No. 708,995. Patented Sept. 16, 1902.

W. E. BUTLER.

DRILLING MACHINE.

(Application filed July 23, 1901.)

(No Model.) 5 Sheets—Sheet 1.

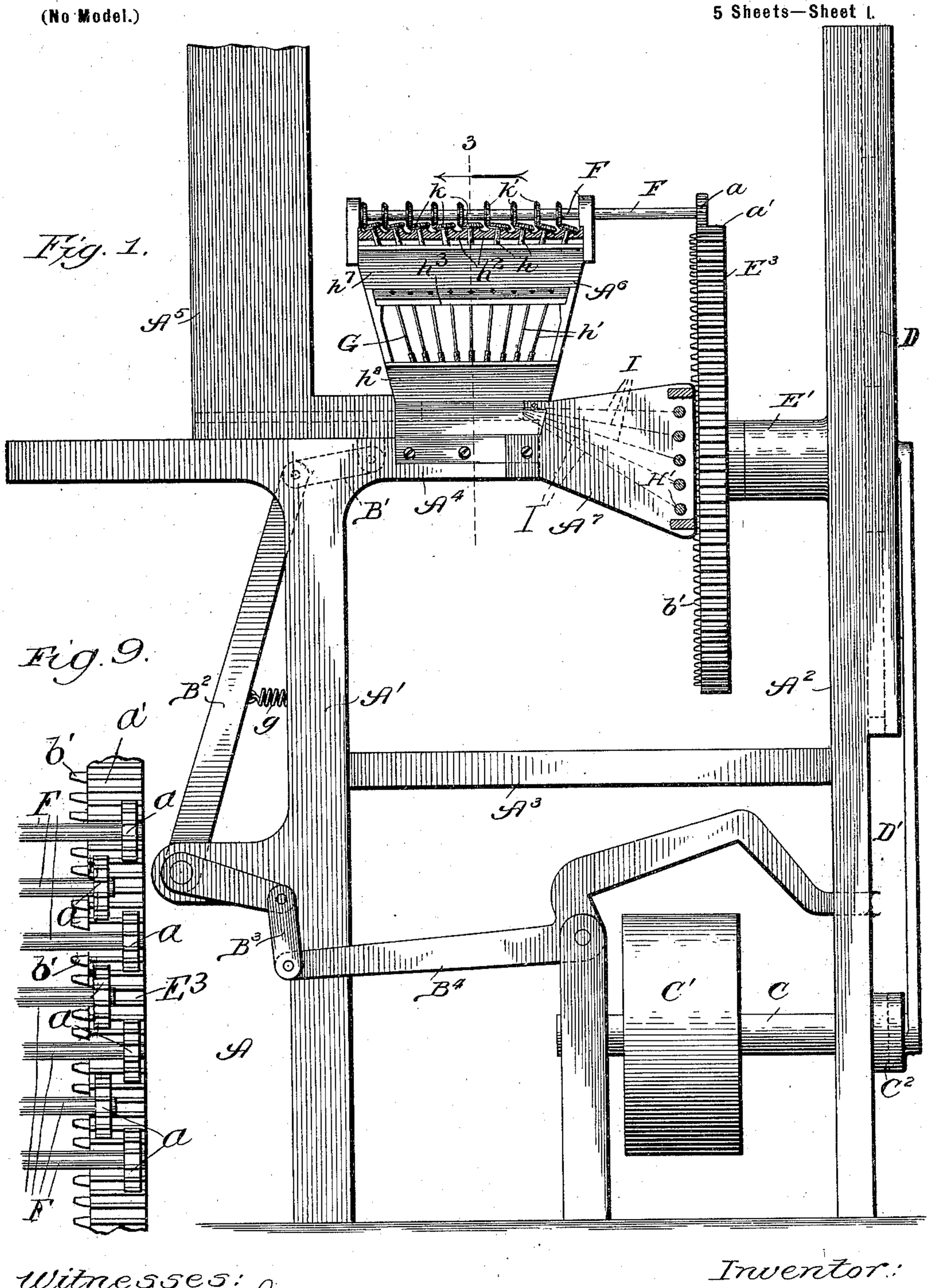

Fig. 1.

Fig. 9.

