

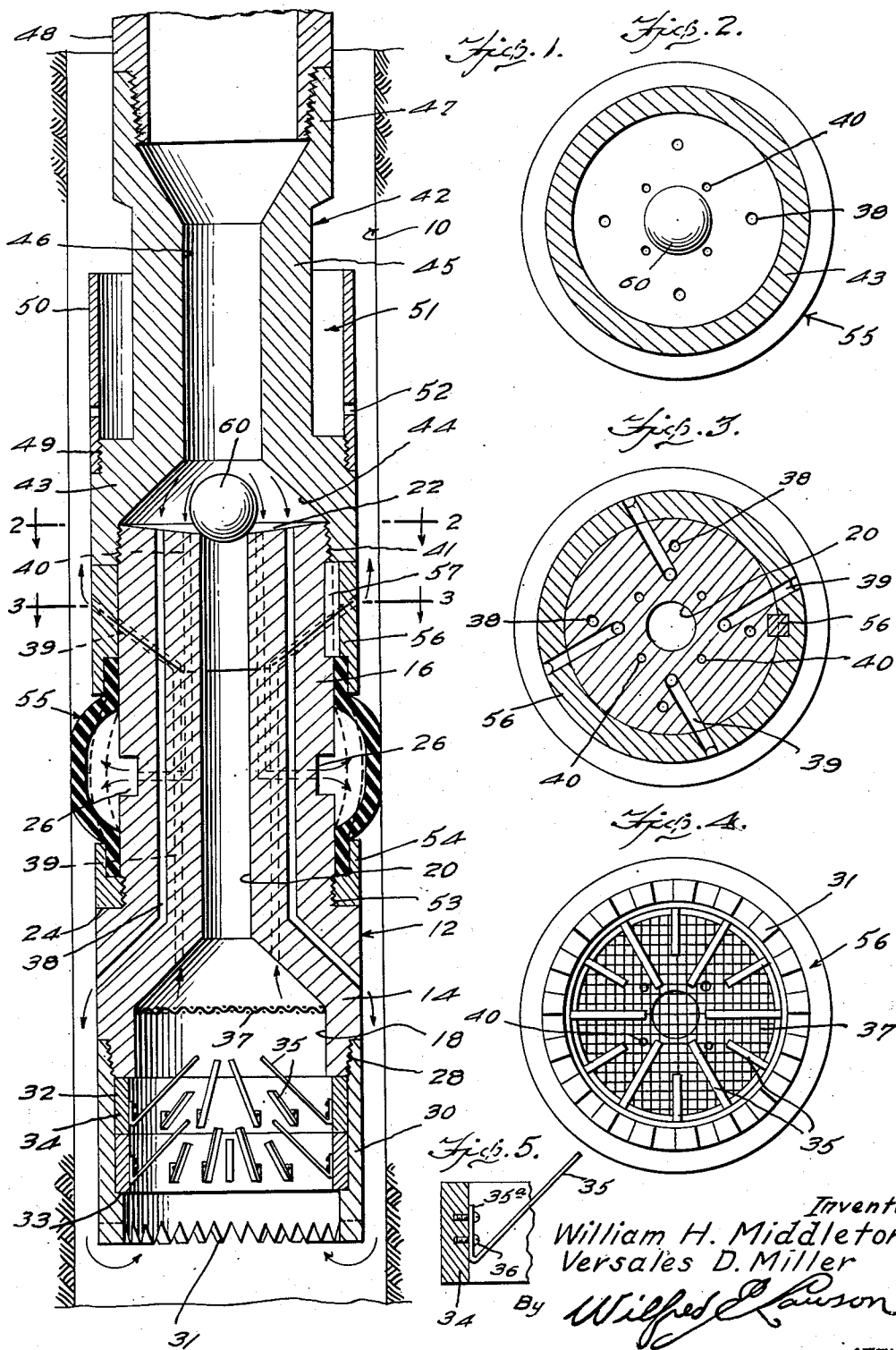
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FISHING TOOL FOR USE IN DEEP WELLS

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FISHING TOOL FOR USE IN DEEP WELLS

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This invention relates generally to the class of wells and is directed particularly to improvements in fishing tools for use in deep wells such as oil wells and the like.

