

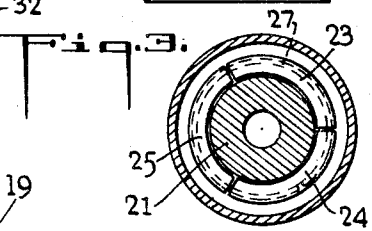
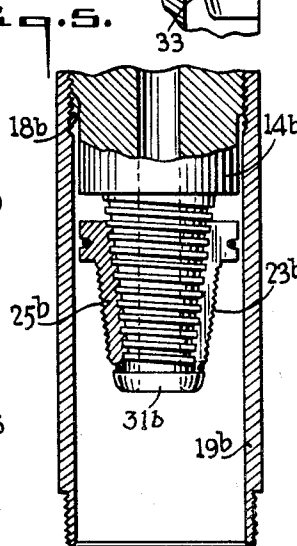
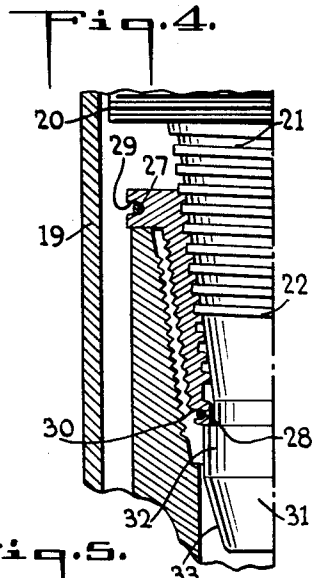
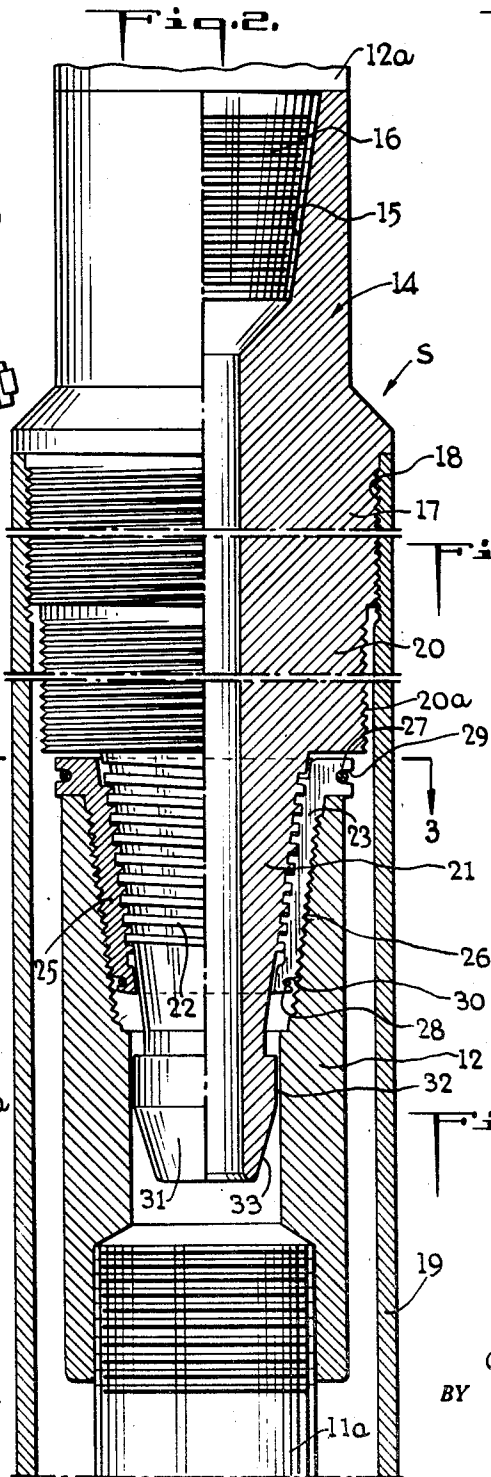
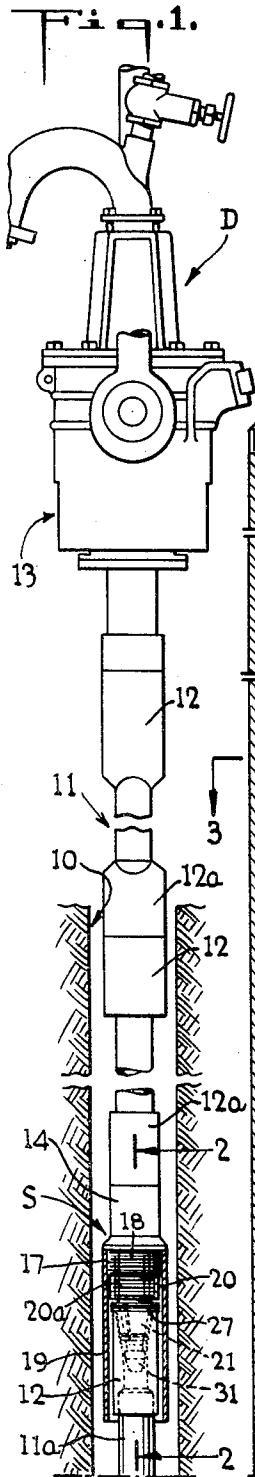
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COMBINATION SUB FOR DRILLING OPERATIONS

