No. 643,082. Patented Feb. 6, 1900.

M. C. BULLOCK, Dec'd.

M. A. BULLOCK, Executrix.

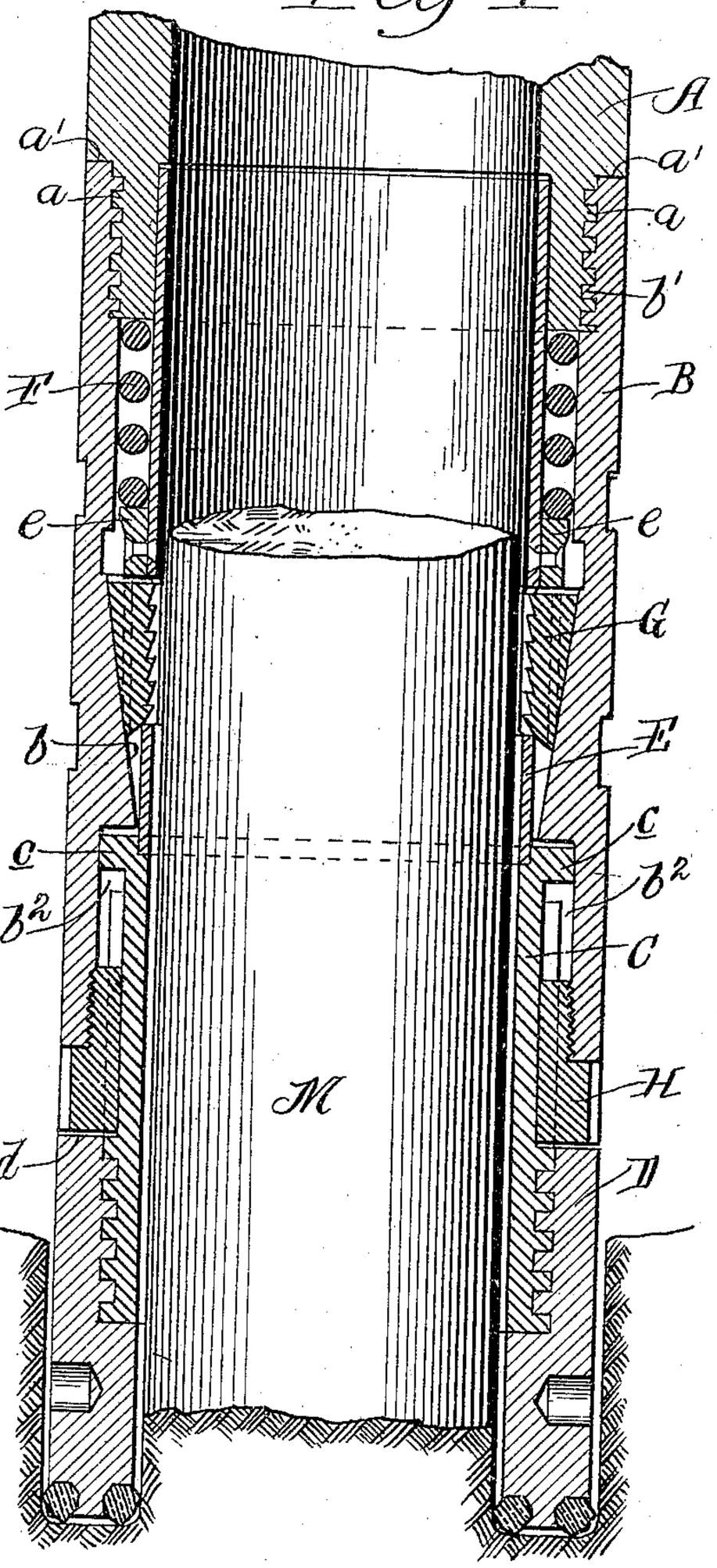
CORE BREAKER AND LIFTER FOR ROCK DRILLS.