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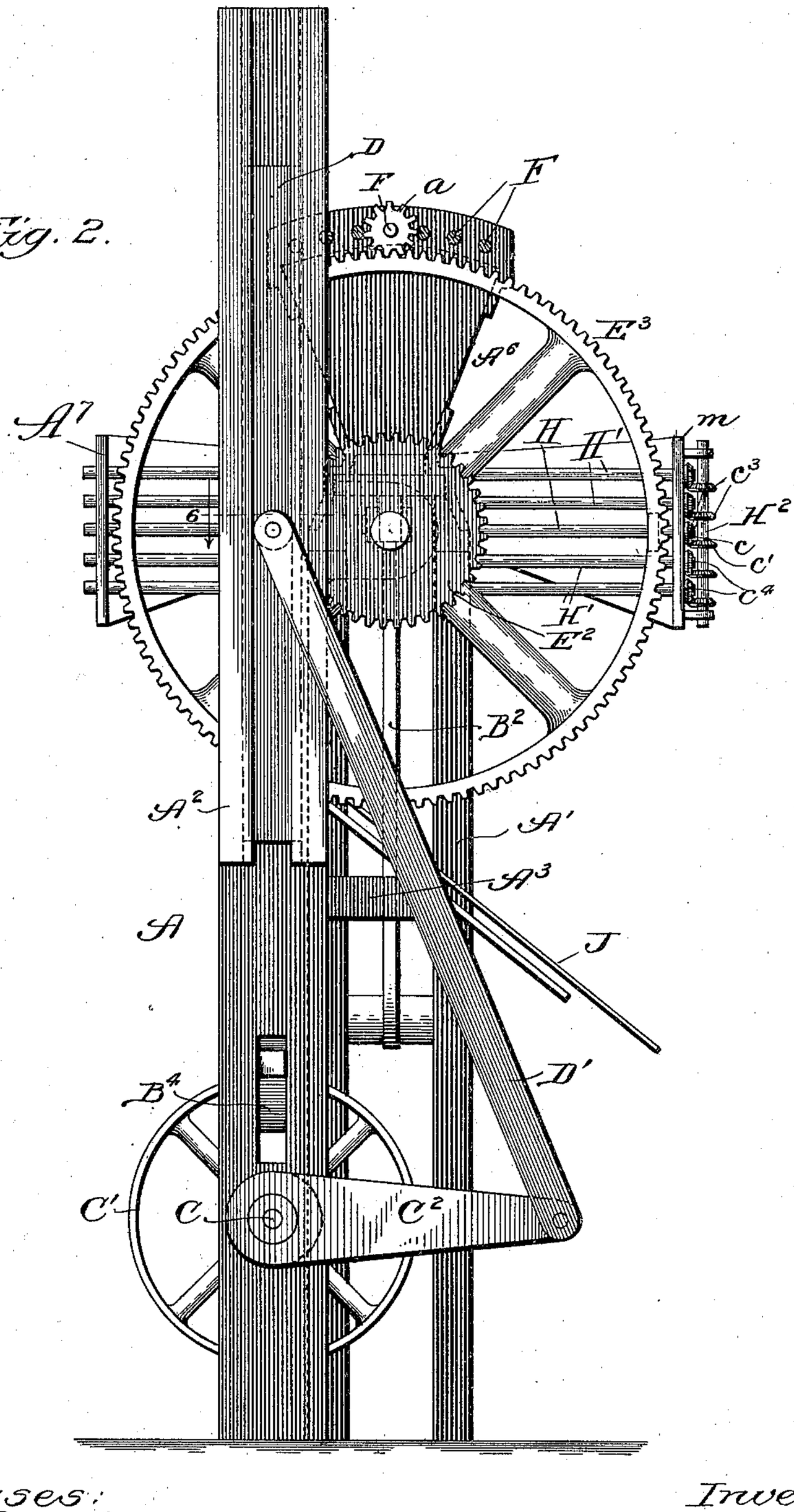
Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

