

Jan. 22, 1963

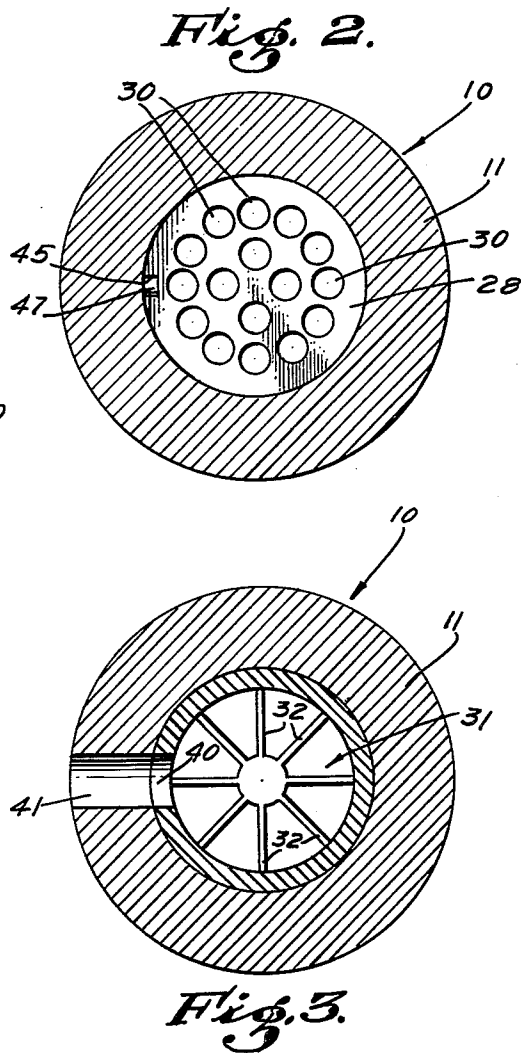
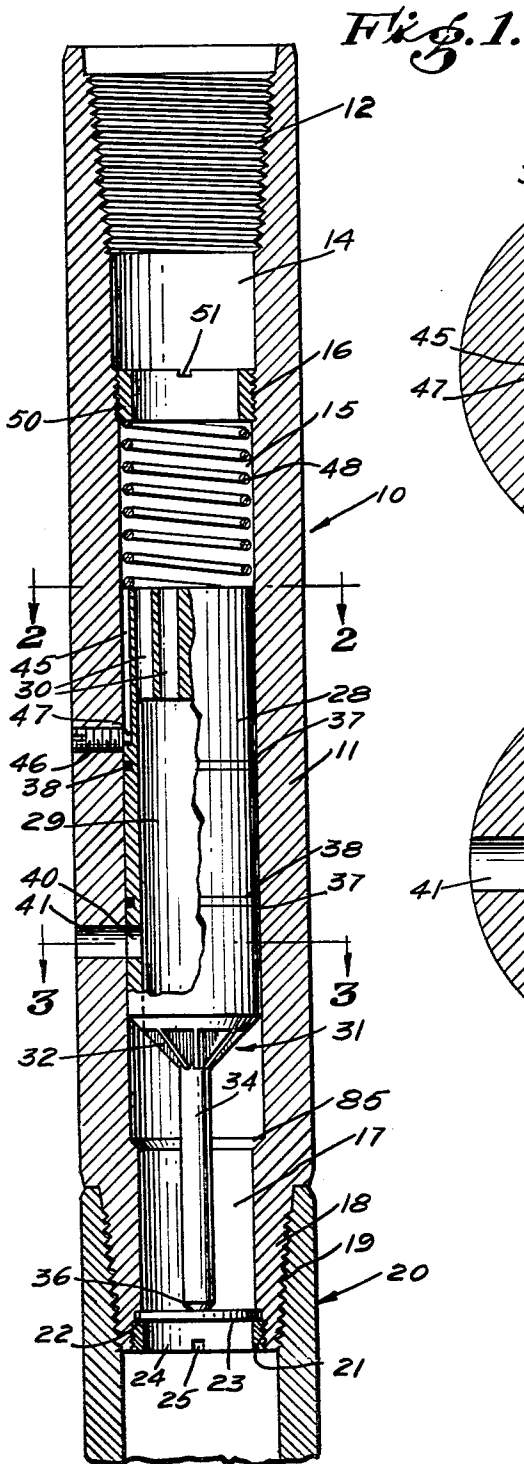
J. W. MURRAY, JR.

