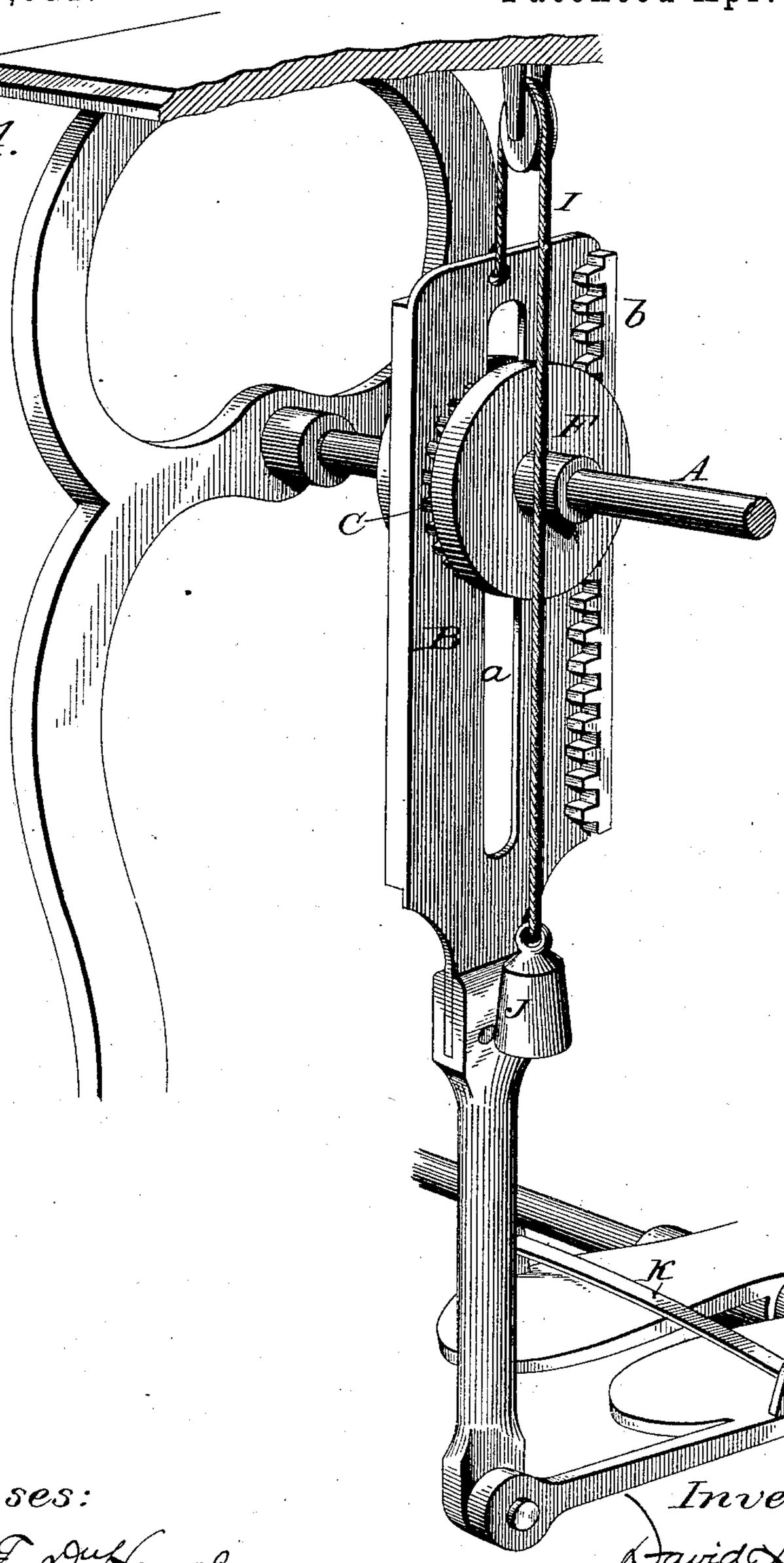
(No Model.) 2 Sheets—Sheet 1.

D. L. MILLER.

MOTOR.

No. 315,051. Patented Apr. 7, 1885.

Fig. 1.