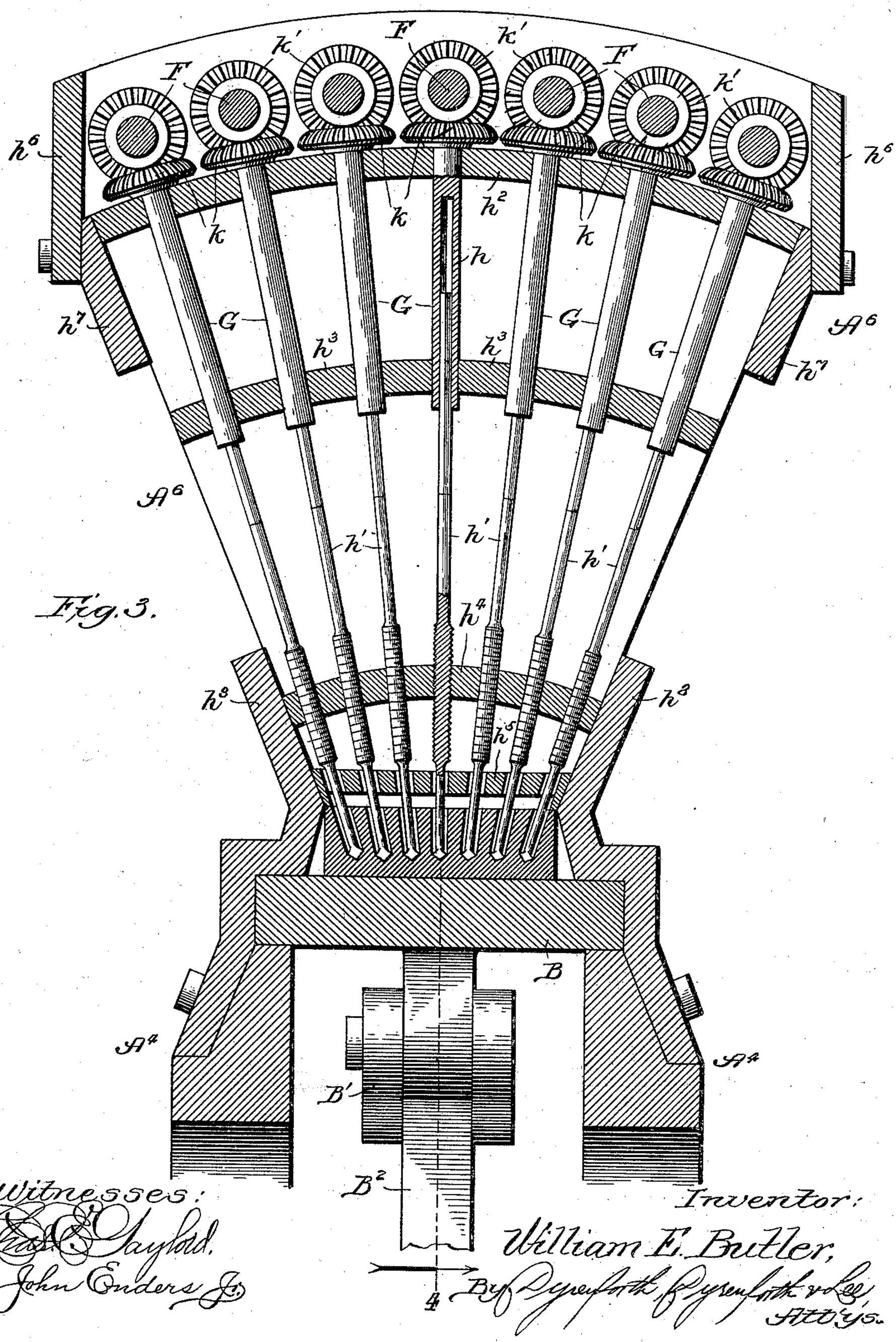

Fig. 3.

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(Application filed July 23, 1901.)

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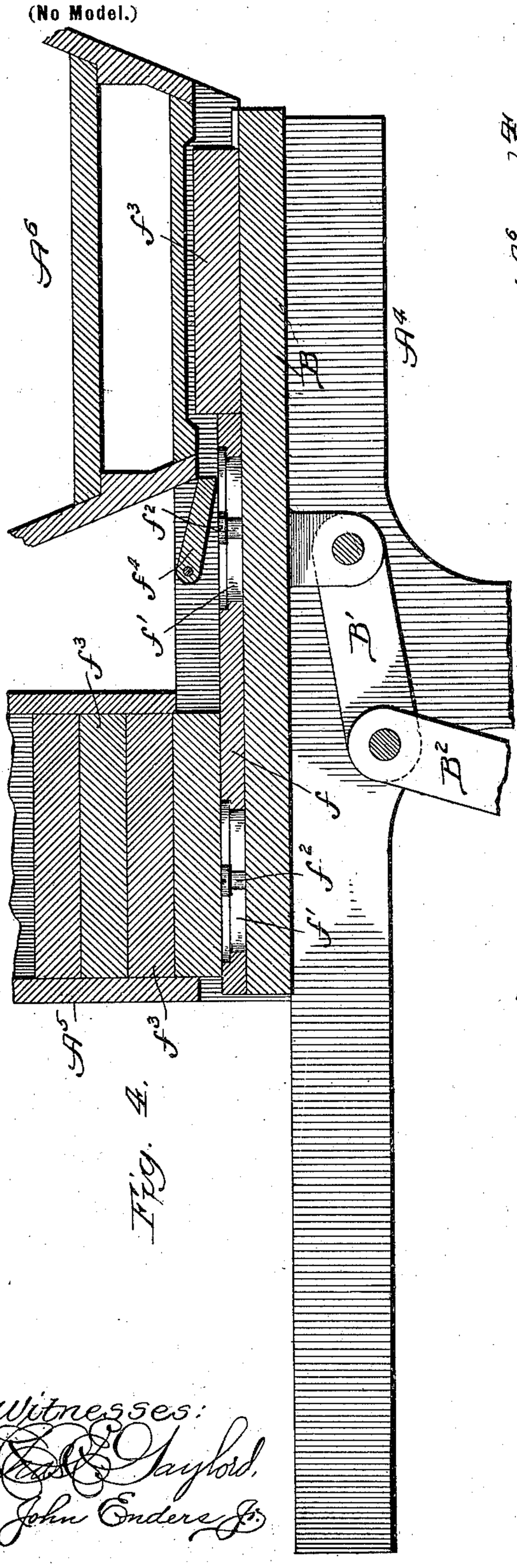

Fig. 4.

