(No Model.) 2 Sheets—Sheet 1.

C. C. LANE.

EXPANSION DRILL BIT FOR ARTESIAN WELL BORING.

No. 345,385. Patented July 13, 1886.

FIG. 1.

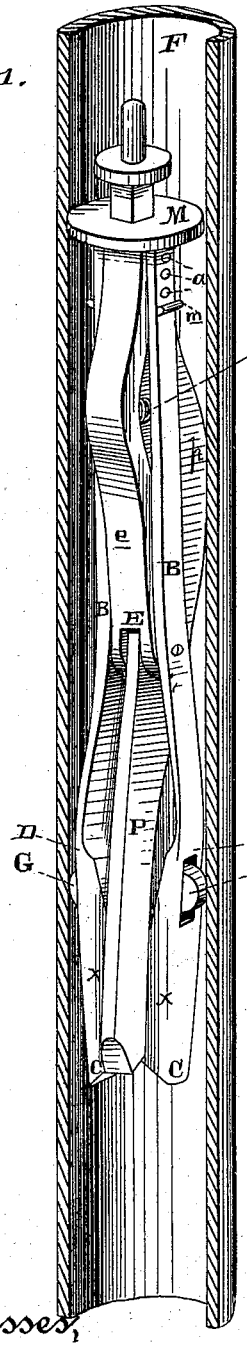


FIG. 3

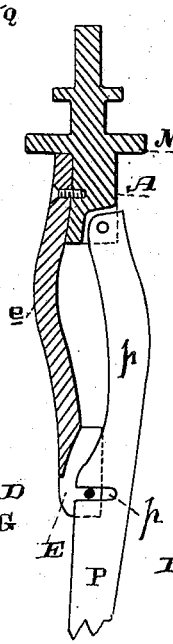
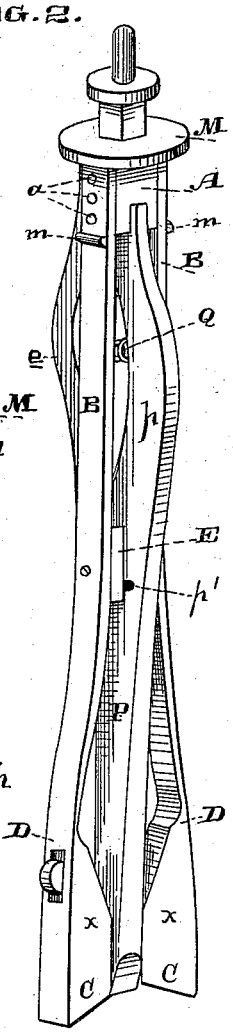


FIG. 2.



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(No Model.) 2 Sheets—Sheet 2.

C. C. LANE.

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FIG. 4.

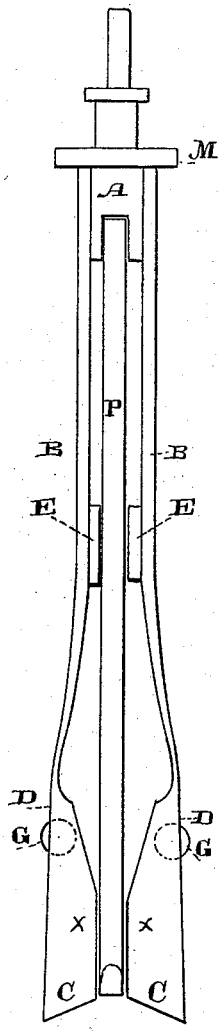
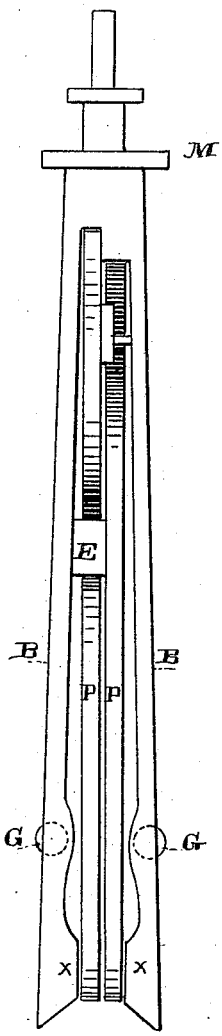


FIG. 5.



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UNITED STATES PATENT OFFICE.

CHARLES C. LANE, OF SAN FRANCISCO, CALIFORNIA.

EXPANDING DRILL-BIT FOR ARTESIAN-WELL BORING.

SPECIFICATION forming part of Letters Patent No. 345,385, dated July 13, 1886.