A principal object of the present invention is to provide a fishing tool by means of which various pieces or bits of tools or other materials generally termed "junk" may be readily removed from a well with relative ease.

Another object of the invention is to provide a clean out tool or fishing tool, in a manner as hereinafter set forth, by means of which sand cavings and shale can first be removed from tool parts or other junk in the bottom of the well and such junk then picked up for removal, in the one operation of running the tool into the well.

Still another object of the invention is to provide a fishing tool, in the manner as hereinafter set forth, by means of which a strong reverse flow of fluid can be created through the tool to effect the picking up of the junk pieces from the bottom of the well, by means of an expansible packer which effectively seals the space between the tool and the wall of the well hole.

A still further object of the invention is to provide, in a manner as hereinafter set forth, a fishing tool of the character stated wherein the sealing packer is so constructed and arranged that it can be maintained in contracted condition when the tool is being run into the well and then expanded after the tool has reached the position where it is to be held while the washing operation is being carried out, as a result of which the tool can be introduced into the well and removed many times without damaging the packer.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawing:

Figure 1 is a longitudinal sectional view through a tool constructed in accordance with the present invention, the same being shown in a well hole with the sealing packer in expanded condition and the central fluid passage through the tool closed.

Figure 2 is a transverse section taken substantially on the line 2—2 of Figure 1.

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Figure 3 is a transverse section taken substantially on the line 3—3 of Figure 1.

Figure 4 is a bottom view of the tool.

Figure 5 is a detail section illustrating the mounting of a spring finger.

Referring now more particularly to the drawing the numeral 10 generally designates a well hole in which the tool is shown in the position which it occupies after the initial operation of removing sand and shale from above the tool pieces has been completed and the tool is ready for operation to wash up and catch the tool pieces or junk.

As illustrated the tool comprises a lower cylindrical portion which may be generally defined as a foot piece, generally designated 12. This foot piece is externally of two diameters, comprising the lower part 14 of largest diameter and the upper part 16 of smaller outside diameter. The lower part 14 has the downwardly opening chamber 18 which leads upwardly and connects with the central passage 20 which leads through the upper part, the top end of the upper part 16 being slightly dished as indicated at 22 for the purpose hereinafter pointed out.

At the line of connection between the upper and lower parts 14 and 16 of the foot portion there is formed the shoulder 24 and above this shoulder the upper part 16 has formed in the outside wall thereof the encircling channel 26.

The lower part 14 of the foot portion is externally screw threaded as indicated at 28 and has threaded thereon the cylindrical cutting head 30, the bottom edge of which is provided with the cutting teeth 31 as illustrated. This cutting head has the upper inside portion of slightly enlarged diameter forming the inside recess 32 and the shoulder 33 at the bottom of the recess and positioned within the recess 32 and resting upon the shoulder 33 are the two concentric rings 34.

The rings 34 have fixed to the inner surfaces thereof, as shown in Figure 4, a plurality of upwardly and inwardly directed spring fingers 35. Any suitable means may be provided for securing these fingers in position but the means here shown comprises the forming of an upturned end portion 35a at the lower end of each finger, which is positioned against the inner surface of the ring 34 and secured thereto by suitable screws 36 or in any other suitable manner.

It will be readily apparent that these rings converge inwardly and upwardly and they are so constructed that pieces of material washed up from the bottom of the well hole can move upwardly past the fingers into the chamber 18 but

will be prevented from dropping back into the hole when the tool is withdrawn.

It is also to be pointed out that while the illustration shows two rings 34 one upon the other, the invention is not restricted to this specific construction since a single ring or more than two rings may be used if found desirable.

In the upper part of the chamber 18 and extending across and bridging the same, there is fixed a screen insert 37 which, as will be readily apparent, functions to permit the upward flow of fluid from the chamber 18 and prevent the passage of parts of tools or other matter upwardly so that the passage 20 and the hereinafter described flow passages, will not be blocked.