(Application filed Sept. 22, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig-1



Witnesses

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Fig. 2

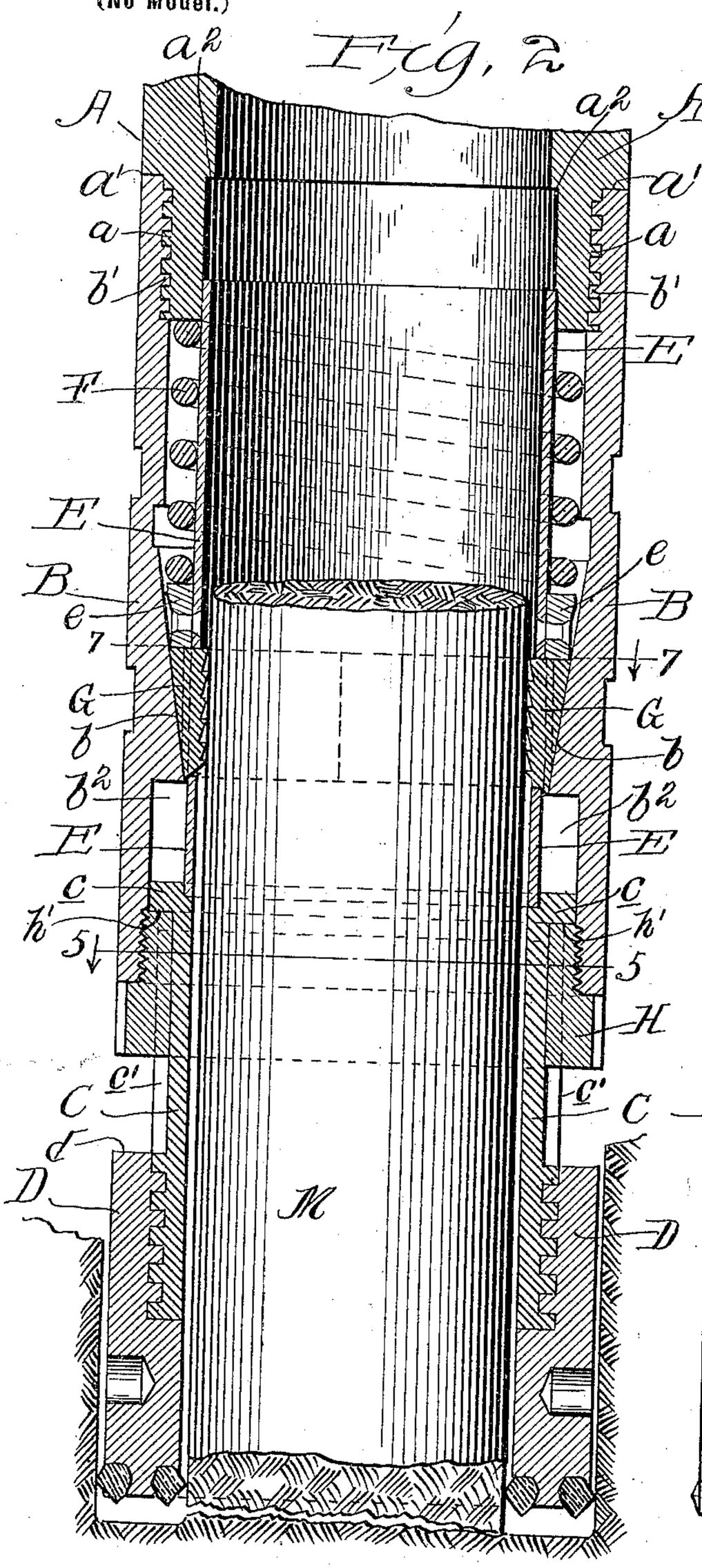
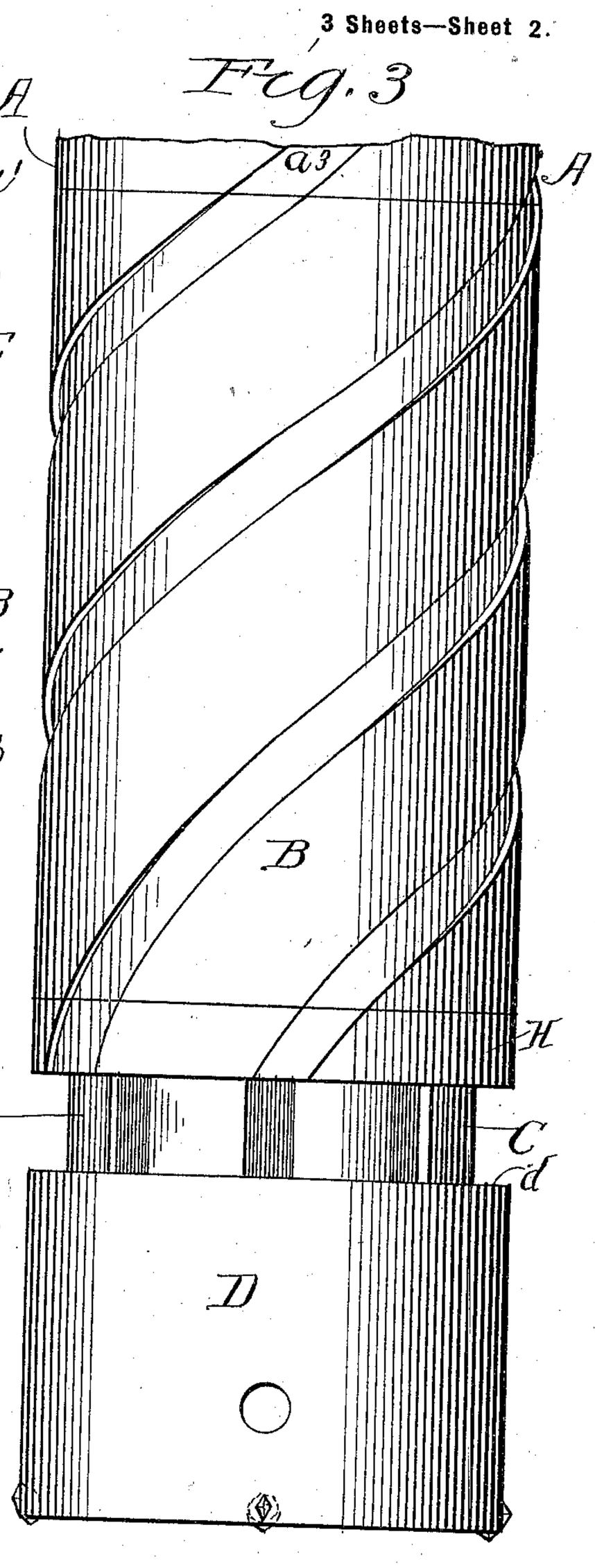


