

(No Model.)

M. T. CHAPMAN.
EXPANSION DRILL.

No. 370,046.

Patented Sept. 20, 1887.

Fig. 1.

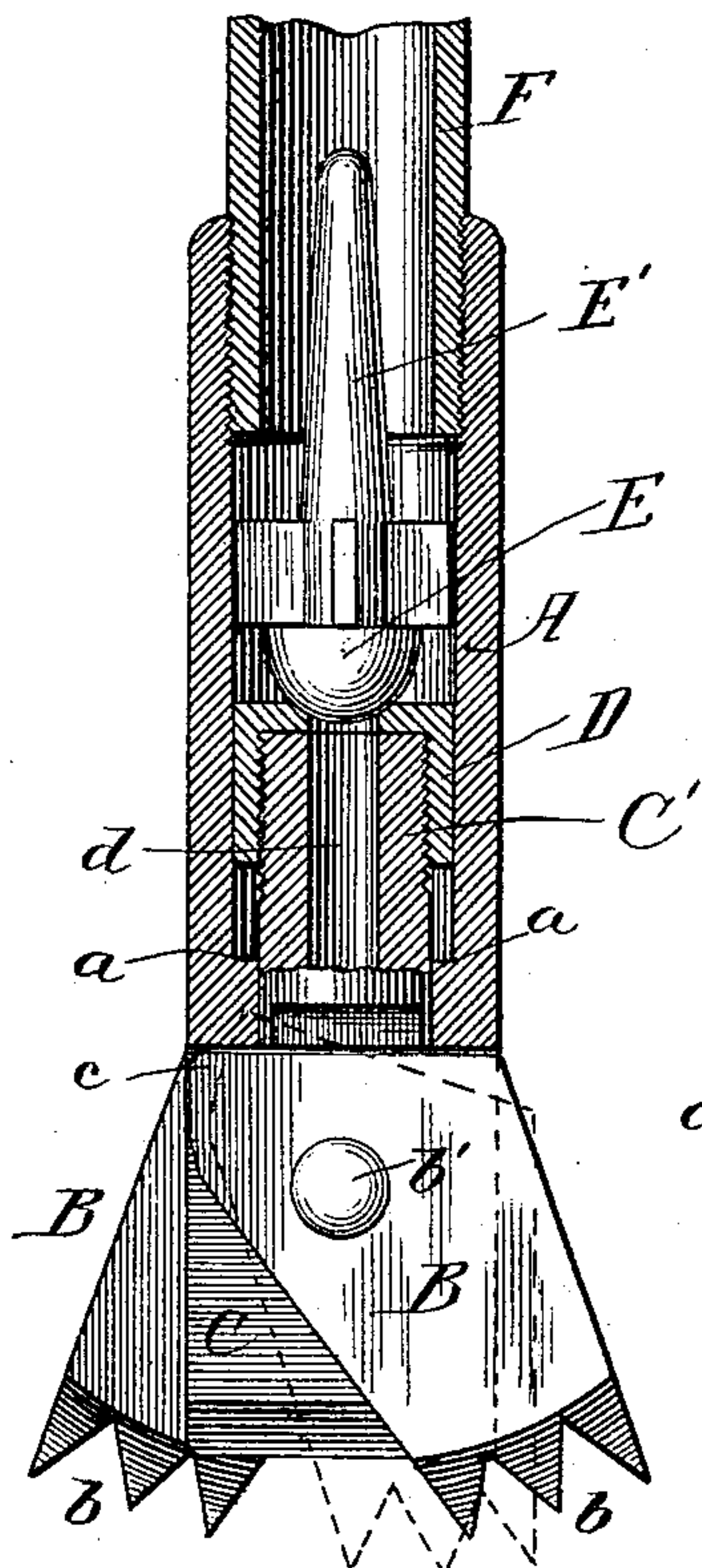


Fig. 4

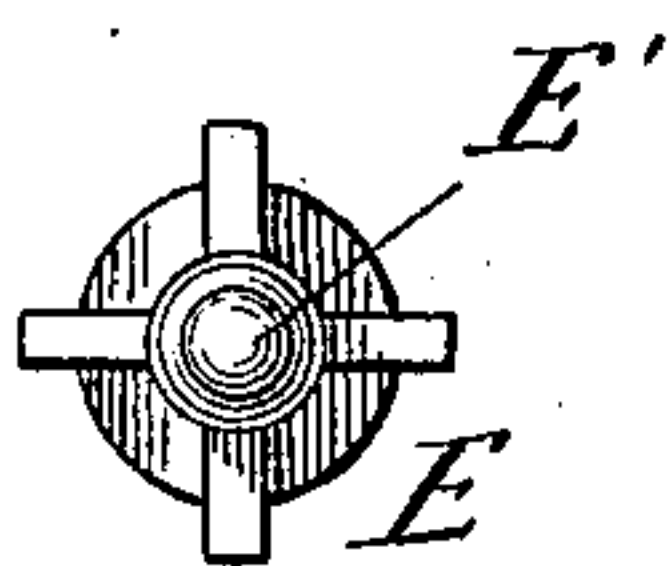


Fig. 3