The foot portion 12 has formed longitudinally through the upper part 16 the wash passages 38 which are preferably four in number as shown in Figure 2 and which at their lower ends are directed laterally to open through the outer wall of the lower part 14 below the shoulder 24 while the upper ends of the passages 38 open through the dished top end 22 of the part 16.

In addition to the passages 38 the foot portion 12 has formed therein the longitudinally extending reverse flow passages or bores 39 which are also preferably four in number and which open at their lower ends into the upper part of the chamber 18 above the screen wall 37 while at their upper ends they are directed laterally outwardly through the wall of the upper part 16 adjacent to the upper end of the latter.

In addition to the two passages 38 and 39 the first being termed the wash passage and the second the reverse flow passage or bore, the foot portion 12 has extending downwardly through the upper part 16 from and opening through the dished top end portion 22, the packer supply passages 40 which may also be four in number as shown in Figure 2 and which, in the plane of the channel 26 are directed laterally at their lower ends to open into the channel as illustrated in Figure 1.

The top end of the upper part 16 is externally screw threaded as indicated at 41 whereby the foot portion has detachably connected therewith the top or head portion which is generally designated 42. This head portion comprises a lower part 43 which is of the same outside diameter as the lower part 14 of the foot portion and which is chambered in its lower end as indicated at 44 to receive the threaded upper end of the part 16 of the foot portion whereby the head and foot portions are coupled together.

The lower part 43 of the head portion joins the long neck portion 45 which is of smaller outside diameter than the portion 43 as shown and which has the longitudinal fluid passage 46 formed therethrough.

The upper end of the neck portion terminates in the coupling 47 which is internally screw threaded to facilitate the attachment thereto of the lower end of a drill pipe, a portion of which is shown and designated 48.

At the top of the part 43 of the head portion external screw threads 49 are formed and surrounding and threadably connected with the portion 43 and extending longitudinally of and in spaced relation with the neck 45 is a cylindrical wall 50. The major portion of this wall is spaced from the wall of the neck 45 thereby providing a receptacle or basket, designated 51 in which sand, shale or small bits of junk may collect in the manner hereinafter described. The lower

part of the wall 50 has fluid escape apertures 52 therethrough for obvious reasons.

Resting upon the shoulder 24 and encircling the upper part 16 of the foot portion, and also threadably joined thereto as indicated at 53, is a bottom packer ring 54 to which is joined the bottom edge of a packer sleeve 55 which is formed of suitable heavy rubber and which encircles the area of the part 16 in which the channel 26 is formed.

The top edge of the packer sleeve 55 is joined to a top packer ring 56 which encircles the upper end of the part 16 and is secured against rotation by a key 57 which connects it with the part 16 as shown.

The upper ring 56 has formed therein upwardly and outwardly directed flow passages 39a which align with the upwardly directed outlet ends of the reverse flow passages or bores 39 and the key 57 prevents the ring 56 from getting out of position so that these passages are kept in alignment.

In the operation of the present tool, when it is run into the well hole 10 the packer is in contracted condition as indicated in dotted lines in Figure 1 so that it will not be damaged by contact with the wall of the hole.

If it is necessary to remove sand from the lower part of the well before the tool pieces can be brought up into the chamber 18, the fishing tool can be dropped to the bottom so that the cutting head penetrates the sand and the tool can then be rotated as may be necessary to loosen up the material after which washing fluid is forced down through the drill pipe to pass down through the passages 23 and 46 to the bottom of the hole. This fluid will then flow back up through the well around the outside of the tool and the sand, shale or other small particles of material will be caught or trapped in the basket 51 which surrounds the upper end of the tool.

After this preliminary cleaning action has been completed the next step can be carried out without removing the tool from the well hole, which step is the picking up or trapping of the tool pieces from the bottom of the well in the chamber 18.

Before proceeding to the performance of this operation a heavy ball plug 60 is dropped down through the drill pipe and through the passage 46 onto the top 22 of the part 16 where it will settle in the upper end of the passage 20 as illustrated in Figure 1 to close the latter.