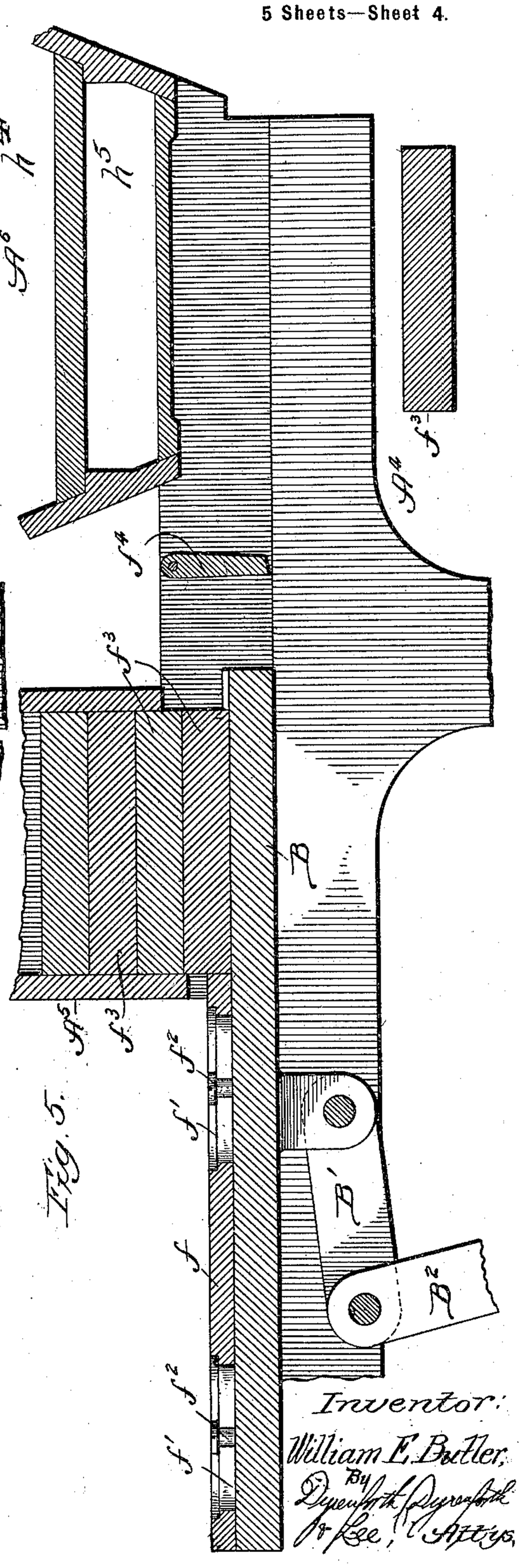

Fig. 5.

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No. 708,995. Patented Sept. 16, 1902.

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DRILLING MACHINE.

(Application filed July 23, 1901.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 6.

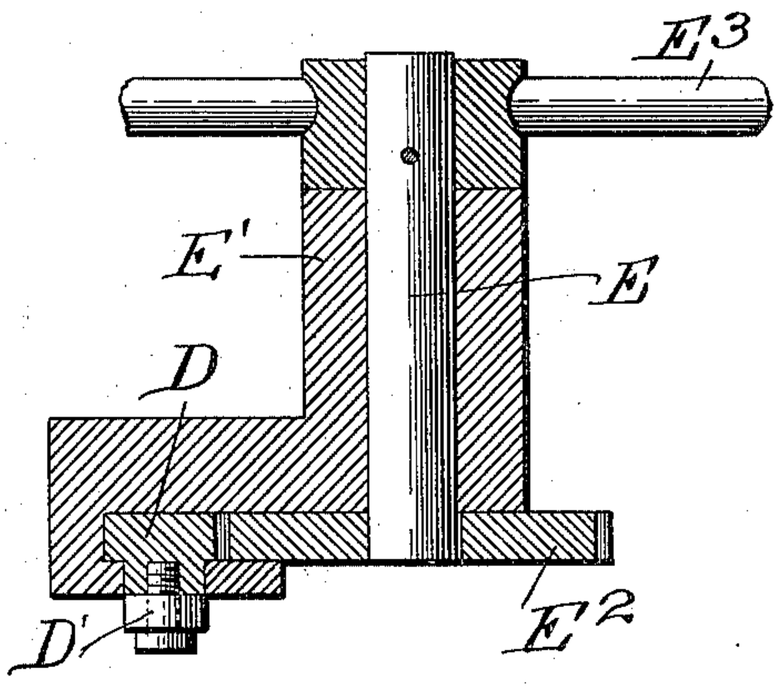


Fig. 7.

