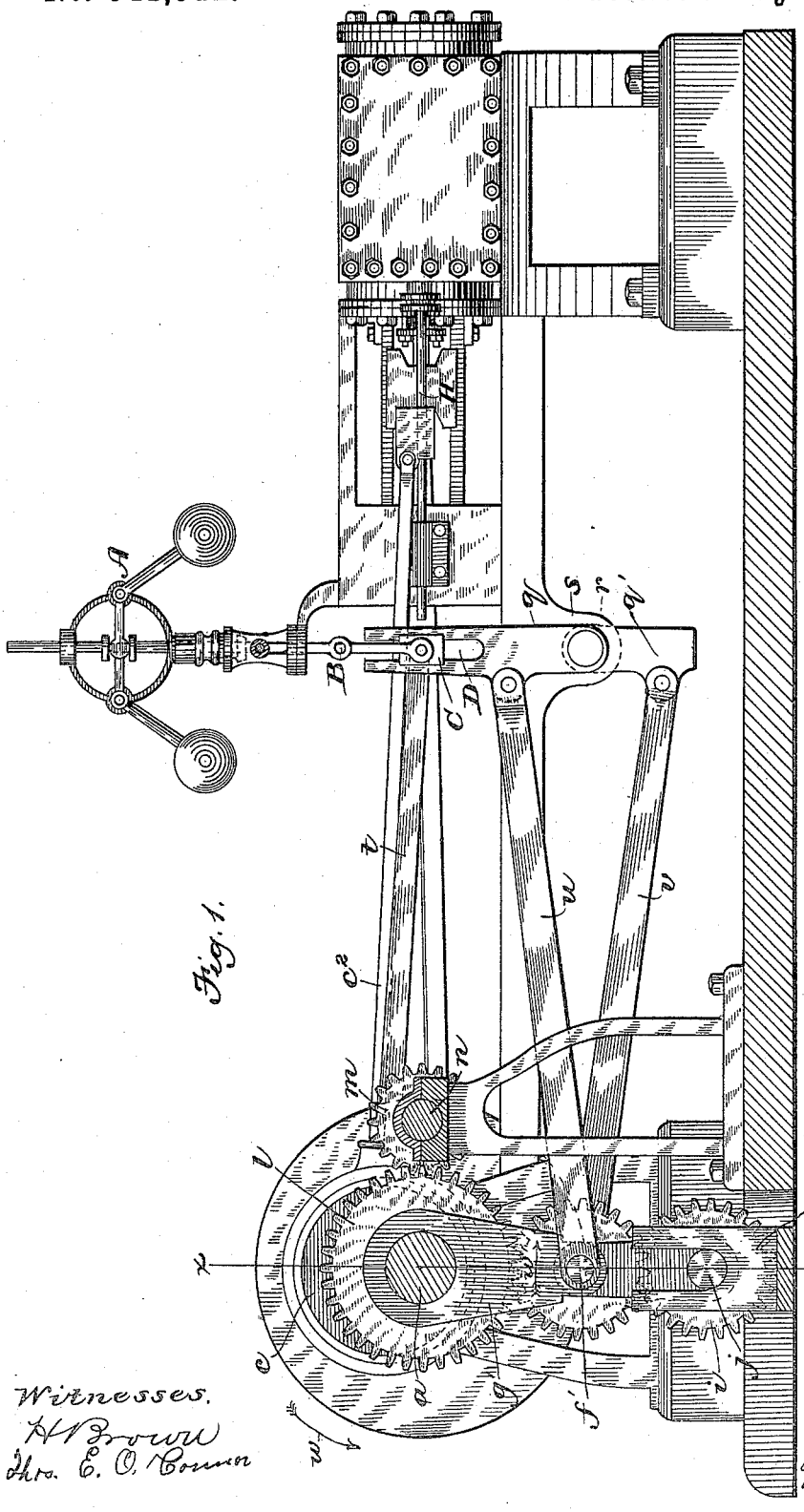
(Model.) 2 Sheets—Sheet 1.

J. A. HORTON.

MECHANICAL MOVEMENT.

No. 341,912. Patented May 18, 1886.



Witnesses.
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Inventor.
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(Model.) 2 Sheets—Sheet 2.

