

M. C. BULLOCK.
ROCK DRILLING APPARATUS.

No. 473,909.

Patented May 3, 1892.

Fig 1.

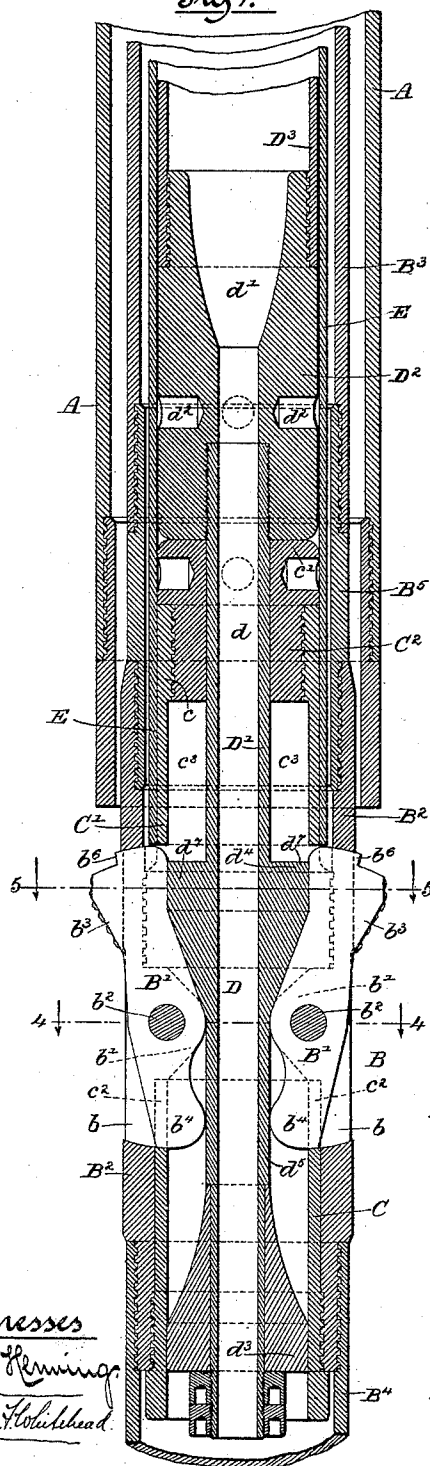


Fig 3.

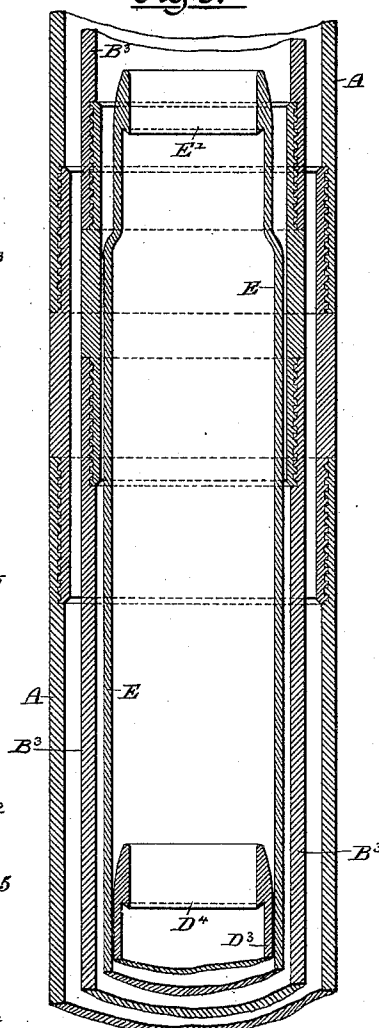
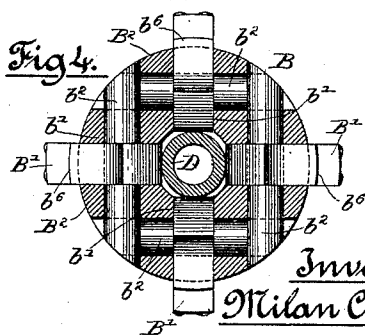


Fig 4.



Witnesses
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Fig 2.

