(No Model.) 2 Sheets—Sheet 1.

T. G. CHAPMAN.

WELL DRILLING TOOL.

No. 487,989. Patented Dec. 13, 1892.

Fig. 1

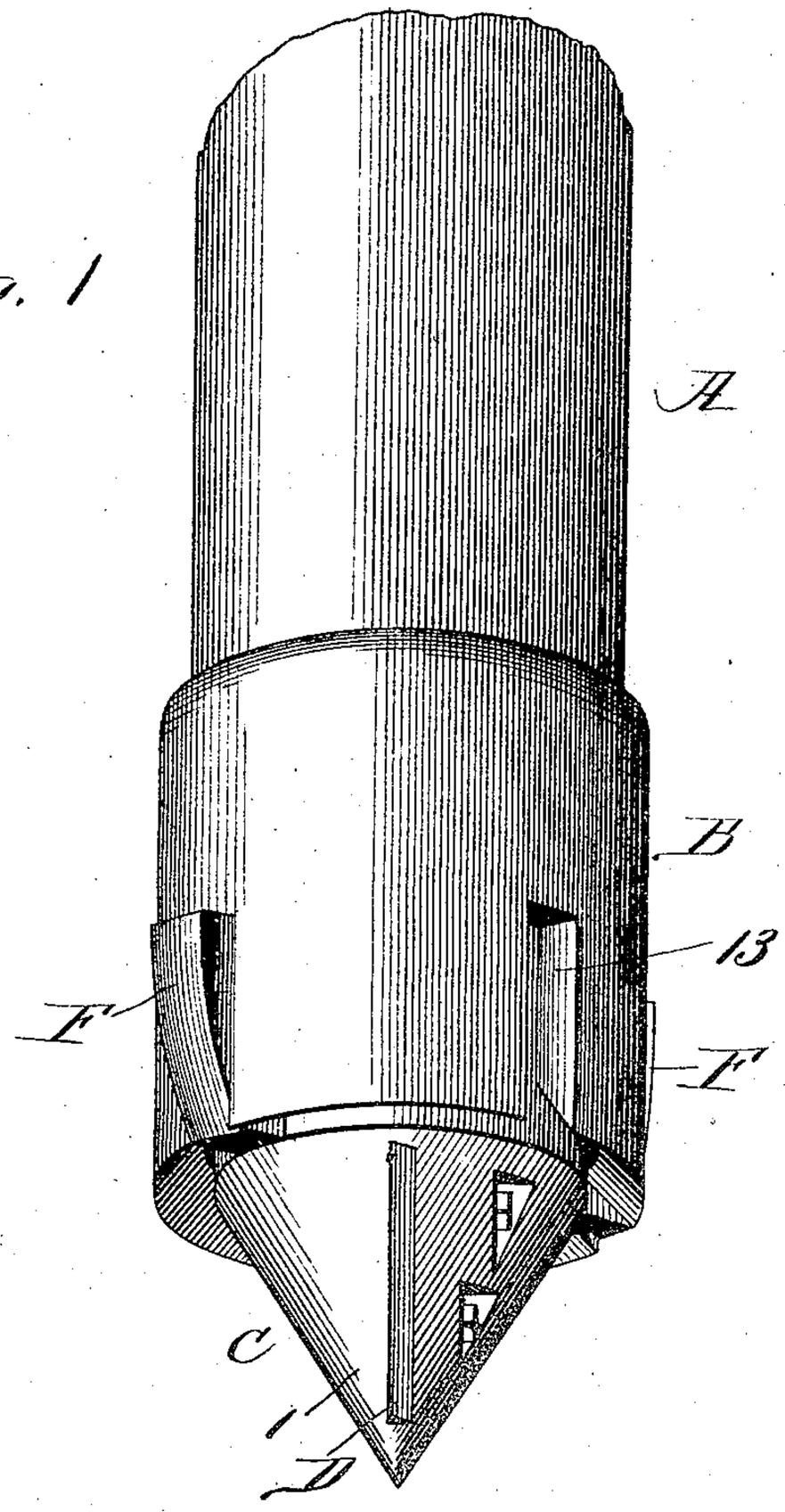
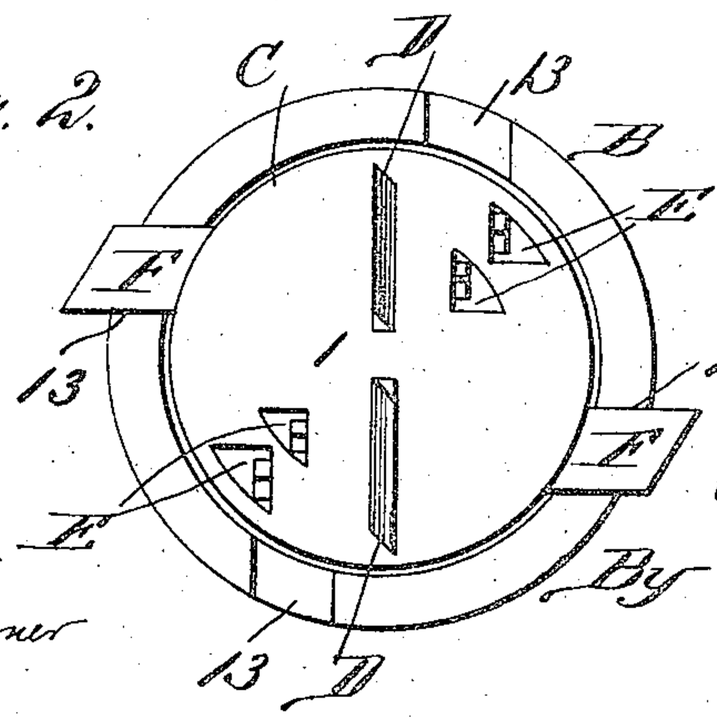