J. A. HORTON.

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Fig. 2.

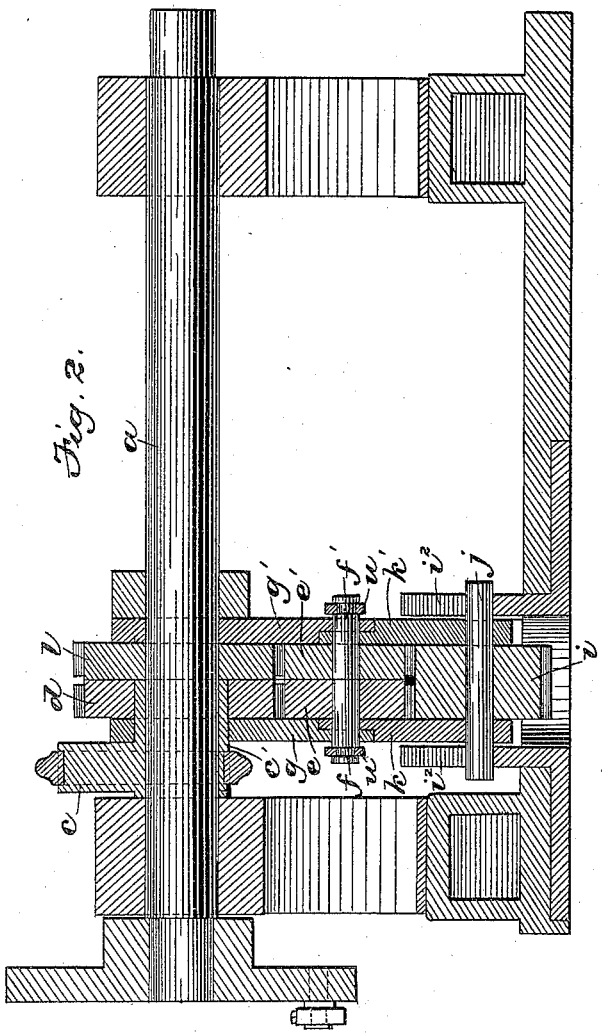
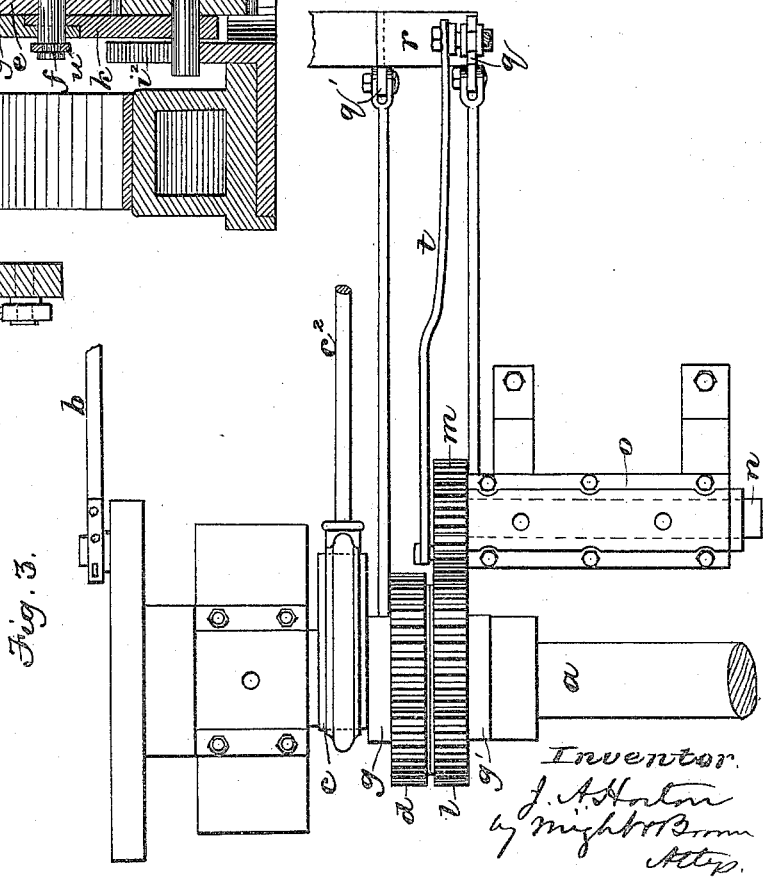


Fig. 3.



