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2,617,486

WELL FISHING TOOL

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FIG. 1

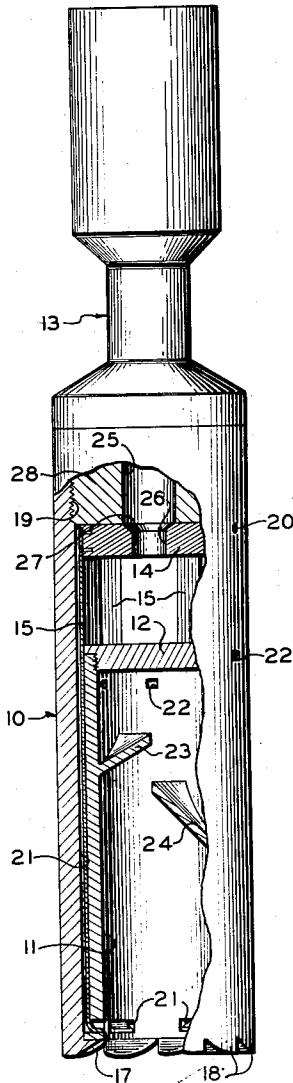


FIG. 3

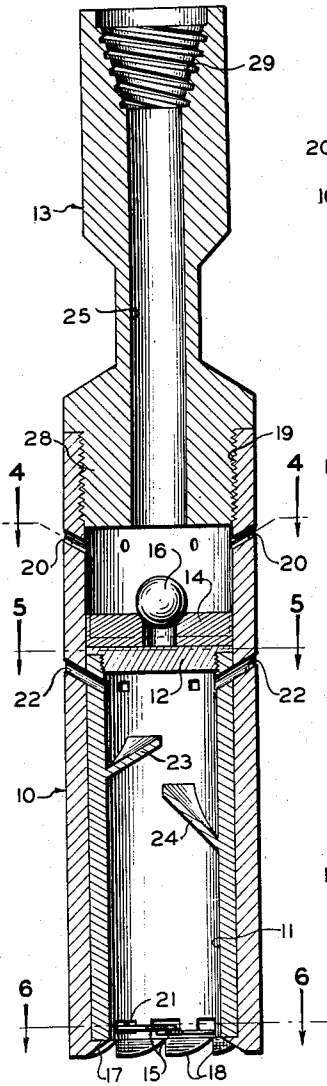


FIG. 4

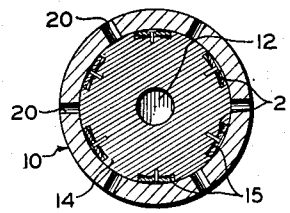


FIG. 5

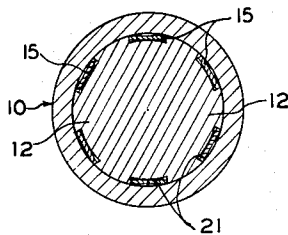


FIG. 6

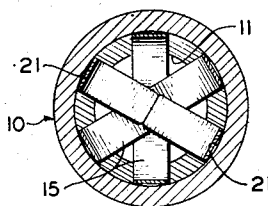
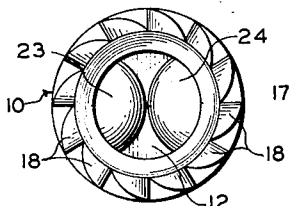


FIG. 2



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WELL FISHING TOOL

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3 Claims. (Cl. 166—19)

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This invention relates to well fishing tools for removing obstructing objects from well bottoms, and more particularly to a fishing tool for removing small objects, such as drill bit fragments.

It is among the objects of the invention to provide an improved well fishing tool of hollow construction and having an open bottom and a diameter substantially equal to the diameter of the well bore at the bottom of the well so that, when lowered to the bottom of the well, it will overlies small obstructing objects on the well bottom, which includes means for creating an upwardly-directed fluid flow for lifting objects from the well bottom into the tool for removal from the well, and fluid-pressure-operated means for closing off the open bottom end of the tool to retain the objects therein, which is rotatable in the well bore and is provided, on its bottom end, with means for directing objects to the interior thereof upon rotation of the tool at the bottom of a well, and which is strong and durable in construction, simple and economical to manufacture, easily attachable to a string of conventional well tubing, positive in operation and easy to use.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawing, wherein:

Figure 1 is a side elevation of a well fishing tool illustrative of the invention, a portion being broken away and shown in longitudinal, medial cross-section to better illustrate the construction of the tool;

Figure 2 is a bottom plan view of the tool illustrated in Figure 1;

Figure 3 is a longitudinal, medial cross-section of the tool with the movable parts thereof in a different operative position from that illustrated in Figure 1;

Figure 4 is a transverse cross-section on the line 4—4 of Figure 3;

Figure 5 is a transverse cross-section on the line 5—5 of Figure 3; and

Figure 6 is a transverse cross-section on the line 6—6 of Figure 3.

