(No Model.)

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FEED MECHANISM FOR ELECTRIC RECIPROCATING ENGINES.

No. 479,961. Patented Aug. 2, 1892.

Fig. 1.

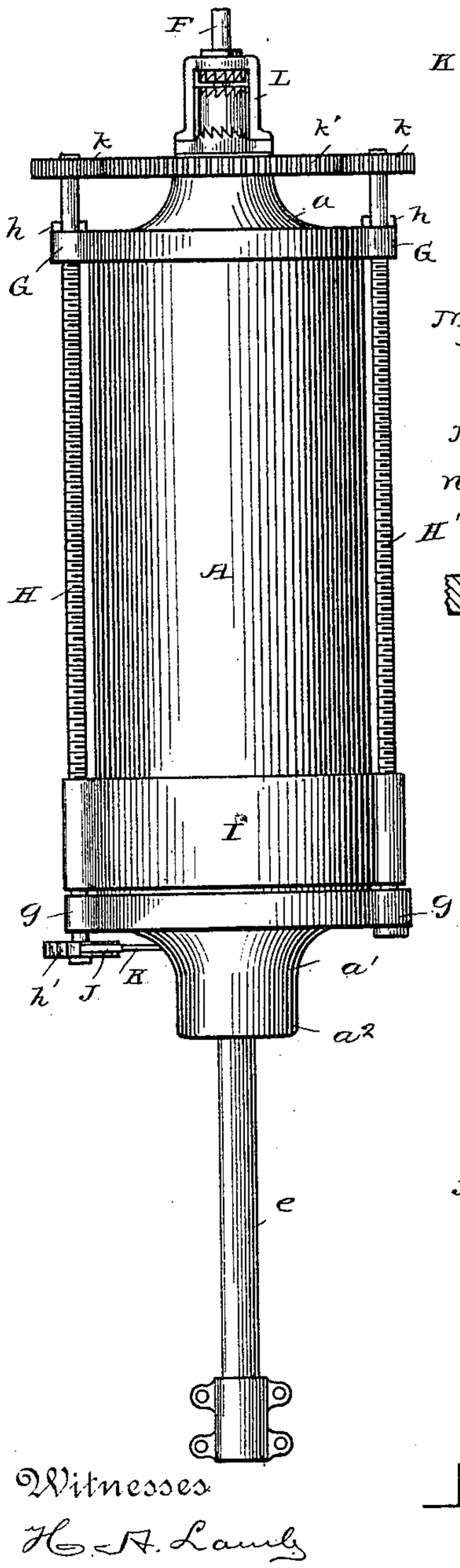


Fig. 3.

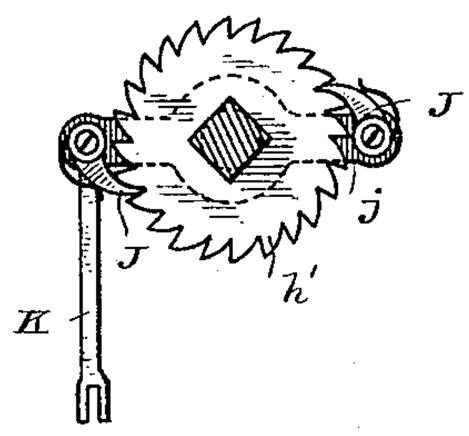


Fig. 6.

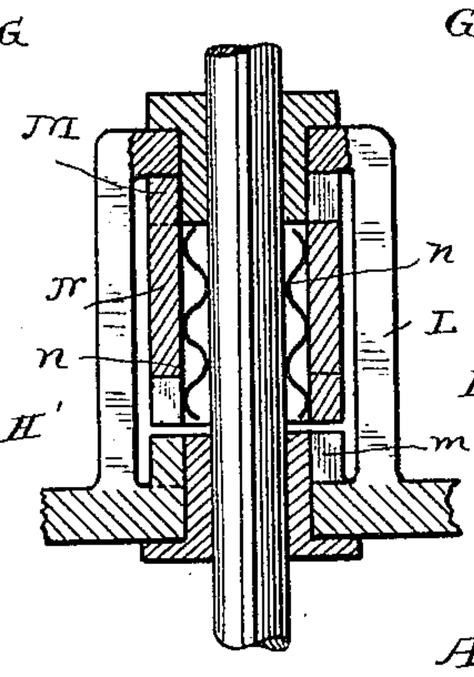


Fig. 5.