Witnesses.
H. Brown,
J. E. A. Connor

Inventor.
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UNITED STATES PATENT OFFICE.

JAMES A. HORTON, OF READING, MASSACHUSETTS.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 341,912, dated May 18, 1886.

Application filed August 5, 1885. Serial No. 173,627. (Model.)

To all whom it may concern:

Be it known that I, JAMES A. HORTON, of Reading, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

This invention consists in the improved mechanical movement hereinafter described, whereby the movement of an eccentric operated by a continuously-rotated shaft is made irregular, so that the reciprocating movement imparted to the rod of the eccentric, while of a uniform length, is caused to take place irregularly, said rod being alternately moved faster than it would be moved by an eccentric as ordinarily operated, and then caused to halt sufficiently to compensate for the increase in the rate of its movement. Means are provided for varying the periods of accelerated motion and rest of the eccentric.

The invention is intended, chiefly, as a means for operating the slide-valve of a steam-engine, the periods of accelerated motion and rest being capable of adjustment, so that the duration of the admission of steam and the time of admitting and of shutting it off may be regulated without any variation in the length of the entire stroke of the valve, thus causing the valve to wear its seat uniformly, instead of wearing it unevenly, as it does when the length of its stroke is varied in varying the cut-off, as is usual in this class of valves.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of my improved mechanical movement applied to the slide-valve of a steam-engine. Fig. 2 represents a section on line *x x*, Fig. 1. Fig. 3 represents a top view.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a shaft continuously rotated by any suitable power, as by a steam-engine through a connecting-rod, *b*. *c* represents an eccentric mounted on said shaft, but not attached thereto, the shaft and eccentric being capable of rotating independently. The eccentric has a sleeve, *c'*, concentric with the shaft *a*, and to this sleeve is rigidly attached a gear-wheel, *d*, which of course necessarily rotates with the eccentric.

e represents a smaller gear-wheel meshing with the wheel *d*, and mounted on a stud, *f*, which is supported by an arm, *g*, adapted to oscillate on the shaft *a*.

i represents a gear-wheel meshing with the wheel *e*, and mounted on a stud, *j*, which is supported by two arms, *k k'*, adapted to oscillate, respectively, on the stud *f* and on a similar stud, *f'*, supported by another arm, *g'*, which is also adapted to oscillate on the shaft *a*. The stud *f'* supports a gear-wheel, *e'*, of the same size as the wheel *e*, and located beside the latter and meshing with the wheel *i*.

l represents a gear-wheel located beside the wheel *d* upon the shaft *a*, but affixed rigidly to said shaft. A pinion, *m*, supported by a stud, *n*, journaled in a fixed bearing, *o*, meshes with the wheel *l*.

q q' represent two arms projecting in opposite directions from a journaled sleeve or rock-shaft, *r*, to which they are rigidly attached, said rock-shaft being supported by a fixed bearing, *s'*. The arm *q* is connected by a rod, *t*, to an eccentric wrist-pin on the pinion *m*, and by a rod, *u*, to the stud *f'*, supporting the wheel *e'*, while the arm *q'* is connected by a rod, *v*, with the stud *f*, supporting the wheel *e*.

The shaft *a* and the wheel *l* attached thereto being continuously rotated, motion is communicated from the wheel *l* to the eccentric through the wheels *e'*, *i*, *e*, and *d*. The proportions of said wheels are such that if the wheels *e e'* were not oscillated, as hereinafter described, the eccentric would be rotated in unison with the shaft, just as it would be if attached to the shaft, so as to be rotated directly by it. It will be seen, however, that the continuous rotation of the shaft *a* and the wheel *l* causes the latter to impart, through the pinion *m* and rod *t*, an oscillating motion to the rock-shaft *r*. Said rock-shaft is caused, through the rods *v v*, to oscillate the arms *k' k* and the wheels *e' e* simultaneously in opposite directions. Assuming that the shaft *a* rotates in the direction indicated by the arrow *w* in Fig. 1, it will be observed that the movement of the wheel *e'* in the direction indicated by the arrow *w'* in Fig. 1, and the simultaneous movement of the wheel *e* in the opposite direction, the effect of the continuous rotation of the wheel *l* on the wheel *d* of the eccentric, through the intermediate wheels, is neutralized and the eccentric and its wheel remain at rest,

