

No. 819,042.

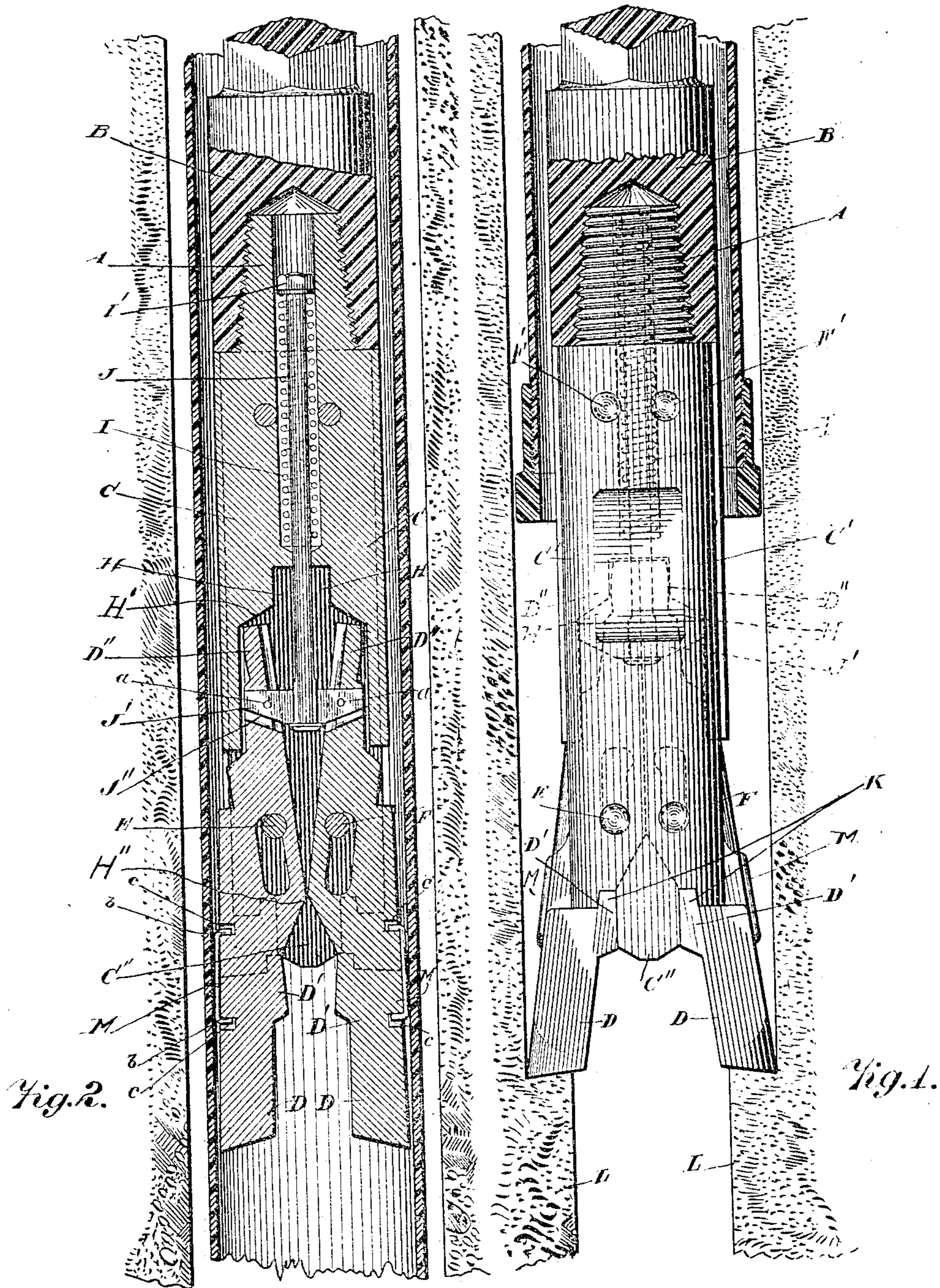
PATENTED MAY 1, 1906.

A. CUMMINGS.

UNDERREAMER FOR MINERAL BORING.

APPLICATION FILED FEB. 25, 1905.

2 SHEETS—SHEET 1.



Witnesses.

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UNDERREAMER FOR MINERAL BORING.

No. 819,042.

Specification of Letters Patent.

Patented May 1, 1908.

Application filed February 25, 1905. Serial No. 247,240½.

To all whom it may concern:

Be it known that I, ALEXANDER CUMMINGS, of the city of Los Angeles, in the county of Los Angeles, in the State of California, have invented a new or Improved Underreamer for Mineral Boring, of which the following is a full, clear, and exact description or specification, reference being had to the annexed drawings, and to the letters marked thereon.