3,074,486

KICK SUB

Filed April 22, 1958

2 Sheets-Sheet 1



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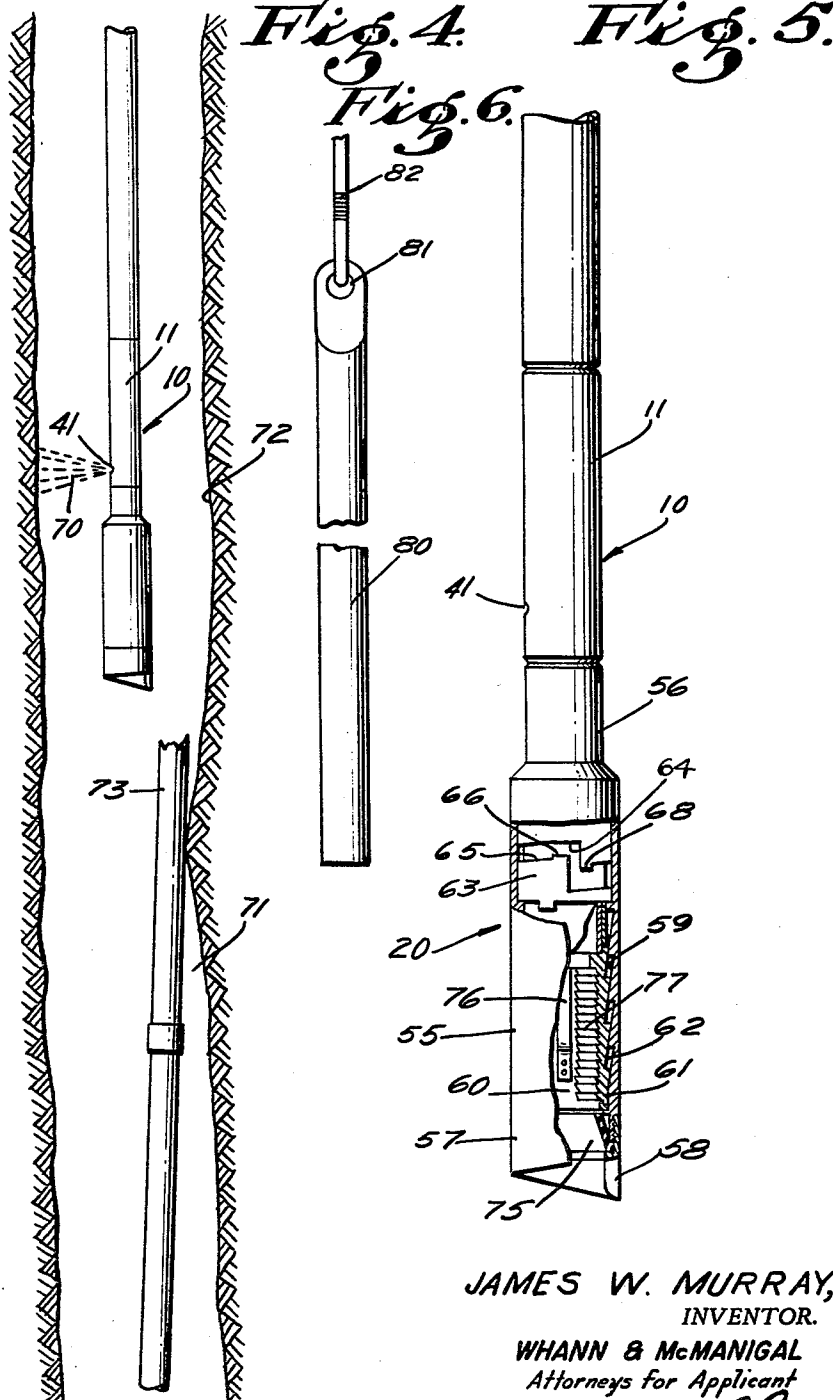
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2 Sheets-Sheet 2



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3,074,486
KICK SUB

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Filed Apr. 22, 1958, Ser. No. 730,125
3 Claims. (Cl. 166-222)

This invention relates generally to well drilling equipment or apparatus and relates more particularly to fishing tools and the like.

While the invention has particular utility in connection with oil well drilling equipment, and is herein shown and described in such connection, it is to be understood that its utility is not confined thereto.

In oil well drilling operations equipment may be broken or lost in a well, such equipment being, for example, drill pipe, tool joints, drill collars, liners, tubing, or any other type of fish.