Fig. 3



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(No Model.) 3 Sheets—Sheet 3.

Fig-4

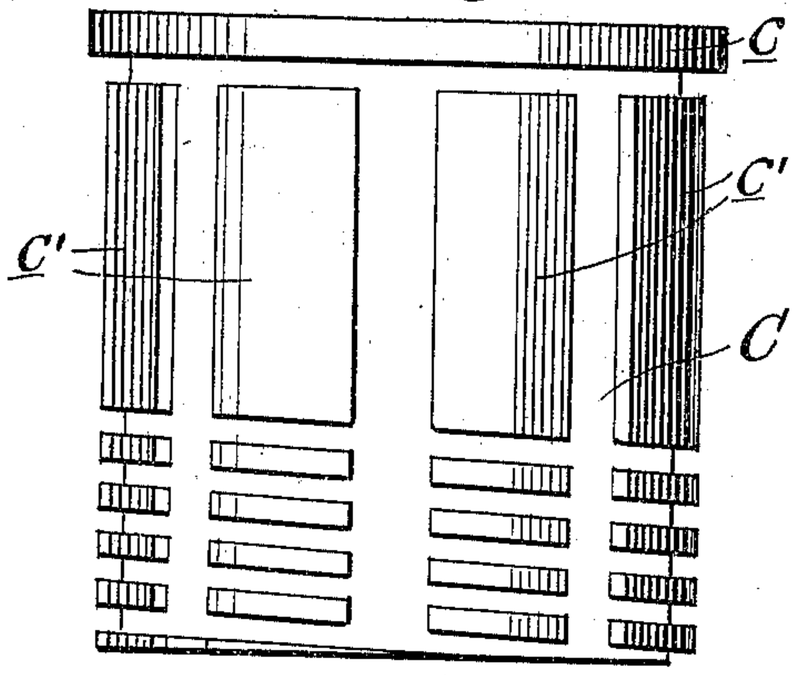


Fig-6

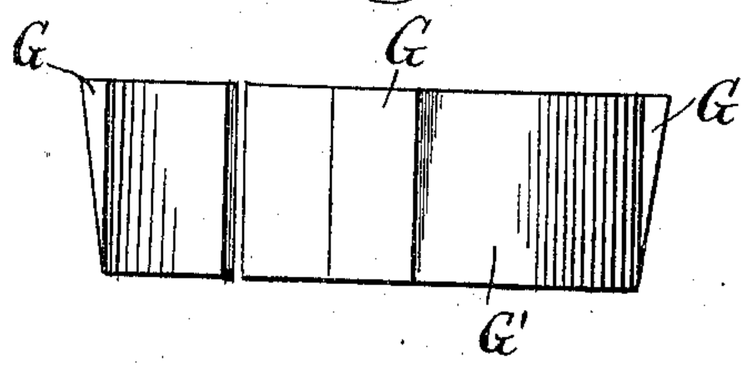


Fig-5

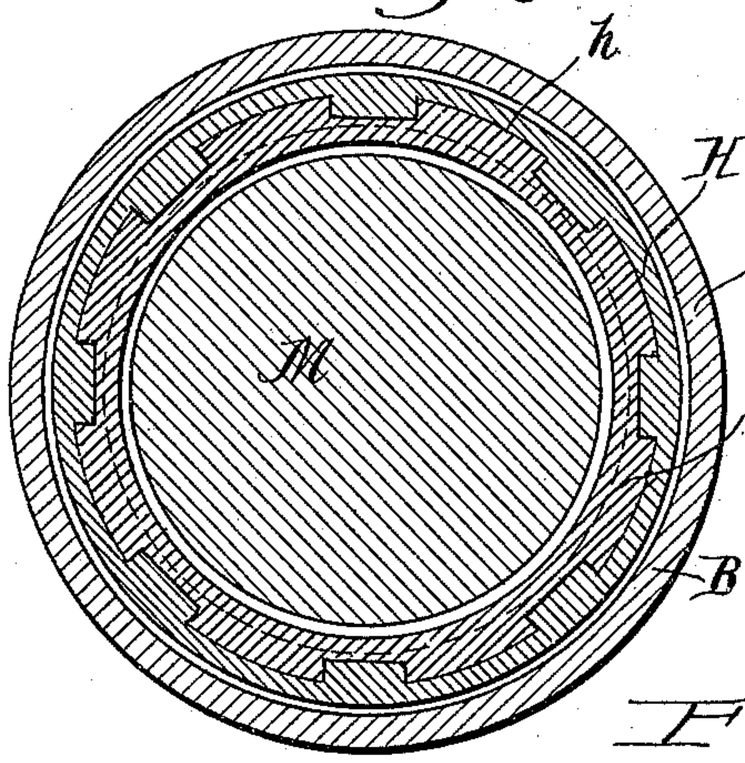


Fig. 7

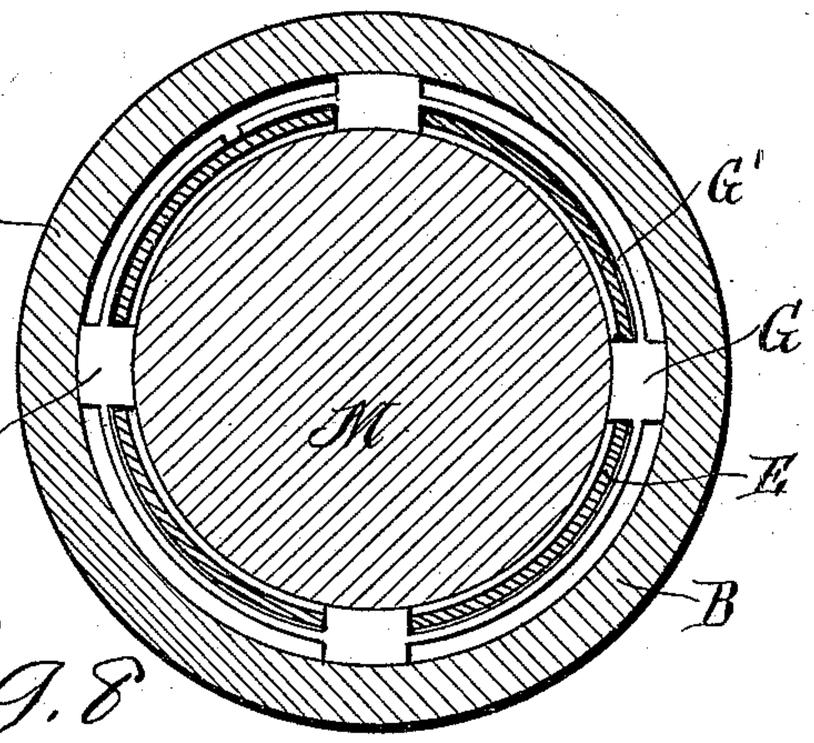
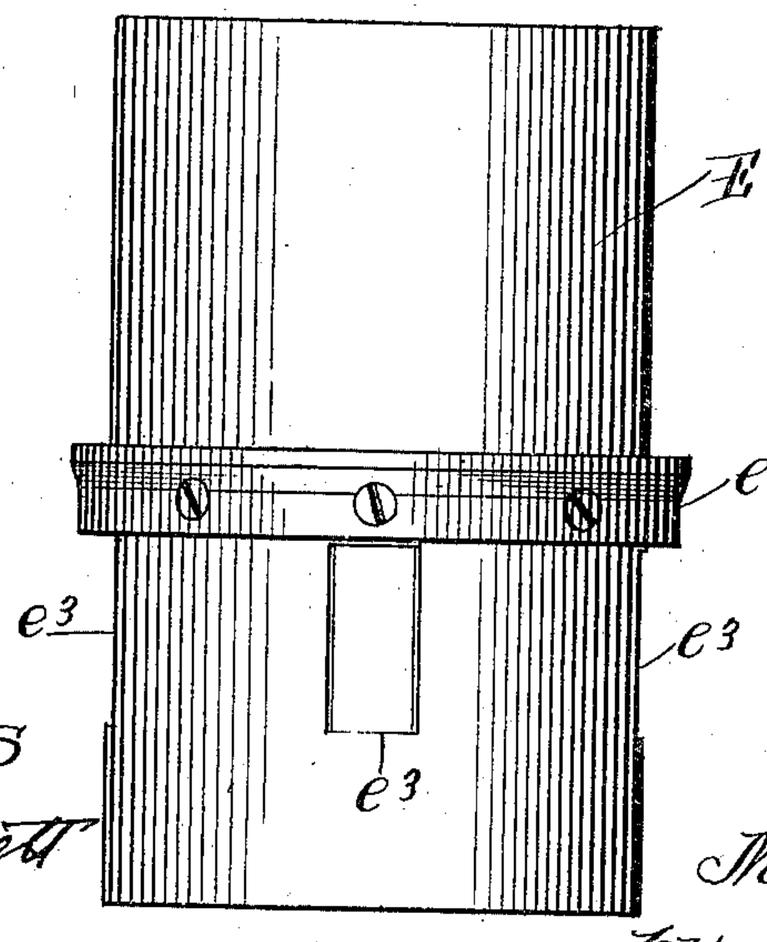


Fig. 8



Witnesses
Harold G Bennett
C. H. Crawford

Inventor
Milan C. Bullock
by Poole & Brown
his Attys

UNITED STATES PATENT OFFICE.

MILAN C. BULLOCK, OF CHICAGO, ILLINOIS; MARY A. BULLOCK, EXECUTRIX OF SAID MILAN C. BULLOCK, DECEASED, ASSIGNOR TO MARY ANN BULLOCK.

CORE BREAKER AND LIFTER FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 643,082, dated February 6, 1900.

Application filed September 22, 1898. Serial No. 691,604. (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 Core Breakers and Lifters for Rock-Drills; 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 an improved core-breaking and core-lifting device for drilling apparatus of that kind having rotary tubular bits or cutters, such as are commonly known as "diamond drills."

In a separate application for Letters Patent filed by me on the 22d day of September, 1898, Serial No. 691,603, I have shown a drilling apparatus having a drill-rod or core-barrel, a cutting-head which is movable with respect to the drill-rod or core-barrel, and core gripping devices which are actuated automatically through the movement of the cutting-head with respect to the drill-rod or core-barrel.