This invention, which relates to certain new and useful improvements in the construction and operation of underreamers, such as are used in enlarging a bore-hole or well which has been drilled in mineral formations or strata of the earth's crust, consists of a pair of cutting-jaws which are capable of being closed sufficiently to enable the underreamer to be lowered through the casing which is usually employed to line and protect such bore-holes or wells. These jaws are each pivoted to the upper part of the device by which the cutting edges of the underreamer are connected to the rods of the mineral-boring apparatus, and these parts are otherwise so constructed that while during descent of the underreamer within the casing the jaws are closed together and prevented from bearing directly against the interior of the casing, yet the cutting parts of the jaws are free to open outward to the width necessary for the underreaming operation so soon as the underreamer has passed downward and sufficiently far below the bottom of the casing to enable the underreaming operation to be proceeded with.

Upon the annexed drawings, Figure 1 is an elevation of my new or improved underreamer, showing the cutting-jaws in their fully-opened position and as they appear and are situated in the act of underreaming a bore-hole below the casing or lining shown in the upper part of the figure in transverse section, the lower part of the auger-stem to which my new or improved underreamer is connected by a tapered screw in the ordinary manner being also shown in transverse section. Fig. 2 is a vertical section of my new or improved underreamer, showing the cutting-jaws and all the other parts of the device in the position which they occupy when within the casing of the bore-hole or well. Fig. 3 is a view of my new or improved underreamer, partly in elevation and partly in transverse section, showing the same at right angles to Figs. 1 and 2. Fig. 4 is a transverse section of the casing, showing the bottom of

the underreamer as it appears when descending through or inclosed within the casing. Fig. 5 is an inverted plan of the bottom of the underreamer, showing its cutting-jaws opened out to their full width or in their operating position corresponding to Fig. 1. Fig. 6 is a perspective view of my new or improved underreamer, showing one of the detachable parts thereof removed in order to the better display the construction of the interior parts of the device. Fig. 7 is a perspective view of one of the lateral detachable parts.

As shown by Figs. 1 to 7, my underreamer is attached to the ordinary auger-stem by means of a tapered screw A, screwed into the socket B. The stock or body of the underreamer comprises a part C, between the lateral parts C' of which the cutting-jaws D are disposed, pins E and F extending transversely therethrough. Pins E and F assist in guiding the jaws in their movement within the stock also cooperate with the pins E' and F' to securely connect the lateral pieces C' with the part C. The lower and upper pins E F and E' and F' are preferably formed with tapered heads at one end fitting into corresponding holes in the sides C' C', as shown in the drawings, while through a hole in the opposite end of each a split pin G is passed to prevent the respective pins from in any way falling out of the holes in which they are contained.

The jaws D are held in their open position (shown at Figs. 1, 5, and 6) by the lower portion C'' of each lateral piece C', becoming situated between the parts D' when the jaws D are drawn into their uppermost position—that is to say, with the upper parts D'' D'' bearing against the top and between the sides of the recess H, as shown dotted in Fig. 1 and in full lines in Figs. 3, 5, and 6.

The inner walls of the reamer at H' H' are shouldered or inclined at an angle adjacent to the recesses H H to engage the upper ends D'' D'' of the jaws when the latter are in the lowered position. (Shown in Fig. 2.) At intermediate points H'' upon their adjacent faces the jaws D are formed with angular engaging portions in pivotal contact, the action of the jaws when moved in a vertical direction within the body of the reamer being to rock upon each other, the lower or cutting ends of the jaws being expanded and the upper ends D'' D'' retracted, or vice versa, as a consequence of the engagement of said ends D'' with the inclined shoulders H'.

The cutting-jaws D are drawn upward into open position by the action of the compressed spring I against the washer beneath the nut I', forcing the rod J and its cross-tail J' (whose ends are within the slots J'', Fig. 2, formed in the top of each cutting-jaw D) upward and in such relationship of the parts that the cutting-jaws D D are not only open fully outward into their cutting positions, as shown on the drawings, but are maintained in the cutting positions by the action of the spring I, the rod J, and the cross-tail J', holding the cutting-jaws D D in close contact with the lower ends of the lateral pieces C' and the upper prolongations D'' D'' of these jaws in hard contact with the top of the recess H.

For the more securely holding of the cutting-jaws D D in their operative positions each jaw has vertical projections K, which enter into corresponding recesses in the lower end of each lateral piece C'. The slots E'' and F'' in each jaw-piece, respectively, are constructed with the upper end of each of these slots widening inward, as shown particularly at Figs. 1, 2, and 6, the reason for this extension of these slots in the manner and directions shown in the drawings being to prevent the pins E and F from impeding the moving of the jaws D D into their closed position when the jaws are drawn downward or outward from the other parts of the underreamer device—as, for example, when entering it into the casing B, when lowering the underreamer down the casing B, or in drawing it upward into and through the casing B—when the bore-hole is ready for the chips and sand accumulated therein from the underreaming operations to be removed by lowering the sand-pump or equivalent device, as is well understood in the practice of mineral boring.

The cross-tail J' has a rod-receiving opening of the proper shape to receive the end of the spring-actuated rod J, the latter being swaged with a rounded head and ribs on opposite sides of said head to prevent rotation of the rod when the nut I' is being placed in position thereon.