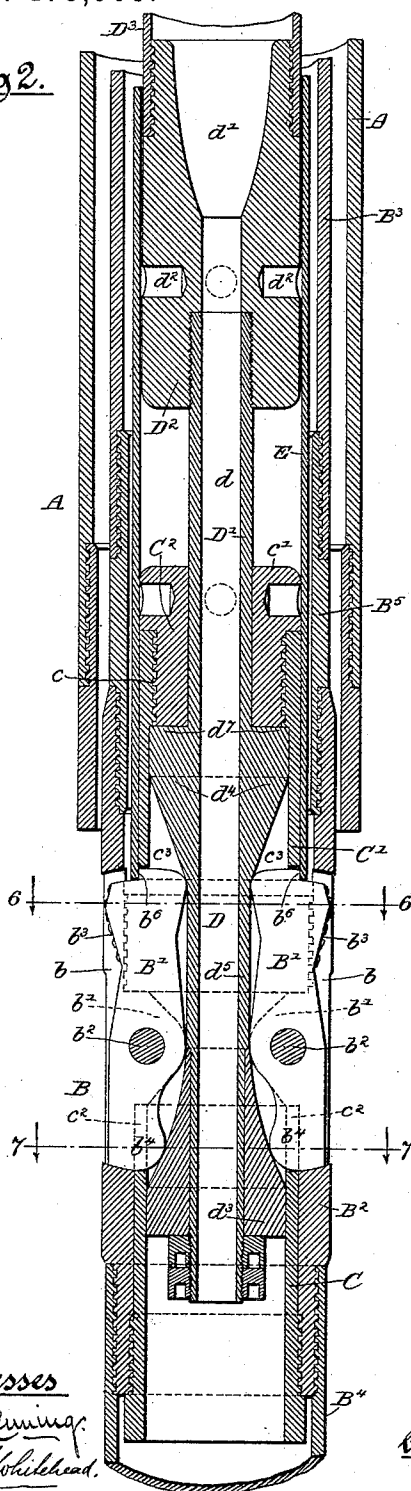


Fig 5.

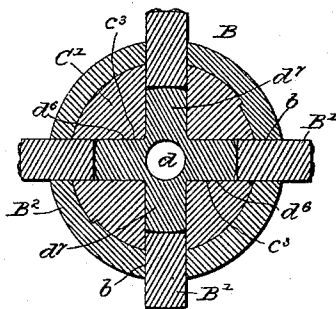


Fig 6.

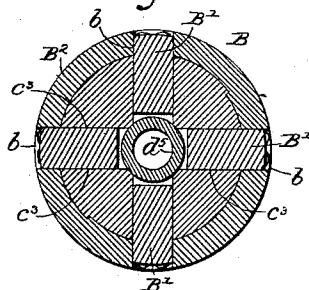
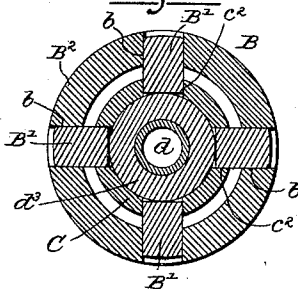


Fig 7.

2 Witnesses

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UNITED STATES PATENT OFFICE.

MILAN C. BULLOCK, OF CHICAGO, ILLINOIS.

ROCK-DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 473,909, dated May 3, 1892.

Application filed May 18, 1889. Renewed October 5, 1891. Serial No. 407,670. (No model.)

To all whom it may concern:

Be it known that I, MILAN C. BULLOCK, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rock-Drilling Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel construction in rock-drills, and more especially to a drill or reamer which is intended to be employed when it is desired to enlarge a previously-drilled hole to insert therein a casing which is larger than the drilling-tool originally employed.

The invention consists in the features and construction and combinations of parts hereinafter fully described, and pointed out in the appended claims.

In the drawings, Figure 1 is a central vertical sectional view of a section of a core-drilling apparatus provided with a surrounding casing and reaming-cutters, the latter being shown as expanded and in side elevation. Fig. 2 is a similar view with the several parts shown in different position and with the reaming-cutters contracted. Fig. 3 is a central vertical sectional view of an upper section of the devices illustrated in Figs. 1 and 2. Figs. 4 and 5 are horizontal sectional views on the lines 4 4 and 5 5 of Fig. 1. Figs. 6 and 7 are horizontal sectional views on the lines 6 6 and 7 7, respectively, of Fig. 2.