The present invention embraces the general principles of construction illustrated in said prior application and constitutes a species of the generic invention therein set forth. In the mechanism specifically illustrated in the prior application the core-gripping device is actuated through a rotative movement of the cutting-head with respect to the drill-rod or core-barrel. In the present application another form of core-actuating means is employed, wherein the cutting-head has an endwise-sliding or telescopic movement with respect to the drill-rod or core-barrel, and the actuation of the core-gripping device is effected solely through such telescopic movement, the parts being so arranged that when the drill-rod is thrust forward in cutting or drilling the cutting-head will be moved backwardly, and thereby relieve the gripping device from contact with the core, and when the drill-rod is withdrawn the cutting-head will be advanced with respect thereto and close the gripping device upon the core.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

As shown in the drawings, Figure 1 is a sectional view of a device embodying my invention, showing the core-breaker out of contact with the core and the drill in position for drilling. Fig. 2 is a sectional view of the same device, showing the core-breaker in operative engagement with and lifting the core. Fig. 3 is an elevation of a device embraced in my invention. Fig. 4 is an elevation of a longitudinally-ribbed coupling-sleeve embodied in my invention. Fig. 5 is a section on line 5 5 of Fig. 2. Fig. 6 is a view of one form of core-breaker embraced in my invention. Fig. 7 is a section on line 7 7 of Fig. 2. Fig. 8 is a view of a carrier-shell having apertures through which the core-breaker jaws operate.

A device embodying my invention, as shown in the said drawings, embraces a tubular drill-rod A, a core-lifter shell B, having screw-threaded engagement with the lower end of the drill-rod A, a coupling-sleeve C, having a sliding or telescopic engagement with the lower end of the core-lifting shell B, and a cutting-head D, attached at its upper end to said coupling-sleeve. The coupling-sleeve C is provided with external longitudinal ribs or grooves and is engaged with the shell B by means of a notched or grooved inwardly-projecting part or flange on the lower end of said shell, herein shown as formed by means of a separate ring H, connected by screw-threads with said shell. The said sleeve C has at its upper edge a stop-flange *c*, which by contact with the upper edge of the ring H prevents separation of the parts and limits the downward movement of the drill-head with respect to the said shell. A sliding shell or cylinder E is located within said core-lifting shell B and engages at its lower end the coupling-sleeve C, and a spiral spring F surrounds the upper part of said shell E and operates by endwise expansion to throw downwardly or outwardly the said shell and the connected coupling-sleeve and drill-head. Said spring is located between the upper part of the shell E and the part of the shell B which surrounds the same and is held or confined at its ends by contact with a shoulder on the drill-rod

at its upper end and a shoulder on the shell E at its lower end. Conveniently the bearing-shoulder for the upper end of the spring is formed by the lower end of the drill-rod A, while that for its lower end is formed by a ring *e*, which is secured by rivets to the said shell E. Serrated wedge-shaped gripping-jaws G are located within the shell B and engage an inclined or conical interior surface *b*, which forms within the shell a conical recess larger at its upper than at its lower end. The inner or gripping faces of said jaws extend through openings e^3 in the shell E. Said jaws are shown as having the form of blocks connected by intermediate parts or webs, so as to form a ring, as shown in Fig. 7, said ring being cut or split at one point to enable it to expand and contract as the jaws are moved inwardly or outwardly. The core is indicated by M in the drawings.

Referring to the details of construction illustrated, the tubular drill-rod A is provided at its lower end with an externally-screw-threaded portion *a* of less diameter than the drill-rod and forming an external shoulder *a'*. The inner part of the lower end of said drill-rod is reamed out to form an annular recess to receive the upper end of the shell F, which is adapted to slide therein, the upper limit of said recess forming the shoulder a^2. The said drill-rod is also provided with an external spiral clearance-groove a^3 in a familiar manner. The core-lifter shell B has the same external diameter as the said drill-rod A and is also provided with a spiral clearance-groove continuous with that of the drill-rod when the said shell B is in place upon the drill-rod. The upper end of said shell B is provided on its inner surface with the screw-thread *b'*, adapted to be engaged by the screw-threaded end *a* of the drill-rod. The thickness of the shell B at the said part is equal to the depth of the said shoulder *a'*, so that the outer surfaces of the said drill-rod and said shell B form a continuous cylindrical surface, and the spiral grooves of the said shell B are continuous with the similar grooves a^3 a^3 of the drill-rod. The inner surface of the said shell B is enlarged above the conical part thereof to receive the spring F, which surrounds the upper part of the said shell below the lower end of the drill-rod. The lower end of said shell B is provided with a cylindric enlargement b^2, in which the stop-flange *c* of the coupling-sleeve fits and slides. The lower end of said core-lifting shell is provided with an interior screw-thread adapted to receive the externally-screw-threaded end of the notched ring H, which is, in effect, an extension of the core-lifting shell. The said ring H is provided with inner longitudinal notches *h*, (shown on Fig. 5,) which engage the ribs on the coupling-sleeve.