While various types of equipment or devices have been used to recover such fish various difficulties and/or problems are encountered therewith. As is well known, a well being drilled or bored does not have perfectly straight side walls and a drill pipe or the like may become broken and the upper end lean against the wall in such a position as to be extremely difficult to engage with fishing tools. Not only must the fishing tool engage the fish but there should be a pack off to insure circulating while lifting, pulling, or jarring operations are carried on to recover the fish.

It is, therefore, an object of the present invention to provide a tool or device that will overcome the difficulties and problems referred to above.

Another object of the invention is to provide a fishing tool or piece of equipment to which various types of fish engaging apparatus may be attached and which will urge or swing such apparatus outwardly adjacent to or against the well wall so as to facilitate picking up the adjacent end of the fish.

Still another object of the invention is to provide a tool or piece of equipment of this character having means to utilize the pressure of drilling fluid to effect such swinging action toward or against the wall of the well.

A further object of the invention is to provide in equipment of this character, means for cutting off the discharge of drilling fluid which effects such outward movement of the tool.

A still further object of the invention is to provide apparatus of this character wherein circulation of drilling fluid is established with the fish after the fishing tool engages said fish.

Another object of the invention is to provide apparatus of this character that is simple and sturdy in construction, and effective and reliable in operation.

Still another object of the invention is to provide apparatus of this character that is relatively inexpensive to manufacture.

The characteristics and advantages of the invention further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent one embodiment. After considering this example, skilled persons will understand that variations may be made without departing from the

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principles disclosed, and I contemplate the employment of any structures, arrangements, modes of operation that are properly within the scope of the appended claims.

Referring to the drawings:

FIG. 1 is a longitudinal sectional view of a fishing tool embodying the present invention;

FIG. 2 is a cross sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a cross sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a diagrammatic view of a portion of an oil well with a fish therein and apparatus embodying the present invention in position to begin the fishing operation;

FIG. 5 is a side view of apparatus embodying the present invention with a fishing tool attached thereto, said fishing tool having portions broken away to show the interior construction; and

FIG. 6 is a side view of a circulation establishing tool.

Referring more particularly to the drawings, there is shown a kick sub embodying the present invention and indicated generally at 10, said kick sub including a tubular barrel 11 having at its upper end an inwardly tapered, internally threaded socket 12 whereby the device may be threadably connected to the externally threaded pin of an adjacent piece of equipment, such as the lower end of a drill string pipe, bumper sub, or other apparatus. The barrel 11 has an internal bore portion 14 just below the socket 12, the upper end of said bore 14 communicating with said socket, the lower end of said bore communicating with a slightly reduced diameter bore 15 which is provided at its upper end with internal threads 16. Bore 14 extends longitudinally through the barrel 11 to a point adjacent the lower end of said barrel whereat said bore 14 communicates with a reduced diameter bore portion 17, the latter extending downwardly through a pin 18 at the lower end of said barrel. Pin 18 is slightly tapered toward its free end and is provided with external threads 19 for threadable connection with other equipment or apparatus such as, for example, the upper end of a rotary releasing socket 20.

The device may, of course, also be connected to other types of fishing equipment such as rotary releasing spears, etc.

From the lower or outer end of the pin 18 there is a counterbore 21 which is internally threaded, there being an annular shoulder 22 at the upper end of said counterbore 21. A disc or plate 23 is disposed against the shoulder 22 and is held in this position by an externally threaded annular nut 24 having notches 25 in the outer end for reception of a suitable tool whereby said nut 24 may be rotated for screwing same into the counterbore 21 or screwing same out of said counterbore. The plate 23 is of cast iron or any other suitable material that may be fractured or broken.

Within the bore 15 of the barrel 11 there is slidably disposed a cylindrical plunger 28 having a hollow central portion 29. The upper part of the plunger 28 is provided with a plurality of longitudinally extending passages 30 which extend from the upper end of said plunger and communicate with the interior chamber 29 thereof while the lower end of said plunger 28 has a spider, indicated generally at 31 which has a plurality

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of arms 32, said spider tapering downwardly and inwardly. The lower end of the spider 31 is connected to or formed integrally with a rod 34 which extends axially of said plunger and which has an inverted frusto-conical tip 36 at the lower free end resting on the plate 23. The plunger is provided with a plurality of annular, external grooves 37 in which are disposed sealing rings 38 which may be O rings.