Fig. 2.



Witnesses.
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Margaret M. Wagner

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

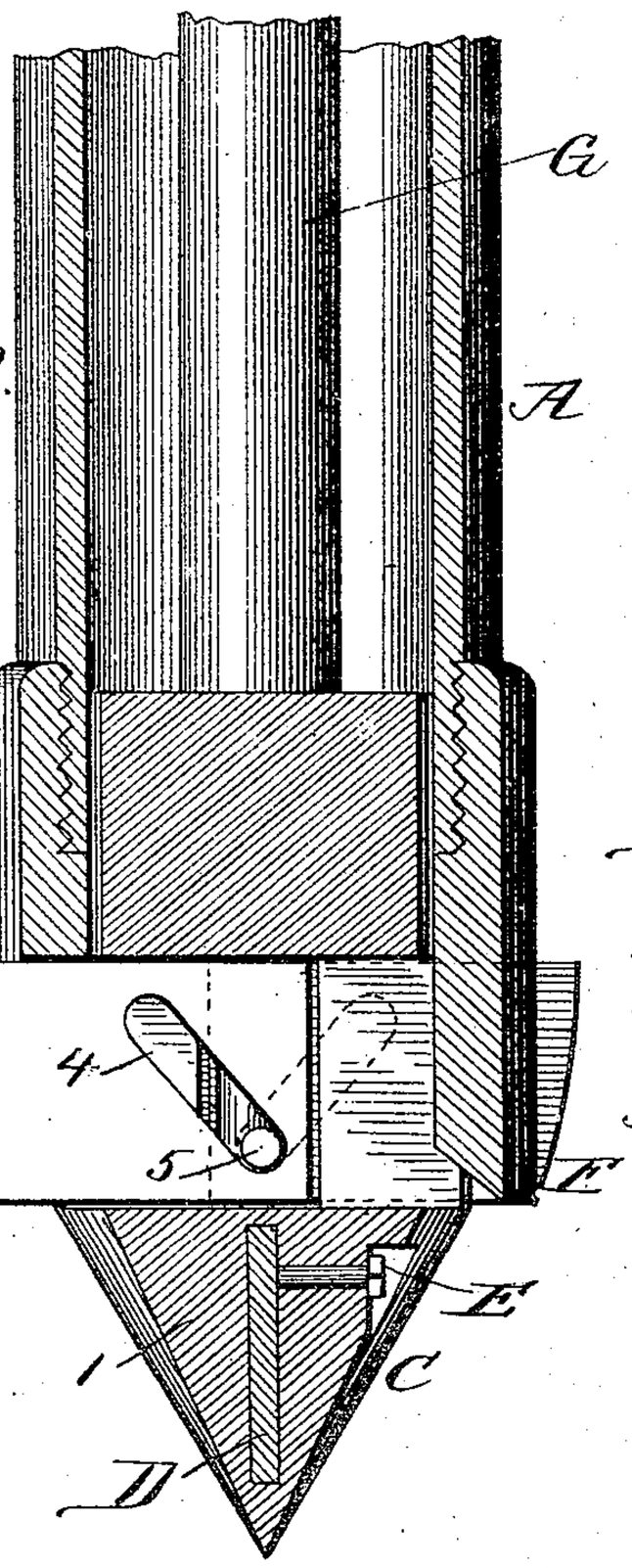


Fig. 4.