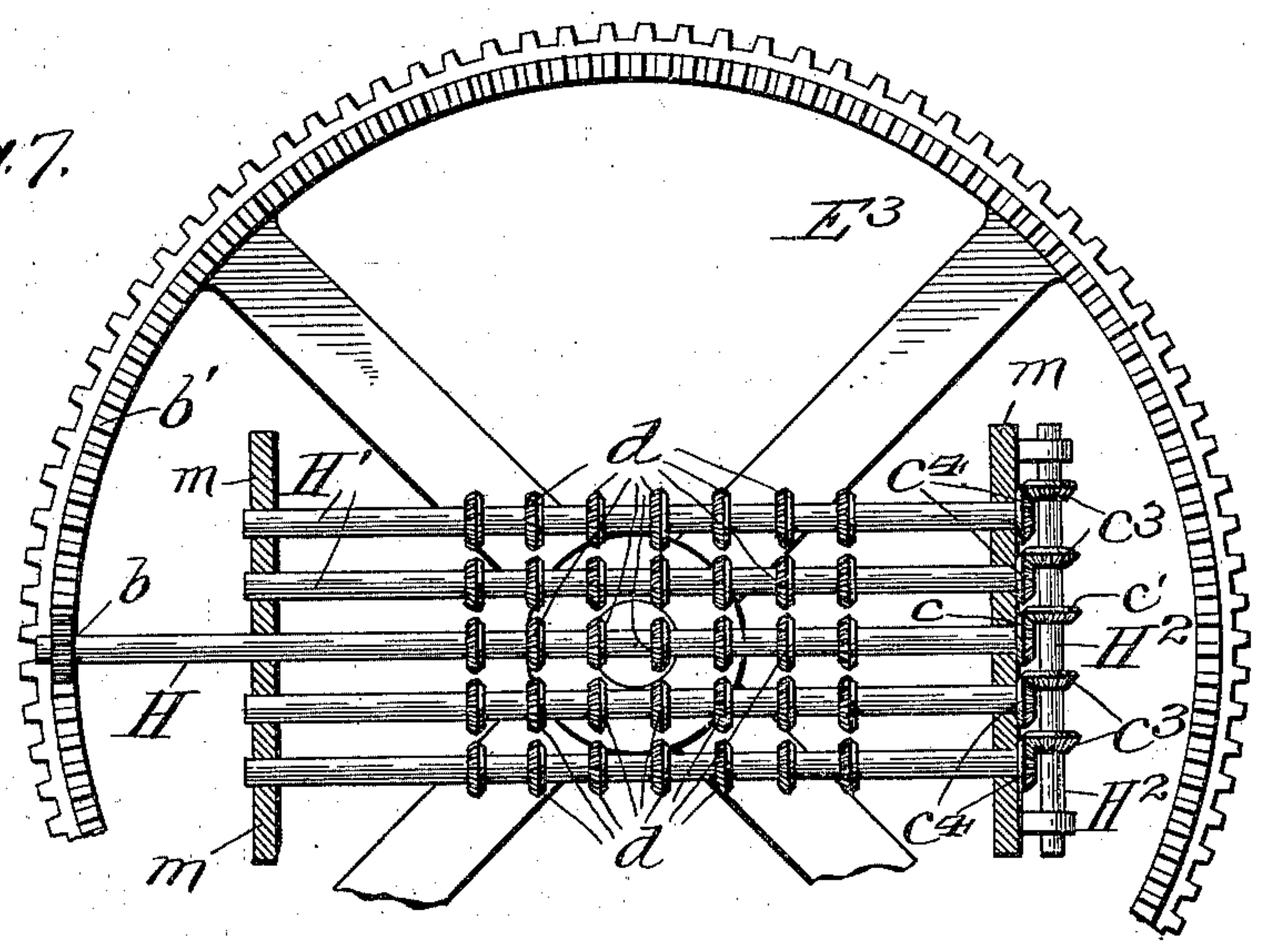
