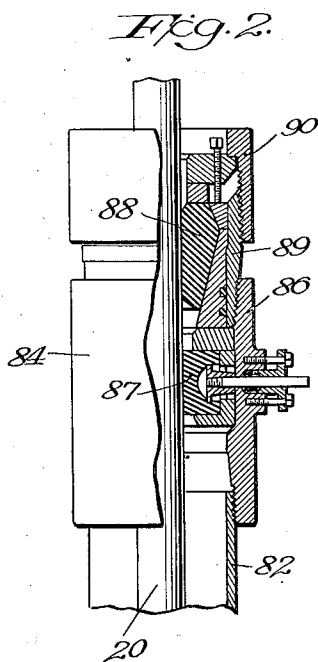
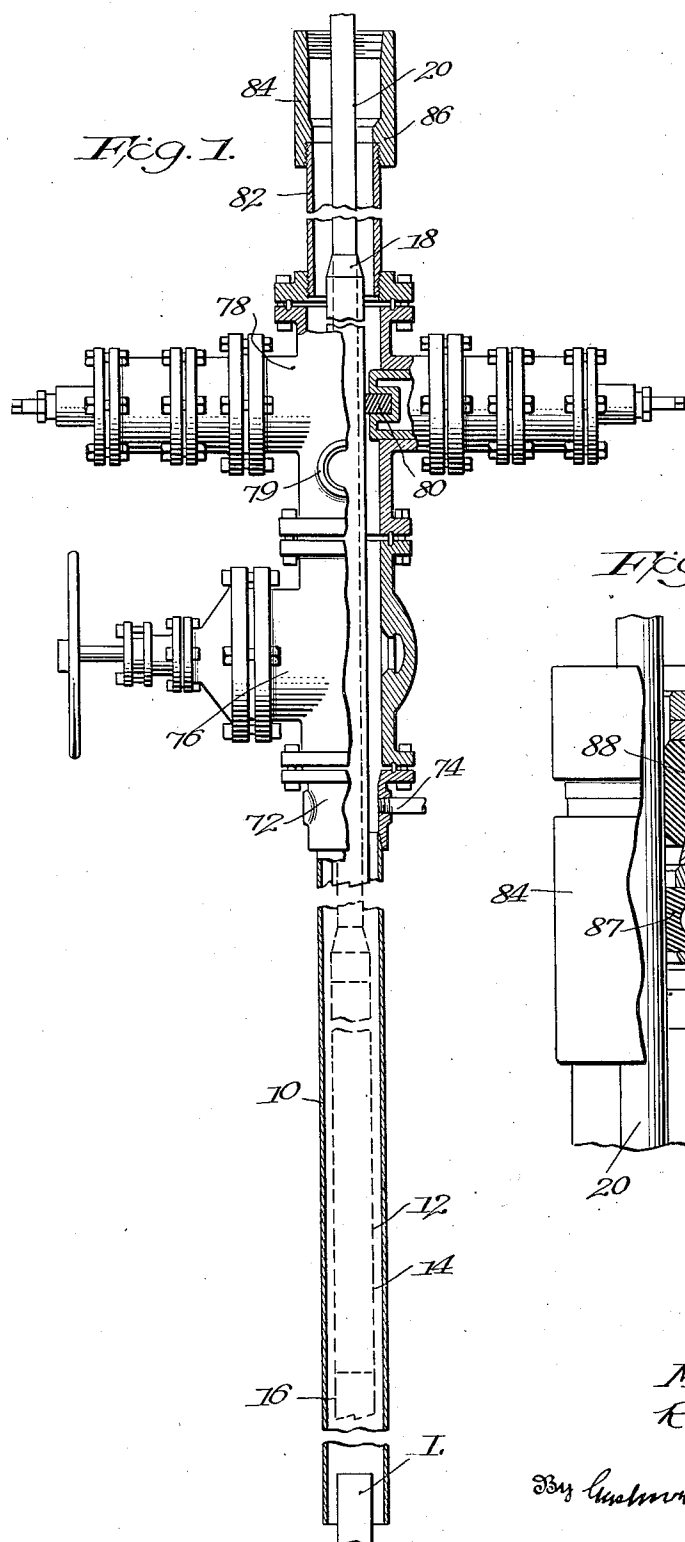
M. L. CASHION ET AL