Application filed November 12, 1885. Serial No. 182,637. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. LANE, of the city and county of San Francisco, and State of California, have invented an Improvement in Expanding Drill-Bits for Artesian-Well Boring; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the class of expanding reamers, and particularly to that class of drill-bits for Artesian-well boring, exemplified by the device shown and described in Letters Patent of the United States No. 326,661, issued to me September 22, 1885.

My present invention is an improvement upon my former bit; and it consists in two or more spring-legs firmly secured at their tops to the head of the tool, their lower ends being formed into or provided with cutters, above which, on their outer surfaces, are formed peculiar or frictional bearing-knees; in a novel fixed or stationary fulcrum-block between the legs, over which they are adapted to bend when their lower ends are forced together, whereby the distance between the cutters is made shorter than the distance between the knees; in a novel adjustable and automatic brace adapted to operate between the legs, to hold them rigidly separated when at work and to release them when the tool has to be raised; in a beveled surface for the lower portion of the legs to guide and hold the brace and relieve its upper portion from undue friction; in a protecting and strengthening disk or flange on the head of the tool, and a protecting-rib on the upper portion of the legs, all of which, with details of construction, I shall hereinafter fully describe.

In Artesian-well boring, the drill-bit is passed down on the inside of the pipe until its cutting points or ends project below, when it is rotated by suitable mechanism from above. In order to make a hole below the pipe larger than the pipe itself, the drill-bit is adapted to expand upon emerging from the pipe, but while passing down or up through the pipe it is in a contracted condition. This is made possible by reason of the yielding or springy capacity of the legs; but it is obvious that after they have expanded some means must be used to hold them rigidly separated while at work and to relieve them when about to be drawn up or lowered through the pipe.

The main object of my invention is to provide simple and effective means to this end, and other objects are to perfect the other portions of the tool.

Referring to the accompanying drawings, Figure 1 is a perspective view of my drill-bit, showing the pipe through which it passes. Fig. 2 is a similar view, the pipe being omitted. Fig. 3 is a detail section. Figs. 4, 5 are views of a modification.

The drill-bit has two or more legs, B, the tops of which are firmly bound by the bolts *a* to the head A of the tool, and their lower ends are formed into cutters or points C for boring. These legs are of a length sufficient to insure or to allow of their having a slight spring, whereby their cutters or points C may be forced closer together. The legs diverge toward the bottom, their inner or adjacent edges being approximately straight, except near the bottom, where they curve inwardly, whence they proceed approximately straight again. Their outer edges for a certain distance from the top are parallel approximately with their inner edges to a point a little below the inward curve of said inner edges, which point is designated by D, whereby knees are formed which are slightly rounded off, and from whence the legs extend downward and parallel with the inner edges, or slightly curved to the cutters C.

In the normal or expanded condition of the legs, Fig. 2, it will be seen that because they diverge the distance between the outer edges of the cutters C is greater than the distance between the knees D, and this fact would lead to a difficulty in the passage of the drill-bit down the pipe, as its cutting-points would form the only frictional bearing between it and the pipe. This is not desirable, not only on account of the tendency to injury, which the cutters would sustain, but also because said cutters would come in contact with and catch upon the joints of the pipe, which is constructed of sections screwed into one another. To remedy these difficulties I place between the legs, about or a little above their centers, the fulcrum-block E, which may be secured in any suita-

ble manner to the legs. This block serves as a fulcrum, over which the legs may bend when their cutter-points are forced together. The effect of this bending is to make the distance between the cutter-points shorter than the distance between the knees when the drill is in a contracted condition. This is shown in Fig. 1, where the drill-bit is confined by the pipe F. It will be seen that the knees now form the frictional bearing-surface while the cutter-points are free of the pipe. In some cases I may introduce into the knees the anti-friction rollers G.

The shape of the legs enables the drill-bit when being raised into the pipe to close its cutting-points and present its knees to the pipe, whereby the points are saved in hoisting as well as in lowering.

The drill-bit, as far as described, is substantially similar to the one I have already patented; but in that bit I employed a mechanism for holding the legs rigidly separated when at work and relieving them when the tool was passing through the pipe, which I have since found not very desirable, both on account of its complicated character and also because of the lightness of the mechanism. Instead of that system of extensible levers described in my previous patent I now use a single bar or brace, P. This is pivoted at its upper end in the head of the tool, whence it extends downwardly on an outward curve, projecting beyond the sides of the legs, as shown at *p*, is slotted at *p'* on a pin in a groove in the fulcrum-block, and extends downwardly between the legs, holding them rigidly separated.