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## COMBINATION SUB FOR DRILLING OPERATIONS

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8 Claims. (Cl. 294—86)

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This invention relates to well drilling tools and more particularly to novel "sub" constructions for use in retrieving "fishes" during drilling operations.

In rotary drilling operations it is conventional practice in making connections between drill pipe and drill collars, or between drill collars and bits, or between drill pipe and various fishing or other special tools to sometimes require insertion of a small connector between the pieces to be joined because of difference in size and types of threads on each. These connectors are commonly referred to as "subs." Often in the drilling of wells, the drill pipe becomes stuck, because of caving in of the hole or the settling of sand or other sediments, and it is freed by use of what is called "wash-over pipe."

It is conventional practice to disconnect or "back off" the tool joint just above where the drill pipe is stuck, raise the disconnected parts out of the hole, apply a piece of wash-over pipe thereto, which may vary in length from a few feet to several hundred feet, go back into the hole, and wash over the stuck pipe by circulating drilling fluid through the wash pipe and thus wash out the substance holding the stuck pipe. The wash-over pipe is, of course, of greater inside diameter than the outside diameter of the drill pipe. After a considerable section of the stuck pipe has been washed over, the wash pipe is again pulled out of the hole and disconnected. The drill pipe part to which it has been attached is then again lowered into the hole and connected with the washed over section of drill pipe. Then "back off shot" or "string shot" is lowered into the thus connected drill pipe and stuck section.

This explosive "string shot" usually about 33 feet in length, a little longer than a length of drill pipe is lowered by electric wires inside the drill pipe to the lowest tool joint washed over. Left hand torque is applied to the drill pipe and the "string shot" is detonated. This has the effect of jarring the joint loose so that it will readily unscrew, being much the same as applying a pipe wrench at the coupling of two pieces of pipe and hitting the coupling with a hammer as force is applied to the wrench. After the freed pipe is thus loosened, it is pulled out of the hole, the wash-over pipe placed on its lower end and re-lowered into the hole and the cycle described repeated on the next stuck pipe length if needed.

Particularly in deep wells, where the stuck pipe is very far down in the well, a great deal

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of time is lost in this practice in the round trip of the pipe sections above the stuck pipe needed for disconnecting the wash pipe and then for going back into the well with the drill pipe for application of the string shot and for retrieving the "fish."

Principal objects and features of this invention are the provision of a novel "combination sub" construction to which wash pipe may be connected and which also has a connector that may be screwed into the freed section of the pipe after it has been washed over, and permits lowering and detonation of "string shot" so that the washed-over section of pipe may be backed off and pulled out of the well without the necessity of previously removing the wash pipe, thus eliminating one full round trip of the drill pipe for purposes of disconnecting the wash pipe, as presently practiced, and going back in to retrieve the "fish."

Further objects and features of the invention are the provision of simple effective "combination sub" constructions, applicable for use with existing drilling equipment, that are easy to use, relatively low in cost and time saving in their use.