2,179,033

METHOD AND APPARATUS FOR PERFORMING FISHING OPERATIONS

Filed Oct. 28, 1937

2 Sheets-Sheet 1



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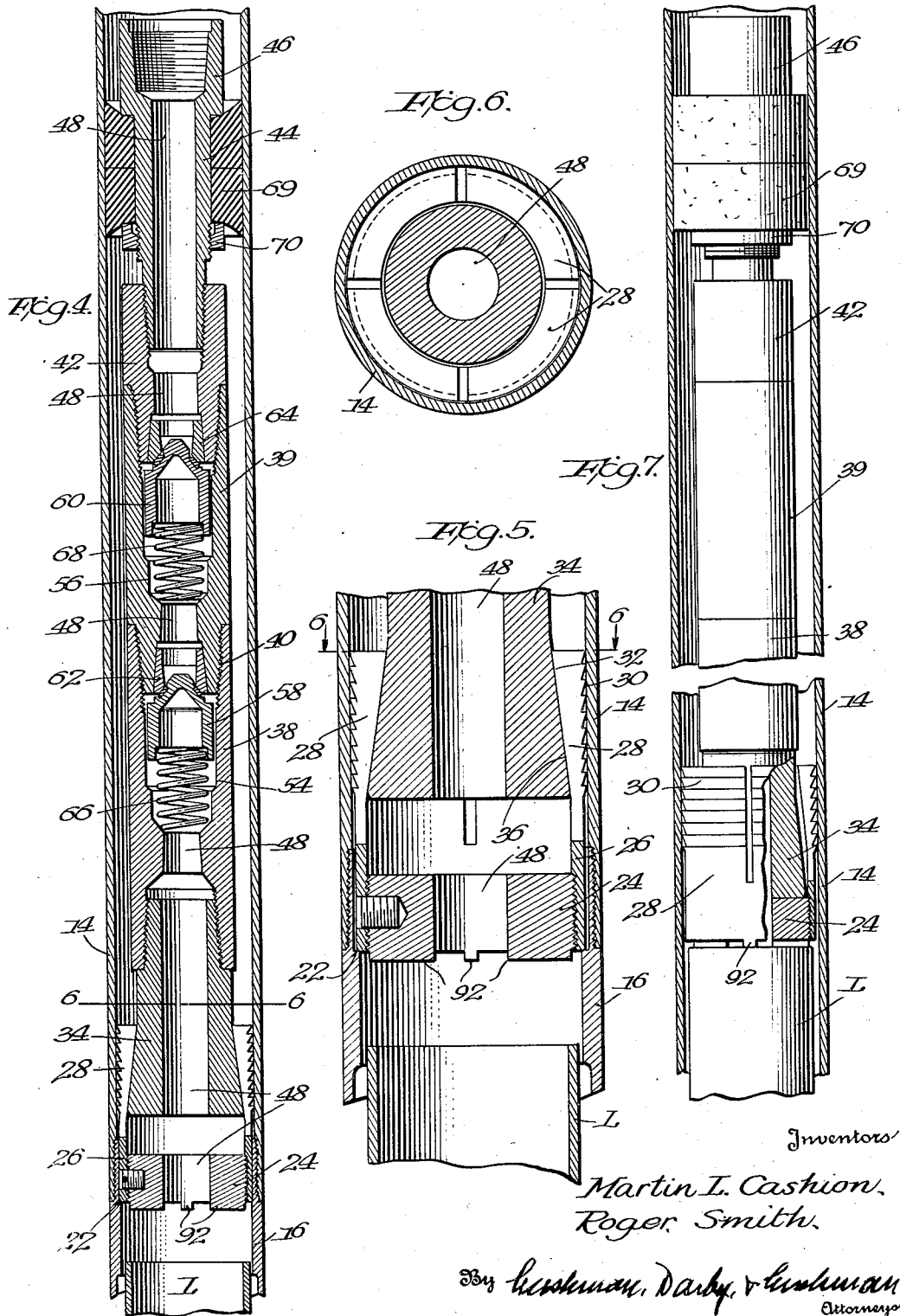
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,179,033

METHOD AND APPARATUS FOR PERFORMING FISHING OPERATIONS

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21 Claims. (Cl. 166—15)

The present invention relates to a method and apparatus for performing fishing operations, and particularly the performance of such operations in oil wells and the like having a high formation pressure.

A primary object of the invention is to provide a method and apparatus for performing fishing operations, in which a second string of drill tubing may be lowered into and removed from the well to dislodge the fish, without at any time losing control of the well, either by upward flow of high pressure fluid through the casing or through the second string of drill tubing.

Another object of the invention is to provide a second drilling string for clearing a lost string of tubing, which second string may be used to drill down around the lost string to dislodge the same, but which will provide for sealing the second string at the bottom end thereof during the lowering into and removal of said second string from the well.

A further object of the invention is to provide a second drill string provided with a plug or closure comprising a valve assembly and means for operating the same, which assembly will move upwardly in said second string as the latter drills down around the lost string to dislodge the same, and which will be moved downwardly to assume position at the bottom end of said second string when the latter is lifted from the lost string and elevated from the well.

Another object of the invention is to provide a method and apparatus for performing fishing operations in a well having high pressure therein in which a second string of drill pipe may be lowered so as to drill about and encompass the entire fish in order to dislodge the same and to allow circulation to be had to the bottom of the well in order to overbalance the formation pressure with drilling mud.