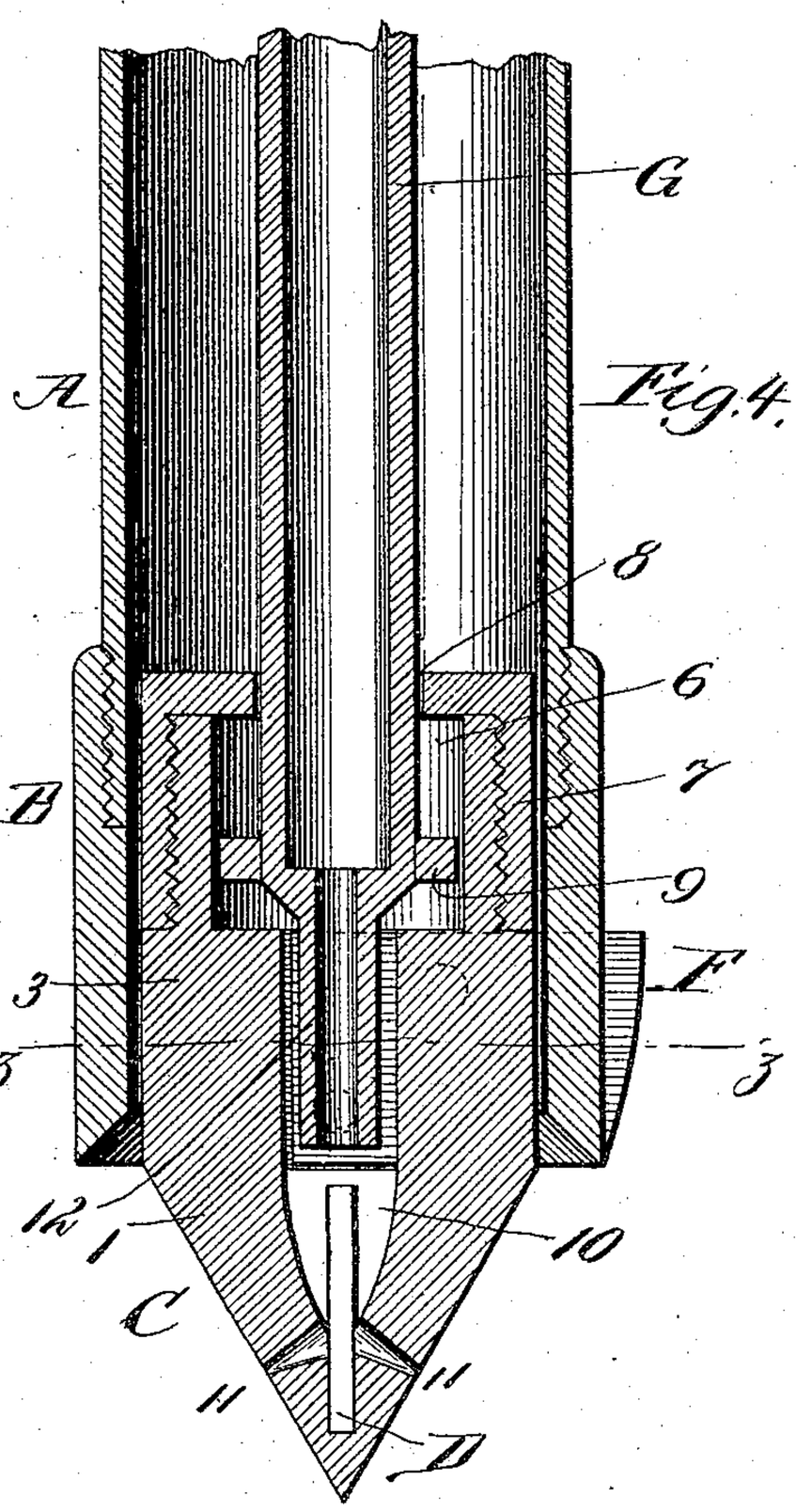
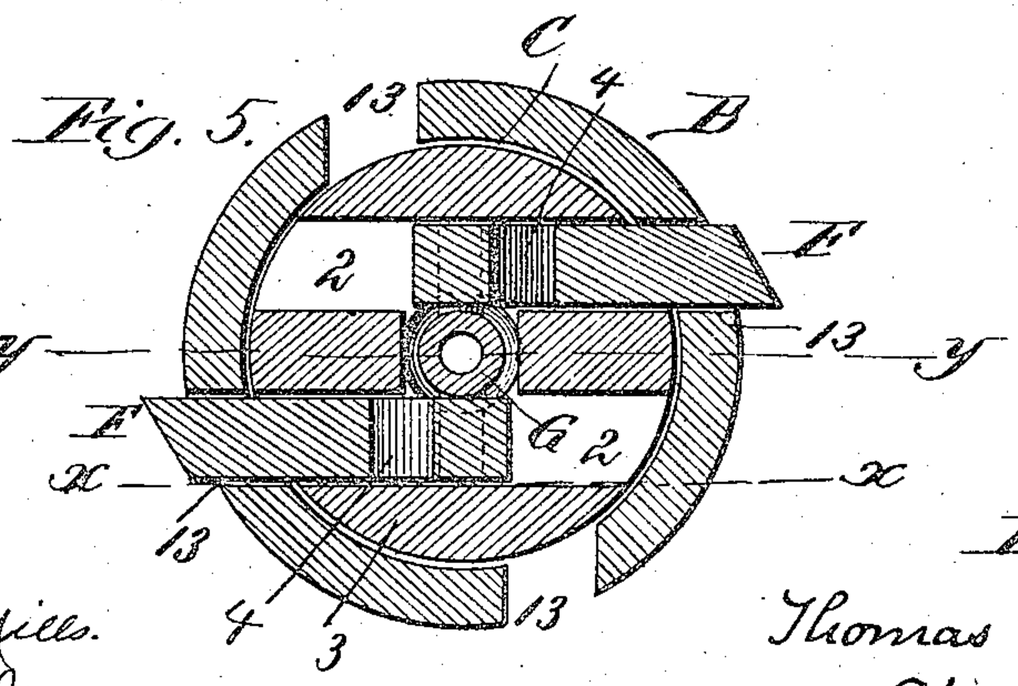


Fig. 5.



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UNITED STATES PATENT OFFICE.

THOMAS G. CHAPMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO FREDERICK C. AUSTIN, OF SAME PLACE.

WELL-DRILLING TOOL.

SPECIFICATION forming part of Letters Patent No. 487,989, dated December 13, 1892.