Other objects and novel features will become apparent from the following specification and accompanying drawings wherein similar reference characters denote corresponding parts and wherein:

Fig. 1 is an elevational view of the device embodying the invention shown in position of use;

Fig. 2 is a longitudinal section taken along line 2—2 of Fig. 1 and viewed in the direction of the arrows;

Fig. 3 is a transverse section taken along line 3—3 of Fig. 2;

Fig. 4 is a fragmentary longitudinal section similar to that of Fig. 3, showing parts in another position; and

Fig. 5 is a longitudinal section similar to that of Fig. 3 of a modified form of construction.

Referring to the drawing, 10 denotes a hole being drilled by conventional drilling equipment D including drill pipe 11 the lowermost length 11a of which for purposes of this application is assumed to be the stuck pipe. The lengths of pipe 11 are strung together end to end being connected by conventional sub parts 12 and 12a in usual manner during actual drilling operations, the uppermost pipe being suspended from the head part 13 of the drilling equipment. The sub part 12 in this disclosure is a female part

attached to the upper end of a drill pipe length while sub part 12a is a male part secured to the lower end of a drill pipe length.

The combination sub S embodying the invention, which is to be utilized whenever a drill pipe length becomes stuck comprises a tubular member 14 whose upper end has a threaded socket 15, the threads of which are adapted to be screwed onto the right hand threads 16 on the pin end of the regular sub part or tool joint 12a on the lower end of the drill pipe above the stuck section 11a. The portion 17 of the tubular member 14 below socket 15 is of substantially larger diameter than the drill pipe, and is threaded externally at 18 to receive threaded a length of wash pipe 19. A portion 20 below the externally threaded portion 18 of reduced diameter is also threaded externally at 20a for application thereto, if desirable, of wash pipe (not shown) of smaller diameter than wash pipe 19.

The lower part of the tubular member 14 is further reduced in diameter, at portion 21 tapered and provided with an external preferably square left-hand thread 22, that is, thread running in opposite direction to the threads 16.

Three segmental parts 23, 24, 25 internally tapered and threaded to fit on the left-hand thread 22 of portion 21 are threaded externally at 26 with a tool joint right-hand thread for connection with the standard threaded socket of the sub 12 carrying the stuck pipe section 11a. The parts 23, 24 and 25 are held in place on the portion 21 by snap rings 27, 28 fitting in the respective annular grooves 29, 30 in the parts 23, 24 and 25. Below the left-hand threaded portion 21, the body 14 extends as a nose or head 31 having a largest external diameter 32 dimensioned to fit slidably in the internal diameter of the bore in sub 12 and a tapered leading part 33 to guide the head into the said bore.

In utilizing the combination sub assembly described when a drill pipe length 11a becomes stuck, the drill pipe above the stuck section is given clockwise rotation causing upper joint part 12a of the pipe length 11 just above the stuck section to be unscrewed from part 12 of the stuck section 11a. The detached pipe lengths including the just separated part 12a are drawn upwardly out of the hole 10. The combination sub S is then attached to the pin end 16 of the latter-named joint part 12a by screwing the socket 15 of member 14 onto the said threaded pin end 16. Wash pipe 19 is then screwed onto threaded portion 18 of body 14 or threaded part 20. The assembled parts are then lowered into the hole to the level of the stuck pipe 11a and wash water or drilling fluid sent down through the pipe lengths 11 and lower outlet end of the bore in body 14 at its nose 31. The wash water acts to wash away cave-in or blocking or clogging material about the stuck pipe 11a and permit gradual lowering of the nose 31 of body 14 into the bore of sub 12 of the stuck pipe until the threaded parts 23, 24 and 25 lie aligned with the threaded socket of this sub 12. The entire assembly is then rotated counterclockwise, or to the left. Friction between the threaded parts 23, 24 and 25 and the socket of the said sub 12, causes the threaded left-hand tapered portion 21 to screw into the socket defined by the internal threads of parts 23, 24, 25 and expand these parts causing their external threads to fit in and engage the right-hand threads of the socket of the said sub 12. After the string shot

has been lowered and as left-handed or counterclockwise rotation is continued, left torque is applied to the drill pipe 11a through the tubular part 14 so that when the "string shot" is detonated, the fish or pipe 11a is freed and can be pulled up out of the hole without unscrewing the members 23, 24, 25 from sub 12.