or are rotated at a slower rate than the shaft; but during the movements of the wheels $e' e$ in the direction opposite to those last indicated the wheel d and the eccentric are rotated at an accelerated speed equal to that of the wheel l plus the additional speed imparted by the last-named movements of the wheels $e' e$. The result of this is that the eccentric is rotated intermittently or irregularly, its periods of inaction or retarded movement being followed by periods of accelerated movement, said periods being so proportioned that a complete rotation of the eccentric is accomplished in a given time.

The periods of inaction or retarded movement and of accelerated movement may be adjusted by varying the distance between the point of connection of the rod t to the arm q, and the center of oscillation of the rock-shaft r, so as to vary the extent of the oscillating movements imparted to the wheels $e' e$. Said change may be effected automatically by means of a fly ball-governor, A, connected by a jointed rod, B, with a slide, C, to which the connecting-rod t is pivoted, said slide being movable in a slot, D, in the arm q. The weighted arms of the governor are rotated by the engine, as usual, and an increase in the rate of their rotation causes them to move the slide C toward the center of the rock-shaft r, thus increasing the extent of the oscillating movements of the wheels $e' e$ and the duration of the periods of inaction or retarded motion of the eccentric, and vice versa.

When my improvement is used as a means for operating the slide-valve of a steam-engine, the rod H of said valve being connected to the rod e^2 of the eccentric, as shown in Fig. 1, the direct admission of steam to the cylinder is governed by the relative periods of inaction and accelerated motion of the eccentric, and any change in the length of said periods by the action of the governor causes a corresponding change in the admission and shutting off of the steam without any variation in the total length of the stroke, the valve being thus caused to wear its seat evenly.

My invention may be applied to locomotive-engines, in which case the movement of the connecting-rod t, which regulates the oscillating movement of the gears $e' e$, may be effected by a lever operated by the engineer, and any desired number of movable gears may be employed.

The invention may be used for other purposes to which it may be found capable of application.

The proportions of the gears which communicate motion from the shaft a to the eccentric may be varied as may be desired. The pinion m should be one-half the size of the wheel l.

The stud j, supporting the wheel i, is guided by vertical slots in fixed brackets or guides $i^2 i^2$, so that said wheel cannot oscillate or move laterally.

It is obvious that the continuously-rotated wheel l may be rotated by other means than by the shaft a—for example, by a gear-wheel or belt, the shaft a being fixed.

Instead of an eccentric, some other device may be connected with the gear-wheel d and alternately arrested or retarded and accelerated by the operation of said wheel.

I claim—

1. The improved mechanical movement, consisting of a continuously-rotated gear-wheel, an independently-rotatable eccentric having a corresponding axis provided with a gear-wheel, a series of gear-wheels, whereby rotary motion may be imparted from the continuously-rotated gear-wheel to the gear-wheel of the eccentric, and means for oscillating the gear-wheels meshing with the said continuously-rotated wheel of the eccentric, whereby rotary movement of the eccentric is alternately retarded or arrested and accelerated, as set forth.

2. The improved mechanical movement, consisting of the shaft, the independently-rotatable eccentric, and mechanism, substantially as described, whereby the rotary movement of the eccentric is alternately retarded, arrested, and accelerated, combined with automatic means, substantially as described, whereby the relative duration of the periods of retarded motion or arrest and accelerated motion of the eccentric is regulated, as set forth.

3. The combination of the shaft having the gear-wheel l affixed to it, the eccentric adapted to rotate independently on the shaft, and provided with the gear-wheel d, the gear-wheels $e' e$, meshing, respectively, with the wheels $l d$, and adapted to oscillate, as described, the wheel i, meshing with the wheels $e' e$, the pinion m, meshing with the wheel l, the rock-shaft r, and connections, substantially as described, whereby the rock-shaft is oscillated by the rotation of the wheel l, and is caused to oscillate the wheels $e' e$, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 25th day of July, 1885.

JAMES A. HORTON.

Witnesses:
C. F. BROWN,
H. BROWN.