With continued reference to the drawing, the well fishing tool comprises, in general, an outer cylinder 10, an inner cylinder 11, a closure or plug 12 for one end of the inner cylinder, a plug 13 secured in the corresponding end of the outer cylinder, a piston 14 slidable in the outer cylinder between the plug 13 and the inner cylinder 11, flat springs 15 secured to the piston and slid-

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able between the inner and outer cylinders, and a valve ball 16 which cooperates with the piston 14 to cause the piston to move under the influence of fluid pressure in a direction from the plug 13 toward the end closure 12 of the inner cylinder.

The outer cylinder 10 has an external diameter corresponding to the diameter of the well bore at the bottom of the well, so that this cylinder, when lowered into the well to the bottom thereof, substantially fills the well bore, but is freely slidable and rotatable in the well. This cylinder has, at one end, which is the bottom end of the tool when in operative position, an internal annular shoulder 17, and outwardly of the shoulder 17 a series of radially-inclined teeth or serrations 18 so shaped that when the outer cylinder is rotated at the bottom of the well objects lying on the well bottom will be directed toward the center of the outer cylinder. These are not cutting teeth, but are for the purpose of loosening objects lying on or embedded in the bottom of the well and directing such objects toward the center of the tool.

The outer cylinder 10 is provided, near its opposite end, with internal screw threads 19, and adjacent the inner end of these screw threads with an annularly-arranged series of apertures 20.

The inner cylinder 11 is materially shorter than the outer cylinder 10, and is disposed in the outer cylinder, so that one end rests on the internal shoulder 17 at the bottom end of the outer cylinder. This inner cylinder is provided, in its outer surface, with a plurality of longitudinally-extending grooves 21 which are disposed at substantially equal, angular intervals around the outer surface of the inner cylinder and, near the end of the inner cylinder resting on the shoulder 17 extend through the wall of the inner cylinder from the outer to the inner surface thereof.

At its opposite end, the inner cylinder is internally screw threaded and the end plug 12 is threaded into and closes this end of the inner cylinder. An annularly-disposed series of angularly spaced-apart openings 22 extend through the inner and outer cylinders adjacent the plug 12 from the interior of the inner cylinder to the exterior of the outer cylinder.

Shelves 23 and 24 are provided within the inner cylinder extending partly thereacross to receive and retain objects floated into the inner cylinder from the bottom of the well.

The plug 13 is an elongated, generally cylindrical body having at one end an externally

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screw-threaded shank 28 threaded into the opposite or upper end of the outer cylinder 10, and having in its opposite end an internally screw-threaded socket 29 to receive the bottom end of a string of well tubing. This plug has a substantially central bore 25 extending from the socket 29 into the outer cylinder 10 to conduct fluid, under pressure, from the string of well tubing into the outer cylinder.

The piston 14 has therein a central aperture 26 which registers with the bore 25 in the plug 13 and is beveled at its upper end to provide a valve seat 27 for the valve ball 16. The flat springs 15 are attached, at their upper ends, to the piston 14 and extend downwardly through the grooves 21 in the inner cylinder 11, respectively, with their bottom ends following these grooves to the inner surface of the inner cylinder.

When the fishing tool is assembled with the well tubing string to be lowered into the well, the piston 14 is placed in its uppermost position, as illustrated in Figure 1. Under these conditions, after the tool has been lowered to the bottom of the well, it is rotated so that the serrations 18 will loosen obstructing objects on the bottom of the well and direct such objects toward the center of the tool and at the same time, fluid under pressure is forced downwardly through the well tubing string and through the bore 25 of the plug 13 to the outer cylinder 10. This fluid under pressure flows through the aperture 26 in the piston 14 and downwardly through the grooves 21 in the inner cylinder and through the bottom ends of these grooves to the interior of the inner cylinder at the bottom end thereof. It then flows upwardly through the inner cylinder and out of the inner cylinder through the openings 22, causing an upwardly-directed fluid flow through the inner cylinder which tends to lift or float obstructing objects upwardly into the inner cylinder to be deposited on the shelves 23 and 24.

After the fluid under pressure has been supplied to the tool for what is considered a sufficient length of time, the valve ball 16 is dropped into the upper end of the string of well tubing and descends through the well tubing string and the plug 13 to the piston 14 where it rests on the valve seat 27, closing the aperture 14. The fluid under pressure then forces the piston downwardly in a direction from the plug 13 toward the adjacent end of the inner cylinder 11, forcing the springs 15 downwardly, and the lower ends of these springs extend inwardly through openings provided in the inner cylinder from the ends of the grooves 21 to the interior of the inner cylinder and the springs then extend across the open, bottom end of the tool to close off the bottom end of the tool, as is particularly illustrated in Figure 6. These springs thus retain in the tool, all objects which have been moved into the tool and the tool may now be raised to remove such objects from the well.

