E. E. SHAFFER.

SHOE FOR DRILLING OIL WELLS.

APPLICATION FILED FEB. 15, 1915.

1,163,867. Patented Dec. 14, 1915.

Fig. 1.

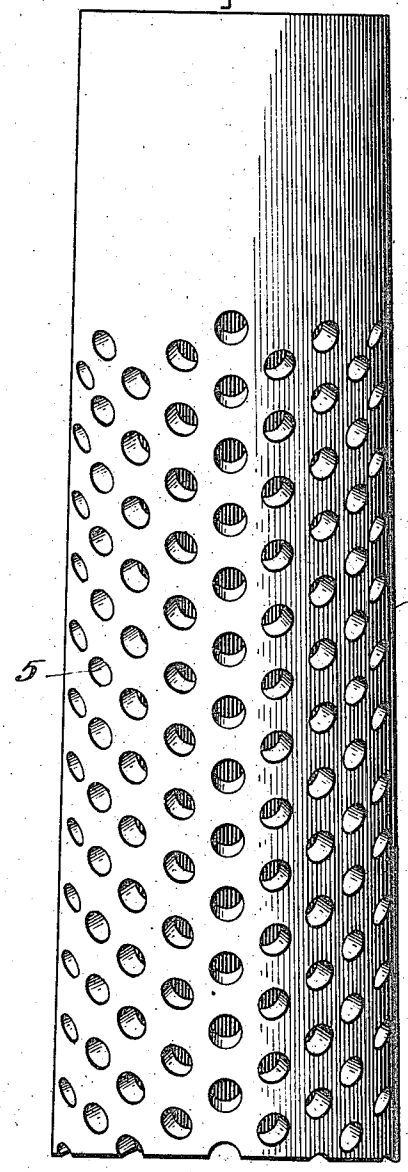
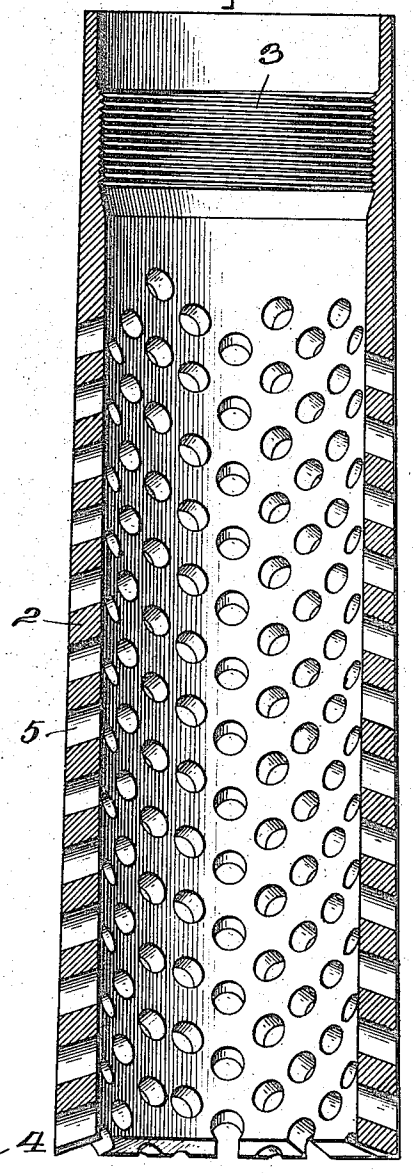



Fig. 2.



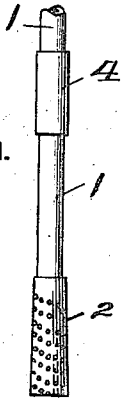




Fig. 3.

WITNESSES

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## SHOE FOR DRILLING OIL-WELLS.

1,163,867. Specification of Letters Patent. Patented Dec. 14, 1915.

Application filed February 15, 1915. Serial No. 8,327.

*To all whom it may concern:*

Be it known that I, ELMER E. SHAFFER, a citizen of the United States, residing at Tulsa, in the county of Tulsa and State of Oklahoma, have invented new and useful Improvements in Shoes for Drilling Oil-Wells, of which the following is a specification.

