(No Model.)

2 Sheets--Sheet 1

J. F. GORDON.

Mechanical Movement.

No. 232,486. Patented Sept. 21, 1880.

Fig. 1.

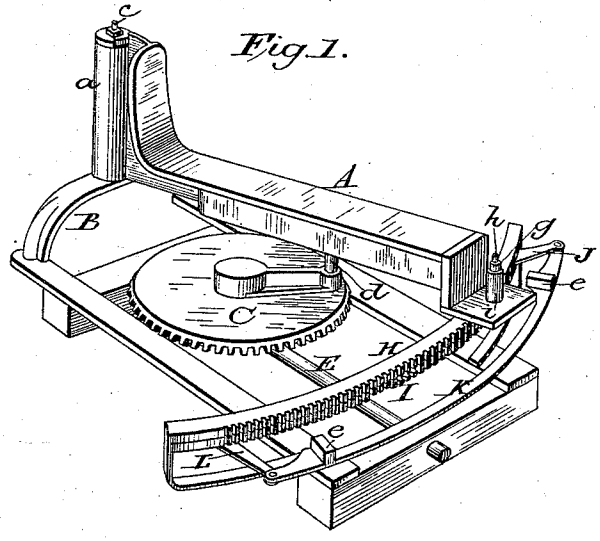
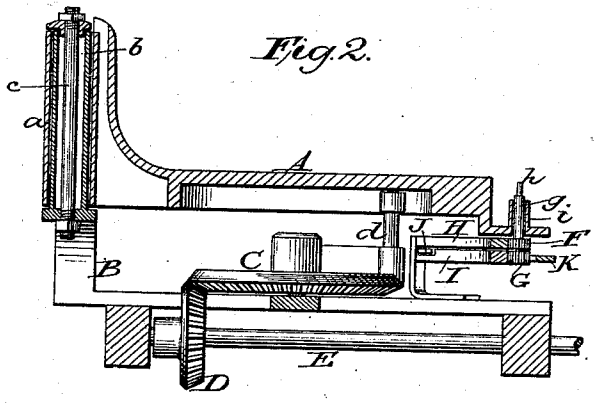


Fig. 2.



Attest:

Sidney P. Hollingsworth,

William M. Dodge.

Inventor:

J. F. Gordon,

By Dodge & Dodge,

Attys

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.)

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Fig. 3.

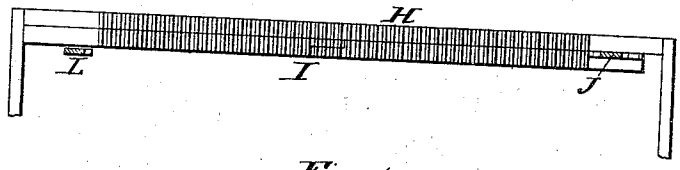


Fig. 4.

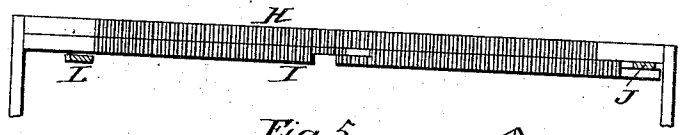


Fig. 5

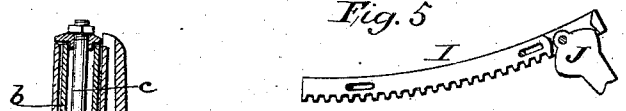


Fig. 6

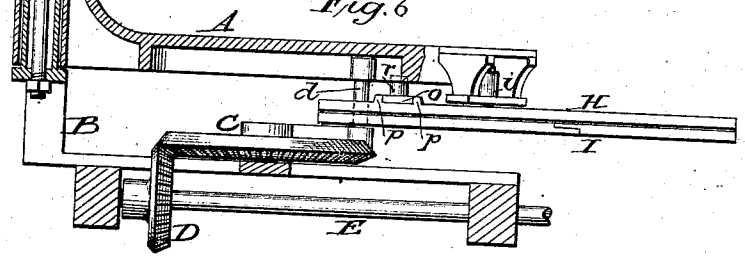


Fig. 7

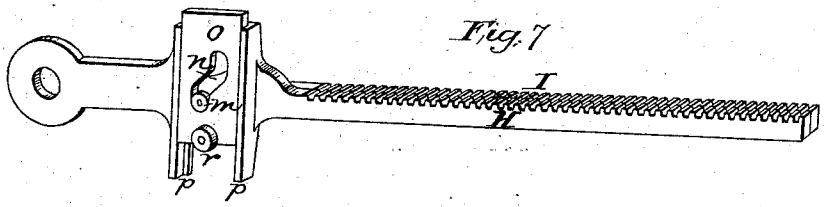
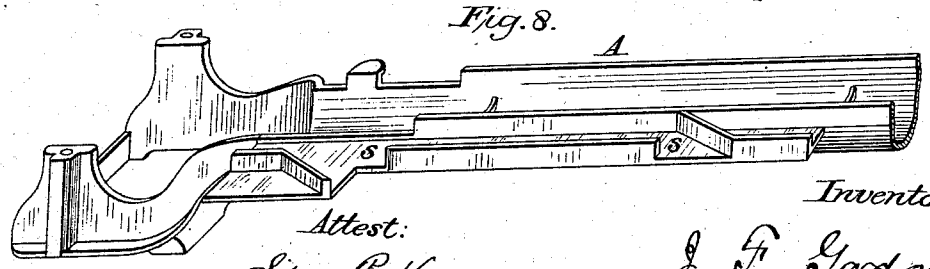


Fig. 8.