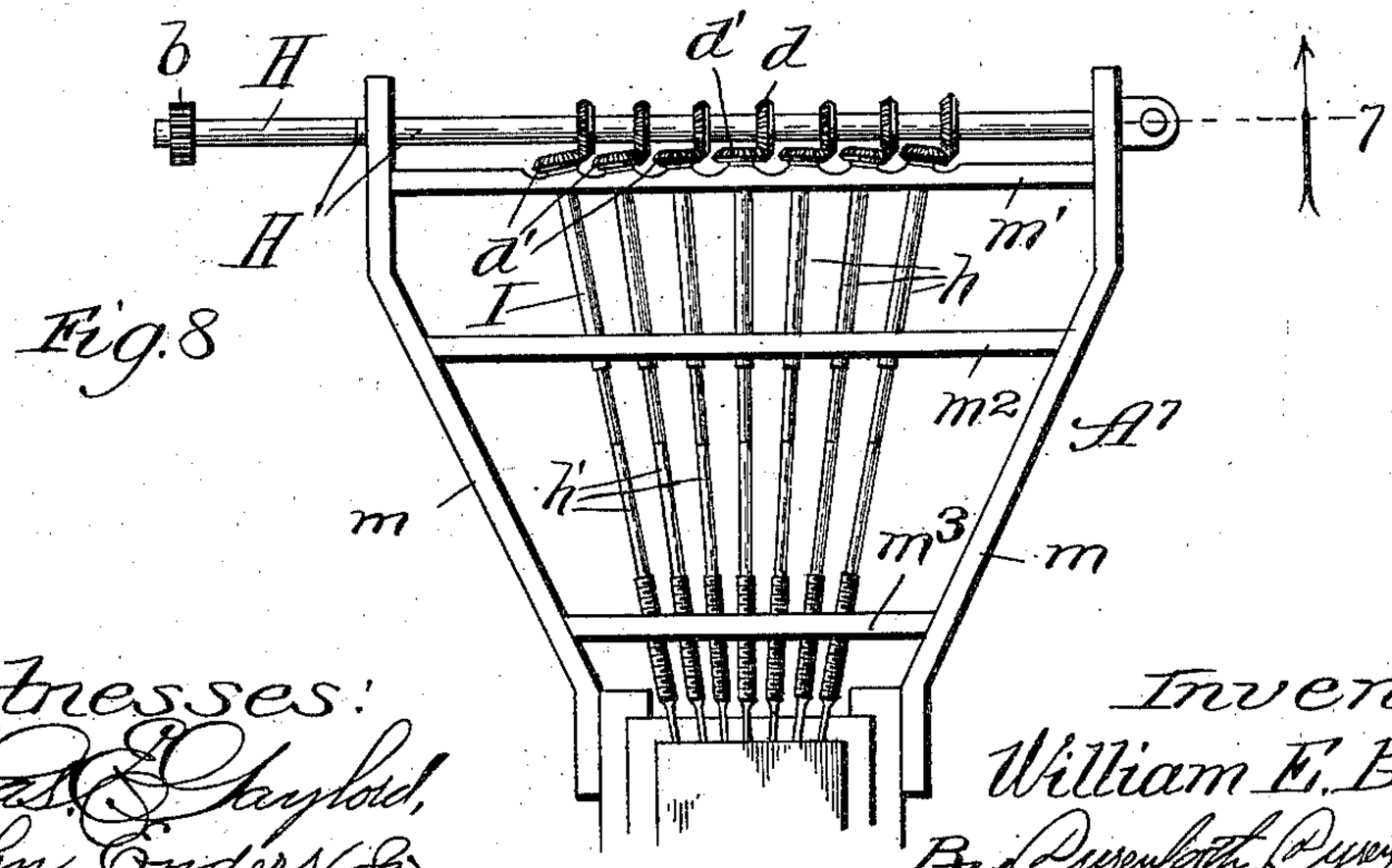