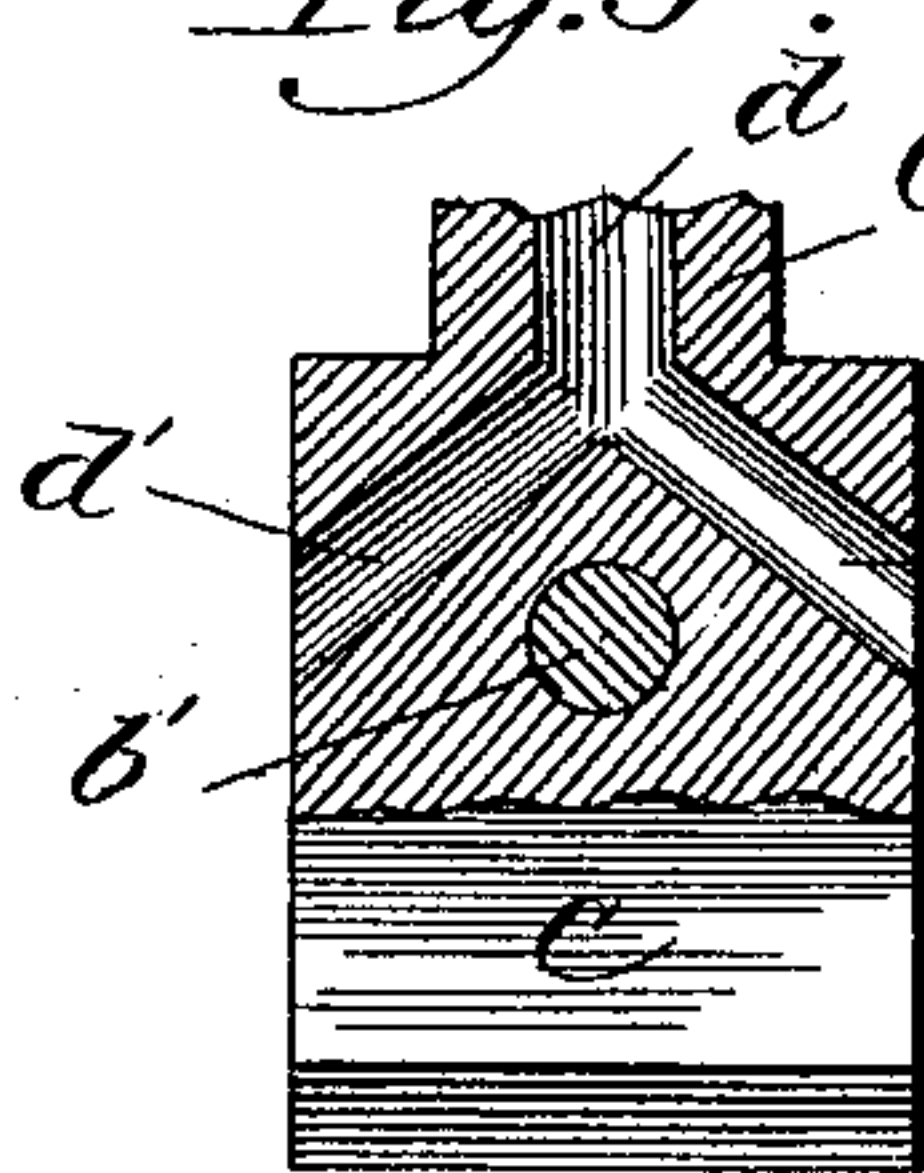


Fig. 2.

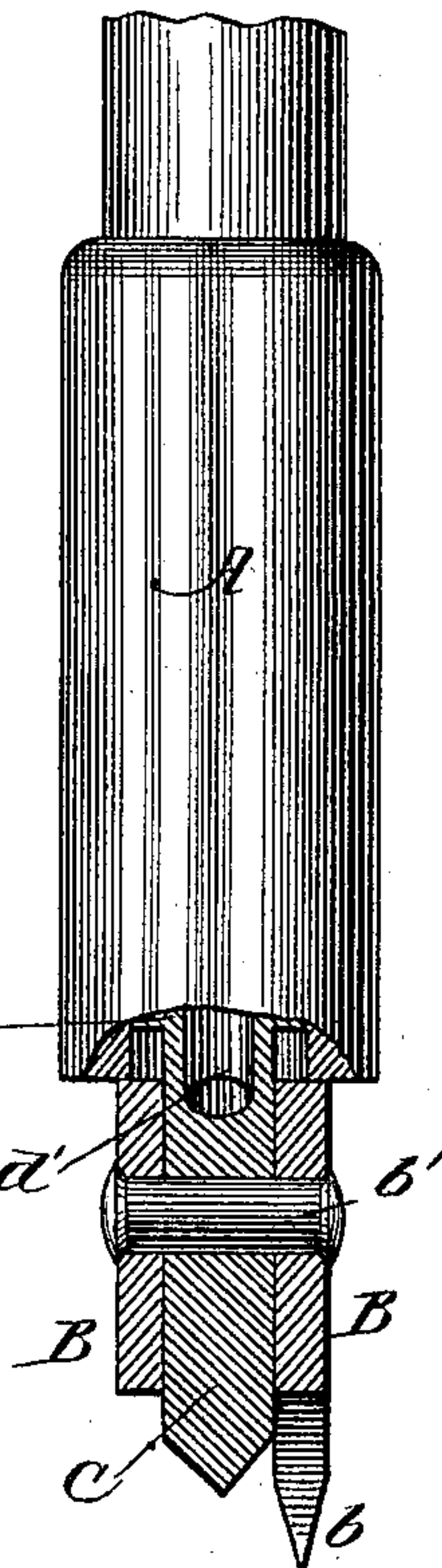


Fig. 5.