To prevent the cutting edges of the jaws D D from coming into contact with the inner surface of the casing C, either when being lowered or being raised through the casing B, each jaw D may be fitted with a removable contact-piece M, which is thick enough to bear with its outer narrow edge against the interior of the casing B, while the inner edge bears against the outer parts of the jaws D D and their connections, as shown at Fig. 2, thus maintaining the cutting edges of the jaws out of contact with the interior surface of the casing B while the underreamer is being passed therethrough.

The contact-pieces M are readily detachable and the ends thereof are bent angularly to enter holes c c, spaced apart upon the outer

faces of the jaws. These contact-pieces are constructed of various sizes of either square or round rods, the size of the rod employed determining the distance between the cutting-jaws and the casing. The cutting-jaws, as shown, are formed angular upon their outer faces and are rounded at the base adjacent to their cutting edges to permit the jaws to be more readily withdrawn and inserted into the casing.

It is to be understood that in place of constructing the sides C' of the body C of the underreamer removable or detachable, as hereinbefore described and shown on the drawings, the sides C' may also be in one solid piece of metal with the central body part C, in which case the upper pins E' F' are not used.

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

1. In an underreamer, a body having a recess extending upwardly into its lower end, a pair of jaws vertically movable in the recess and having tilting engagement with each other, the sides of the jaws being in firm sliding contact with the walls of the recess, and means for actuating the jaws to cause the upper ends thereof to contract simultaneously with the expansion of their lower ends, substantially as shown and described.

2. In an underreamer, a body having a recess extending upwardly into its lower end between lateral portions thereof, a pair of jaws in tilting engagement with each other, having free vertical movement between said lateral portions but held from sidewise movement by said lateral portions, means for actuating the jaws to cause the upper ends thereof to retract simultaneously with the expansion of their lower ends, and transverse guide-pins carried by the lateral portions of the body adapted to engage the jaws to guide them in their movement, substantially as shown and described.

3. In an underreamer, a body provided with a socket at its lower end, a pair of jaws vertically slidable in said socket and provided upon their adjacent faces with angular fulcrum portions in contact, said jaws also having slots adjacent to their fulcrum portions, guide-pins carried by the body and extending through said slots, resilient means for holding said jaws normally in raised position in the socket in the body, and means for actuating the jaws to cause the upper ends thereof to retract simultaneously with the expansion of the lower ends thereof, substantially as described.

4. In an underreamer, a body having projecting portions C'' and provided with recesses adjacent to said portions, a pair of jaws slidable in the lower end of the body and in tilting engagement with each other, means for normally maintaining said jaws in ele-

vated position in the body, and lateral portions upon said jaws engaging the sides of the portions C'' and entering the recesses adjacent thereto to hold the lower ends of the jaws apart when elevated, substantially as described.

5 5. In an underreamer, a body having a socket at its lower end, a pair of jaws in said socket in tilting engagement with each other, 10 said jaws having slots adjacent to the tilting portions, guide-pins carried by the body and extending through the slots in the jaws, means for holding the jaws normally in raised position, means for expanding the lower ends 15 of the jaws when in raised position, and portions C'' upon the body disposed between the lower ends of the jaws and adapted to positively hold the latter expanded when raised, substantially as described.

20 6. In an underreamer, a body, a pair of jaws vertically slidable in the body, means for normally holding said jaws in raised position, means for expanding the lower ends of the jaws when in raised position; and inter- 25 engaging portions disposed at the lower end of the body and on the sides of the jaws to positively hold the latter expanded when in raised position, substantially as described.

30 7. In an underreamer, a body provided with downwardly-projecting portions C'' at its lower end, a pair of jaws vertically movable in the body and in tilting engagement with each other, means for normally holding said jaws in raised position, and laterally- 35 projecting portions upon said jaws adapted to contact with the portions C'' when the jaws are raised to positively hold the latter open, substantially as described.

8. In an underreamer, a body having a socket provided with recesses H at its upper 40 end and having the inclined shoulders H' adjacent to said recesses, said body having the projection C'', and upwardly-extending recesses at the sides of the projection C'', a pair of jaws disposed in the socket in the 45 body, each jaw having a shank the upper end of which is adapted to engage one of the inclined shoulders H' and be guided into the recess H, projections K on opposite sides of each jaw adapted to enter the recesses at the 50 sides of the portions C'', said jaws also having contacting angular portions upon their adjacent faces, a spring-actuated rod disposed axially in the upper end of the body, and a cross-tail carried at the lower end of 55 said rod adapted to engage the upper ends of the jaws, substantially as described.

9. In an underreamer, a body provided with a socket, a pair of jaws slidably mounted in the socket in pivotal contact with each 60 other, said jaws being provided on their outer faces with a pair of spaced perforations, and detachable contact-pieces adapted to be interposed between the face of the jaws and the well-casing, said contact-pieces consist- 65 ing of metal bars having angular bent ends adapted for insertion into said spaced perforations, substantially as described.

In testimony whereof I, the said ALEXANDER CUMMINGS, have hereunto set my hand 70 and seal, at Los Angeles aforesaid, in the presence of two subscribing witnesses.

ALEXANDER CUMMINGS. [L. s.]

Witnesses:

ST. JOHN DAY,
HADASSAH DAY.