The core-bit D may be of any approved design, but as herein shown is a metal ring armed with diamond cutters at its lower edge, and is attached by a screw-thread to the coupling-sleeve C. The said sleeve has an interior diameter slightly greater than the core and is provided with external screw-threads at its lower end adapted to engage similar internal screw-threads in the upper end of the cutting-head. This manner of engagement with the cutting-head causes the upper end of the cutting-head to constitute an upwardly-facing shoulder *d*. The upper end of the said coupling-sleeve C is provided with an outwardly-extending flange *c*, having an external diameter equal to the interior diameter of the core-lifting shell at the enlargement or recess b^2. The bore of said sleeve C is reamed out at its upper end to receive the lower end of the cylindrical carrier-shell E, hereinafter described. The said coupling-sleeve is provided externally with longitudinal ribs *c'*, corresponding with the notches *h* of the ring H and adapted to slide therein. Said ribs and notches are provided to communicate the rotary motion of the drill-rod to the cutting-head. The sliding shell E rests upon the upper end of the said coupling-sleeve, and the inner surfaces of the coupling-sleeve and carrier-shell form one continuous cylindrical surface, and the length of the said carrier-shell is such that when the said coupling-sleeve C is at its lower point the carrier-shell resting thereon shall extend upwardly until the upper end thereof shall extend into the enlargement in the end of the tubular drill-rod. The lower ends of the gripping-jaws G are beveled inwardly, as shown in Figs. 1 and 2, and are adapted to engage the edges of the sliding shell at the lower parts of the aperture C^3, so that when the said carrier-shell is forced upwardly the lower wall of the aperture will press outwardly on the jaws and carry them out of contact with the core and into the upper part of the conical recess.

The operation of the device is as follows: When the apparatus constructed as described is set in operation, the thrust of the drill-rod A against the resistance of the rock causes the spring F to be compressed until upward movement of the drill-head is arrested by contact of its upper end with the ring H. As shown in Fig. 1, owing to the taper of the surface *b* and the beveled shape of the lower end of the core-gripping jaws G, as heretofore described, the jaws will be forced upward and outwardly to the position shown in said Fig. 1. In this position the core-breaker is entirely out of contact with the core and will so remain so long as operative pressure is maintained upon the cutting-head. When the drill-rod is raised, the spring F immediately expands and the carrying-sleeve E and all parts engaged therewith are forced downwardly to the position shown in Figs. 2 and 3. This movement is of course aided by the weight of the drill-head. The inclined surface *b* acting on the gripping-jaws G forces the said jaws inwardly into contact with the core, as shown in said Fig. 1. It is obvious that in this position the greater the upward

force on the drill-rod the more firmly the jaws will grip the core.

When the gripping-jaws and the metal parts connecting them are adapted to constitute a spring-ring, as shown, said ring may be made of such diameter that the tension of the springs will either tend to close the jaws on the core or to hold them free therefrom, the spring in one case aiding the actuating-spring F and in the other case supplementing the expanding devices in throwing the jaws away from the core. The ring may, however, be made of an intermediate size, so that it will be made neutral, and both expansion and contraction in that case will be effected solely by the action of the said spring or by the upward thrust of the sliding shell. Obviously the connecting parts between the jaws serve merely as a means of holding them in place; but as the openings in the shell also perform this function the said connecting parts may be omitted and a series of separate jaws employed. It is also obvious that the spring F may be omitted, and the gravity of the cutting-head and connected parts may be utilized to advance the cutting-head in the withdrawal of the drill-rod.

From the above description of the construction and operation of the device illustrated it will be clear that in this invention the cutting-head has an endwise or telescopic movement with respect to the drill-rod or core-barrel and that the actuation of the core-gripping device is effected automatically and solely by such endwise-sliding or telescopic movement of the cutting-head. In the apparatus herein shown, therefore, a distinctive feature is the endwise-sliding or telescopic movement of the cutting-head as distinguished from a rotative or combined rotative and endwise movement of the cutting-head, such as is presented in the device illustrated in the said prior application hereinbefore referred to.

I claim as my invention—

1. The combination with a drill-rod of an annular cutting-head which slides endwise with respect to the drill-rod, an expansible core-gripper and means actuated through the endwise movement of the cutting-head acting to hold the core-gripper extended during the operation of drilling.