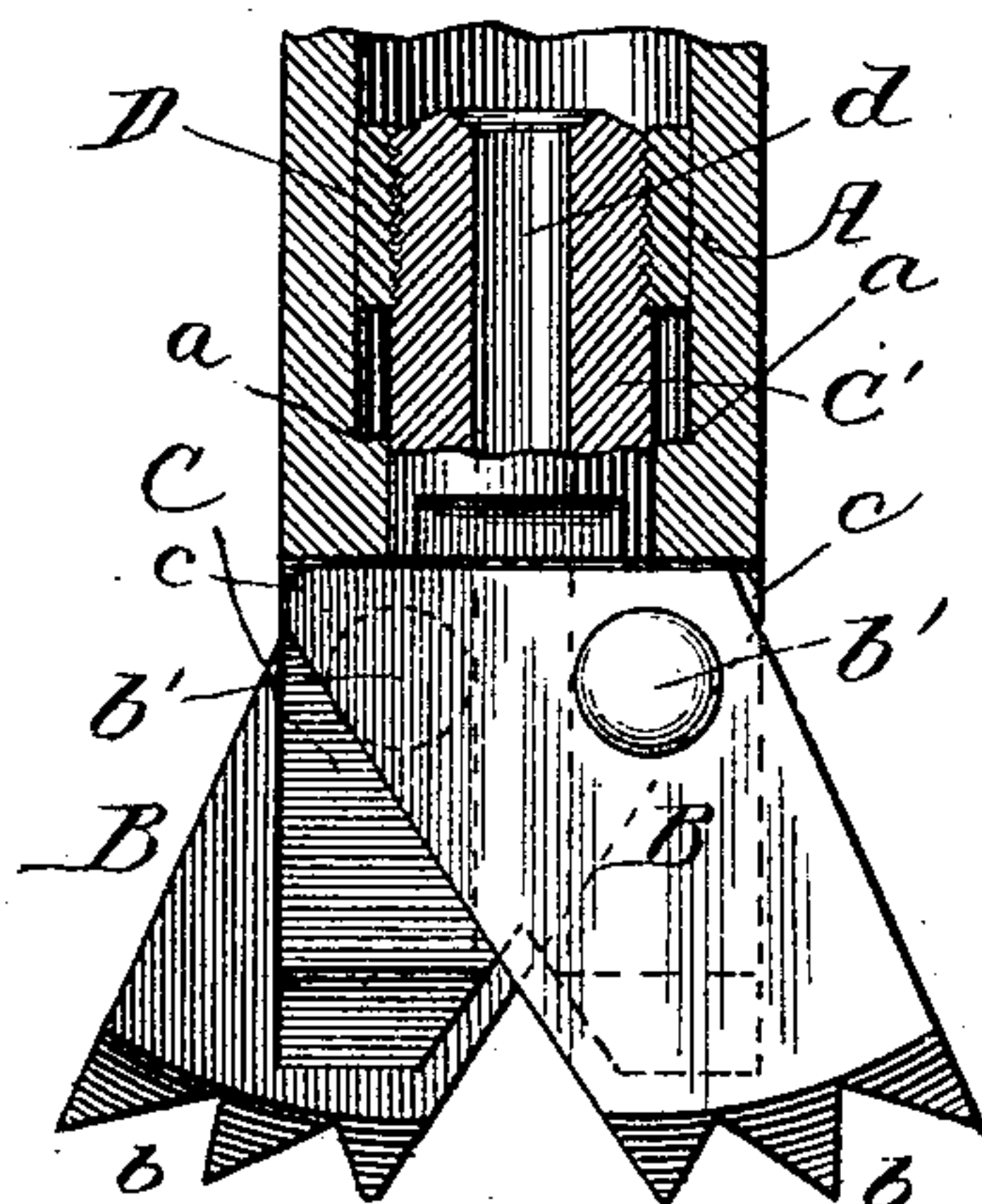


Fig. 7.