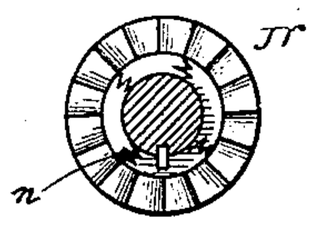


Fig. 4.

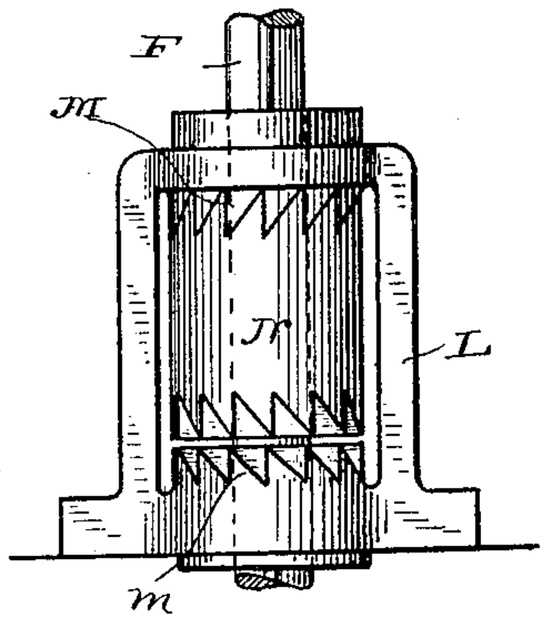
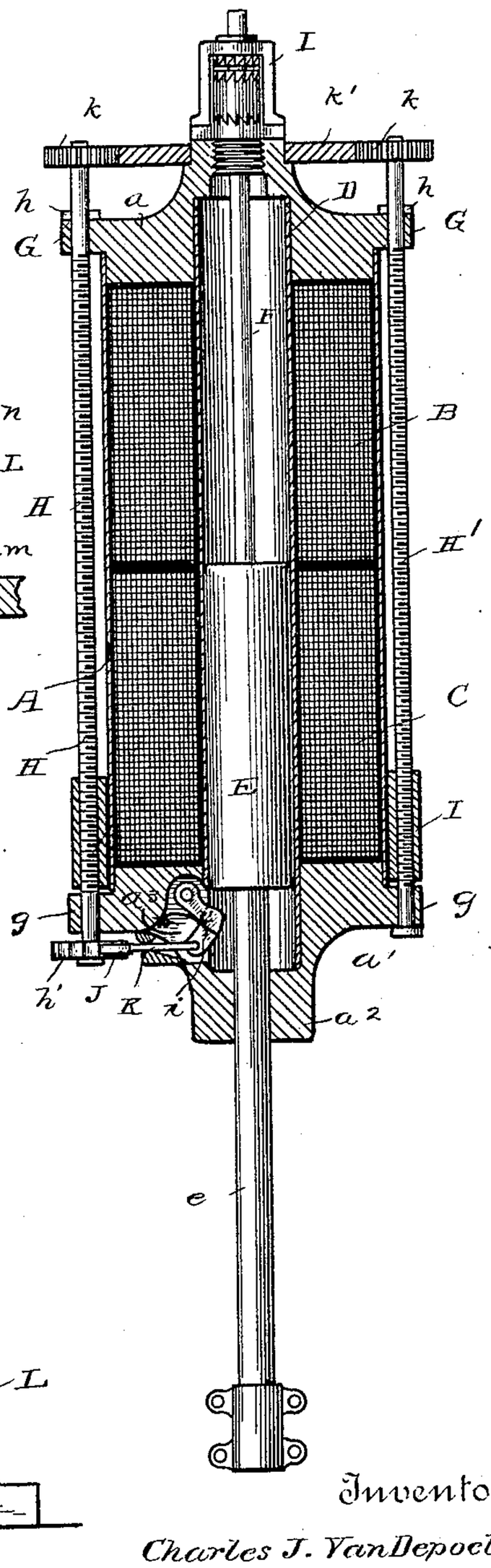


Fig. 2.