Witnesses:

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Inventor:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

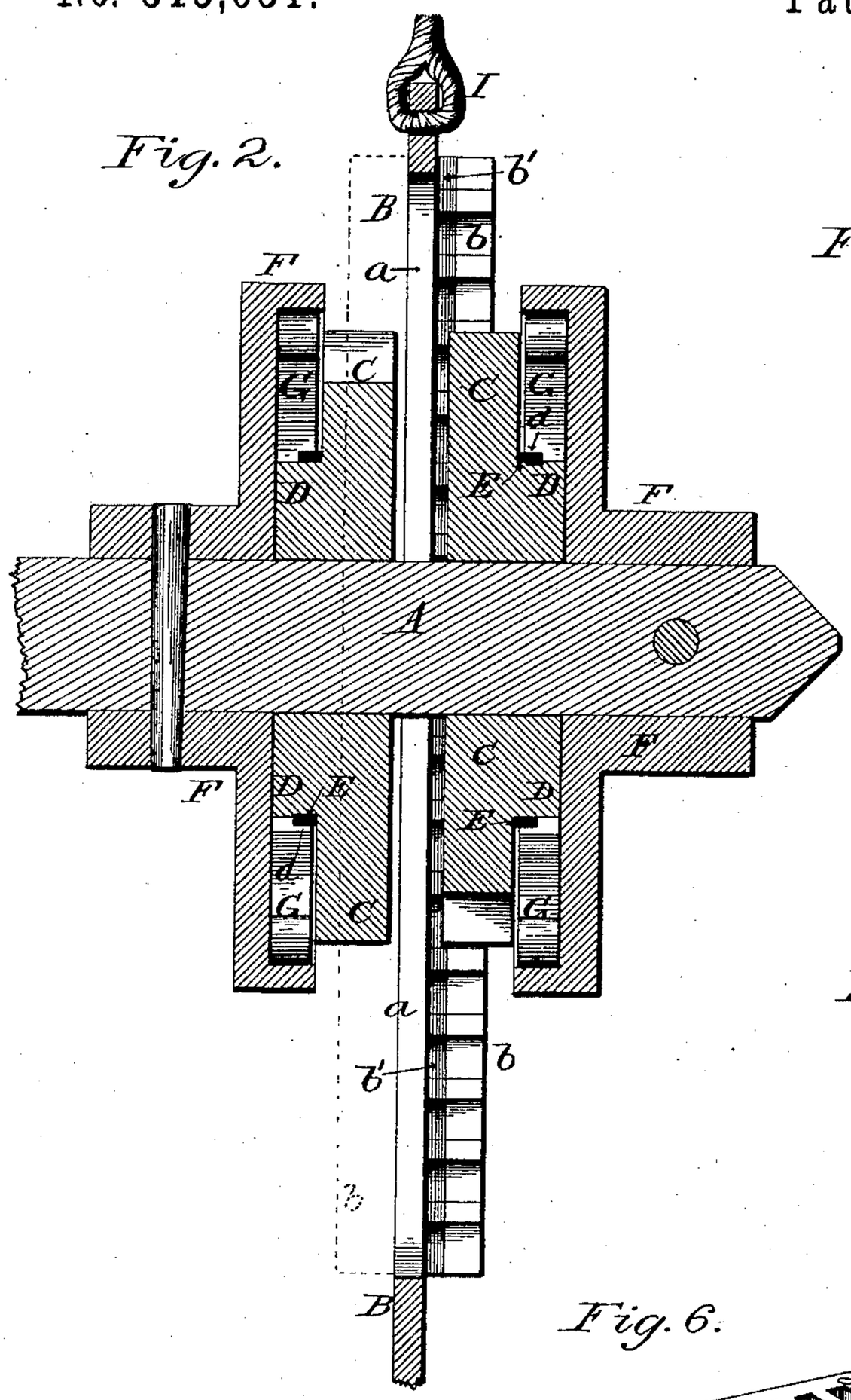


Fig. 3.

