

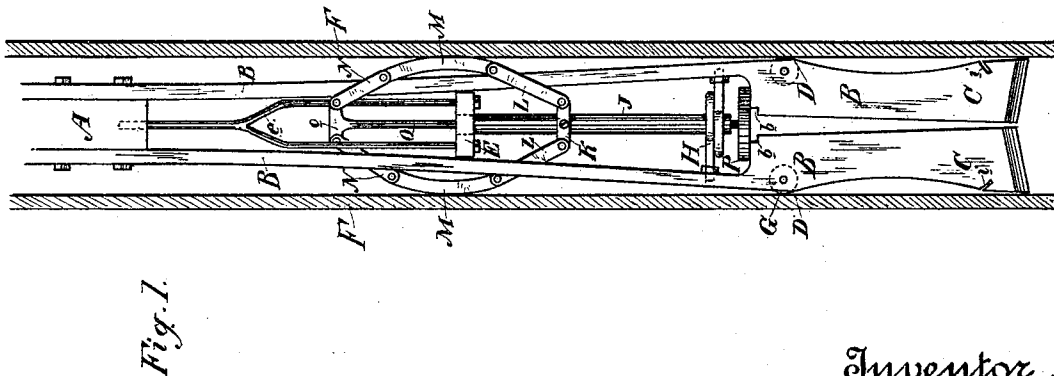
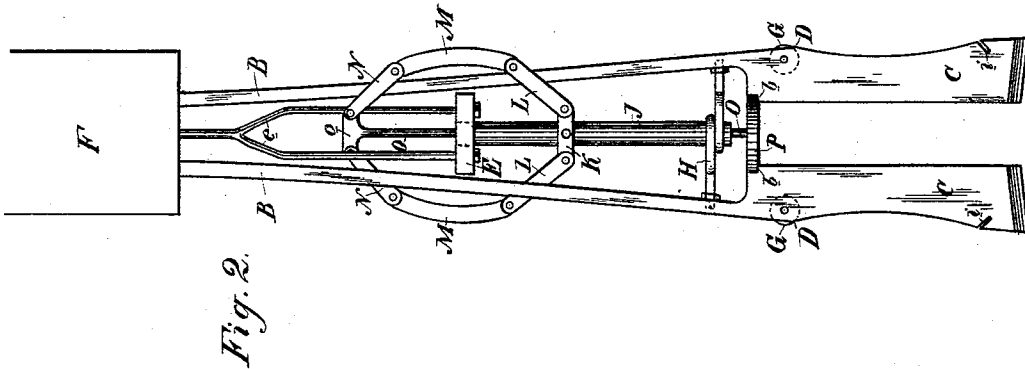
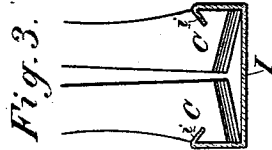
(No Model.)

C. C. LANE.

EXPANDING DRILL BIT FOR ARTESIAN WELL BORING.

No. 326,661.

Patented Sept. 22, 1885.



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UNITED STATES PATENT OFFICE.

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EXPANDING DRILL-BIT FOR ARTESIAN-WELL BORING.

SPECIFICATION forming part of Letters Patent No. 326,661, dated September 22, 1885.

Application filed December 29, 1884. (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 a new and useful expanding or extension drill-bit specially adapted for use in boring Artesian wells; and my invention 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 edges, are formed peculiar frictional or bearing knees in a 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, and in a vertically adjustable automatic strut-brace adapted to operate between the legs to hold them rigidly separated, and to release them when the tool has to be raised.

It consists, further, in providing in some cases anti-friction rollers for the knees and a clamping-band for the cutters, and in other details of construction, all of which I shall explain.

In Artesian-well boring the drill-bit is passed down on the inside of the pipe until its cutting points or ends project below the pipe. The drill is then rotated by suitable mechanism, and as it makes its hole the pipe is forced down after it. In ordinary drill-bits it is obvious that as they are no wider than the interior diameter of the pipe the hole made by them is also of that size, and therefore the pipe, which for the space it occupies is measured by its exterior diameter, has to be forced down a hole too small for it. To obviate this difficulty, extension or expansion drill-bits have been attempted. These are adapted to pass down through the pipe in a contracted condition, and when they get beyond the pipe they expand or extend in order to cut a hole larger than the pipe itself; but it is obvious that the friction of the descending drill-bit against the interior wall of the pipe as it is being lowered is materially increased by the fact that it is being held in a contracted condition, merely by reason of its confinement within the pipe.

It is the object of my invention to overcome these various difficulties by providing a drill-bit which, though in its downward passage it is contracted by reason of its confinement, will generate, nevertheless, the least amount of friction, and will expand or extend when it projects below the pipe, whereby it is adapted to cut a hole larger than the pipe itself.

Referring to the accompanying drawings, Figure 1 is an elevation of my bit, showing it within the pipe. Fig. 2 is an elevation of the bit, showing it below the pipe and expanded. Fig. 3 is a detail view showing the lower end of the bit and the band I applied to it.