Application filed July 14, 1891. Serial No. 399,462. (No model.)

To all whom it may concern:

Be it known that I, THOMAS G. CHAPMAN, a subject of the Queen of Great Britain, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Well-Drilling Tools, of which the following is a specification.

The objects of my invention are to provide a simple, compact, durable, and efficient construction of well-drilling tool; to permit the blades for reaming or enlarging the well-bore to be readily expanded and retracted without the use of springs; to permit the drill-head to be conveniently lowered and raised within the well-tube, and to facilitate both the expansion or projection and the retraction of the blades regardless of the depth to which the lower end of the well-tube may be sunk.

To the attainment of the foregoing and other useful ends my invention consists in matters hereinafter set forth.

In the accompanying drawings, Figure 1 represents, in perspective, a shoe applied to the lower portion of a well-tube and the drill-head embodying my invention. Fig. 2 is a plan of the lower end of the device of Fig. 1. Fig. 3 is a vertical section on a plane at one side of the longitudinal center of the drill-head and indicated by line *x x* in Fig. 5. Fig. 4 is a longitudinal central section on line *y x y* in Fig. 5. Fig. 5 is a cross-section on line *z z* in Fig. 4.

In the drawings, A indicates the well-tube, provided at its lower end with a sleeve or shoe B, which can be coupled with the well-tube in any suitable way.

The drill-head C is formed with a conical or suitably-sharpened lower end portion 1, and is provided with cutters D, desirably formed separately from the drill-head and secured within recesses in the same by screws E, having their heads sunk within recesses in the tapered or conical portion of the drill-head, although said cutters can be secured in any other suitable way. The drill-head is also provided with a suitable water way or ways arranged for discharging adjacent to or at points between the cutters D, so as to soften up the earth, it being observed that the feature of providing a water-way for such purpose is common in well-drilling tools, and that I do not for the broader purposes of my invention herein confine myself to any particular arrangement of water way or passage.

The drill-head carries a couple of blades F, which are confined within mortises 2, formed through the upper portion 3 of the drill-head. These mortises are formed on parallel planes, respectively, at opposite sides of the longitudinal center of the drill-head, as best illustrated in Fig. 5. The walls of the mortises form bearings for the blades F, which can be caused to project from opposite sides of the drill-head and also retracted within the same. The blades may therefore be said to slide laterally with relation to the drill-head in contradistinction to drilling-tools in which the blades are pivotally held and arranged to swing out from their allotted holder. Each blade is provided with a slot 4, arranged obliquely to the length of the blade, and hence arranged obliquely or at an inclination to the longitudinal center of the drill-head. These slots incline upwardly and outwardly from the inner ends of the blades and receive studs respectively provided on opposite sides of the lower end of the drill-rod G, one of said studs 5 being shown in full lines in Fig. 3, while both of them are illustrated by dotted lines in Fig. 5. When the blades are retracted within the drill-head, the studs on the drill-rod will be at the upper outer ends of slots 4, and when the blades are projected into working position the studs will be at the lower inner ends of the slots. Hence if the drill-rod is raised independently of the drill-head the blades F will be retracted, while, on the other hand, if the drill-rod is depressed the blades will be forced outwardly.

In order to permit an independent end movement relatively between the drill-rod and the drill-head, I provide a limited sliding connection between the two.

As herein shown, the drill-head has its upper end provided with a centrally-arranged recess 6 and a screw-cap 7, which closes over the recess, but admits entrance thereto through a centrally-arranged opening 8 in the cap. The drill-rod extends through said opening 8 in the cap and is provided with a shoulder 9, arranged within the recess 6 in the drill-head. The drill-head and drill-rod are therefore capable of an end movement independent of

one another to an extent equal to the distance between the cap and the bottom of the recess it serves to cover, and hence while the drill-rod can be raised or depressed to a limited extent independently of the drill-head said two members cannot be separated without unscrewing the cap from the drill-head.