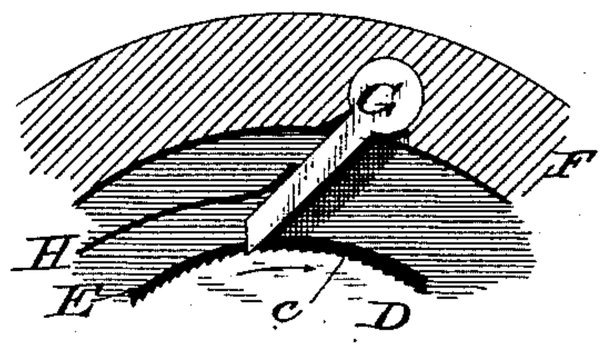


Fig. 4.

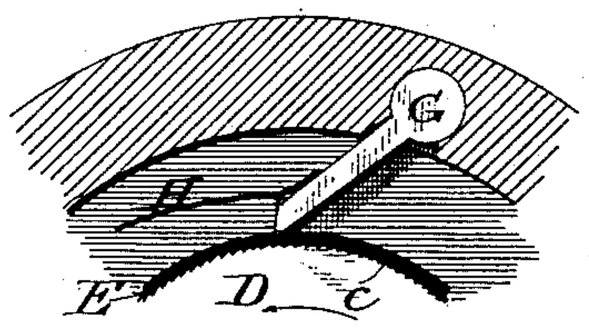


Fig. 5.

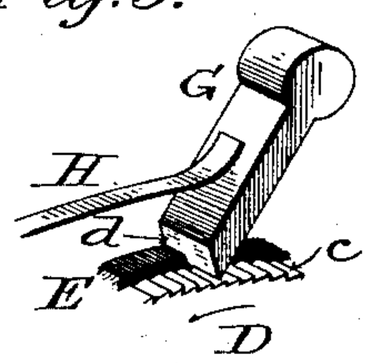


Fig. 6.

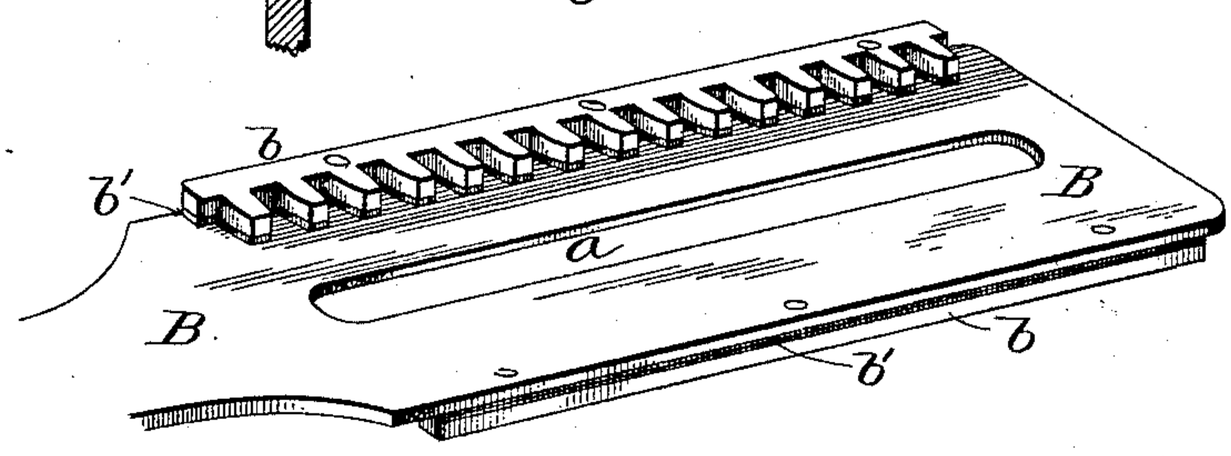
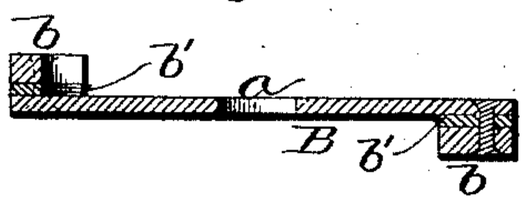


Fig. 7.



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UNITED STATES PATENT OFFICE.

DAVID L. MILLER, OF MADISON, NEW JERSEY.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 315,051, dated April 7, 1885.

Application filed April 23, 1884. Renewed March 7, 1885. (No model.)

To all whom it may concern:

Be it known that I, DAVID L. MILLER, of Madison, in the county of Morris and State of New Jersey, have invented certain new and useful Improvements in Motors, of which the following is a specification.