Inventor:

J. F. Gordon,

By Dodge & Dodge
attys.

Attest:

Sidney P. Hollingsworth,

Wm. H. Rowe

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES F. GORDON, OF ROCHESTER, NEW YORK.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 232,486, dated September 21, 1880.

Application filed August 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. GORDON, of Rochester, in the county of Monroe and State of New York, have invented certain Improvements in Mechanical Movements, of which the following is a specification.

My invention relates to mechanical movements; and it consists in a rack divided at a point between its ends into two parts, one of which is caused to move independently of the other, whereby the movement of the rack as a whole is caused to rotate the pinion with which it meshes a greater distance in one direction than in the other.

The invention consists, further, in the combination, with the divided rack and its pinion, of a solid rack and a second pinion, the arrangement being such that both pinions will be rotated positively together at the same rate of speed in one direction, while in the opposite direction one pinion may be given a greater rotation than the other, or caused to rotate faster than the other during a portion of its revolutions.

In the accompanying drawings, Figure 1 represents a perspective view of my improved mechanism with stationary rack; Fig. 2, a longitudinal vertical section of the same; Figs. 3 and 4, views of the two racks, showing the parts of the divided rack in their two positions; Fig. 5, a view of the rack-shifting device; Fig. 6, a longitudinal vertical section of the machine with a rack arranged to vibrate; Fig. 7, a perspective view of the compound vibrating rack detached from the other parts of the machine; and Fig. 8, a perspective view of the under side of the vibrating arm employed therewith.

This mechanism is designed for use in all places where it is desired to rotate a pinion at different speeds during certain periods without changing the speed of the prime motor, or to impart a like motion to two pinions at one time and different relative motions at another time, or to cause one pinion to remain at rest during certain periods, while the other revolves a greater distance.

The invention may be embodied in machines having stationary racks and traveling pinions, or in machines having stationary pinions and traveling racks, both of which forms are shown in the drawings. The racks may be of any form—straight, curved, or angular—and the teeth may be on any desired face of the same.

I will first describe the machine represented in Figs. 1 to 5, inclusive, in which the stationary rack is shown, and then the form in which a moving rack is employed.

Referring now to Figs. 1 to 5, A represents a horizontal arm having at one end a vertical tubular neck, *a*, and B a base-frame, provided with a strong vertical post or journal, *b*, upon which the neck *a* of the arm A is mounted, so that said arm is free to vibrate in a horizontal plane, the parts being retained in position by means of a central vertical bolt, *c*, as shown.

The lower face of arm A is provided with a longitudinal slot to receive a vertical roller or crank-pin, *d*, secured upon a horizontally-rotating gear-wheel, C, as shown in Fig. 2, so that the rotation of the wheel causes the roller or crank-pin to traverse the slot, and thereby impart the vibratory motion to the swinging arm.

The wheel C is mounted on a cross-bar in the base-frame, and is driven by a pinion, D, mounted on a horizontal driving-shaft, E, sustained in bearings in the frame and receiving motion from any convenient source.

F and G represent two pinions, secured, respectively, to two concentric spindles, *g h*, one of which passes through the other, as shown, and both of which are supported in the outer end of arm A by a surrounding sleeve, *i*. The two pinions are secured firmly to the respective spindles and gear respectively into horizontal rack-bars H and I, which are curved to correspond with the path in which the pinions are carried by the vibrations of the arm A.

The two rack-bars are arranged one directly above the other, and are mounted on the base-frame B. The upper rack, H, is made in one solid piece, and is secured immovably in place, so that it imparts to the pinion F backward and forward rotations equal in number or extent one to the other. The lower rack, I, is divided, preferably at or near the middle, into two parts, in the peculiar manner represented in Figs. 3 and 4, the two adjoining ends being lapped past each other. The forward end of this rack is secured rigidly in place; but the rear end or section is secured in place by pins

and slots in such manner that it may have a limited longitudinal movement, the extent of movement allowed being made greater or less according to the relative difference of rotation of the pinions desired.