The drill-rod G is desirably made hollow, so as to provide a passage for the downflow of water, and as a means for extending such passage to the lower tapered end or point 1 of the drill-head the latter is provided with a centrally-arranged bore 10, which extends downwardly from recess 6 and terminates in the laterally-arranged outlets 11. The lower end portion 12 of the drill-rod is contracted and arranged within the upper portion of the bore 10, in which way water from the hollow rod will discharge into the lower portion of said bore and thence pass out through the outlets 11.

The shoe is provided with slots 13, which are formed to extend upwardly from its lower end and arranged to provide passages through which the outer ends of the blades F may be extended. While I may provide the shoe with only one pair of such slots, I prefer providing it with two pairs of slots, as in Fig. 2, in which way either pair can be used, as may be found most convenient. Thus when the blades are retracted within the drill-head and the latter is let down within the shoe, as in Figs. 3 and 4, the blades can be caused to extend through such slots as they can be most readily brought into register with. I also prefer to arrange the mortises 2 so that they small communicate with the centrally-arranged water-way, and hence during operation water will also pass out through said mortises and around the blades F. When the blades F are retracted, the drill-head can be raised and lowered within the well-tube, while, on the other hand, when said blades are extended out through the openings in the shoe the drill-head and well-tube will be locked together.

As a brief summary of the foregoing it will be observed that by providing the drill stock or head C with transversely-arranged guideways—*i. e.*, with guideways transverse to its axis—the blades which slide transverse to the axis of the head will be backed by the walls of the guideways against all shocks and strains perpendicular or lateral to the length of the blades, and that by such arrangement—that is to say, by providing these transversely-sliding blades in contradistinction to the pivoted blades of the class in which the expansion and contraction of the blades is due to their swing about a pivotal center—I avoid the use, and consequently the objectionable feature of breakage, of pivots. The blades herein are also normally movable or sliding blades, in contradistinction to proposed primitive and impractical arrangements involving adjustable blades, which must be set and locked in place before sinking their allotted stock or holder. The blades herein are also not only positively projected by operating the drill-rod, but also positively retracted by operating the same, and hence no matter at what depth in the hole the drill stock or head may be the blades can be either projected or retracted laterally with relation to the stock or head by operating the drill-rod. This important feature permits the blades to be operated as aforesaid without necessitating an attempt to either open or close the blades by lowering or raising the head, and does away with an old proposed way of attempting to squeeze the expanded blades within the well-tube as a means for contracting the blades.

What I claim as my invention is—

1. The combination, in a well-drilling machine, of the drill-stock adapted for reception within the well-tube and provided with mortises 2, arranged to form parallel and transversely-extending guideways for the blades, respectively, along opposite sides of the axis of the drill-stock, the longitudinally-sliding blades F, provided with inclined ways or slots and arranged and operative for end movement along said guideways, respectively, in opposite directions, so as to project laterally from and retract within the drill-stock, and an independently and longitudinally movable operating-rod arranged to extend from the drill-stock upwardly within the well-tube, so as to permit the blades to be operated at any desired depth and extended between and connected with the inclined ways or slots of the blades, so as to positively project and retract the blades in accordance with the direction in which the rod is moved longitudinally, substantially as described.

2. The combination of the drill-stock provided with the transversely-arranged sliding blades and a recess 6, the rod engaging the blades, so as to control their adjustment, substantially as set forth, and provided with a stop-shoulder arranged within said recess, and a cap provided with an opening for the passage of the rod and detachably fitted upon the drill-stock, so as to cover the recess, substantially as described.

3. The combination of the well-tube A, the shoe B, secured upon the well-tube and provided with side openings, a drill stock or head C, adapted to fit within the bore of the well-tube and shoe, sliding blades F, carried by the drill-stock and arranged for movement at right angles to the axis of the head and in lines coincident with the openings in the shoe, and an upwardly-extending drill-rod having a movable connection with the drill-stock and connected with the blades as a means for projecting and retracting them, substantially as described.

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Witnesses:
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W. T. BEATTY.