Adjacent the lower end of the chamber 29 there is an opening 40 in the wall of said plunger which is adapted to communicate with an opening 41 in the wall of the barrel 11. The opening 41 may be considered a jet opening and when the lower end of the rod 34 rests on the plate 23, the opening 40 of the plunger registers with the jet opening 41 in the barrel wall. When the plunger is in this position, shown in FIG. 1, the sealing rings 38 are located above the orifice 41.

In order to maintain the opening 40 in register with the orifice 41, the plunger 28 is held against rotative movement while still permitted longitudinal movement. This means comprises a longitudinally extending external groove 45 at the upper end of said plunger and the barrel 11 has a tapped opening therethrough for a set screw 46 which has a tip 47 on the inner end slidably received in the groove 45.

Above the plunger 28 and urging same downwardly, there is a spring 48 which is held in position by an externally threaded cylindrical nut 50 screwed into the part 16 of the barrel, nut 50 having notches 51 at the outer end whereby said nut may be engaged for screwing same into the portion 16 or removing same therefrom.

The rotary releasing socket 20 is of well-known type and construction and includes a tubular bowl 55 having a top sub 56 at the upper end and a guide shoe 57 at the lower end, said guide shoe including the usual lip 58 which facilitates engagement of the device with the upper end of a fish. The interior of the tubular bowl 55 is provided with a plurality of annular, tapered steps 59 and operably disposed within the bowl is a cage 60 having a plurality of longitudinally extending openings in which are operably disposed slips 61 which have a plurality of exterior steps 62 cooperable with the steps 59 for effecting operable movements of said slips.

In the upper end of the bowl 55 is a cam 63 which is welded or otherwise secured in the bowl. The upper end portion of the cage 60 is rotatable within said cam 63 and is provided at the upper end with a downwardly facing shoulder 64 having substantially the same configuration as the cam surface 65 of the cam 63. The latter is also provided with an upwardly extending lug 66 and at one end of the shoulder 64 there is a downwardly extending lug 68 which rides on the shoulder 65, the lug 66 riding on the shoulder 64.

When fishing operations are in progress, the drill string is rotated slowly so as to rotate the kick sub 10 and the fishing tool 20. At the same time the drilling fluid is discharged, as indicated at 70, FIG. 4, to force the fishing tool 20 laterally. In FIG. 4, there is shown a well bore 71, the wall 72 of which is irregular. The upper end of a fish 73 is shown leaning against the wall 72, as often occurs. The kick sub 10 and releasing socket 20 are shown in substantially the vertical position, but as the drill string is rotated and the fluid 72 is discharged under pressure, the device 10 and releasing socket 20 are forced outwardly and into engagement with the side wall 72 of the well. Rotation of the drill string is continued and said string is gradually lowered until the guide shoe 57 engages the upper end of the fish 73 which thereupon enters said shoe. With further lowering of the equipment, the upper end of the fish will pass up through the pack off rubber 75 in the socket 57, FIG. 5, and into a position with the bowl 55 of the releasing socket 20 whereat the slips 61 are in a position to engage the upper end of the fish. Detection of the engagement of the releasing socket 20 with the fish is made in the usual man-

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ner and when it is ascertained that the fish has been engaged, the rotary releasing socket is rotated to the left one or more turns. Bow springs 76, secured to the cage 60, engage the end of the fish within the socket 55 and hold the cage against rotation as the bowl 55 is rotated. The cam arrangement above described effects lowering of the cage in the well-known manner so that the wickers 77 of the slips 61 engage the fish. A pull sets the slips on the steps 59 of the bowl and on the fish so as to securely grip said fish.

The next step is the establishment of the circulation of drilling fluid through the fish and this is effected by applying sufficient fluid pressure in the string and the kick sub to break the plate 23 so that the drilling fluid may be pumped down into and through said fish. This drilling fluid passes through the passages 30 in the plunger 28 and thence into the chamber 29 from which it leaves by way of the openings in the spider 31.

The spring 48 urges the plunger 28 downward so that the upper end portion of the spider 31 rests on a shoulder 85 at the lower end of the bore 15. When the plunger is in this position, the discharge jet 41 is cut off thereby from communication with the interior kick sub 10 so that full pump pressure may be applied to the fluid within the string and fish and normal procedures may thereafter be followed in the fishing operations. It is to be understood, of course, that the discharge of fluid through the orifice or discharge jet 41 is also similarly cut off when the plate 23 is broken by the fluid pressure in the string.