The drill-bit has two or more legs, B, the tops of which are firmly bound to the head A of the tool, and the lower ends are formed into cutters or points C for boring. These legs are of a length sufficient to insure or 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. At the points where the inward curves join the succeeding straight edges small shoulders b are made. Their outer edges for a certain distance from the top are parallel, approximately, with their inner edges to a point a little below the shoulders b, and designated by D, forming the knees, which are rounded off, whence they extend downward about 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 at a point a little above their centers the fulcrum block or bar E, which

may be secured in any suitable manner, as by the forked rod *e* extending from the head of the bit. This block may be of wood or other material, and even of hard rubber or other elastic substance, in order to take up the spring of the legs in a better manner and to stiffen them. This block serves, principally, however, 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. The knees being rounded do not create much friction, and are subject to no injury. In some cases the anti-friction rollers G may be set into the knees, which will cause them to ride over the joints of the pipe with ease and lessen the friction in the passage downward of the bit. 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 lowering. In order to limit and adjust the separation of the legs, I have the link H, which prevents them from spreading beyond what may be desired. In some cases it may be found necessary to place the clamping-band I on the cutters or points C, Fig. 3. This consists of a strip of metal having bent ends adapted to engage suitable sockets or notches, *i*, in the points C, whereby the said points may be drawn together to such an extent as to relieve wholly or in part the knees D from friction. A few strokes of the bit when in position cuts away the band I, and the cutters spread to the proper cutting width.

By varying the shape of the cutters the implement may be used as a reamer. It will be found necessary to make the legs of the tool when separated and doing work as rigid as possible in their expanded or extended condition, as they would have a tendency to be forced together at times. But whatever device be used to effect this result it is obvious that it must release the legs when the tool is being let down or drawn up. Secured to the block E is a tube, J, extending downwardly to a point just below the limiting link. Secured to this tube at about its center is a short bar, K, to the ends of which the levers L are pivoted. To the tops of these levers are pivoted the outwardly-curved levers M, having pivoted to their tops the levers N, the tops of which are pivoted to the head *o* of the spindle O. The spindle passes down loosely through tube J, and carries on its lower end a bar, P, which is adapted to find a seat in the shoulders *b*, whereby it acts as a strut-brace to hold the legs rigidly separated. As the tool descends through pipe F the contact between the curved levers M and the pipe forces said levers to-

gether, thus elongating the system of levers; but as the lower ends of the system are pivoted to a fixed point their upper ends alone rise, thus carrying up the spindle and holding the strut-brace above its seat; but when free of the pipe the weight of the spindle causes its brace to descend to its seat, whereby the legs are held firmly separated. In rising again the system of levers upon entering the pipe elongate and withdraw the brace, whereby the legs may be forced together by their knees entering the pipe.

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

1. In a well-boring 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, in combination with the links H between said legs, by which their divergence is limited, substantially as herein described.

2. In a well-boring expanding drill-bit, the combination of 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 on their outer edges, above the cutters, the knees D, as described, and the fixed or stationary fulcrum-block E between said 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, substantially as and for the purpose herein described.

3. In a well-boring expanding drill-bit, the combination of the divergent spring legs B, the tops of which are firmly bound to the head of the tool and the lower ends formed into cutters C, said legs having on their outer edges, above the cutters, the knees D, the anti-friction rollers G, mounted in said knees, and the fixed or stationary fulcrum-block between said legs, over which they are adapted to bend, substantially as and for the purpose herein described.

4. In a well-boring 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, in combination with a mechanism by which the legs are held rigidly separated when at work and relieved when passing down or up the pipe, consisting of a strut-brace adapted to find a seat between the legs and a system of pivoted extensible levers operated by contact with the pipe to withdraw the brace and adapted to seat it when free of the pipe, substantially as herein described.

5. In a well-boring 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, in combination with the strut-brace P, adapted to seat itself between the legs, the spindle O, carrying the brace, and the extensible system of pivoted levers L M N, pivoted below to a fixed point

and to the head of the spindle O above, all operating substantially as and for the purpose herein described.

5 6. In a well-boring expanding drill-bit, the divergent spring legs B, having shoulders *b* and cutters C, and the fixed block E and tube J, suspended from the head of the tool between the legs, in combination with the strut-brace P, adapted to seat itself in the shoulders
10 *b*, the spindle O, passing down through the tube and carrying the brace, and the extensible system of pivoted levers L M N, pivoted below to the tube J and above to the head of the spindle O, all operating and constructed
15 substantially as and for the purpose herein described.

7. A well-boring expanding drill-bit consisting of the divergent spring legs B, the tops of which are firmly bound to the head of the

tool and the lower ends formed into cutters C, 20 said legs having on their outer edges, above the cutters, the knees D, the fixed fulcrum-block E between the legs, and the links G, limiting their divergence, and the means for 25 holding them rigidly separated when working, consisting of the strut-brace P, adapted to find a seat between the legs, the spindle O, carrying the brace, and the system of extensible pivoted levers L M N, pivoted below to a fixed point and above to the head of the spindle, substantially as herein described. 30

In witness whereof I have hereunto set my hand.

CHARLES C. LANE.

Witnesses:

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