(No Model.) 3 Sheets—Sheet 1.

F. GARDNER.

BORING APPARATUS.

No. 488,354. Patented Dec. 20, 1892.

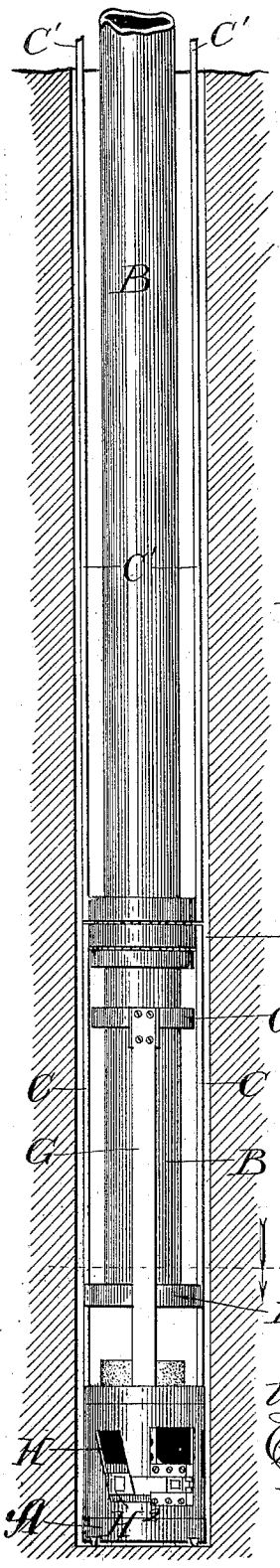

Fig. 1.

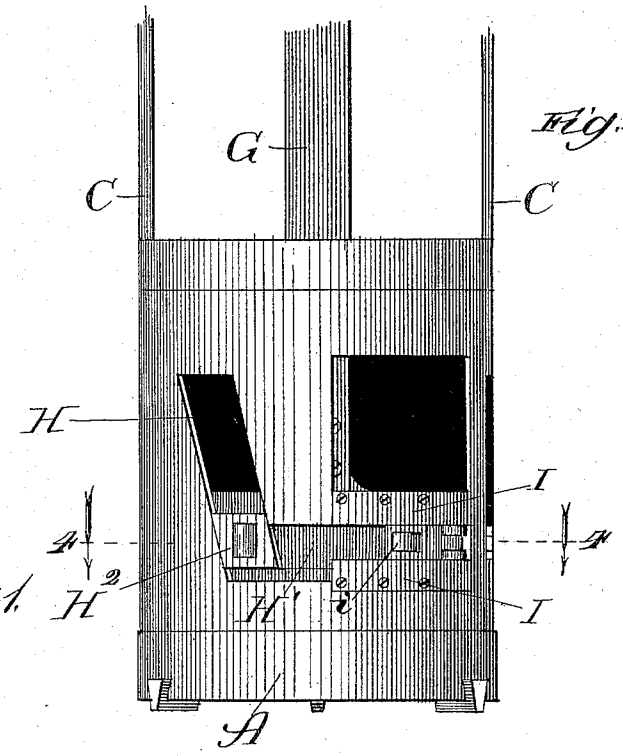

Fig. 2.

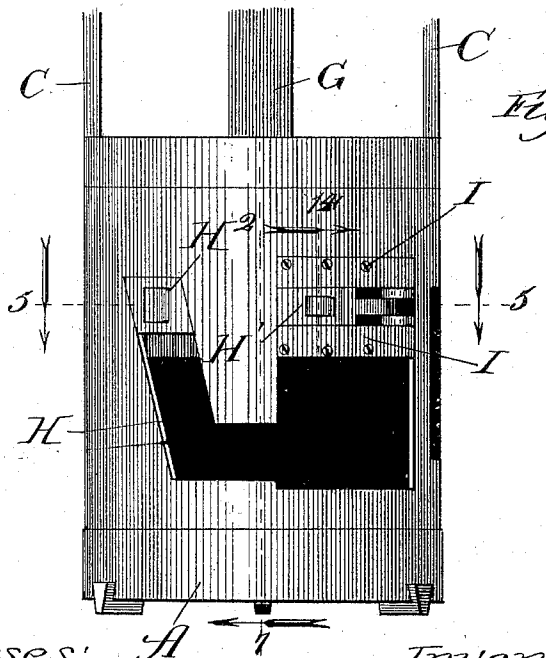

Fig. 3.

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Clifford N. White.

Inventor:
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By Banning & Banning & Payson,
Att'ys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

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BORING APPARATUS.

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Fig. 4.

