

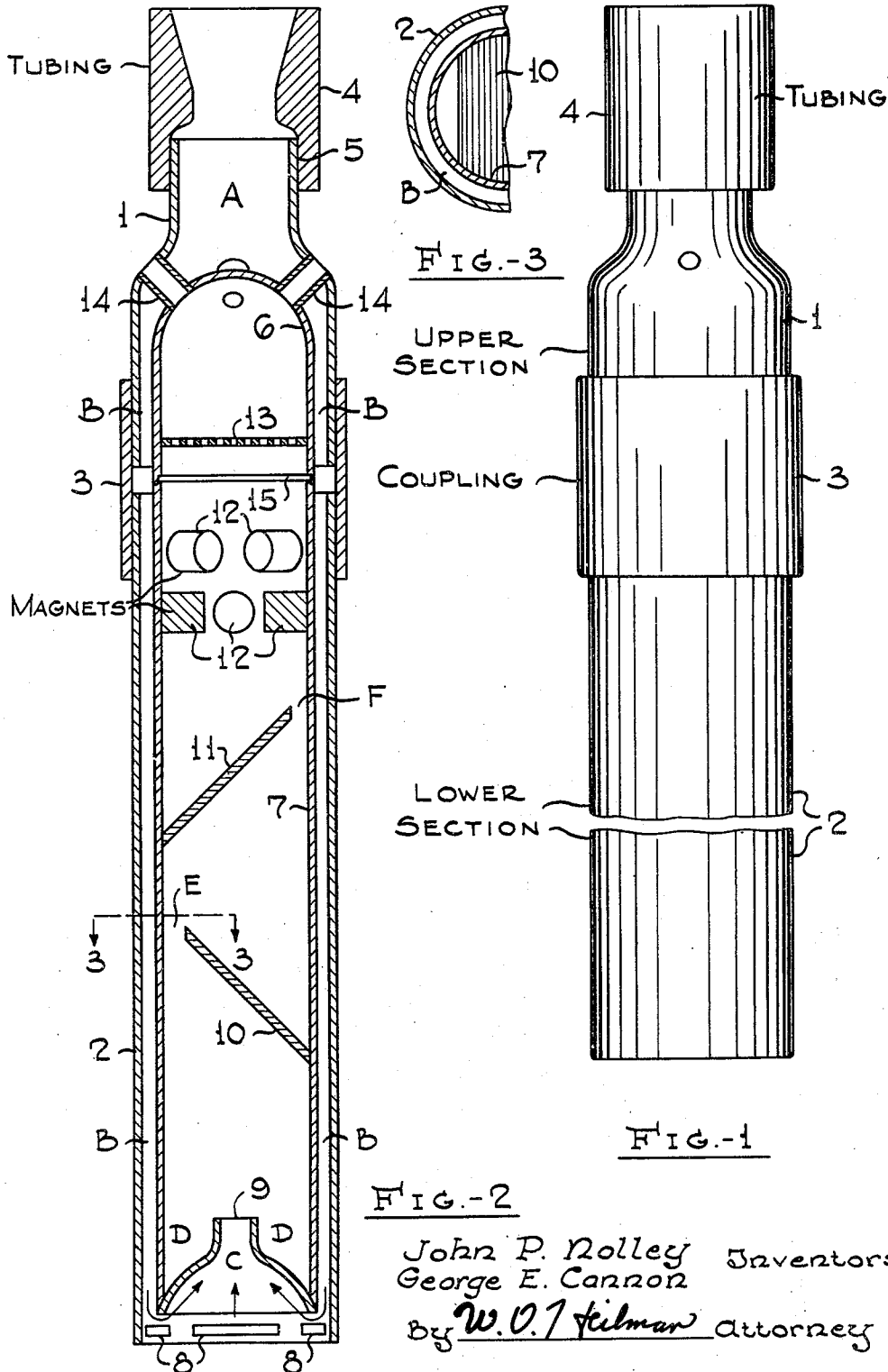
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MAGNETIC JUNK BASKET FOR WELL BORES

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MAGNETIC JUNK BASKET FOR WELL BORES

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The present invention is concerned with a method and apparatus for the removal of metallic elements from the bottom of a borehole. The invention is more particularly concerned with an improved junk basket or retrieving tool which is particularly adapted for the recovery of metallic elements such as pieces of iron bits, pipe, hand tools, bearing elements and the like, from the bottom of boreholes. The retrieving apparatus comprises a unit containing baffle and retaining elements and magnetic elements whereby substantially complete removal and recovery of the undesirable metallic materials from the bottom of the well is effected.

In the production and recovery of oil, gas and the like, from subsurface strata it is the conventional procedure to drill well holes through subterranean areas from the surface by means of various tool bits and the like. During the course of these drilling operations most of the rock strata is removed by water or oil circulation. However, during these drilling operations pieces of pipe break off, bearing elements crack and break off, and in many instances pieces of pipe or hand tools are accidentally dropped into the bottom of the well hole. These materials are not desirable and in many instances are quite harmful in operation as, for example, in diamond bit drilling operations. It is therefore essential that they be completely and efficiently removed. In order to accomplish this, a new apparatus or junk basket which will efficiently and completely remove these undesirable metallic elements has been discovered. The apparatus may be readily understood by reference to the drawings illustrating the same.