This invention relates to the shoes or tools which are employed for drilling oil and similar wells. One of its objects is the provision of an inexpensive tool of this character so constructed that its cutting edge is automatically kept sharp, and so that the tool is not liable to become bound in the well-hole.

Further objects are to so construct the tool that the formation or excavated material will be spaded or directed toward the center of the well, and so that when the shoe penetrates a stratum of lime, the cement will anchor it securely in the lime.

In the accompanying drawings: Figure 1 is a side elevation of the shoe. Fig. 2 is a longitudinal section thereof. Fig. 3 is a side elevation, on a reduced scale, of the shoe and the rotary pipe or shank to which it is secured.

Similar characters of reference indicate corresponding parts throughout the several views.

1 indicates a rotary pipe or hollow shank to which the shoe or drilling tool 2 is attached by a screw threaded joint 3 or any other suitable fastening. The pipe 1 may be rotated by any appropriate or well-known mechanism forming no part of the present invention and therefore not shown in the drawings.

The shoe is hollow or tubular and circular in cross section, and comparatively long. Its external surface is preferably tapered toward its upper end, as shown, and its large lower end has a greater external diameter than the rotary shank or pipe 1 and any collars, couplings or other enlargements thereof, one of such collars being shown at 4 in Fig. 3. This tapering construction effectually prevents the shoe from binding or freezing in the well-hole.

Drilled or otherwise formed in the wall of the shoe are rows of openings or perforations 5 extending around the circumference of the shoe from its lower end or cutting edge nearly to its upper end, as shown. These openings are preferably circular and the openings of each row are interspaced with those of the preceding row, so that adjacent rows overlap. The cutting edge of the shoe is formed by the side edges of the lowermost openings which are partial holes or notches, as shown. By this arrangement as the cutting edge wears away by the rotation of the shoe, the openings of the second row from the bottom or those nearest the cutting edge are worn into and furnish fresh boring edges before the lowermost openings are wholly worn away. The shoe is thus self-sharpening, and the labor and expense of manually sharpening it from time to time are saved.

In the preferred construction of the shoe illustrated in the drawings, the openings are disposed in spiral rows or lines. By this arrangement, the active openings constituting the cutting edge do not all wear at the same points of their arcs at the same time, as would be the case if the rows were annular or parallel with the cutting edge. Hence, of the different openings active at the same time, no two present cutting edges of like depth or extent but the several active openings progressively increase in depth, producing more satisfactory results.

In order to cause the formation or excavated material to be spaded or directed toward the center of the well as the shoe rotates, the openings 5 are inclined or drilled at a suitable angle to the axis of the shoe. An angle of about forty-five degrees has been found satisfactory for this purpose but a greater or less angle may be employed, if desired.

The upwardly-tapering form of the shoe in conjunction with its perforations affords the further advantage that when the shoe enters a stratum of lime above the oil or gas-sand, it may be cemented in the lime, and securely anchored therein, to prevent upward displacement of the casing by the oil or gas pressure. This anchoring is accomplished in the usual manner by lowering cement into the well by means of a bailer. The cement passes through the openings of the shoe and fills the upwardly-enlarging space between the tapering shoe and the surrounding lime, thereby securely cementing the shoe to the latter.

I claim as my invention:

1. A well-drilling tool, consisting of a tubular shoe having rows of openings extending through its wall, the openings of adjacent rows being arranged to overlap,

whereby as the cutting edge of the shoe wears away, the openings near said edge are partly worn into before the openings in said edge are wholly worn away, the shoe being tapered upwardly throughout the length of its perforated portion.

2. A well-drilling tool, consisting of a tubular shoe having openings passing through its wall and extending in spiral rows around the same, said openings being inclined to direct the drilled material toward the axis of the shoe, and the shoe being tapered upwardly throughout the length of its perforated portion.

Witness my hand this 23d day of January, 1915.

ELMER E. SHAFFER.

Witnesses:
W. H. MANDEVILLE,
CHAS. F. BISETT.