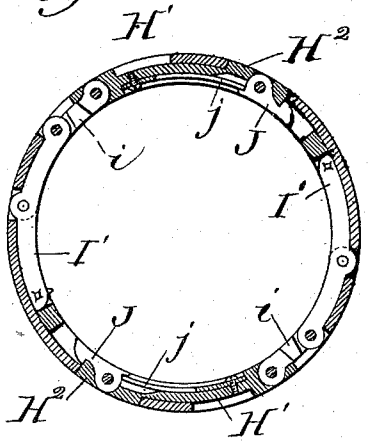


Fig. 6.

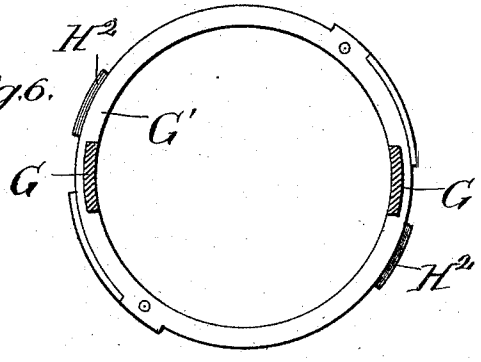


Fig. 5.

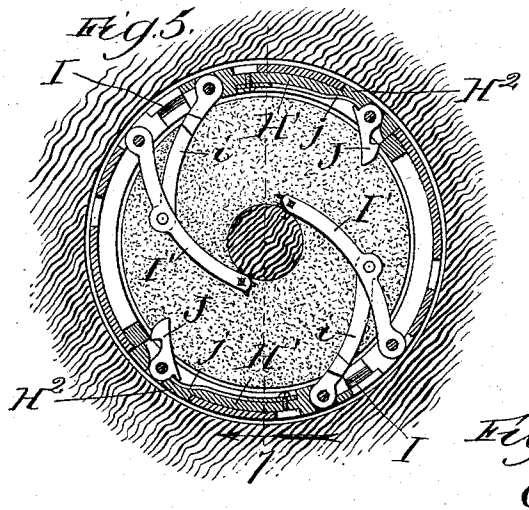


Fig. 7.

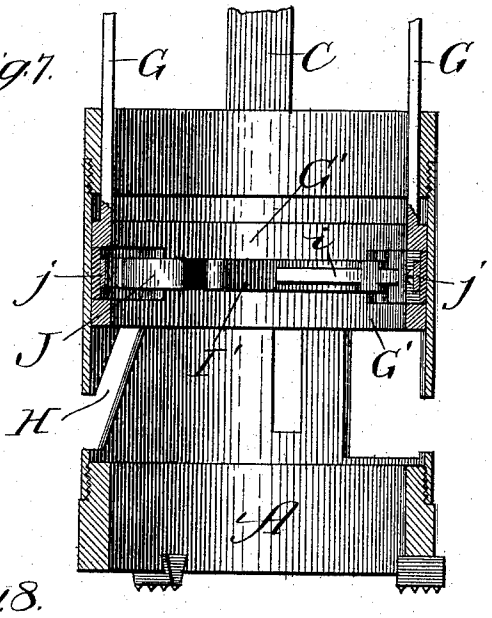
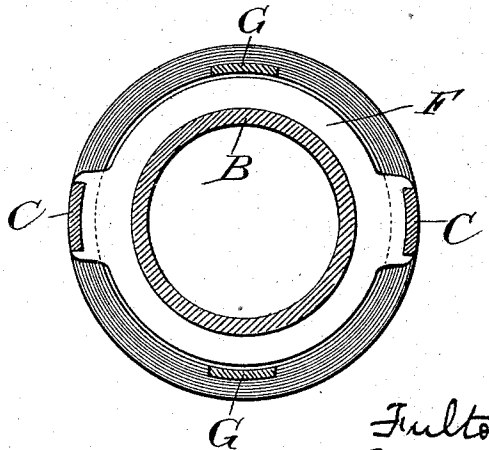


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

F. GARDNER.

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Fig. 9.

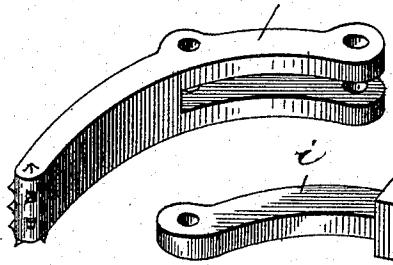


Fig. 10.

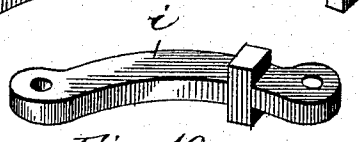


Fig. 11.

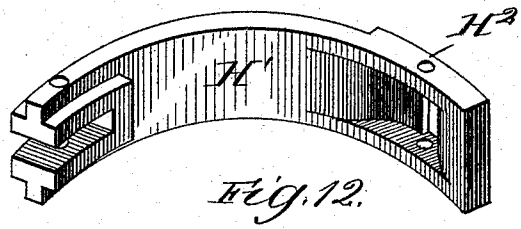


Fig. 12.