A further object of the invention is to provide a method and apparatus for performing fishing operations, in which the fishing tools may be inserted into and removed from the well as many times as necessary without at any time opening up the well to flow of fluid from the formation either through the casing or the drill stem. This may be necessary for instance, in order to repair or replace the drilling bits used.

Other objects and advantages of the method and apparatus herein disclosed will be apparent as the specification progresses.

In the drawings, which are illustrative of one form of the apparatus adapted to perform the method of the invention;

Figure 1 is a partial vertical sectional view through an oil well, showing the manner in which the second string is passed through the casing head equipment.

Figure 2 is a partial vertical sectional view of the packer disclosed in Figure 1, with the packing material inserted therein around the second string of tubing.

Figure 3 is a partial vertical sectional view of the well, showing the second drill string in encompassing engagement with the lost string or fish.

Figure 4 is a vertical sectional view of the lower end of the second drill string, showing the valve assembly in place at the lower end thereof in expanded condition.

Figure 5 is an enlarged vertical sectional view of the lower end of the second drill string showing the serrated spring fingers which retain the valve assembly in position in said string.

Figure 6 is a horizontal sectional view on the line 6—6 of Figure 5.

Figure 7 is a partial vertical sectional view of the lower end of the second drill string, showing the valve assembly in contracted condition.

The method and apparatus of the present invention is adapted for use in the removal of strings of tubing which have become stuck in a well, such as strings of drill pipe which have become stuck during ordinary drilling operations, or as the result of a blow-out.

In the performance of such operations as drilling, after a predetermined initial depth of the well has been drilled, such as for instance, a thousand feet, a surface casing is run into the well and cemented therein, after which drilling operations may be carried on below the lower end of this surface casing for any required depth, as for instance, to a depth of perhaps seven thousand feet more or less. A surface casing, as mentioned above, is disclosed set in position in Figure 1.

The ordinary drilling operations at the present time are usually performed by a rotary drill carried at the lower end of a drill pipe, and this pipe may extend down in the well to a depth of several thousand feet. This drill pipe is conventionally formed from a plurality of sections or strings, which are assembled one to the other as needed at the casing head as the drilling progresses.

During the drilling operations it sometimes occurs that an area of extreme pressure is encountered, and this high pressure fluid may rise up through the hole and out through the sands several thousand feet above where the extreme

pressure was encountered, often cratering at the surface of the earth some distance from the hole.

After such an occurrence, and to prevent or terminate any blow-out, whether or not it is as serious as one of the type described above, it is the practice to fill the hole with oil well mud, in order to build up a head in the well which will counteract the formation pressure. After the well is mudded up, it is frequently found that the drill string is stuck in the well by reason of cave-ins brought about during the course of the blow-out, and until the stuck string of tubing is dislodged or removed, no further operations on the site can be performed. Under such circumstances, it is customary to back off and remove from the well as much of the upper end of the drill tubing as possible, and after this has been done, there may remain a "lost" string of tubing in the well which will be free at its upper end where the removed string was backed off.

When the drilling operations are being carried out at extreme depths and under high pressure conditions, it may happen that fluid at a pressure corresponding to the depth of the drilling bit at the time the blowout occurred, will be trapped in the sands, or in and about the drill stem a considerable distance further up in the well, at a depth where the head of mud is not sufficient to counteract the same.

Under the above conditions, it is imperative during fishing operations for the lost string, that means be provided for maintaining control of the well at all times, in order to prevent the fishing operations from resulting in another blow-out. It is customary in dislodging a lost string of drill tubing or the like, to drill down around the outside of the same, and if high enough pressure exists at any depth in the formation surrounding the lost string to overcome the head of mud at that depth, a blow-out may result.

In Figure 1, the upper end of the lost string of drill pipe is shown at L, and for purposes of illustration, this end is shown disposed just above the lower end of the surface casing 10, it being assumed that the upper strings of the first drill pipe or tubing have been removed by ordinary backing off and removing equipment after the drill tubing has become stuck. The second string of drill tubing is shown at 12, the lower end of said tubing comprising an enlarged string 14 having at the lower end thereof a drilling bit 16, and having therein a plug or closure comprising a valve assembly, said enlarged string being adapted to encompass the lost string L during the time that the drilling shoe 16 is drilling down around the lost string to dislodge the same from the caved-in formation.

The upper end of the enlarged or telescoping portion 14 of the second string of drill tubing terminates in a sub 18 which connects said enlarged portion with a smaller or main portion 20 of the second string. The second string of drill tubing is lowered through the casing head control equipment disclosed in Figure 1 maintaining control of the well both within the second string of drill tubing and between said tubing and the casing in a manner hereinafter described.