After the aperture 26 has been closed by the valve ball 16 and the piston forced downwardly from the position illustrated in Figure 1 to the position illustrated in Figure 2, fluid under pressure forced into the outer cylinder 10 will escape through the apertures 20 which are uncovered by this downward movement of the piston.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the

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scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A well fishing tool comprising a hollow outer cylinder having at one end an internal annular shoulder and radially inclined serrations, a hollow inner cylinder shorter than said outer cylinder disposed within the latter and bearing at one end on said annular shoulder, said inner cylinder having longitudinally extending grooves in its outer surface disposed at substantially equal angular intervals therearound and extending from the other end of said inner cylinder longitudinally of the latter and inwardly of said inner cylinder at said one end thereof, means closing said other end of said inner cylinder, a plug secured in the other end of said outer cylinder and having therein a screw threaded socket to receive the lower end of a string of well tubing and a bore leading from said socket into said outer cylinder, said outer and inner cylinders having mutually registering openings leading from the interior of said inner cylinder to the exterior of said outer cylinder adjacent the means closing said other end of the inner cylinder and disposed between said grooves so that fluid under pressure supplied from a string of well tubing through said plug may flow downwardly through said grooves into said inner cylinder and upwardly through said inner cylinder and out through said openings to create an upwardly directed fluid flow through said inner cylinder, a piston in said outer cylinder between said plug and said means closing the other end of said inner cylinder, said piston having an aperture extending therethrough and beveled at one end to provide a valve seat facing said plug, flat springs slidable one in each groove in said inner cylinder and each connected at one end to said piston with its other end adjacent said annular shoulder for projection from the ends of said grooves at said annular shoulder across the open end of said inner cylinder when said piston is moved in a direction from said plug toward the adjacent closed end of said inner cylinder, and a valve element adapted to be dropped through the bore in said plug into engagement with the valve seat in said piston to close the aperture there-through and enable fluid under pressure in said bore to move said piston towards the adjacent end of said inner cylinder.

2. A well fishing tool comprising a hollow outer cylinder, a hollow inner cylinder shorter than said outer cylinder disposed within said outer cylinder and substantially co-terminous at its open end with said outer cylinder at the open end of the latter, means closing the other end of said inner cylinder, a plug secured at one end in the other end of said outer cylinder and spaced from the closed end of said inner cylinder, said plug having a screw threaded socket in its other end for attachment of the tool to a well tubing string and having a bore extending therethrough from said socket to the interior of said outer cylinder, a piston slidable in said outer cylinder between said plug and said means closing the closed end of said inner cylinder and having an aperture therethrough, controllable means movable through the bore in said plug into closing relationship with the aperture in said piston, said inner cylinder having flat grooves in its

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outer surface extending longitudinally from one end to the other thereof and angularly spaced apart therearound, a plurality of flat springs attached each at one end to said piston and extending slidably one through each of said grooves, and fluid conducting means at the open end of said inner cylinder communicating with said grooves for deflecting said springs across the open end of said inner cylinder when said springs are projected from said cylinders by movement of said piston in a direction from said plug toward the adjacent closed end of said inner cylinder upon closing of the aperture in said piston, said grooves also constituting fluid passages from said plug to within said open end of said inner cylinder and said cylinders having mutually registering fluid passages extending transversely therethrough and disposed between said grooves and adjacent the means closing the closed end of the inner cylinder and constituting fluid outlet passages for said inner cylinder.

3. A well fishing tool comprising a first hollow cylinder having a closed end and an open end and a supporting means at the open end thereof, a second hollow cylinder positioned within the first hollow cylinder and supported at one end on said supporting means, a first plug closing the other end of said second cylinder, said second cylinder having a plurality of angularly spaced apart grooves in the outer surface thereof extending longitudinally of said second cylinder from one end thereof to the other, a second plug closing the closed end of said first cylinder and extending longitudinally therefrom, said second plug having a bore extending longitudinally therethrough, a piston slidably disposed in said first cylinder between said first and second plugs and movable toward and away from said first plug, and a plurality of flat springs positioned

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above the outer surface of said piston and secured each at one end thereto, each of said springs extending slidably through a corresponding groove in said second cylinder, there also being a plurality of spaced apart openings extending transversely through said second cylinder at the end thereof adjacent said supporting means and said springs extending one through each of said openings and being movable radially of said one end of said first cylinder in response to the movements of said piston toward and away from said first plug, said piston being provided with a centrally disposed aperture extending therethrough and a valve seat formed in the face thereof remote from said first plug and adapted to support a valve element when dropped through the longitudinally extending bore in said second plug to thereby close the aperture and enable fluid under pressure to effect movement of said piston toward said first plug to move said springs inwardly of the open end of said first cylinder.

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