Fig. 8



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UNITED STATES PATENT OFFICE.

WILLIAM E. BUTLER, OF BEDFORD, INDIANA.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 708,995, dated September 16, 1902.

Application filed July 23, 1901. Serial No. 69,415. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. BUTLER, a citizen of the United States, residing at Bedford, in the county of Lawrence and State of Indiana, have invented new and useful Improvements in Drilling-Machines, of which the following is a specification.

My invention relates particularly to drilling-machines for use in boring brush-backs, &c., where it is advantageous to be able to drill a large number of holes, disposed at angles to each other, at one operation.

My primary object is to provide a machine of this character of high capacity, simple construction, and great durability.

In the preferred construction there are employed a series of parallel pinion-equipped shafts (usually horizontal) arranged in the outline of a portion of a cylinder, a plurality of rows of two-part extensible drills operated therefrom and arranged in radial planes and with convergent individuals in each row, an oscillating master-gear engaging the pinions on said shafts, and means for automatically feeding blocks beneath the reciprocating rotating bit portions of the drills. In addition there may be employed when desired a plurality of rows of drills operated from the aforesaid master-wheel and serving to drill at one end of the block.

The invention is illustrated in its preferred form in the accompanying drawings, in which—

Figure 1 is a view in side elevation of the machine; Fig. 2, a view in rear end elevation thereof; Fig. 3, an enlarged transverse vertical section of the main drill-frame, taken as indicated at line 3 of Fig. 1, the drills carried by said frame serving to drill holes at the upper surface of the stock; Figs. 4 and 5, enlarged broken sections showing the stock-receptacle and the feed-slide employed, the latter being shown in different positions; Fig. 6, an enlarged section taken as indicated at line 6 of Fig. 1; Fig. 7, a side view of a master-gear employed looking at the front side thereof and showing in connection therewith a portion of a supplemental or auxiliary drill-frame employed; Fig. 8, a plan view of said supplemental drill-frame, the drills whereof serve to drill one end of the stock; and Fig. 9, Sheet 1, a broken plan view showing the manner of operating the shafts at the main drill-frame.

The preferred construction is as follows:

A represents a main frame, comprising standards A′ A², joined by a cross-piece A³; A⁴, a feed-block guide forming a part of the main frame; A⁵, a stock-receptacle supported adjacent thereto; A⁶, a frame for the group of drills which serve to drill one side of the stock, said frame being supported from the guide A⁴; A⁷, a frame for the drills which serve to bore one end of the stock, said frame being supported from the guide A⁴; B, a reciprocating feed-block or plunger moving in the guide A⁴ and operated through the medium of links and levers B′ B² B³ B⁴; C, a driving-shaft journaled in the main frame and bearing a pulley C′ and provided also with a crank C²; D, Figs. 2 and 6, a vertically-disposed reciprocating rack moving in a guide in the frame member A² and operated through the medium of a link D′, connected with the crank C²; E, a shaft journaled in a boss E′, with which the frame member A² is provided, and equipped at one end with a pinion E², meshing with the rack D, and equipped at the other end with a master-gear E³; F, horizontally-disposed shafts equipped with pinions *a*, meshing with peripheral cogs *a′* on the master-wheel E³, said shafts F being grouped in the outline of a portion of a cylinder; G, a plurality of rows of two-part extensible drills lying in downwardly-converging planes, Fig. 3, the individuals of each row being also downwardly convergent, Fig. 1; H, Figs. 7 and 8, a shaft parallel to the master-gear E³ and equipped with a pinion *b*, meshing with cogs *b′* on a lateral peripheral margin of said master-gear; H′, shafts parallel to the shaft H; H², a shaft perpendicular to the shaft H and operated therefrom through the medium of bevel-gears *c c′*, the shafts H′ being operated from the shaft H² through the medium of bevel-gears *c³ c⁴*; I, Figs. 1, 7, and 8, rows of two-part extensible drills lying in inwardly-converging planes, Fig. 1, and having inwardly-converging individuals, Fig. 8, said drills being operated from the shafts H H′ through the medium of bevel-gears *d d′*, and J a downwardly and laterally inclined discharge-chute which receives the finished stock.

The manner in which the plunger or feed-block B operates to feed the stock from the receptacle A^5 beneath the drills is illustrated in Figs. 4 and 5. The plunger B is provided with an adjustable block f, having slots f' for receiving screws f^2, the inner or right-hand end of the block f serving as a shoulder for engaging one end of the block which is to be fed into the machine. The blocks of stock f^3—in this instance brush-backs—are received in superimposed position by the receptacle A^5, the lowermost block resting upon the plunger. When the plunger is in the position indicated in Fig. 5, the lowermost block is engaged by the inner end of the adjustable block f, and when the plunger moves rearwardly the brush-back is automatically fed beneath the drills. A pivoted block or stop f^4 is supported by the guide A^4 and serves to prevent retraction of the brush-back when the plunger is retracted. When the plunger is withdrawn from beneath the drilled block, the latter is permitted to drop through the guide which carries the plunger and into the discharge-chute J. The plunger is normally held at the inner end of its traverse by a spring g, Fig. 1, and is retracted through the medium of the levers and links shown, when the rear end of the lever B^4 is engaged by the lower end of the rack D during the downward movement of said rack. It will be understood that the rack D receives a reciprocating motion through the medium of the crank C^2 and that the master-gear E^3 accordingly receives oscillating movement about its axis. Each drill comprises a spindle h and a bit portion h', having an angular shank received by an angular socket provided in the spindle. Referring to Fig. 3, the spindles of the drills are shown journaled in part-cylindrical-form frame members h^2 h^3, and the bit portions have threaded connection with a part-cylindrical-form frame member h^4, said bit portions being received adjacent to their lower extremities by a suitable perforated frame member h^5. The drill-frame is in this instance completed by side members h^6 h^7 h^8. The spindles are equipped with bevel-gears k, rounded for the sake of interchangeability and meshing with bevel-gears k' on the shafts F F'. In Fig. 2 only one of the pinions a is shown, the shafts F for the remaining pinions being shown in section. As shown, said shafts are too close together to accommodate all the pinions in the same plane, and accordingly alternate shafts are shortened to cause the pinions to be staggered with relation to each other, as shown in Fig. 9.