The wash fluid is then forced down through the drill pipe and some of it will pass down through the wash passages 38 to flow out into the well hole below the packer while a portion of the fluid will flow down through the packer supply passages 40 and out into the channel 26 to expand the packer against the wall of the well hole as illustrated in Figure 1. With the well hole thus sealed off the wash fluid which has entered the lower part of the well by way of the passages 38 will flow around under the lower end of the tool, the latter having been lifted to the proper extent, and sweep up through the chamber 18 to return by way of the reverse flow passages or bores 39 to the well hole above the packer 55.

The passages 38, 39 and 40 are of different diameters as clearly shown in Figures 3 and 4. The reverse flow passages 39 are of largest diameter while the passages of intermediate size are the wash passages 38 while the packer supply passages 40 are of smallest size.

The upward sweep of the water entering the well hole below the packer by way of the passages 38 and flowing around and up through the

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chamber 18 will cause small pieces of the tool and other material in the hole which is to be removed, to be forced upwardly past the flexible fingers 35. The screen wall 37 stops the particles from passing up into the passages 39 and the spring fingers prevent the particles from falling back into the hole. Thus when the wash fluid has been circulated in this manner for a predetermined period of time, the tool may be withdrawn so as to remove the pieces of junk which may have been picked up and for the cleaning out of the basket 51 around the upper part of the tool.

From the foregoing it will be apparent that there is provided by the present invention a fishing tool of maximum efficiency by means of which the performance of the two separate operations of first removing the sand and shale from the bottom of the hole and then picking up and removing the broken tool pieces and other material, can be accomplished with the one insertion of the tool into the well hole whereas with cleaning and fishing tools of the character at present in use these two operations have to be performed in two separate steps, that is, one tool must be inserted and employed for removing the sand and other material of that character and after the first tool has been withdrawn a second tool is inserted for fishing up the broken tool pieces from the bottom of the well.

The present tool has for a further advantageous feature that it can be run in various size holes by changing only the cutting head 30. For example, if the operator is fishing for bit cones that have been lost off of a $7\frac{3}{8}$ inch bit he would use a 7 inch overall diameter head or if he wanted to fish a bit cone from a $7\frac{7}{8}$ inch bit he would put on a larger head so that the large cone would get up inside above the resilient fingers. In using these different size heads it would not be necessary to use a larger upper part for the tool as it is constructed so that the packer will seal off in several different sizes of holes. Thus it will be seen that the present tool effects the saving of material and accordingly saves the operator money in view of the fact that one tool will do the job which heretofore has required the use of three or more tools of different sizes.

We claim:

1. A tool for fishing up junk from the bottom

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of a well hole comprising an elongate body divided into a foot portion and a head portion, the foot portion comprising a lower part of circular form and an elongate upper part of smaller diameter and having an encircling recess therein and external screw threads around its top end, said foot portion further having a central passage opening at its lower end into a downwardly opening chamber in the lower part, said head portion comprising a lower part of the same outside diameter as that of the lower part of the foot portion and a reduced neck part terminating at its top in a pipe coupling, said head portion having a central passage opening at its lower end into an internally threaded enlargement in which the threaded top end of said elongate upper part is secured, an expansible packer sleeve encircling the said upper part of the foot portion and secured thereto at its top and bottom edges respectively above and below said encircling recess, means for closing the top end of the passage in the said upper part, wash fluid passages extending from the top of said upper part and opening through the outer wall of the lower part of the foot portion below the packer, packer fluid supply passages extending from the top end of said upper part to and opening into said recess, said wash and supply passages communicating at their top ends with the passage in the head portion when the top end of the central passage in the foot portion is closed, return flow passages in the foot portion leading from the upper part of the chamber therein through the outside wall thereof above the packer, and resilient finger elements in said chamber for trapping and holding material washed thereinto.

2. The invention according to claim 1, in combination with a second material trapping means comprising a cylindrical wall encircling the lower part of the said neck of the head portion and secured to the lower part of the head portion and forming an upwardly opening basket above the outlet ends of said return flow passages.

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