#### Modification

In the modified form of construction shown in Fig. 5, the essential difference is that only the externally threaded portion 18b corresponding to threaded portion 18 is provided in the tubular part 14b. Likewise the nose 31 of part 14 is replaced by a nose part 31b on the end of part 14b which performs the function of nose 31 of tubular member 14. Operation is substantially the same except that the device is limited to use of wash pipe of but a single diameter instead of permitting the use of differently diametered wash pipes in conjunction therewith.

While specific embodiments of the invention have been described and shown, variations in structural detail within the scope of the appended claims are possible and are contemplated. There is no intention, therefore, of limitation to the exact details shown and described.

What is claimed is:

1. A combination sub for use in hole drilling for the recovery of stuck tool parts comprising a tubular member having a threaded socket at one end for direct attachment to the conventional threads of a threaded pin end of a tool joint part, a portion having external threads for attachment thereto of a wash pipe, a tapered portion on said member having an external thread in reverse direction to the thread direction of the threaded pin end, a plurality of tapered sectional parts internally threaded to mate with the reversely directed external thread of said tapered portion mounted in assembled relationship on said last named thread, said tapered sectional parts being tapered externally and provided with external conventionally directed threads to match the conventional thread of an internally threaded socket of a second tool joint part, said sectional parts being expansible to fit their external threads into threaded relationship with the internally threaded socket of said second tool joint part, upon rotation of said tapered portion in a direction to screw it into the internal threads of said sectional parts.

2. The combination of claim 1 in which the tubular member has a nose part for guiding the sectional parts into the internally threaded socket of said second tool joint part.

3. The combination of claim 1 in which snap rings mounted on said sectional parts hold them expansibly in assembled relationship on said tapered portion of said tubular member.

4. The combination of claim 1 in which said sectional parts have grooves and in which snap rings fitting within the grooves hold said sectional parts expansibly in assembled relationship on said tapered portion of said tubular member.

5. The combination of claim 1 in which said sectional parts have end portions shaped to define a guiding nose to facilitate guiding of the assembled sectional parts on said tapered portion into the internally threaded socket of said second tool joint part.

6. The combination of claim 1 in which the external conventionally directed threads are right hand threads and in which the external thread on said tapered portion is a left handed thread.

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7. A combination sub for use in hole drilling for the recovery of stuck tool parts comprising a tubular member having a threaded socket at one end for direct attachment to the conventional threads of a threaded pin end of a tool joint part, a portion having external threads for attachment thereto of a wash pipe, a second portion of different diameter having external conventionally directed threads for attachment thereto of a different diametered wash pipe, a tapered portion on said member having an external thread in reverse direction to the thread direction of the threaded pin end, a plurality of tapered sectional parts internally threaded to mate with the reversely directed external thread of said tapered portion mounted in assembled relationship on said last named thread, said tapered sectional parts being tapered externally and provided with external conventionally directed threads to match the conventional thread of an internally threaded socket of a second tool joint part, said sectional parts being expansible to fit their external threads into threaded relationship with the internally threaded socket of said second tool joint part, upon rotation of said tapered portion in a direc- 25

tion to screw it into the internal threads of said sectional parts.

8. A combination sub for use in hole drilling comprising a tubular member having a threaded socket at one end for attachment to a threaded pin end of a tool joint part, a threaded external portion for attachment thereto, of a wash pipe, a tapered portion provided with a thread of reverse direction to that of the first named threaded portion, a plurality of internally threaded tapered parts mounted in assembled relationship on the reverse thread of said tapered portion, expansible means for holding said parts on said threaded tapered portion, said internally threaded tapered parts being externally threaded to match the thread of a threaded socket of a second tool joint part and being expansible to fit the latter named thread upon rotation of the threaded tapered portion in a direction to screw it into the internal thread of the said threaded internally tapered parts.

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No references cited.