Fig. 1 is a view of the assembled junk basket;

Fig. 2 is a longitudinal section of the unit; while

Fig. 3 is a detail of the baffle section.

Referring specifically to Fig. 1, the junk basket comprises an upper section 1, a lower section 2, and a coupling element 3. The upper section is rigidly attached to the bottom of the tubing 4 by suitable means.

Referring specifically to Fig. 2, the upper section 1, is rigidly attached to tubing 4 by means of a tool joint 5. The upper section 1 is attached to lower section 2 by means of coupling 3.

The upper section 1 comprises a swage unit. A short section of a bull-plug pipe 6 is welded in the neck of the swage. The bull-plug pipe 6 is positioned symmetrically within the swage as shown. The lower section comprises the cylindrical element 2 and a smaller cylindrical ele-

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ment 7 positioned within cylindrical element 2. A tight fit is maintained between pipe 6 and element 7 by means of seal ring 15.

In operation the junk basket is lowered by suitable means to the bottom of the well hole and rests on the bottom of the hole. A fluid, preferably a drilling mud, is pumped down within the tubing 4 and into the area A of the junk basket.

The fluid flows downwardly in the area B between the respective cylindrical elements. The fluid flows around the lower edge of cylindrical element 7 and through slots 8 into the area C within cylindrical element 7. The flow of fluid picks up the undesirable metallic materials and washes them upwardly through the throat 9 in the bottom of cylindrical element 7. Heavy elements may filter out and fall back into retaining areas D on the upper side of throat unit 9. The fluid containing other elements flows upwardly around baffle plate element 10 and through open area E. The fluid then flows up around plate 11 through open area F. Materials which tend to settle out are retained in the area between the plate elements 10 and 11 and the walls of inner cylindrical element 7. The fluid containing very fine metallic particles then passes through a magnetic zone containing a plurality of magnets 12. These magnets comprise permanent magnets and retain fine metallic elements thereon. The fluid flows upwardly through a perforated plate 13 and flows into the area between the borehole and the outer area of the tubing through ports 14.

The invention in general comprises the employment of a magnetic junk basket which contains at least one baffle and retaining area. In general, it is preferred that at least two or three baffles and retaining elements be utilized. The baffle elements may be positioned as desired although in general it is preferred that they have an angle of about 40 to 50°, preferably about 45° with respect to the shell wall. In operation it is desirable to discontinue the pumping of the fluid at periodic intervals in order to permit the metallic particles to settle into the respective retaining areas created by the baffles.

The dimensions of the junk basket may vary appreciably, depending upon the size of the borehole.

It is preferred that the junk basket be constructed of two pieces to facilitate handling and examination of any recovered junk. The upper portion preferably consists of about a 4½ inch tool joint welded to about a 4½ inch x 7-inch

swage and a 7-inch collar. A short section of a 5-inch bull-plug pipe is welded in the neck of the swage and the lower rim of the 5-inch pipe preferably machined and fitted with a rubber sealed ring. The screen is placed inside the 5-inch pipe near the fluid exit to prevent junk being circulated through the tool. It is also preferred that about four 1-inch holes be cut in the top of the 5-inch bull-plug pipe and in the neck of the swage and segments of 1-inch pipe welded into them in order to allow circulation from within the tool to the annular space between the drill pipe and the hole. The lower section of the tool preferably consists of a section of 7-inch pipe with a slightly longer section of 5-inch pipe spaced and welded inside the 7-inch pipe. Baffle plates are placed at approximately a 45° angle in a vertical plate within the 5-inch pipe and welded. The space between the 5-inch and the 7-inch pipes at the bottom is completely sealed off except for four rectangular slots.

It is to be understood that the actual dimensions may vary appreciably and that the number of baffles employed within the inner element likewise vary. The apparatus may be made of any suitable material and the number of magnets utilized vary to meet the particular conditions of use.

Having described the invention, it is claimed:

1. Improved junk basket which comprises an outer cylindrical element, an inner cylindrical element so disposed to create an area between the inner surface of the outer cylindrical element and the outer surface of the inner cylindrical element, means of communication between

the two cylindrical elements at the bottom thereof, ports from within said inner cylindrical element to the area without said outer cylindrical element disposed at the top of said inner cylindrical element, a horizontally disposed pierced plate disposed near the top of said inner cylindrical element adjacent said ports, baffle elements disposed within the said inner cylindrical element, a plurality of relatively small permanent magnet elements disposed within said inner cylindrical element above said baffle elements and below said pierced plate.

2. Apparatus as defined by claim 1 wherein the baffle elements are disposed at an angle of 45° with respect to the wall of said inner cylindrical element.

3. Apparatus as defined by claim 1 wherein means are provided for circulating a fluid downwardly in the area between the respective cylindrical elements, upwardly and around the baffles within said inner cylindrical element and through said communication means at the top of said cylindrical element.

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