There may be conditions, however, such that the drilling fluid pressure developed by the pump or pumps is insufficient to fracture or shatter the plate 23. In such case, it is necessary to use other means to break the plate. One such means is a rod 80, FIG. 6, having an eye 81 at the upper end to which is secured a line 82. The rod is lowered through the drill string by means of the cable and dropped on the upper end of the plunger 28. The diameter of the rod is such that it will not enter the passages 30 nor be caught therein, said ends striking a sufficiently large area of the upper end of the plunger so as to impart a blow thereon which will cause the rod 34 of the plunger to shatter plate 23 and thus establish circulation through the fish.

It is to be understood, of course, that other means may be used to strike the plunger a blow sufficient to effect shattering of the plate 23.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it is thought that it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing all of its material advantages, the embodiment hereinbefore described being merely for the purposes of illustration.

I claim:

1. A kick sub, comprising: a barrel having a longitudinal passageway therethrough with an annular tapered, upwardly facing shoulder adjacent the lower end, and an internally threaded counterbore in the lower end of said passage with a downwardly facing shoulder at the upper end thereof, said barrel having an internally threaded socket at the upper end, an externally threaded pin at the lower end, and a radially extending jet discharge orifice through the wall thereof connecting the passage in said barrel with the exterior thereof, said barrel also having a radially extending tapped opening through the wall thereof above the orifice; a shatterable plate in said counterbore, said plate having a peripheral edge portion abutting the second mentioned shoulder; an externally threaded annular nut screwed into said counterbore and securing said plate against said shoulder; a hollow, cylindrical plunger having a discharge opening in the side wall thereof from the interior to the exterior, said plunger

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being slidably disposed in the passageway in said barrel above said shoulder and having a wall at the upper end thereof provided with a plurality of openings therethrough into the interior of said plunger, a spider on the lower end of said plunger having openings therethrough, said spider tapering downwardly and inwardly, and an axially arranged rod secured at the lower end of said spider with the lower end of said rod of relatively small area, the upper end of said spider being adapted to seat on said upwardly facing shoulder when the plunger is in the lowermost position, said plunger being held above said shoulder by engagement of the lower end of said rod with said plate, said plunger having a longitudinally extending exterior groove at the upper end thereof and also having a plurality of external, annular grooves thereabout; sealing elements disposed in said groove and slidably engageable with the wall of the passage; a set screw screwed into the tapped opening in said barrel and having an inner end receivable in said longitudinally extending groove of the plunger permitting longitudinal movement of said plunger but preventing rotation thereof, the opening in said plunger registering with the discharge orifice when said plunger is in the upper position; an internally threaded portion in the upper part of the passage in said barrel; a spring engageable at its lower end with the upper end of said plunger; and an externally threaded annular screw in said threaded portion of the barrel against which the upper end of said spring abuts so as to cause said spring to urge the plunger downwardly for engagement with said shoulder, the opening in said plunger being out of register with said orifice so as to prevent fluid flow from the interior of the barrel through said orifice when the plunger is seated on said shoulder.

2. A kick sub, comprising: a barrel having a longitudinal passage therethrough including a cylindrical bore, there being a shoulder adjacent the lower end of said bore, and an internally threaded counterbore in the lower end of said passage, said barrel having an internally threaded socket at the upper end, an externally threaded pin at the lower end, and a radially extending discharge orifice through the wall thereof connecting the bore of said barrel with the exterior thereof; a shatterable plate in said counterbore; an externally threaded annular nut screwed into said counterbore and securing said plate therein; a hollow plunger slidably disposed in said bore in said barrel above said tapered shoulder, said plunger having a lateral discharge opening therein and a wall at the upper end thereof provided with a plurality of openings therethrough into the interior of said plunger, a spider on the lower end of said plunger having openings therethrough, said spider tapering downwardly and inwardly, and an axially arranged rod secured at the lower end of said spider, the plunger having an annular lower end part adapted to seat on said shoulder when the plunger is in the lowermost position, said plunger being held above said shoulder by engagement of the lower end of said rod with said plate, said plunger having a plurality of external, annular grooves thereabout; sealing elements disposed in said groove and slidably engageable with the wall of the passage; means holding the plunger against rotation in said bore but permitting longitudinal movement thereof, the lateral opening of the plunger registering with the discharge orifice when said plunger is in the upper position; and a spring secured in the barrel passage above the plunger urging the plunger downwardly for engagement with said shoulder, the opening in said plunger then being out of register with said orifice so as to prevent fluid flow from the interior of the barrel and plunger through said discharge orifice.