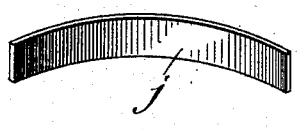


Fig. 13.

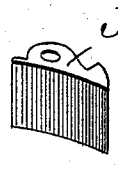


Fig. 14.

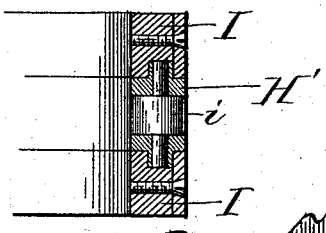
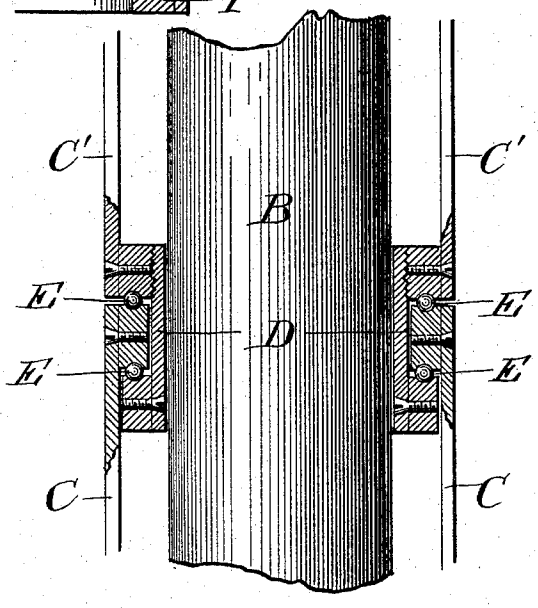


Fig. 15.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FULTON GARDNER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO SAMUEL T. WHITE, OF SAME PLACE.

BORING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 488,354, dated December 20, 1892.

Application filed August 19, 1892. Serial No. 443,482. (No model.)

To all whom it may concern:

Be it known that I, FULTON GARDNER, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Boring Apparatus, of which the following is a specification.

The object of my invention has more particular reference to the means for cutting off and romoving the core of rock formed by the boring mechanism, where the same is passing through a stratum of rock in the boring of deep wells or shafts; and my invention consists in the combinations and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation, showing the lower portion of the cutting tool in a well boring apparatus; Fig. 2 is a side elevation of the lower end of the same, showing the core severing mechanism in its inoperative position; Fig. 3 is a side elevation of the same, showing the position of the core cutting mechanism after the operation of severing a core; Fig. 4 is a plan view of a section taken in the line 4 of Fig. 2, showing the core cutting mechanism; Fig. 5 is a plan view of a section taken in the line 5 of Fig. 3; Fig. 6 is a plan view of a ring hereinafter described; Fig. 7 is an inside view of the boring and core cutting mechanism, taken in the line 7 of Fig. 5; Fig. 8 is a plan view of a section, taken in the line 8 of Fig. 1; Fig. 9 is a perspective view of the core cutter; Fig. 10 is a perspective view of the link for moving the same into cutting position; Fig. 11 is a perspective view of the ring by which the core cutters are moved while at work; Fig. 12 is a perspective view of a spring for moving lifting dogs hereinafter described; Fig. 13 is a perspective view of a lifting dog hereinafter described; Fig. 14 is an enlarged view of the core cutting ring, taken in the line 14 of Fig. 3; and Fig. 15 is an enlarged parallel sectional view of Fig. 1, taken at 15 on Fig. 1.

In making my improved core cutter, I use a rotating boring or drilling head, A, provided with cutters or carbons adapted to work their way through rock as the same may be encountered in the boring of wells or shafts. This head is intended to be rotated by any convenient motive power, as electricity or other means. I have shown the boring head as hollow, and as mounted upon a rotatable shaft, B, through which the power is intended to be applied by means of rods or bars, C, which are connected with a non-rotatable collar, D, surrounding the rotatable shaft. I have arranged ball bearings, E, at this point, but as the arrangement will be apparent from an inspection of Fig. 15 of the drawings, I will not enter into any detailed description as to their arrangement or operation. In order to give a thrust or feed to the cutting mechanism and force it to descend, I arrange other rods, C′, that are also connected with the non-rotatable collar, D, and which are provided with ball bearings as above described. At the lower end of the rotatable shaft I arrange a shoulder, F, that rotates with the shaft, and which is provided with slots or grooves through which the rods or bars, C, pass, so that the rotatable shaft imparts rotation to the bars, and through them to the cutting head. I arrange within the hollow boring head core cutting mechanism, which is intended to be inoperative until the boring head has descended or progressed sufficiently through the rock to form a core of the desired length to be cut off and removed. This core may be of any desired length—as two or three feet—and it will of course be of the diameter of the space between the cutting tools which form an annular groove or channel around it. The core cutting mechanism is connected through straps or bars, G, with a collar, G′, that loosely surrounds the rotatable shaft. As the boring head descends or progresses through the rock, the collar G′ moves along the rotatable shaft until it comes into contact with the shoulder, F, when of course it can progress no farther. The core cutting mechanism will therefore be stopped from further progress at this point and held or suspended on the shoulder, F, but permitted to rotate with the boring head. In order to operate the core severing mechanism, so that the severed section may be lifted and elevated to the top of the well or shaft and removed, I provide in the boring head inclined slots or grooves, H, and arrange in a groove or recess around the inside of the boring head a ring I, and segments of rings H′, with their ends or heads, H^2, extending out