My invention relates to mechanism for converting reciprocating into rotary motion, and is designed as an improvement upon that for which Letters Patent were granted to me bearing date January 9, 1883, and numbered 270,458.

The present improvement consists, primarily, in constructing or providing the clutch-wheel and rack with a sound-deadening strip, band, or portion capable of preventing the vibrations and consequent resonance of said parts.

The invention further consists in a novel construction of a clutch whereby the locking dogs or pawls are caused to ride clear of the teeth on the back stroke or turn, and in other features and details of construction hereinafter fully set forth and explained.

In the accompanying drawings, Figure 1 is a perspective view of my improved device; Fig. 2, a vertical section in the plane of the axis of the shaft; Figs. 3, 4, and 5, detail views illustrating the construction and operation of the clutch; Figs. 6 and 7, details of the operating rack.

Mechanisms for converting reciprocation into rotary motion have heretofore been made in a variety of forms, and many such mechanisms have embraced alternately-acting clutches. Such construction is shown, for instance, in my former patent, above referred to.

In operating all classes of machinery it is desirable to avoid noise as far as possible, and this desire becomes a necessity when the mechanism is employed for domestic purposes—as, for instance, in operating sewing-machines.

The object of my invention therefore is, primarily, to so construct the mechanism that it shall be practically noiseless in operation, which result I secure through the construction now explained with the aid of the accompanying drawings.

A indicates a shaft, which in practice is mounted in boxes carried upon centers or otherwise suitably supported to permit it to rotate freely, and B is a plate or bar of metal having a longitudinal slot or opening, *a*, midway between its edges, to permit the shaft to pass through it and to allow a longitudinal movement of the plate while thus straddling the shaft, as more plainly illustrated in Fig. 1. The plate is formed with a toothed rack, *b*, on each face, the rack on one face being at or near the opposite edge of the plate from that at which the other rack is located, and both of said racks having the points or ends of their teeth turned inward toward the shaft or toward the slot *a*. Each rack gives rotary motion alternately in opposite directions to a gear-wheel or pinion, C, one of said pinions being placed loosely upon the shaft against the face of the plate, and the other being similarly mounted at the other side of said plate, as shown in Figs. 1 and 2.

In consequence of the racks *b* being on opposite sides of shaft A, it follows that when the plate or bar B is moved in either direction one pinion will be caused to turn forward and the other backward, or in the opposite direction, and this action will of course occur whether the plate or bar be moved in one direction or the other; but the direction of rotation of both pinions is reversed when the direction of movement of plate or bar B changes. It thus happens that one or the other pinion is moving forward at all times so long as the plate or bar is reciprocated.

Thus far the construction is the same substantially as that described in my former patent.

In the present case, however, each pinion is formed with a laterally-projecting hub or boss toothed or notched on its periphery to form a ratchet-wheel, D, as shown in Figs. 2, 3, 4, and 5, and upon this hub or ratchet-wheel, preferably at the inner side next to the face of pinion C, is placed a ring or band, E, of leather, rubber, or other flexible or elastic non-resonant material, either seated in a groove in or drawn tightly around the surface of the ratchet-hub and projecting slightly beyond or above the crests of the teeth *c*, as more plainly shown in Figs. 3, 4, and 5. Outside of the pinions C are placed two disks or shells, F, formed with an inwardly-turned overhanging

flange of a depth about equal to the breadth or thickness of the ratchet-hubs D, as shown in Fig. 2. Each disk or shell F is provided with one, two, or more pawls, G, pivoted near the periphery of the disk and extending inward to the toothed surface of the ratchet-hubs, as more plainly shown in Figs. 2, 3, and 4, toward which surface they are urged by springs H. The pawls G are of the form shown in Figs. 2 and 5 being slightly cut away at their free ends about one-half their width to make room for the band E of leather or like material. The height or thickness of the said band and the projection of the tooth or beveled end of the pawl beyond the cut-away portion bear such relation that when the ratchet-hub is moving backward, and there is no tendency for the shoulder or face *d* to bind upon the hub E, said band holds the pawl up sufficiently to raise its beveled end off the ratchet-teeth, and thus to prevent any noise on the back-stroke or return. When, however, the pinion and its ratchet-hub are turned forward, the shoulder *d*, bearing upon the band and held against the same by the pressure of the spring H, binds thereon and tends to move the free end of the pawl with it. Such movement, carried to even the slightest degree, causes the pawl to approach more nearly a radial position, and hence throws the beveled nose inward toward the axis of the wheel, which movement, though very slight, is nevertheless sufficient to cause the engagement of the pawl with the ratchet. All further movement of the ratchet of course causes a corresponding rotation of the disk or shell F, carrying the pawl or pawls thus thrown into engagement with the ratchet.