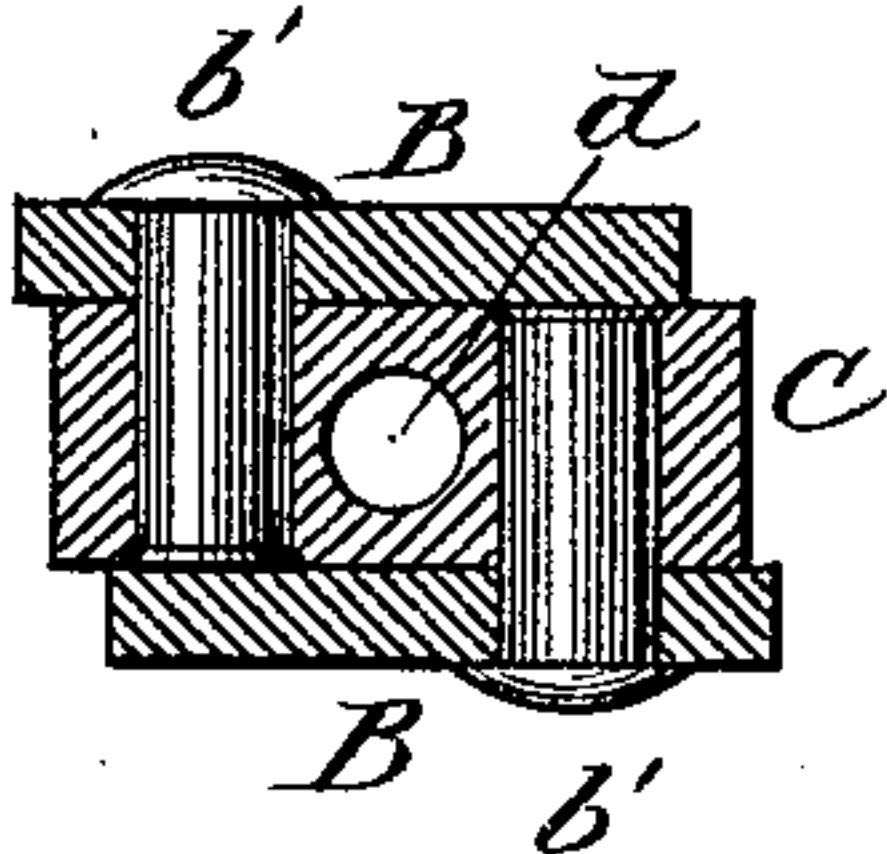
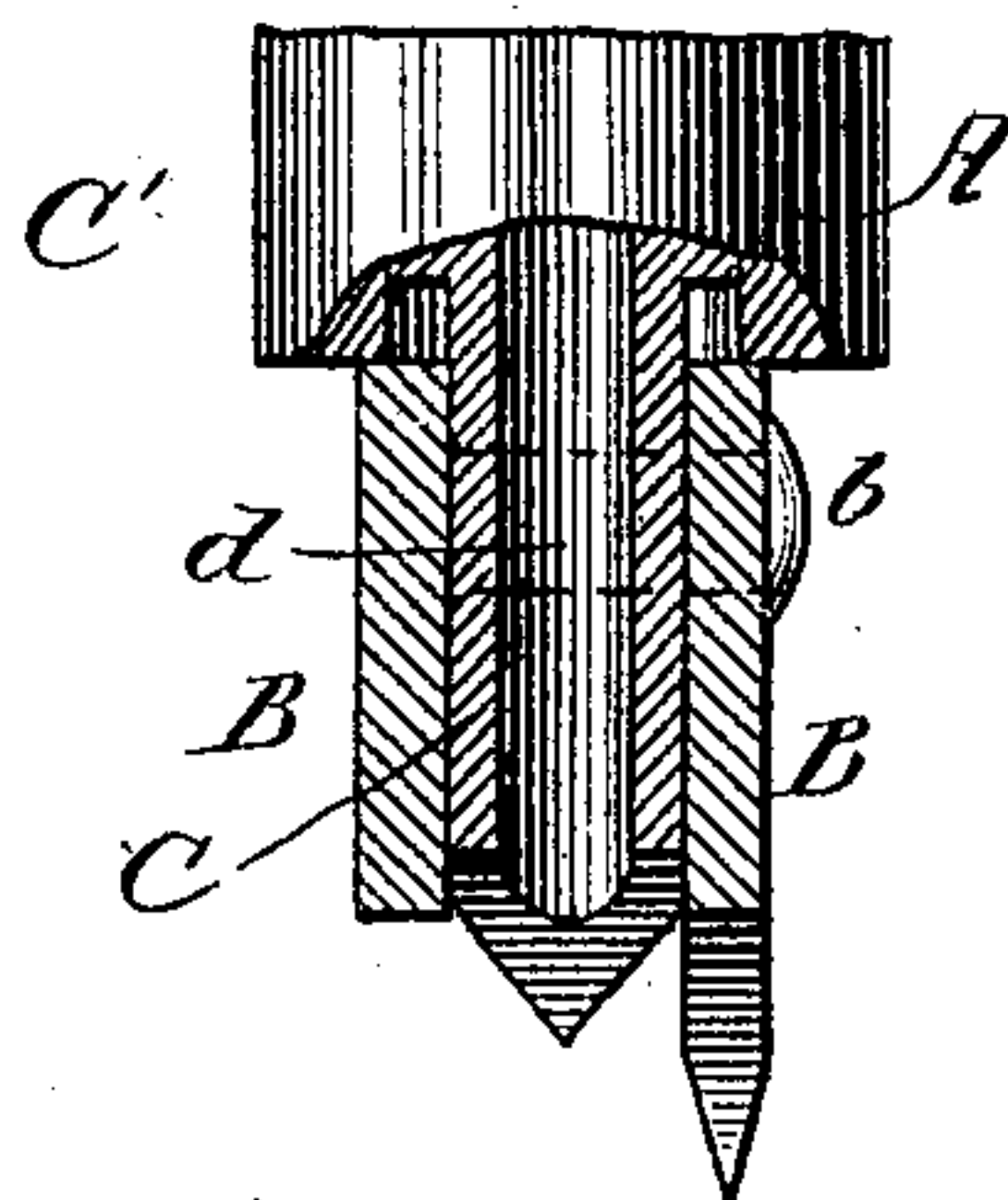