The frame A^7 comprises in the preferred construction converging side members m, connected by cross-plates m' m^2 m^3. The spindles of the drills at this frame are journaled in the members m' m^2, and the bit portions of the drills have threaded connection with the member m^3. In Figs. 1 and 2 the rear or most widely separated ends of the side members m are separated by a space greater than the diameter of the master-gear E^3, whereas in the slightly-modified construction of Figs. 7 and 8 the rear ends of said side members are separated by a space less than the diameter of said master-gear. In the former case the shafts H H' are longer than in the latter case, the shaft H^2 and the bevel-gear connections of the shafts H H' being outside the periphery of the master-gear. The construction of Figs. 1 and 2 is permissible where the shafts F are not arranged on an arc of greater extent than that shown. Should the arc about which the shafts F are arranged be extended greatly, it would be necessary to have the shafts H H' and their gear connections wholly within the diameter of the master-gear, as is evident. This is the purpose of the modification shown in Figs. 7 and 8.

The operation will be readily understood from the foregoing description. Power is applied to the machine at the pulley C', and an oscillating movement is imparted to the master-gear through the medium of the reciprocating rack. At each downward movement of the rack the feed-plunger is rotated and upon the return movement carries a block beneath the drills. The result of the oscillating movement of the master-gear is to turn the drills first in one direction and then in the opposite direction. While the drills are being turned in one direction the bit portions are carried downwardly or inwardly, as the case may be, to operate upon the block or brush-back, and when the drills are turned in the opposite direction the bit portions thereof are retracted, whereupon the feed-slide is withdrawn from beneath the block, permitting the latter to be discharged.

It readily will be understood that by means of my improved machine articles such as brush-backs may be quickly and automatically drilled and that the holes drilled may have any desired inclination. Moreover, since each bit has a longitudinally-reciprocating movement there is no tendency to bend the drills, regardless of the depth to which they are caused to bore.

Changes in details of construction within the spirit of my invention may be made. Hence no limitation is to be understood from the foregoing detailed description except as shall appear from the appended claims.

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

1. In a drilling-machine, the combination of a suitable frame, and a rotatably (reversible) extensible two-part drill, comprising a spindle, through which power is applied, and a bit portion having threaded connection with the frame.

2. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, a series of rows of drills operated through said shafts, and means for imparting to the

drill-bits reciprocating longitudinal movement.

3. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, means for imparting oscillating rotary movement to said shafts, and a series of rows of two-part drills operated through said shafts and comprising spindles geared to said shafts and bit portions operated by said spindles and having reciprocating longitudinal movement.

4. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, means for imparting oscillating rotary movement to said shafts, and a series of rows of two-part drills operated through said shafts and comprising spindles geared to said shafts and bit portions having sliding connection with said spindles and threaded connection with said frame.

5. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, a master-gear having gear connection with said shafts, a reciprocating rack serving to operate said master-gear, a series of rows of extensible drills operated through said parallel shafts, and means for feeding stock beneath said drills.

6. In a drilling-machine, the combination of a suitable frame, a reciprocating feed-slide, a driving-shaft, a reciprocating rack, said rack and feed-slide being operated through said shaft, a master-gear actuated by said rack, a series of shafts actuated from said master-gear, and extensible drills actuated from said last-named shafts.

7. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts arranged on the surface of a portion of a cylinder, a master-gear, gear connections between said master-gear and said shafts, a series of rows of extensible drills operated from said shafts, a reciprocating feed-slide, a reciprocating rack, a lever connected with said feed-slide and having an end projecting into the path of said rack, and means for reciprocating said rack.

8. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, a series of rows of drills actuated from said shafts and lying in convergent planes, the individuals of each row being convergent, and means for operating said shafts.

9. In a drilling-machine, the combination of a suitable frame, a series of parallel shafts, extensible drills operated by said shafts, a master-gear operating said shafts, and a plurality of drills disposed substantially at right angles to said first-named group of drills and operated from said master-gear, said first-named group of drills operating to drill a side of a block and said second-named group of drills operating to drill an end of a block.

10. In a drilling-machine, the combination of a suitable frame, a guide, a reciprocating feed-slide connected with said guide, a plurality of drills arranged above said guide and operating to drill a side of a block, and a plurality of drills disposed substantially at right angles to said first-named group of drills and operating to drill an end of a block.

11. In a drilling-machine, the combination of a suitable frame, a reciprocating slide, a plurality of drills located above the path of said slide, a plurality of drills located at the rear end of the traverse of said slide, a master-gear, a plurality of shafts perpendicular to said master-gear and serving to operate said first-named drills, said shafts having gear connection to the periphery of said master-gear, and a shaft parallel to said master-gear and serving to operate said last-named group of drills, said last-named shaft having gear connection with a lateral peripheral margin of said master-gear.

WILLIAM E. BUTLER.

In presence of—
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JOHN S. ZAHN.