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UNITED STATES PATENT OFFICE.

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FEED MECHANISM FOR ELECTRIC RECIPROCATING ENGINES.

SPECIFICATION forming part of Letters Patent No. 479,961, dated August 2, 1892.

Application filed May 22 1890. Serial No. 352,718. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Tool-Rotating and Feed Mechanism for Electric Reciprocating Engines, of which the following is a description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to a new and improved tool-rotating and feed mechanism for reciprocating electric engines.

The invention is not necessarily restricted to electric engines, but may be employed in connection with reciprocating apparatus of various types.

A form of the apparatus is shown by way of illustration, and will be hereinafter fully described, and referred to in the appended claims.

In the drawings, Figure 1 is a view in elevation showing a reciprocating electric engine embodying the invention. Fig. 2 is a vertical sectional elevation, some of the parts being shown in full. Fig. 3 is an enlarged detail of part of the feed-actuating mechanism. Figs. 4, 5, and 6 are enlarged detail views of the tool-rotating mechanism.

As seen in the drawings, A is the outer casing, within which are contained the motor-coils B C. A protecting tube or lining D is fitted within the motor-coils, and the magnetic piston E is arranged to be reciprocated within the tube D. The piston E carries at its lower end a tool-stock *e* and is provided at its upper end with an extension in the form of a guide-rod F. The ends of the cylinder A are closed by heads *a a'*. The head *a'* is provided with a suitable extension a^3, through which passes the tool-stock or piston-rod *e*, which may be surrounded at that point with suitable packing, if desired. Lugs G G *g g* are formed or provided upon the heads *a a'*, said lugs extending beyond the outer diameter of the cylinder A. Feed-screws H H' are at their extremities rotatably sustained in suitable bearings formed in the said lugs, the screw-threaded portion of the said feed-screws being entirely between the lugs. Furthermore, the feed-screws are secured in position by collars or similar devices *h*. A stationary part or support I is provided with screw-threaded openings, through which the feed-screws pass, and it follows from the connection existing between the feed-screws and the cylinder A and connected parts that upon rotation of said feed-screws the machine will be moved relatively to the support I. The support I may in itself be adjustable or fixed, as is well known in the art, for which reason no specific details are shown in connection therewith.

A step-by-step movement is imparted to the feed-screws and through them to the engine by means of a pawl-and-ratchet mechanism connected, preferably, to the lower extremity of one of said feed-screws and arranged to operated in accordance with the movement of the piston E. Within a cavity a^3, formed in the head *a'*, is pivoted a trigger *i*. The trigger *i* will, when the machine is operated vertically, normally hang in such position that one of its angles *i'* will be in the path of the piston E when said piston reaches a point near the end of its stroke. A ratchet *h'* is secured to the lower extremity of the feed-screw H for imparting motion thereto, and pawls J J are pivoted upon a cross-arm *j*, which is rotatably sustained upon the lower extremity of the feed-screw H. One end of the cross-arm *j* is connected by a rod K with the lower portion or swinging part of the trigger *i*, so that when the trigger *i* is forced outward by contact with the piston E it will push forward the connecting-rod K, thereby moving the arm *j* and pawls J, which, being in engagement with the teeth of the ratchet *h'*, will impart thereto a degree of movement depending upon the extent of the throw of the trigger *i*. The friction of the connected parts, the feed-screws, and supports, will hold the ratchet in the position to which it has been forced, and the cross-arm and pawls may, when the piston has been retracted, move back to their normal position by gravity, al-

though I may use a retracting-spring, which may be attached to the connecting-rod K or placed in the cavity a^3 in front of the trigger i. The feed-screws must of course be of the same pitch and their upper extremities are connected by suitable gearing, so that they will move together at all times. Upon the upper end of each feed-screw is placed a gear-pinion k. The pinions k are connected by an intermediate gear-wheel k', which may conveniently be journaled upon the upper end of the head a.