2. The combination with a drill-rod of an annular cutting-head which is movable endwise with respect to the drill-rod, an expansible core-gripper comprising endwise and radially movable gripping-jaws and means actuating said jaws, comprising an inclined surface of the interior of the drill-rod, and connecting means between the cutting-head and said jaws by which the latter are moved with respect to the inclined surface in the endwise movement of said cutting-head.

3. The combination with a drill-rod of an annular cutting-head which is movable endwise with respect to the drill-rod, a spring applied to extend the cutting-head, an expansible core-gripper and actuating means for the core-gripper embracing operative connections with the cutting-head, whereby the core-gripper is contracted when the cutting-head is thrown outwardly by said spring, and extended when said cutting-head is forced inward by pressure against the rock in drilling.

4. The combination with a drill-rod of an annular cutting-head which is movable endwise with respect to the drill-rod, a spring applied to extend the cutting-head, an expansible core-gripper and means for actuating said core-gripper, embracing an inclined surface on the drill-rod and a connection between the moving parts of the gripper and the cutting-head by which the said moving parts are actuated through the endwise movement of the cutting-head.

5. The combination with a drill-rod provided with an inclined interior surface, of an annular cutting-head which is movable endwise with respect to the drill-rod, an expansible core-gripper, embracing jaws which engage and slide endwise upon said inclined surface of the core-barrel and an operative connection between said cutting-head and said jaws, acting to move the said jaws within the drill-rod when the cutting-head is moved with respect to said drill-rod.

6. The combination with a drill-rod provided with an interior inclined surface, of an annular cutting-head which is movable endwise with respect to said drill-rod, an expansible core-gripper, embracing jaws which engage said inclined surface of the drill-rod, connecting means between the cutting-head and jaws acting to move said jaws endwise with the cutting-head and a spring applied between the cutting-head and the drill-rod to extend the cutting-head.

7. The combination with a drill-rod provided with an interior inclined surface, of an annular cutting-head which is movable endwise with respect to the drill-rod, a core-gripper, embracing jaws which engage and slide endwise upon said inclined surface, and a sliding sleeve connecting said jaws with the said cutting-head.

8. The combination with a drill-rod provided with an interior inclined surface, of an annular cutting-head which is movable endwise with respect to the drill-rod, a core-gripper, embracing jaws which engage and slide endwise upon said inclined surface, a sliding sleeve connecting said jaws with the said cutting-head, and an actuating-spring applied between the said sleeve and the drill-rod.

9. The combination with the drill-rod of an annular cutting-head provided with a longitudinally-grooved sleeve which has sliding engagement with a notched flange on the drill-rod, a core-gripper and actuating means for operating the core-gripper through the endwise movement of the cutting-head with respect to the drill-rod.

10. The combination of a tubular drill-rod provided with an interior tapered surface and with a notched flange at its lower end, of an

annular cutting-head provided with a longitudinally-grooved sleeve which has sliding engagement with said notched flange, a gripping device, embracing jaws which slide upon said inclined surface, and connecting means between the jaws and said cutting-head for actuating the former from the latter.

11. The combination of a tubular drilling-rod provided with an interior tapered surface, an annular cutting-head which has endwise-sliding engagement with the drill-rod, a sliding sleeve within the drill-rod engaging with said cutting-head and provided with openings for gripper-jaws, and gripper-jaws engaging with said openings and bearing against the inclined surface of the drill-rod.

12. The combination with a drill-rod provided with an interior conical surface, an annular cutting-head having endwise-sliding engagement with the drill-rod, a sliding sleeve engaging with the cutting-head and provided with an opening for gripping-jaws, gripping-jaws which engage said openings and bear against the said inclined surface, and a coiled spring surrounding said sleeve and bearing at one end against a shoulder on the drill-rod and at its opposite end against a shoulder on said sleeve.

13. The combination with a drill-rod provided with an interior tapered surface, a drill-head having endwise-sliding engagement with said drill-rod, a sliding sleeve connected with said drill-head and provided with openings to engage clamping-jaws, clamping-jaws to bear against the said inclined surface and engage said openings, said clamping-jaws being provided with inclined surfaces adapted for engagement with said sliding sleeve and acting to throw outwardly the clamping-jaws when the cutting-head and sleeve are thrust inwardly.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of September, A. D. 1898.

MILAN C. BULLOCK.

Witnesses:
CHARLES S. BARTHOLF,
R. CUTHBERT VIVIAN.