As shown in said drawings, A is an outer casing intended to be inserted in a drill-hole and for the reception of which the hole previously drilled is reamed out or enlarged. Said casing A will ordinarily be sunk without being rotated. However, if desired, it may be rotated by means of any suitable mechanism.

B is an inner casing or tubular drill-rod composed of sections and adapted to pass within the casing A. Vertical slots $b\ b$ are formed in said casing, desirably four in number. Upon the inside of the inner casing and on either side of said slots $b\ b$ are located lugs $b' b'$, through which are passed transversely-arranged pins $b^2 b^2$, affording pivotal support to reamers or reaming-cutters B' B'. The

said reamers are provided on their outer sides above their pivots with vertical and downwardly and inwardly inclined faces $b^3 b^3$, provided with cutting-diamonds. Said reamers are provided below their pivots with actuating-arms $b^4 b^4$, which extend downwardly and engage devices hereinafter described by which the reamers are retracted, the outer faces of said arms being arranged at such an angle that when the reamers are thrown outwardly or in position for cutting said faces will stand considerably within the outer surface of the drill-rod. The surfaces $b^3 b^3$ of the cutters project through the slots $b\ b$ beyond the inner casing.

$b^6 b^6$ are shoulders formed on the tops of the reamers for engagement with the devices by which said reamers are held in their retracted position.

It will be manifest from the construction above described that when the surfaces $b^3 b^3$ are retracted or brought within the casing the lower ends or arms of said reamers will not project through the slots beyond the casing, so that the casing B is without lateral projections and can be used as a drill-rod and drawn out through the casing A without difficulty.

The casing B is provided on its lower end, which is not herein shown, with the usual annular cutting-head and a core-barrel.

The lugs $b' b'$ are herein shown as formed on a sleeve or coupling B², which is connected at its ends by screw-threaded joints with sections B³ B⁴ of the drill-tube B, the casing-section B³ being connected to the coupling B² by means of a short pipe-coupling B⁵.

C is a short tube located within the lower part of the coupling B² and connected therewith by means of a screw-thread at its lower end engaged with an interior screw-thread on the said coupling, said tube extending upwardly to a point adjacent to the pivots of the reamers B' B'. A cylindric plug or guide-piece C' is located within the coupling B² and secured thereto at its lower end by means of a screw-threaded joint on said coupling. The said plug extends from a point near the pivots a considerable distance above the upper ends of said reamers and is formed at its upper end with a hollow internally-screw-threaded portion c, with which a hollow nut

C² is connected by means of said screw-threads, the head c' of which is desirably made of the same diameter as the exterior of said plug. Vertical slots c² c² are formed in the upper
 5 end of the tube C, which register with the slots b b of the coupling B². The plug or guide-piece C' is formed below its hollow portion with a vertical, central, and circular aperture adapted to receive the spindle of the
 10 core or spool hereinafter described. The said plug is also formed with vertical transverse slots c³ c³, preferably four in number, and arranged at right angles so as to register with the slots b b.

15 D is a vertically-movable cylindric actuating-core or spool provided with an upwardly-extending spindle D', which is connected, desirably, by a screw-threaded joint with a head or cylindric casting D². Said head is connected by a screw-threaded joint or otherwise
 20 with an upwardly-extending tube or spool-sheath D³, which is provided interiorly near its upper end with an annular downwardly-projecting flange D⁴, forming a means
 25 by which a suitable tool can engage and lift said spool-sheath to operate the spool. A longitudinal opening or passage d extends through the spool-spindle and the head D², said passage being enlarged at the top of the
 30 head to form a conical recess d', the utility of which will hereinafter appear. The said passage d provides a conduit for the downward flow of water to the annular cutters, or an outlet for the upward flow of water when the
 35 supply is from the exterior of the tube.

d² d² are lateral recesses formed in the head D², into which a wrench or other suitable tool can be inserted to tighten up or unscrew the same.