Referring to Figures 4 and 5, the lower end of the enlarged portion of the second string of drill tubing is provided with an interior shoulder 22 shown conveniently located on the inner wall of the drill shoe 16. This shoulder serves to limit the downward movement of a collar 24 carried by the valve assembly, which collar is threaded with-

in a ring 26, said ring being equipped with a plurality of upwardly extending spring fingers 28, said fingers being serrated on their outer faces, as at 30, providing slips to engage the inner wall of the second string to retain the valve assembly at the lower end of the second string in a manner hereinafter described.

The inner walls of the fingers 28 taper inwardly and upwardly, as at 32, to engage and retain the foot 34 of the valve assembly, said foot tapering outwardly and downwardly, as at 36, where it is surrounded by the fingers 28.

The complete valve assembly is shown in Figure 4, comprising a pair of hollow valve housings 38 and 39 threaded together, as at 40, the upper valve housing 39 being threadedly connected with a valve assembly top member 42, to the upper end of which is in turn threaded a tubular member 44, which terminates at its upper end in an interiorly threaded socket 46 to receive any appropriate tool for operating upon the valve assembly.

All of the parts comprising the valve assembly are centrally bored providing a fluid passage 48 extending throughout the length of said assembly, from the socket 46 through the collar 24.

The housings 38 and 39 are also provided, respectively, with enlarged counterbores 54 and 56, which counterbores slidably house valve members 58 and 60, said valve members being adapted to seat against valve seats 62 and 64, respectively, secured in the lower ends of the valve housings 38 and 39. The valve members are normally retained against their seats by the respective springs 66 and 68 which are contained within the counterbores, and said valve members are adapted to be moved from their seats to permit passage of fluid through the bore 48 of the valve assembly in a manner hereinafter described.

It will be understood that the valve members 58 and 60 operate at all times simultaneously, and two of such valve members are provided merely to supplement one another, so that control of the passage of fluid through the valve assembly will be insured at all times, even though one of said valves becomes leaky.

Any suitable type of packing 69 may be disposed around the tubular member 44 at the upper end of the valve assembly, said packing being retained between a shoulder at the lower end of the socket 46 and a ring 70 threaded to the outside of the tubular member 44 below the packing. The lower end of the packing may be flared outwardly as shown so that well pressure will assist in sealing the same.

The apparatus described above may be used in performing fishing operations in association with the well known casing head control equipment disclosed in Figure 1. In said figure the casing head is shown at 72 threaded or secured in any other suitable manner to the upper end of the casing 10, provided with the conventional side openings 74, which may be plugged or controlled by any well known type of valves as desired. Secured above the casing head is a gate valve 76, and attached to the upper end of the gate valve is a blow-out preventer 78 of well known type, including rams 80 adapted to be forced inwardly by fluid pressure or other suitable means to engage the tubing and seal off the area between the casing and tubing, in a well known manner. The engaging faces of the rams are provided with packing to seal in engagement with the outer wall of the tubing.

A short length of casing 82 may be connected

above the blow-out preventer, and attached to the upper end of this casing is a packer 84 of known type, the details of which are illustrated in Figure 2. The blow-out preventer is equipped with the conventional side outlets 79 disposed in the wall thereof below the rams 80, and said outlets are controlled by suitable valves.

The packer 84 is of a well known construction, and no detailed description thereof is necessary. In general, said packer comprises a housing 86 threaded to the upper end of the casing section 82, which housing removably carries therein an inflatable packing element 87 and a mechanical packing element 88, the latter being carried within a sleeve 89 threaded within the upper end of the housing 86, sleeve 89 being adapted to receive a cap 90, which is threaded to the upper end thereof, said cap serving to compress the packing element 88. The packing elements may be removed from the housing 86 at any time desired for a purpose which will hereinafter appear.

Referring to Figure 1, and assuming that L is the upper end of a fish which remains in the well after the upper sections thereof have been backed off by ordinary methods, the operation in clearing the lost string is as follows:

Sections of the enlarged portion 14 of the second string of the drill tubing are assembled within the derrick with the valve assembly located at the bottom of the lowermost section as shown in Figure 4. With the gate valve 76 closed, the rams 80 are retracted and the lower end of the string 14 is passed through the blow-out preventer, after which the rams are forced into engagement with the outer wall of the tubing section 14 by fluid or other suitable pressure, to form a seal between the tubing and the casing. During the operation of inserting the lower end of the tubing section 14, the packing will be removed from the housing 86 of the packer 84, as shown in Figure 1.

After the lower end of the second string has been inserted through the rams as discussed above, the gate valve 76 is opened, after which the tubing is lowered into the well until the connector 18 is disposed just above the rams 80. During the operations subsequent to the opening of the gate valve 76, the casing will be sealed by the rams 80, while the tubing will be sealed by the valves 58 and 60 of the valve assembly, said valves being held to their seats by any pressure which may exist in the well when the gate valve 76 is opened. If any such pressure exists it will operate against the lower face of the packing 69 and the valve 58 and will move the valve assembly upwardly to expand the spring fingers 28, in the manner shown in Figure 4, thus preventing any upward movement of the valve assembly in the tubing and retaining the same at the lower end of said tubing.