With such a construction if the machine be started when the tool is at a distance from the work the piston e will make its full stroke and at each reciprocation will strike the trigger i, thus bringing the machine nearer to the work at each stroke and actuating the feed mechanism to its fullest extent. Supposing the tool carried by the rod e to be a drill-steel, as the latter encounters the rock the stroke of the piston will be somewhat shortened and the trigger i will therefore only be struck by the piston as the tool penetrates the rock. Consequently the feed of the machine will depend entirely upon the progress of the work and be thereby rendered automatic. I propose, of course, to vary the shape of the trigger i or to change its position so as to bring its outer angle into the path of the piston nearer to or farther from the limit of the stroke thereof, according to the result desired. One of the peculiarities of my electro-magnetic reciprocating engine is found in the magnetic cushion, which prevents the piston from passing out of its field of force under any circumstances, and this enables me to adjust the relative position of the trigger and piston in a satisfactory manner.

The tool-rotating mechanism comprises a metallic frame L, which is mounted upon the upper portion of the head a and is provided with two face-ratchets M m, the ratchet M, for instance, being secured at the upper part of the frame L concentric with the piston and with its teeth pointing downward. The ratchet m is secured at the lower part of the frame L, with its teeth pointing upward. The two face-ratchets, however, are so arranged that their teeth are somewhat displaced with respect each to the other, although they may be in all other respects exactly similar. The face-ratchets are both centrally apertured to give free passage to the outer end of the guide-rod F. The guide-rod F extends up through both face-ratchets, and upon that portion extending between the ratchets it is provided with a cylindrical double-ended ratchet N. The double ratchet N is provided with similar symmetrically-arranged teeth at each end so that in ascending its upper teeth will engage the face-ratchet M, while in descending the teeth on its lower face will engage the ratchet m. If, however, the teeth of one of the face-ratchets be displaced so that the lower teeth, for example, of the double ratchet engage the apices of the teeth of the displaced ratchet, its continued descent would impart rotary movement to the extent of a portion of the angles of said teeth, depending upon the extent of their displacement. The rod F is capable of moving through the double ratchet N, since said ratchet need only move a distance slightly exceeding the depth of its teeth. At the same time said ratchet must be moved by the rod. Therefore a frictional connection (indicated by springs n) is provided within the ratchet, which is, however, also connected to said rod by a feather and spline, so that in the reciprocations of the rod the ratchet is first carried up into engagement with the face-ratchet M, where it remains until the rod has moved to the extent of its stroke, when as the rod begins its return stroke the ratchet is moved back into engagement with the other face-ratchet and at that moment imparts its rotary movement to the rod F and connected parts, the rod mean while continuing its forward or working stroke.

Various modifications and specific changes may be made in the construction and arrangement of the hereinbefore-described apparatus without departing from the spirit or nature of the invention, and I therefore do not limit myself to the particular details herein set forth.

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

1. The combination, in a reciprocating engine, of a cylinder having heads and a reciprocating piston having a tool-holding extension at one end and grooved or splined extension at the other, a fixed support through which the cylinder is movable, two feed-screws on opposite sides of the engine, said screws being sustained in the fixed support and engaging screw-threaded extensions upon the cylinder, a gear-wheel at one end of each feed-screw and an idler in mesh with both, a ratchet at the other end of one of the feed-screws, a movable trigger in the path of the piston, and a connection between the trigger and the ratchet, whereby the feed mechanism is operated by the movement of the plunger, and a rotating mechanism engaging the splined extension and actuated by the reciprocations of the plunger to impart rotary movement thereto at each stroke.

2. In a reciprocating engine, a tool-rotating mechanism comprising stationary face-ratchets, a reciprocating extension from the moving parts, and a double-ended ratchet in frictional engagement with the moving extension, but non-rotatable thereon, and arranged to be thereby moved into engagement with first one and then the other of the face-ratchets, one of said ratchets being displaced, whereby the return-stroke of the extension will move the double ratchet into engagement with the displaced face-ratchet and cause a partial rotation of the double ratchet and connected parts.

3. In a reciprocating engine, the combination, with an extension from the piston, of a pair of opposing face-ratchets, one of said

ratchets being displaced and between which the said extension is reciprocated, a double-ended ratchet movable between the face-ratchets to engage first one and then the other, said double ratchet being non-rotatable upon the extension, and a frictional connection between the double ratchet and the said extension, whereby the double ratchet is moved into engagement with the face-ratchets alternately in accordance with the reciprocations of the extension.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:
HENRY A. LAMB,
WM. D. POOL.