

APPLICATION FILED JULY 15, 1912.

Patented May 27, 1913.



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WELL-CASING SHOE.

1,062,647.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed July 15, 1912. Serial No. 709,333.

To all whom it may concern:

Be it known that we, SAMUEL ALLEN GUIBERSON, JR., and HARRY MEAD, citizens of the United States, residing at Coalinga, in the county of Fresno and State of California, have invented certain new and useful Improvements in Well-Casing Shoes, of which the following is a specification.

Our invention relates to well-boring apparatus and appliances, and particularly to those devices carried by the lower end or foot of a string of casing-pipe, and which are known as "casing-shoes."

Our invention consists in an improved casing-shoe, the nature of which, together with its objects and advantages, will be hereinafter fully described, by reference to the accompanying drawings in which—

Figure 1 is a vertical section of the lower end or foot of a string of casing-pipe, and of our improved shoe applied thereto, the casing with its shoe being shown elevated with respect to the several ledges of the hole-walls or bank which said shoe is engaged in cutting away in the water-sand. Fig. 2 is a similar section showing the casing-pipe farther down and its shoe landed in the hard shell or clay formation to form a tight joint against the leakage of water from the water-sand just above. Fig. 3 is a bottom view of the casing-shoe.

1 is the foot of a string of casing-pipe.

2 is the casing-shoe. This is screwed to the pipe-foot 1, as shown at 3. The outer surface of the shoe, from its beveled sole 4 upwardly is formed with a plurality of circumferential cutting-toes 5, the uppermost having the largest diameter, the lowermost the smallest diameter and the intervening ones having diameters increasing upward. There may be as many of these circumferential cutting-toes 5 as are found best or desirable. For the present illustration we have shown a series of three including the lowermost, though we wish it distinctly understood that we do not confine ourselves to this number. In practice these cutting toes may be readily formed by a lathe, the toe itself, for effective work, being inwardly undercut and the surface between toes being flared outwardly downward.

In order to make clear our improvement, a few words as to the function or purpose of a casing-shoe will here be necessary. The ordinary shoe is screwed to the foot of a string

of casing-pipe and its lowermost edge serves as a cutting-toe. The shoe at this point has a thickness sufficiently great to make its diameter large enough to cut away the wall or bank of the hole which is left by the drilling-tool; the latter, owing to the fact that it works down through the casing, leaving a hole having a diameter not greater than the interior diameter of the casing pipe. It is the function of the casing shoe to enlarge this drill-hole to a diameter sufficient to provide for the collars on the string of casing-pipe, said collars being about every twenty feet, where the sections of pipe are connected together. The hole is thus enlarged sufficiently to let the string of pipe with its collars go down. In a formation which is soft enough, the ordinary shoe is adapted to cut down through the bank or rim of the drill-hole, and when a harder formation is reached which cannot be cut by the shoe, a tool called an "under-reamer" is used. This is a tool which works down through the casing and is provided with expanding cutting dogs or jaws, which when clear of the casing expand to greater diameter and cut away the bank. As this tool is pulled up, the lower end of the shoe compresses its jaws to the casing pipe diameter; and to do this and to properly receive and stand the jar of the jaws or dogs of the under-reamer, the shoe at this point, that is, at its bottom, is inwardly beveled, which advantageous construction we preserve as we show by the sole 4. But the ordinary single-cutter-shoe is not always capable of cutting down through formation which should not require the under-reamer, and, consequently, attempts have been made to increase the cutting capacity of the shoe by making around the circle of and directly in its lower edge a number of teeth, all in the same plane, like a serrated edge. This construction, however, while possibly increasing the cutting capacity of the shoe, has the disadvantage of decreasing its capacity to form a tight joint against the leakage of water, when the shoe with its string of casing is finally landed in the hard shell or clay formation below the water sand, and above the oil sand.

The essential improvements in our shoe may now be stated to be, first, its increased capacity for cutting away the wall or rim of the drill hole, and, second, its better adaptation for forming a water-tight joint when

landed in the hard shell or clay formation. The first of these is shown in Fig. 1 wherein it will be seen that the shoe is lifted and is about to descend to cut away the bank 6 of the drill hole 7, in the water sand 8. Each cutting toe 5 has only its own relatively narrow portion of the bank 6 to cut away and the shoe is, therefore, more capable of cutting this bank than if a single cutting edge were required to cut away the whole thickness of the bank. The second advantage is shown in Fig. 2, wherein the shoe has passed through the water-sand 8, and is landed in the hard shell or clay formation 9 which lies above the oil sand 10. In thus landing in the hard shell, each cutting-toe 5 lies squarely on its own ledge, and as there is a rising series of these joints there is less chance of the water leaking by the joints thus formed than if there were but a single joint, and thus a better, because tighter joint is formed.

Having thus described our invention what

we claim as new and desire to secure by Letters Patent is—

1. In combination with a casing-pipe, a shoe fitted to the foot thereof, said shoe being provided on the outer surface of its lower portion with a plurality of circumferential cutting-toes in rising series increasing in diameter upward.

2. In combination with a casing-pipe a shoe provided at its upper portion with means for attaching it exteriorly to the foot of the casing-pipe, and provided on the outer surface of its lower portion with a plurality of circumferential cutting-toes in rising series increasing in diameter upward.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

SAMUEL ALLEN GUIBERSON, Jr.

HARRY MEAD.

Witnesses:

HARRY PRESSFIELD,

H. R. CROZIER.