When the entire length of the enlarged portion 14 of the second string has been lowered into the well to such depth that the connector 18 is disposed just above the rams 80, as shown in Figure 1, the packing elements of the packer 84 are inserted into the housing 86 and around the smaller or main section 20 of the second string of drill tubing to form a seal around the same, as specifically disclosed in Figure 2. The rams may then be retracted, and the tubing is lowered into the well approaching the upper end of the lost string, sections of tubing 20 being added above the packer as necessary.

During the lowering of the second string into the well, the pressure therein will maintain the

valve assembly in the condition shown in Figure 4 and at the lower end of the second string. Any fluid in the well displaced by the lowering of the string will pass upwardly around the outside of said string through the casing and out through the outlets 79.

When the drilling shoe 16 of the second string reaches the upper end L of the lost string, said shoe will encompass the lost string and the upper end of the lost string will bear against a plurality of radial lugs 92 disposed on the lower end of the collar 24. The engagement of the upper end of the lost string with the collar will move the same upwardly with respect to the foot 34, as shown in Figure 7, permitting the spring fingers 28 to contract and permit the valve assembly to move upwardly within the second string.

During the movement of the second string down around the lost string, the former will be rotated by any conventional drilling equipment so that the blades of the drilling shoe 16 will cut away the formation around the lost string to dislodge the latter. While drilling, liquid will be forced downwardly through the second string in the usual manner, and said liquid will be of sufficient pressure to open the valves 60 and 58 and flow past the same and completely through the passage 48, and between the outer wall of the lost string and the inner wall of the drill shoe to carry away the cuttings resulting from the drilling operation. The washing liquid will flow upwardly around the second string, through the surface casing, and will be discharged through the outlets 79 to the mud pit. The flow of liquid to carry away the cuttings will not be impeded by the engagement of the collar 24 with the upper end of the lost string, as the radial lugs 92 will prevent the forming of a seal at the upper end of the lost string, and will permit the drilling liquid to flow downwardly between the outer wall of the lost string and the inner wall of the drill shoe.

It will be evident that during this drilling operation, control of flow through the casing is maintained by the packer 84 which seals around the tubing 20, while control of flow through the tubing is maintained by the valve assembly and valves 58, 60. It will further be evident that the tubing flow control will be maintained at the upper end of the lost string L, as the valve assembly will be retained at the upper end of the lost string while the second string of drill tubing moves downwardly with respect thereto. If during the drilling operation, any excessive pressure is encountered, it cannot blow the valve assembly upwardly through the tubing, for when the well pressure encountered exceeds the pumping pressure of the drilling liquid, the valve assembly will be moved upwardly to the position shown in Figure 4, expanding the spring fingers 28 against the inner wall of the tubing to prevent further movement.

Drilling around the lost string may be continued to any desired depth, up until the time when the valve assembly reaches the upper end of the enlarged portion 14 of the second string, as shown in Figure 3. At this time, the upper end of the valve assembly will be disposed immediately below the connector 18.

A sufficient length of the lost string now having been dislodged, it may be desirable to elevate the second string from the well in order to substitute a tube cutting tool at the lower end thereof in place of the drilling shoe 16, so that the dislodged length of the lost string may be

cut and removed, or it may be desirable to elevate the second string from the well to insert any other appropriate tool for cutting and removing that portion of the lost string which has been dislodged. It will be understood that it is desirable to maintain control of the well during this elevating and removal operation, and as the length of the enlarged portion 14 of the second drill string may be greater than the height of the derrick, it is necessary that a seal for the enlarged string be provided at the lower end thereof during the time that said string is being removed from the well.

In order to provide such a seal, the present invention provides for the maintaining of the valve assembly at the upper end of the lost string during the time that the second string is being lifted therefrom.

When the elevating equipment within the derrick is operated to lift the second string from around the lost string, the formation pressure would naturally maintain the valve assembly in the condition of Figure 4 with the spring fingers 28 expanded, thus holding the valve assembly in the upper end of the enlarged portion 14 of the second string, as shown in Figure 3. In order to maintain the valve assembly at the upper end of the lost string during the lifting of the second string, fluid is pumped downwardly through the second string during the lifting operation, the pumps employed exerting sufficient pressure to overcome the formation pressure beneath the valve assembly, and this pressure exerted upon the upper end of the valve assembly and upon the upper faces of the valves 60 and 58, will cause the valve assembly to telescope downwardly within the spring fingers 28 to the position shown in Figure 7. This downward fluid pressure is maintained during the lifting operation, and the valve assembly will "float" at the upper end of the lost string permitting the second string to move upwardly with respect thereto.