40 The spool is provided at each end with enlarged portions d³ d⁴, the lower one d³ having a cylindric surface which is adapted to fit and slide within the tube C. The enlarged portions d³ d⁴ are tapered inwardly from the outer
 45 ends thereof to a reduced central portion d⁵, which is cylindric, or approximately so. The upper enlarged portion d⁴ of the spool is formed on its outer sides with V-shaped vertically-arranged notches or recesses d⁶ d⁶,
 50 preferably four in number and arranged at right angles, thus forming arms d⁷ d⁷, which register and slide within the slots c³ c³ of the plug, and thereby providing a means for guiding said spool. It will be noted that the arms
 55 d⁷ d⁷ bear upon upper rear faces of the reamers B' B' to actuate the same.

E is a second tube or locking-sheath interposed between the casing B and plug C' at its lower portion and extending upwardly between the said casing B and the spool-head D² and the spool-sheath D³ to a point considerably above the latter. The said locking-sheath fits and slides on the plug C' and is disconnected from any of the adjacent parts,
 60 so that it may slide freely on said plug and will slide downwardly thereon by gravity. Said locking-sheath is normally sustained by

resting at its lower edge upon the upper end of the reamers B' B' inside of the shoulders b⁶ b⁶ thereof. Said locking-sheath, furthermore, is provided with an interior annular
 70 downwardly-projecting flange E' on its upper end for engagement with an implement by which the same is actuated, as hereinafter fully explained. 75

It will be noted that the spool is adapted to slide vertically and is guided by the enlarged portions thereof, which fit within the tube C and plug C', and also by the spindle D' thereof, which passes through the nut C².
 80 The spool is limited in its upward movement by the upper enlarged portion d⁴ striking the bottom of the nut C², and in its downward movement by the contact of the head D² with the top face of the said nut C². 85

The main purpose of the construction described is to enable the reamers to be retracted inside of the surface of the casing-tube B to enable said tubes to be withdrawn upwardly through the casing A for removing the core
 90 cut by the drill-head which is carried by the casing-tube, or for other purposes.

The operation of contracting and expanding the reamers is performed as follows: The parts are illustrated in Fig. 1 with the reamers
 95 expanded and in position for operation. At this time the spool is at the lower limit of its movement and the arms of the upper enlarged part thereof rest behind the upper ends
 100 of the reamers, holding them in their expanded position. At this time the lower enlarged part of the spool is below the arms b⁴ b⁴ of the reamers and the said arms are swung inwardly adjacent to or in contact with the smaller intermediate part of the spool. The reamers are
 105 retracted by lifting the spool so as to carry the arms of its upper enlarged part above the reamers and to bring the lower enlarged part into contact with the reamer-arms b⁴ b⁴, and thereby throw the latter outwardly and swing
 110 the reamers about their pivots until they are carried inside of the surface of the tube. The position of the reamers is shown in Fig. 2. A reverse or downward movement of the spool will obviously throw the reamers outward and restore them to the position shown in Fig. 1.
 115 The endwise or up-and-down movement of the spool is accomplished by the aid of a harpoon or tool having expansible jaws capable of being automatically locked together or in their retracted position when they are compressed.
 120 In two pending applications for Letters Patent, filed by me June 29, 1888, Serial Nos. 278,571 and 278,572, I have shown and described harpoons embodying this construction and similar to the one I intend using in this connection. Said tool is dropped through the casing-tube by a rope until it enters the spool-sheath and by the expansion of its jaws engages with the flange D⁴. As said tool is
 125 drawn upwardly the spool-sheath will be lifted, carrying with it the spool, and thereby retracting the reamers within the casing. The inward movement of the reamers will bring the
 130

shoulders $b^6 b^6$ upon the upper ends thereof to a point within the locking-sheath E, whereupon said locking-sheath will slide downward or fall by gravity until its lower end has passed outside of and engaged the said shoulders, and thereby locked the reamers in their retracted position, as shown in Fig. 2. The casing-tube can now be drawn upwardly through the casing to remove the core-barrel and core or for any other purpose. After the casing-tube has been lowered into the hole to continue the boring and reaming operation the several parts will be in the positions shown in Fig. 2, the reamers being retracted. To expand the same, the harpoon is again dropped through the casing-tube until it enters the locking-sheath E, and is then drawn upwardly to engage the flange E' thereon, after which a further upward movement of the harpoon will lift said sheath upwardly and out of engagement with the shoulders $b^6 b^6$ of the reamers. The latter will thus be unlocked, whereupon the spool will fall and thereby expand the reamers, as before described.