Fig. 6.



Witnesses:

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EXPANSION-DRILL.

SPECIFICATION forming part of Letters Patent No. 370,046, dated September 20, 1887.

Application filed July 11, 1887. Serial No. 244,202. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW T. CHAPMAN, residing at Aurora, in the county of Kane and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Expansion-Drills, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation showing a controlling-valve in the head or coupling; Fig. 2, an elevation, with the lower end in section, showing the manner of pivoting the blades or bits of Fig. 1; Fig. 3, a detail, partly in section, showing the water-discharge; Fig. 4, a top view of the valve; Fig. 5, a detail, being a sectional elevation, showing the blades or bits carried by independent pivots; Fig. 6, a detail with the blades or bits and their support in section; Fig. 7, a cross-section showing the pivots for the construction of Figs. 5 and 6.

This invention belongs to that class of drills in which the blades or bits are made expandible, for the purpose of being passed through the casing, and then thrown out to cut an opening of sufficient diameter for the casing to pass down, and has for its objects to utilize the weight of the drill-rod in opening and operating the blades or bits, and at the same time enable a lifting-valve to be used for raising the cuttings and discharging them through the drill-rod; and its nature consists in the several parts and combination of parts hereinafter described and claimed as new.

In the drawings, A represents a coupling having a length and interior diameter sufficient to receive and permit the operation of a lifting-valve, and having an exterior diameter to correspond with the size of drill used.

B are the blades or bits, two being used in the construction shown, one located on each side of the supporting-head, and each blade having, as shown, a cutting-edge, *b*, formed with saw-teeth; but such edge can be of any other construction; and each blade at its upper end is cut diagonal, so as to leave a projecting corner or end, *c*, against which the end of the coupling strikes to open or expand the blades or bits.

C is a head located below the coupling A, and having its lower end sharpened to assist

in loosening the earth, and on each side of this head C are secured the blades or bits B by means of the single pin or pivot *b'*, in the construction shown in Figs. 1, 2, and 3. This head C has a neck or extension, C', which, when the parts are together, lies within the chamber of the coupling A, and its upper end is screw-threaded. In this extension C' is a hole, *d*, which communicates with branch holes *d'*, running to the edges of the head C, as shown in Fig. 3, forming a passage through which the sediment and cuttings can be drawn into the chamber of the coupling A, to be raised by the action of the lifting-valve through the whole length of the drill-rod, to be discharged at the top of the drill-rod.

The extension C', as shown, is circular in cross section and of a less diameter than the chamber of the coupling A, and the hole through the end of the coupling through which the extension passes is of a corresponding diameter, which forms a shoulder or ridge, *a*, on the interior of the coupling.