through the inclined slots or grooves, H, in the boring head. I prefer to provide the head with two of these inclined slots, and to arrange two segments of rings in the boring head with their heads, H^2, respectively, extending through the two slots in the boring head. I pivot the core cutters or blades, I′, to the ring, I, which is carried by straps or bars, G, so that they may turn on their pivoted ends, and which may be provided at their cutting ends with carbons or cutters, and pivotally connect them about their middle with links *i*, pivoted to the sliding segments of rings, H′. The pivoted ends of the core cutters remain in a fixed position, while the links, as they are drawn around by the segments H′ to their top, move the cutting ends of the cutters toward the center of the core which is to be severed. The segments, H′, are caused to move or slide around, from the fact that their heads extend out through the inclined slots in the boring head, and from the further fact that the core cutting mechanism is prevented from farther descent by the engagement of the ring G′ with the shoulder, F. As the boring head, therefore, continues to descend or progress, the heads of the segments gradually pass up, relatively speaking, along the inclined slots, and as they are thus drawn or slid around, they pull the pivoted links with them, which causes the operative ends of the core cutters or blades to be gradually drawn in toward the center of the core, so as to cut or sever the same by a transverse groove or channel therethrough. By the time the heads of the rings have reached the upper ends of the inclined slots, the cutting or operative ends of the core cutters have approached, or nearly approached, the center of the core. While this operation has been taking place, lifting dogs, J, have been moved by the turning or sliding of the segments, H′, into the cut or groove under the severed core. When the core has been entirely or nearly severed by the movement of the heads of the rings along the inclined slots, the boring apparatus may be run out, by a cable or other means, to the mouth of the well or shaft, carrying with it, resting on the lifting dogs, the severed core, which is thus taken out in the form of a cylinder, which may then be removed at the top of the well by reversing the operation of the parts, so that the core cutters and lifting dogs will be moved from under it into their normal position in the boring head, when the severed core in the form of a cylinder is permitted to drop out. The dogs are then held in their inoperative position by the springs, *j*, until another core has been formed and the operation of severing it repeated as above described.

While I have described the construction, arrangement and operation of my invention with considerable fullness and detail, I wish it understood that I do not propose to confine myself to details of construction and arrangement, further than the same may be called for in my claims, and that I contemplate the use of my boring and core cutting mechanism for other purposes besides those of sinking wells or shafts in the earth.

What I regard as new and desire to secure by Letters Patent is:—

1. In boring apparatus, the combination of a rotatable boring head, means for rotating the boring head core cutting mechanism progressing with the head a pre-determined distance, and means for stopping the progress of the core cutting mechanism while the head still further progresses, substantially as described.

2. In boring apparatus, the combination of a rotatable boring head provided with an inclined slot in the same, means for rotating the boring head core cutting mechanism engaging with the slot and progressing with the head a pre-determined distance, and means for stopping the progress of the core cutting mechanism while the head still further progresses, substantially as described.

3. In boring apparatus, the combination of a rotatable boring head provided with an inclined slot in the same, means for rotating the boring head core cutting mechanism comprising, among other things, a sliding segment engaging at one end with the slot, a core cutting blade having a pivotal movement on its non-cutting end, and a link pivotally connecting the sliding segment and the cutting blade, and means for stopping the progress of the core cutting mechanism while the head still further progresses, whereby, through the engagement of the sliding segment with the slot in the boring head, the core cutting blade is moved toward the center of the core to cut the same off at a rate of speed determined by the rate of speed at which the boring head progresses, substantially as described.

4. In a boring apparatus, the combination of a rotatable boring head provided with an inclined slot in the same, means for rotating the boring head core cutting mechanism comprising, among other things, a sliding segment engaging at one end with the slot, a core cutting blade having a pivotal movement on its non-cutting end, a link pivotally connecting the sliding segment and the cutting blade and a lifting dog movable into the channel made by the cutting blade, and means for stopping the progress of the core cutting mechanism while the head still further progresses, substantially as described.

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Witnesses:
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SAMUEL E. HIBBEN.