3. In a kick sub: a barrel having a longitudinal passageway therethrough with a shoulder adjacent the lower end, said barrel having an internally threaded socket at the upper end, an externally threaded pin at the lower end, and a radially extending discharge orifice through

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the wall thereof connecting the passageway in said barrel with the exterior thereof; a shatterable plate secured in said passageway; a hollow plunger slidably disposed in the passageway in said barrel above said shoulder and having a side opening therein, said plunger having a wall at the upper end thereof provided with a plurality of openings therethrough into the interior of said plunger, a spider on the lower end of said plunger having openings therethrough, and an axially arranged rod secured to said spider, said plunger being adapted to move downwardly to seat on said shoulder, said plunger being held above said shoulder by engagement of the lower end of said rod with said plate; means holding said plunger against rotation in said passageway so that the plunger opening registers with the discharge orifice when said plunger is in the upper position, said means permitting longitudinal movement of said plunger; and yielding means operably disposed in said barrel urging the plunger downwardly for engagement with said shoulder, the opening in said plunger then being out of register with said orifice when said plunger is seated on said shoulder.

4. A kick sub, including: a barrel having a longitudinal passage therethrough and a fluid discharge orifice in the wall thereof for directing fluid from the interior of said barrel laterally outwardly; a shatterable plate secured in said passage and below said orifice; a plunger slidably disposed in said passage and open to fluid flow therethrough, said plunger having a side opening; a rod carried by said plunger at the lower end thereof, the lower end of said rod resting on said plate and positioning said plunger so that the side opening thereof registers with the discharge orifice; means preventing rotation of said plunger but permitting longitudinal movement thereof; yielding means urging the plunger downwardly; and means limiting downward movement of said plunger.

5. The combination of a kick sub including a barrel having a longitudinal passage therethrough and a fluid discharge orifice in the wall thereof for directing fluid from the interior of said barrel laterally outwardly; a shatterable plate secured in said passage and below said orifice; a plunger slidably disposed in said passage and open to fluid flow therethrough, said plunger having a side opening; a rod carried by said plunger at the lower end thereof, the lower end of said rod resting on said plate and positioning said plunger so that the side opening thereof registers with the discharge orifice; means preventing rotation of said plunger but permitting longitudinal movement thereof; yielding means urging the plunger downwardly; means limiting downward movement of said plunger; and a rotary releasing socket having a guide shoe with a lip, said lip being at the diametrically opposite side from the discharge orifice.

6. In combination with a fishing tool, a kick sub, including a barrel having a longitudinal passage therethrough and a fluid discharge orifice in the wall thereof for directing fluid from the interior of said barrel laterally outwardly, said fishing tool being carried by the lower end of said barrel; a shatterable plate secured in said passage and below said orifice; a plunger slidably disposed in said passage and open to fluid flow therethrough, said plunger having a side opening, said plunger having a part resting on said plate and positioning said plunger so that the side opening thereof registers with the discharge orifice; means preventing rotation of said plunger but permitting longitudinal movement thereof; and means limiting downward movement of said plunger.

7. In a kick sub: a barrel having a longitudinal passage therethrough and an orifice through which fluid from said passage may be discharged laterally of the barrel; a shatterable plate secured in the passage below said orifice; and means for controlling flow through said orifice, said means being held in one position by said shatterable plate and when in said one position to permit flow from said orifice but when said plate is broken said means

is movable to another position whereat fluid flow from said orifice is cut off.

8. The combination of a fishing tool with a kick sub comprising a tubular barrel through which fluid may flow, said barrel having a lateral discharge orifice, said fishing tool being secured to the lower end of said barrel; a shatterable member preventing fluid flow through said barrel; and control means for controlling flow through said orifice, said control means being normally held by said plate to permit fluid discharge through said orifice, and movable, when said plate is broken, to another position whereat said means cuts off fluid flow through said orifice.

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References Cited in the file of this patent

UNITED STATES PATENTS

1,707,092	Black	Mar. 26, 1929
2,167,194	Anderson	July 25, 1939
2,502,567	Howard	Apr. 4, 1950
2,504,397	Dickson	Apr. 18, 1950
2,609,226	Young	Sept. 2, 1952
2,680,483	Le Bus	June 8, 1954
2,696,257	Clark	Dec. 7, 1954
2,698,054	Brown et al.	Dec. 28, 1954
2,884,068	Marsee	Apr. 28, 1959
2,915,127	Abendroth	Dec. 1, 1959