Since, as already stated, one pinion and ratchet turns backward as the other turns forward, one or the other ratchet will be free at all times, and when one is free the other will be engaged by the pawls; hence one or the other disk F is at all times being positively turned forward, and as said disks are pinned or keyed to shaft A the shaft receives continuous rotary motion in one and the same direction. The engagement of the pawls occurs almost instantaneously upon the commencement of the forward movement of the respective disks.

In order to overcome the resonance of the racks *b b* and the plate B, I prefer to make them partly of metal and partly of leather, wood, or any non-resonant substance possessing a sufficient amount of strength, in the manner illustrated in Figs. 6 and 7, in which the metal portion of the racks is shown as a separate strip riveted to the plate with an intervening strip, *b'*, of wood, leather, or other suitable material. In practice wood will be found to answer well, the grain being advisably transverse to the length of the rack to cause it to wear to the best advantage.

In order to counterbalance the weight of the plate B and such parts as may be attached to it, a cord or band, I, is connected with the upper end and carried over a pulley, as in Fig. 1, the cord being furnished with a counter-weight, J, as shown.

A spring may obviously be substituted for the counter-weight without departing from the spirit of my invention.

It is obvious that a single-acting machine may be made with one pinion, rack, ratchet, and disk.

The lower end of the arm of plate B will be connected with a treadle, or in any other convenient manner, in order that it may have a reciprocating motion. A cross-bar or strap, K, is carried across the front of the treadle to pass over the toes and give additional power on the upstroke.

Having thus described my invention, what I claim is—

1. The herein-described mechanism for converting motion, consisting of shaft A, plate or bar B, provided with racks *b*, pinions C C, loosely mounted upon the shaft and provided with ratchet-hubs D D, and shells or disks F F, provided with pawls G and springs H, all substantially as shown and described.

2. In a motor substantially such as described and shown, the combination of a ratchet-wheel having an encircling band of non-resonant material and a pawl or pawls arranged to engage with said ratchet, substantially as shown and described.

3. In a motor substantially such as shown and described, the combination, with a rotary disk carrying pawls, of a ratchet-wheel having a non-resonant band to form a rest for the ends of the pawls when not in actual engagement with the teeth of the ratchet, substantially as and for the purpose explained.

4. The combination, substantially as described and shown, of a shaft, A, a disk secured to said shaft and provided with pawls G, having shoulders *d*, pinion C, provided with ratchet-hub D, and non-resonant band E, all constructed and arranged to operate substantially as shown and described.

5. In combination with a ratchet-wheel, a non-resonant band by the side of the teeth, a disk carrying pawls provided with a beveled end to engage with the ratchet and a shoulder to bear upon the non-resonant band, and a shaft extending through the disk and ratchet-wheel, and rigidly connected with one of said parts.

6. In a motor substantially such as described, a ratchet-wheel provided with a non-resonant band, substantially as described, to prevent vibration of the metal of said wheel.

7. In combination with the pinions of a motor substantially as described, a rack, B, having toothed metal strips *b* and non-resonant strips *b'*, interposed between the body or plate of the rack and the toothed metal strips, substantially as shown.

8. In combination with a pinion, a metal rack-bar having a non-resonant strip secured to it to prevent vibration and consequent sound, substantially as explained.

9. In combination with shaft A, rack B, and ratchet mechanism, such as described and shown, a counter-balance connected with said rack, substantially as and for the purpose set forth.

10. In combination with shaft A, rack B, and ratchet mechanism such as described and shown, a foot-treadle connected with the rack-bar and provided with a strap or bar to pass over the toes of the operator, as and for the purpose set forth.

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