The fulcrum-block E may be a separate and distinct piece, as I shall presently show in connection with a modification of my bit, or it may be, as here shown, the lower portion of a bent or curved bar or piece, *e*, which extends upwardly and is bolted solidly to or forms part of the head A. This piece also bends outwardly and projects on the other side of the legs and forms a seat for the spring Q, which influences the brace-bar P to remain in a normal position with its lower end between the legs. When the drill-bit is to be inserted into the pipe, the lower end of the brace is pushed from between the legs, whereby the tool can be inserted in the pipe. Then as the bit moves downward wholly into the pipe the projecting portion *p* of the brace-bar is forced inwardly and held by the pipe, whose diameter is smaller than the width of the tool at its projecting portion, so that the lower end of the brace is kept from between the legs while the bit is passing through the pipe; but as soon as it gets beyond the lower end of the pipe, the brace being relieved, its spring Q forces it back between the legs and holds them rigidly in an expanded condition. When the drill is raised again, the projecting portion entering the pipe causes the lower end of the brace to move from between the legs, thus relieving them, and allowing them to be contracted, to pass into and through the pipe.

I will be observed that the lower ends of the legs on one side are inwardly beveled at *x*. This results in the following advantage: When the brace-bar is moved to one side far enough to reach this beveled surface, the further contraction of the legs as they pass within the pipe forces the brace farther out, and holds it in that position, thus relieving its projecting upper portion to a certain extent and diminishing its friction against the pipe.

As I have before stated, the upper ends of the legs are secured rigidly to the head by means of the bolts *a*. The heads of these bolts are liable when the drill is at work to be knocked off by projecting pieces of rock. In order to prevent this, and to serve several other objects, which I shall describe, I form or secure to the head A a disk or flange, M, having a diameter greater than the width between the legs, so that it projects beyond the vertical plane of the heads of the bolts, and thus protects them; and, to afford greater protection, I may form ribs *m* on the legs below the bolts, which guard them from below. The disk or flange M further serves as a good bearing, against which the tops of the legs may abut, and moreover by being made of about the diameter of the pipe, said disk serves as a guide for the tool when passing through the pipe.

In Figs. 4, 5, I show a drill-bit modified in so far that it has two braces, P, similar to the one previously described. These are arranged oppositely, and are pivoted in the head and guided in the stationary fulcrum-block in about the manner in which the single brace-bar is pivoted and guided.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an expanding drill-bit, the divergent legs B, firmly secured at their tops to the head of the tool, and having cutters C formed on their lower ends, in combination with the laterally-projecting spring-influenced brace-bar P, pivoted to the head, and having its lower end lying between the legs, substantially as herein described.

2. In an expanding drill-bit, the combination, with the spring-legs having cutters at their bottoms and secured at their tops firmly to a head and the fulcrum-block, over which the legs are adapted to bend, for the purpose described, of the spring-actuated brace-bar P, pivoted to the head and lying at its lower end between the legs, said bar having a projecting portion, whereby when entering the pipe its lower end is forced from between the legs, and when emerging from said pipe said end moves back between the legs, substantially as herein described.

3. In an expanding drill-bit, the divergent spring-legs B, firmly secured at their tops to the head of the tool, and having cutters C formed on their lower ends, and the fixed or

stationary fulcrum-block E, over which the legs are adapted to bend, for the purpose described, in combination with the laterally-projecting spring-influenced brace-bar P, pivoted to the head, guided on the fulcrum-block, and having its lower end lying between the legs, substantially as herein described.

4. In an expanding drill-bit, the combination of the divergent spring-legs B, the tops of which are firmly bound to the head A, and their lower ends formed into cutters C, a stationary fulcrum-block, E, between the legs, having an outwardly curved and projecting extension, *e*, secured to the head, the outwardly curved and projecting brace-bar P, pivoted to the head, guided in the fulcrum-block, and having its lower end lying between the lower ends of the legs, and the spring Q, influencing said brace-bar, substantially as herein described.

5. In an expanding drill-bit, the divergent spring-legs B. the tops of which are firmly bound to the head of the tool and their lower ends formed into cutters C, said legs having at their lower portions the inwardly-beveled surfaces *x*, and the fulcrum block E, over which said legs bend, in combination with the projecting pivoted and spring-influenced brace-bar P, having its lower end lying between the lower ends of the legs, substantially as herein described.

6. An expanding drill-bit for Artesian-well boring, comprising the head A, having the disk or flange M, the divergent spring-legs B, formed with bearing-knees D, as described, and cutters C, said legs being bolted to the head under the disk or flange, the stationary fulcrum-block E between the legs, and the pivoted spring-influenced brace-bar P, having an outwardly curved or projecting portion, and its lower end lying between the legs, substantially as herein described.

In witness whereof I have hereunto set my hand.

CHARLES C. LANE.

Witnesses:
C. D. COLE,
J. H. BLOOD.