D is a collar having, as shown in Fig. 1, a top with a hole therein to line with the hole *d* in the extension C', onto which the collar is screwed, and the top of the collar around its central hole is countersunk, as shown in Fig. 1, to form the seat for the lifting-valve; but, as shown in Fig. 5, the top of the collar D is dispensed with and the seat for the valve is formed by a countersink around the end of the hole *d*, and, as shown in Fig. 5, the hole *d* extends straight through the head C and the branch holes *d'* are omitted.

E is a winged valve located within the chamber of the coupling A and having an elongated stem, E', as shown. Such valve, however, could be of some other suitable construction that would act as a lifting-valve for the sediment and cuttings.

F is the drill-rod, screw-threaded onto the end of the coupling A, and formed, as usual, of a number of sections connected together by suitable couplings, in which are located lifting-valves similar to E, or such other form as may be selected.

The parts are assembled by dropping the cap or collar into the interior of the coupling A and screwing the extension C' thereunto, which connects the head C with the coupling

A. The valve E is then dropped into the interior of the coupling and the drill-rod F screwed into place. The blades or bits B are attached by placing them on opposite sides of the head and securing them in place by the pin or pivot *b'*, a single pin or pivot being used, as shown in Figs. 1, 2, and 3, or a pin or pivot *b'* being used for each blade or bit, as shown in Figs. 5, 6, and 7, two pivots being required, so as to allow room for the hole *d*, which extends through the head C. The blades or bits at their acting ends *b*, as shown, are formed in a circle and provided with teeth, and when the projecting corner *c* of each blade is struck by the end of the coupling A it opens or expands the blades or bits.

The operation is as follows: The lifting of the drill-rod raises with it the coupling A, and when the limit of space between the shoulder *a* and the end of the collar D is reached the continued lift of the rod will raise the head C and blades or bits B, and when raised the space between the end of the coupling A and the upper end of the blades or bits permits the blades or bits to fold up, and when folded their position will be as shown by the dotted lines in Fig. 1, with the end *c* of each bit the highest. The drill-rod, as it drops, carries with it the coupling A, forcing the end of the coupling into contact with the ends *c* of the blades, forcing the blades apart and expanding them. It will be seen that this expansion will be positive, and the force of the expansion will have the advantage of the entire weight of the drill-rod, which insures the forcing apart of the blades. The drill-rod, as it strikes, will throw the valve E up, allowing the water and cuttings in the hole to pass up into the chamber above the collar D through the hole *d* and branch holes *d'*, where the cuttings and water are caught and held by the dropping of the valve when the shock of the blow is over, and from this chamber the water and cuttings

will be forced up through the entire length of the drill-rod, assisted by the lifting-valves located in the couplings of the rods.

The forcing of the blades apart by the movable coupling A striking the ends of the blades is had whether the valve F is used or not, and in case of non-use of the valve F the discharge-hole through the head and its expansion can be utilized to discharge water to wash away the cuttings, and the blades or bits at their acting end *b* can be formed to operate either as a rotating drill or as a striking-drill, the feature of forcing the blades apart by the direct end blow of the coupling remaining the same.

What I claim as new, and desire to secure by Letters Patent, is—

1. The coupling A, having an interior chamber to receive a lifting-valve, in combination with the head C, having a neck or extension, *C'*, and carrying cutting-blades, and having an inner passage communicating with the chamber of the coupling, substantially as and for the purpose specified.

2. The coupling A, in combination with the blades B, having the corners *c*, and head C, having the extension *C'*, for expanding the blades from the force and weight of the drill-rod, substantially as specified.

3. The coupling A, in combination with the blades B, having the ends *c*, head C, having a water-passage, and collar D, for operating the blades or bits of a drill-rod, substantially as specified.

4. The coupling A, blades or bits B, having the ends *c*, head C, having a water-passage, and collar D, in combination with the lifting-valve F, for operating the blades and raising the cuttings, substantially as specified.

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Witnesses:

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