During this lifting operation, it will be apparent that control of flow through the casing will be maintained by the packer 84, and control of flow through the tubing will be maintained by the valves 58 and 60. If any excessive pressure arises within the well during this operation, it will cause the valve assembly to move upwardly to expand the fingers 28 and prevent the valve assembly from being forced upwardly in the second string as hereinbefore described.

When the second string has been lifted to the upper end of the lost string, the shoulder 22 on the interior of the drilling shoe 16 will engage and support the collar 24, and at this time the pumping pressure exerted downwardly through the second string is discontinued, and the formation pressure will telescope the valve assembly to the condition shown in Figure 4, expanding the spring fingers 28 and retaining the valve assembly at the lower end of the second string. The second string is now elevated and removed from the well, preparatory to the performance of any further operations such as the cutting and removal of the dislodged portion of the lost string from the well. During this elevating and removing operation, control through the casing and tubing is maintained as hereinbefore described.

When the second string has been elevated to the position shown in Figure 1, with the connector 18 above the blow-out preventer 78, the rams 80 are moved into engagement with the outer wall of the enlarged portion 14 of the second string. This will form an additional seal

between the tubing and casing. The packing elements of the packer 84 are now removed, after which the second string is further elevated until the lower end thereof is disposed above the gate valve 76. It will be apparent that during all of the above operations, a seal is maintained through the tubing at the lower end of the second string by the valves 58, 60, of the valve assembly, and strings of tubing may be broken off above the casing head as the second string is elevated as desired, without opening the tubing to the formation pressure within the well.

When the second string has been elevated so that the drilling shoe is above the gate valve 76, the latter is closed, thus entirely sealing the well, after which the second string may be completely removed, for substitution of a casing cutting and removing tool, or preparatory to the insertion of any other tool to be used in cutting and removing portions of the lost string which have been dislodged by the apparatus and method described above.

It will be understood that the enlarged portion of the second string may be made up long enough to drill down to the lower end of the lost string, if desired. If a blow-out has occurred, the first string of drill pipe may sand up so as to trap well pressure at a point well above the depth of the drilling bit when the blow-out occurred. At the same time, cave-ins may have trapped bottom hole pressure higher up in the well in the area surrounding the first string, and the weight of the mud in the well at these higher points may not be enough to over-balance the well pressure there. In these instances, the second string may be operated to drill down around the first string to the bottom thereof, thus establishing circulation to the bottom of the well. The additional column of mud now had on the formation will be sufficient to counteract the formation pressure.

It will be apparent that the present invention provides for the insertion of a drilling tool or the like into a well in which dangerous pressures may be encountered, drilling around a fish which is lost in said well, and removing the drilling equipment from the well without losing control at any time against the dangerous pressures which may be encountered. Obviously, the apparatus of this invention is of great importance in the safeguarding of life and property during such operations. The practice of the invention provides for the safe removal of fish from high pressure wells, thus permitting for the saving of wells which have heretofore been completely lost, due to inability to remove lost strings of tubing and the like which have become stuck in wells during ordinary drilling operations or as a result of blow-outs, as described before.

Various modifications of the method and apparatus disclosed herein may be made without departing from the scope of the invention.

We claim:

1. The method of fishing for a lost string of tubing in a well having pressure therein, which comprises lowering a second string of drill tubing with a drill bit at the lower end thereof into the well and to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string, drilling around the lost string a predetermined depth to loosen the same and lifting the second string to position at the upper end of the lost string, while maintaining control at the casing head against up-

ward flow through the well around the second string and against upward flow through the second string at the upper end of the lost string, and further elevating the second string from the well while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the lower end thereof.

2. The method of fishing for a lost string of tubing in a well having pressure therein, which comprises lowering a second string of drill tubing with a drill bit at the lower end thereof into the well and to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the lower end thereof, drilling around the lost string a predetermined depth to loosen the same and lifting the second string to position at the upper end of the lost string while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the upper end of the lost string, and further elevating the second string from the well while maintaining control at the casing head against upward flow through the well around the second string, and against upward flow through the second string at the lower end thereof.

3. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of drill pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a drilling bit at the lower end thereof and being adapted to drill down around the outside of the lost string and to be subsequently lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during the lowering, elevating and drilling operations for controlling against upward flow from the well around said second string, means carried by said second string operable during the lowering, elevating and drilling operations for controlling against upward flow through the same, and means for retaining said last named means at the upper end of the lost string while said second string is drilling down around the lost string and during the subsequent lifting of said second string to the upper end of the lost string.

4. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of drill pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a drilling bit at the lower end thereof and being adapted to drill down around the outside of the lost string and to be subsequently lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during lowering, elevating and drilling operations for controlling against upward flow from the well around said second string, closure means in the lower end of said second string operable during the lowering, elevating and drilling operations for controlling against upward flow through the same, said closure means being constructed and arranged in said second string to remain at the upper end of the lost string while the second string drills down around the lost string to loosen

the same, and means for retaining said closure means at the upper end of the lost string while said second string is lifted upwardly from around the lost string and relatively to said closure means.