In another application for patent, Serial No. 322,373, filed by me in the United States Patent Office August 29, 1889, I have described and shown expansible cutting-reamers adapted to be operated by a centrally-arranged spool or actuating-core enlarged at its ends, which is connected with an upwardly-extending spool-sheath or operating-tube similar to the one herein described. In the device described in said application the locking-sheath herein described is dispensed with for the reason that in said device the drill-rod is lowered to its position within the hole and raised therefrom by means of a rope which is connected with the said spool-sheath or tube, so that the spool is held by the tension of the rope at the upward limit of its movement and in position to retain the reamers contracted.

In the apparatus shown in this specification the casing-tube to which the reamers are pivoted is lowered and raised by means connected with its end which protrudes above the surface of the ground. Consequently the spool would tend to fall and expand the reamers, except for the presence of the locking-sheath by means of which the said reamers can be held in their retracted position while being lowered and raised, but can be easily released and allowed to expand by freeing the locking-sheath therefrom in the manner hereinbefore stated.

This device can be used simply to ream out a previously-drilled hole; but when the casing-tube B is provided with an annular cutting or drill head on its advance end it can either be used to drill in advance of the reamers, cutting a core in the usual manner, while at the same time reaming out or enlarging the hole, or simply to cut a new core without reaming when the reamers are retracted. The invention is, however, designed more particularly for reaming out a hole that

has been previously drilled, reamed, and a casing inserted therein when it is desired to insert an additional and larger casing to protect the first casing—that is to say, in starting a well or similar boring the drill-rod is commonly used without a casing where the character of the ground permits; but when a strata of quicksand, gravel, or other material requiring a casing is encountered I preferably remove the drill-rod and core-barrel or other core-lifting device and employ a section of drill-tube having reamers like those herein shown and locking-dogs by which the drill-tube may be engaged with the lower end of a casing larger than the drill-tube and which is rotated to drive the drill-rod and through which the drill-rod and core-barrel may be removed upwardly for taking out the detached fragments of the core. A drill-rod and casing-tube thus constructed and operated are fully described in said application for patent, Serial No. 322,373, hereinbefore mentioned. In the use of such devices a hole is bored somewhat in advance of the revolving casing, the reamers enlarge said hole to receive the casing, and the water used to remove detritus passes downwardly through the drill-rod and upwardly between the same and the casing, or vice versa. In boring in this manner one of the difficulties may be encountered which is often met with when the hole is being formed with the drill-rod alone—that is to say, when the casing passes through gravel or other loose material the latter may pack about the casing and a second casing may be necessary to surround and protect the first casing and allow the latter to be advanced. To accomplish the insertion of such a second casing, it will be necessary to ream out or enlarge the previously-reamed hole. This is done by removing the casing and placing therein at a suitable point a section containing reamers like those herein described. The work is then continued as before, the second or larger casing being driven down without being rotated as the hole is enlarged. After the said larger casing has reached the desired point, and thus protects the inner casing, the section containing the devices herein described can be removed, the inner casing replaced, and the work continued as before.

I claim as my invention—

1. The combination, with a casing-tube or drill-rod and expansible reamers pivoted to the same, of an actuating-core or spool located within said casing-tube adjacent to said reamers and adapted to hold the same normally expanded and a locking-sheath adapted to engage the reamers when they are at the inward limit of their movement, substantially as described.

2. The combination, with a casing-tube or drill-rod and expansible reamers provided on their upper ends with shoulders, of an actuating-core or spool located within the casing-tube adjacent to said reamers and adapted to hold the same normally expanded and a slid-

ing locking-sheath arranged to engage the shoulders of said reamers when the latter are retracted, substantially as described.

3. The combination, with a casing-tube or
5 drill-rod and expansible reamers provided on their upper ends with shoulders, of an actuating-core or spool located within the casing-tube adjacent to said reamers and provided with an upwardly-extending tube or sheath
10 by means of which it may be operated and a sliding locking-sheath arranged to engage the

shoulders of said reamers when the latter are retracted, said locking-sheath having an upwardly-extending tube by means of which it may be operated, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

MILAN C. BULLOCK.

Witnesses:

C. CLARENCE POOLE,

HARRY COBB KENNEDY.