On referring to Figs. 3 and 4 the operation of the divided rack will be readily understood. When the movable end of the rack is forced forward snugly against the other part a continuous rack of the same length as rack H is presented, as shown in Fig. 3. While the rack remains in this position the arm A swings forward and the pinions travel over the racks, which impart precisely the same motion to both pinions, thus turning them without changing the relation of their spindles one to the other. As the arm A swings backward the two pinions receive equal rotations until the lower pinion, G, has passed the division in the rack I, whereupon the rear end of the rack is moved gradually backward endwise while the pinion is traveling over it. The effect of thus moving the rack in the same direction that the pinion is traveling is to check or lessen the rotation of the lower pinion without affecting the motion of the upper pinion, which latter consequently turns forward faster than the lower pinion. As the arm A swings forward the lower rack remains extended and stationary until after the pinion G has passed forward over the break or division, so that the two pinions receive the same motions during their entire forward travel. After the lower pinion has passed forward over the break in the rack the latter closes.

The construction and arrangement are such that the extension of the lower rack does not separate its inner lapped ends from each other. This is a highly important feature of the invention, for the reason that the pinion is thereby enabled to pass over the break in the rack without disengaging or passing out of gear, producing noise or shock, or endangering the teeth of either part.

The movement of the rack may be produced by any suitable devices, many of which will suggest themselves to the skilled mechanic; but I prefer to make use of the devices represented in the drawings.

An arm, J, is pivoted to the under side of the upper rack, H, and bears in a groove or recess in the lower rack, as shown in Figs. 1, 3, 4, and 5, so that its vibration will cause the end movement of the rack-section. A curved bar, K, is pivoted to the arm J, and extended thence across the front of the frame or machine to a pivoted sustaining-arm, L, and is provided on the upper side with two studs, *e*, as shown in Fig. 1.

The arm A strikes the studs *e* alternately at the ends of its vibrations and imparts through the bar K and arm J the proper movements to the rack. The divided rack may be sustained in any suitable manner and modified in form and arrangement, provided the pinion is permitted to pass from one section to the other without disengaging. It is, of course, necessary that whatever distance the rack-section is moved endwise it should in every case be equal to the width exactly of a given number of teeth, in order that the teeth of the lapped ends of the rack may in all cases register perfectly and present a proper surface for the pinion to travel over.

Referring now to Figs. 6, 7, and 8, it will be seen that the arm A is mounted and driven as before, the pinions being located at the outer end of the arm; but it will be observed that instead of the stationary curved racks above described the racks H I are in this case pivoted at one end and arranged to vibrate in a horizontal plane.

In order to effect the longitudinal movement of the divided rack-section, said section is provided with a stud or roller, *m*, working in a cam-groove or slot, *n*, in a plate, *o*, which is arranged to move at right angles to the rack-bar H in guides *p* formed thereon. The movement of the plate *o* transversely of the rack-bar is secured by providing said plate with a stud, *r*, preferably provided with an anti-friction roller, and arranging the rack-bars in such position beneath the vibrating arm that the stud or roller shall extend upward into the cam-shaped channel or passage *s* formed in the under side of the arm A. As shown in Fig. 6, the arm A and the racks H I vibrate about different centers, the free end of the racks being carried and vibrated by the outer or free end of the arm. As the racks are thus vibrated differently from the arm A, it follows that the plate *o* will be moved back and forth, according to the movement of the arm and the form of the cam-passage in its under side. By varying the form of said passage the movement of the plate, and consequently the movement of the rack-section, may be modified as desired.

It is apparent that the pinions may be made to rotate in a fixed position by causing the rack to move in the proper direction, the shifting device first described or its equivalent being used.

I am aware that two racks have been lapped together at their ends, out of line with each other, and arranged to be adjusted endwise with relation to each other and fixed permanently in position. By halving the ends of my racks together, and thus bringing them in line, I am enabled to pass both through the same space or guide, and to have them both act upon one and the same narrow pinion. The combination of automatic shifting mechanism with the rack enables the same to impart the differential movement to the pinion, as described.

Having thus described my invention, what I claim is—

1. In combination with a traveling pinion, a rack divided and lapped at a point between its ends, and mechanism arranged to move one or both ends of the rack endwise, substantially

as described, to give the pinion a greater rotation in one direction than in the other.

2. In combination with the two pinions, the continuous and the divided rack, the latter having one end movable in order to impart a differential movement to the pinions.

3. The combination of the vibratory arm and the two pinions thereon, the stationary rack, the divided rack, having the movable end, and mechanism, substantially such as shown, actuated by the arm and arranged to adjust the movable end of the rack.

4. The combination of the movable rack-section, arms J L, bar K, and the movable arm, arranged to reciprocate the bar.

5. The divided rack-bar having the ends of its two parts halved and lapped together in the peculiar manner shown, with the two parts in line with each other.

6. In combination with a pinion, a rack divided at a point between its ends and mechanism arranged to move one or both ends of the rack endwise, substantially as described, said rack and pinion being arranged one to travel in relation to the other, substantially as described.

JAMES F. GORDON.

Witnesses:
C. D. KEIHEL,
ADELBERT ERONISE.