5. The method of fishing for a lost string of tubing in a well having pressure therein, which comprises lowering a second string of tubing into the well with a tool for dislodging the lost string at the lower end thereof, to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string, moving said second string downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same and lifting the second string to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the upper end of the lost string, and further elevating the second string from the well while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string.

6. The method of fishing for a lost string of tubing in a well having pressure therein which comprises lowering a second string of tubing into the well with a tool for dislodging the lost string at the lower end thereof, to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the lower end thereof, moving said second string downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same and lifting the second string to position at the upper end of the lost string, while maintaining control at the casing head against upward flow through the well around the second string and against upward flow through the second string at the upper end of the lost string, and further elevating the second string from the well while maintaining control at the casing head against upward flow through the well around the second string, and against upward flow through the second string at the lower end thereof.

7. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into and elevated from the well, said second string having a tool at the lower end thereof for dislodging the lost string, and being adapted to be moved downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same, means at the casing head for controlling against upward flow from the well around said second string, and means carried in said second string at the lower end thereof and adapted to be moved upwardly therein by the upper end of the lost string for preventing upward flow through the second string, both of said means being operable during the lowering, elevating and dislodging operations, said second named means forming a seal with the inner wall of said second string during its movement therein.

8. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into and elevated from the well, said second string having a tool at the lower end thereof for dis-

lodging the lost string, and being adapted to be moved downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same, means at the casing head for controlling against upward flow from the well around said second string, means carried in said second string at the lower end thereof and adapted to be moved upwardly therein by the upper end of the lost string for preventing upward flow through the second string, both of said means being operable during the lowering, elevating and dislodging operations, and means for retaining said last-named means at the lower end of said second string while the latter is being lowered into and removed from the well, said means carried in said second string forming a seal with the inner wall of said second string during its movement therein.

9. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a tool at the lower end thereof for dislodging the lost string, and being adapted to be moved downwardly around in encompassing relation to the lost string a predetermined depth to dislodge the same, and to be lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during the lowering, elevating and dislodging operations for controlling against upward flow from the well around said second string, means carried by said second string operable during the lowering, elevating and dislodging operations for controlling against upward flow through the same, and means for retaining said last-named means at the upper end of the lost string while said second string is being moved downwardly around said lost string and during the subsequent lifting of said second string to the upper end of the lost string.

10. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a tool at the lower end thereof for dislodging the lost string, and being adapted to be moved downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same, and to be subsequently lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during the lowering, elevating and drilling operations for controlling against upward flow from the well around said second string, and closure means in the lower end of said second string operable during the lowering, elevating and dislodging operations for preventing upward flow through the same, said closure means being constructed and arranged to be moved upwardly relatively to said second string by the upper end of said lost string when said second string is moved downwardly around said lost string, and having a packer forming a seal with the inner wall of said second string during its movement.

11. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a tool at the lower end thereof for dislodging the lost string, and being adapted to be

moved downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same, and to be subsequently lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during the lowering, elevating and drilling operations for controlling against upward flow from the well around said second string, and closure means in the lower end of said second string operable during the lowering, elevating and dislodging operations for controlling against upward flow through the same, said closure means being constructed and arranged to be moved upwardly relatively to said second string by the upper end of said lost string when said second string is moved downwardly around said lost string, and to be moved downwardly relatively to said second string by the pressure of fluid forced into said second string above said closure means.

12. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well to the upper end of the lost string, and to be elevated from the well, said second string having a tool at the lower end thereof for dislodging the lost string, and being adapted to be moved downwardly around in encompassing relation to the lost string to a predetermined depth to dislodge the same, and to be subsequently lifted to the upper end thereof, preparatory to the elevation of said second string from the well, means at the casing head operable during the lowering, elevating and dislodging operations for controlling against upward flow from the well around said second string, closure means in the lower end of said second string operable during the lowering, elevating and dislodging operations for controlling against upward flow through the same, said closure means being constructed and arranged in said second string to remain at the upper end of the lost string while the second string moves downwardly around the lost string, and means included in said closure means responsive to the pressure of fluid forced into said second string above said closure for retaining the latter at the upper end of the lost string while said second string is lifted upwardly from around the lost string and relatively to said closure means.

13. A fishing tool for wells comprising a tubing adapted to be moved down over a fish in a well, a plug mounted for relative upward and downward movement in said tubing, means operable by well pressure below said plug for securing the same in fixed relation to said tubing, means operable by engagement with said fish for releasing said plug for upward movement in said tubing, and means operable by the pressure of fluid forced into said tubing above said plug for releasing the same for downward movement relative to said tubing under the pressure of the fluid forced into the tubing above said plug, said plug being adapted to be secured in fixed relation at any point of its movement in said tubing by the well pressure below said plug when the latter is moved out of engagement with said fish.

14. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well and down over in encompassing relation to the lost string, and to be elevated from the well, a valve assembly in said pipe adjacent the lower end thereof, said assembly having a valve for preventing upward flow through said pipe

and being mounted for longitudinal movement therein, means on said assembly forming a seal with the inner wall of said pipe during its movement therein, said assembly having means for anchoring the same to the interior of said second string of pipe, and having means operable by contact with the upper end of the lost string for releasing said assembly for upward movement relative to said second string while the latter moves down over the lost string.

15. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well and down over in encompassing relation to the lost string, and to be elevated from the well, a valve assembly in said pipe adjacent the lower end thereof, said assembly having a valve for controlling upward flow through said pipe and being mounted for longitudinal movement therein, said assembly having means operable by well pressure below the same for anchoring the assembly to the interior of said second string of pipe, and having means operable by contact with the upper end of the lost string for releasing said assembly for upward movement relative to said second string while the latter moves down over the lost string, said first-named means being automatically operable to again anchor the assembly to the interior of said second string by well pressure, when said assembly is moved out of contact with the upper end of the lost string.

16. In an apparatus for fishing for a lost string of tubing in a well having pressure therein, a second string of pipe adapted to be lowered into the well and down over in encompassing relation to the lost string, and to be elevated from the well, a valve assembly in said pipe adjacent the lower end thereof, said assembly having a valve for controlling upward flow through said pipe and being mounted for longitudinal movement therein, said assembly having means operable by well pressure below the same for anchoring the assembly to the interior of said second string of pipe, and having means operable by contact with the upper end of the lost string for releasing said assembly for upward movement relative to said second string while the latter moves down over the lost string, said first-named means being automatically operable to again anchor the assembly to the interior of said second string by well pressure, when said assembly is moved out of contact with the upper end of the lost string, said assembly having means operable by fluid pumped downwardly through said second string of pipe for releasing said anchoring means, whereby said assembly may be moved downwardly with respect to said second string when the latter is being elevated from encompassing relation with respect to the lost string.

17. In a device of the character described, a tubing, a plug mounted for relative movement in said tubing, said plug comprising a housing having a longitudinal passage for downward flow of fluid therethrough and a back pressure valve for preventing upward flow of fluid therethrough, means on said plug for securing the same to the inner wall of said tubing, means extending below said housing adapted to contact an obstruction in the well to release said securing means,

whereby said plug may move upwardly with respect to said tubing, and means on the exterior of said housing forming a seal with the inner wall of said tubing during said movement of said plug.

18. In a device of the character described, a tubing, a plug mounted for relative movement in said tubing, said plug comprising a housing having a longitudinal passage for downward flow of fluid therethrough and a back pressure valve for controlling against upward flow of fluid therethrough, slip means mounted for limited longitudinal movement on said housing, means on said housing operable when the latter is moved upwardly by well pressure for expanding said slip means to secure said plug to the inner wall of said tubing, and a collar positioned below said housing and secured to said slip means adapted to contact an obstruction in the well to release said slip means, whereby said plug may move upwardly with respect to said tubing.

19. In a fishing tool for wells comprising a tubing to be moved down over a fish in a well, a plug mounted for relative upward movement in said tubing, means on said plug for forming a seal with the inner wall of the tubing during such movement, means for securing said plug in fixed relation to said tubing, means operable by engagement with said fish for releasing said plug for upward movement in said tubing, and means operable by the pressure of fluid forced into said tubing above said plug for releasing the same for downward relative movement in said tubing under the pressure of said fluid.

20. A fishing tool for wells comprising a tubing to be moved down over a fish in a well, a plug mounted for relative upward and downward movement in said tubing, means on said plug for forming a seal with the inner wall of the tubing during such movement, means operable by well pressure below said plug for securing the same in fixed relation to said tubing, means operable by engagement with said fish for releasing said plug for upward movement in said tubing, and means operable by the pressure of fluid forced into said tubing above said plug for releasing the same for downward movement relative to said tubing under the pressure of the fluid forced into the tubing above said plug, said plug being adapted to be secured in fixed relation at any point of its movement in said tubing by the well pressure below said plug when the latter moves out of engagement with said fish.

21. In a device of the character described, a tubing, a plug mounted for relative movement in said tubing, means on said plug for forming a seal with the inner wall of the tubing during such movement, said plug comprising a housing having a longitudinal passage for downward flow of fluid therethrough and a back pressure valve for preventing upward flow of fluid therethrough, means on said plug for securing the same to the inner wall of said tubing, and means at the lower end of said housing adapted to contact an obstruction in the well to release said securing means, whereby said plug may move upwardly with respect to said tubing.

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