(No Model.)

2 Sheets—Sheet 1.

F. HART.

SPEED REGULATOR.

No. 397,716. Patented Feb. 12, 1889.

Fig. 1.

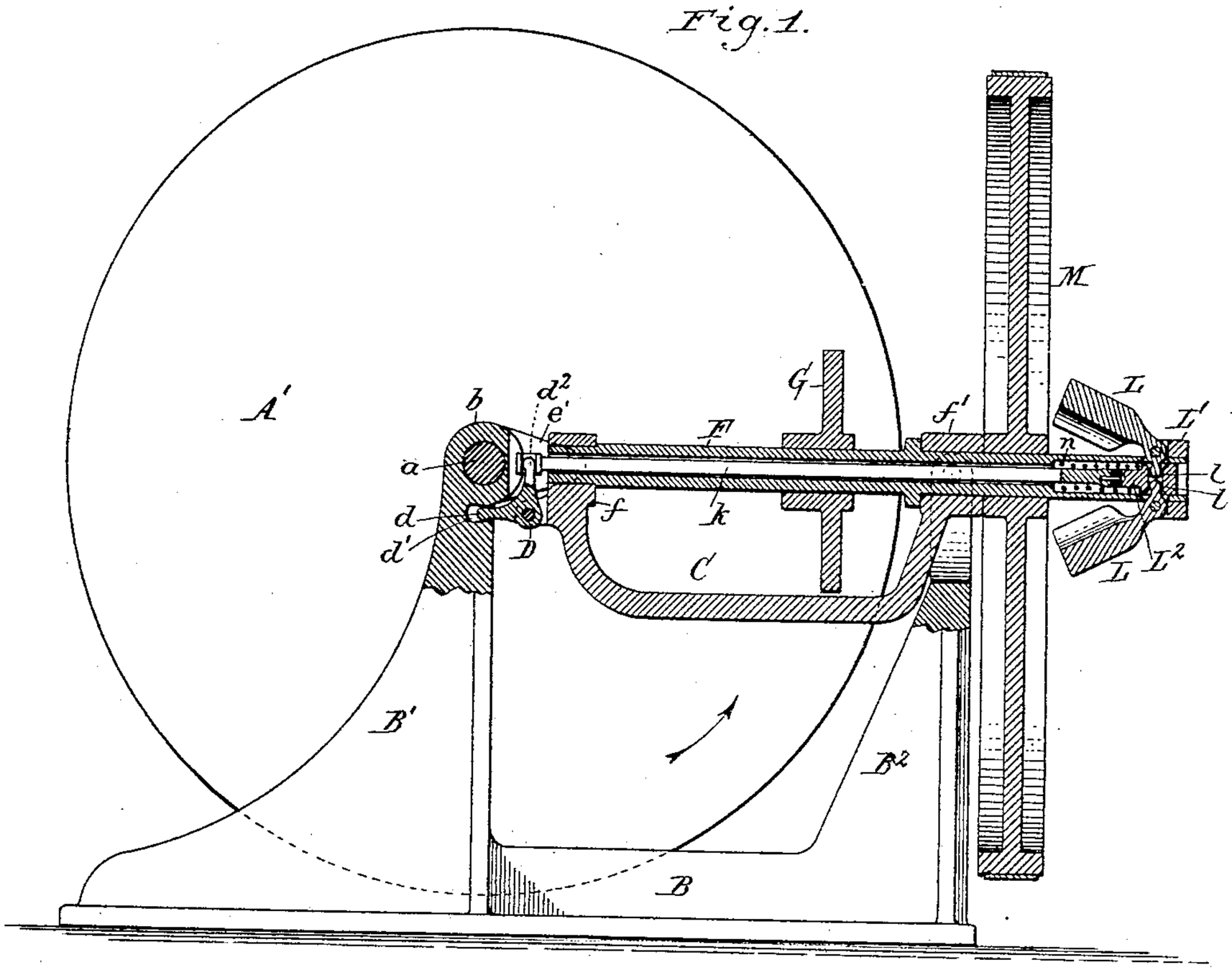
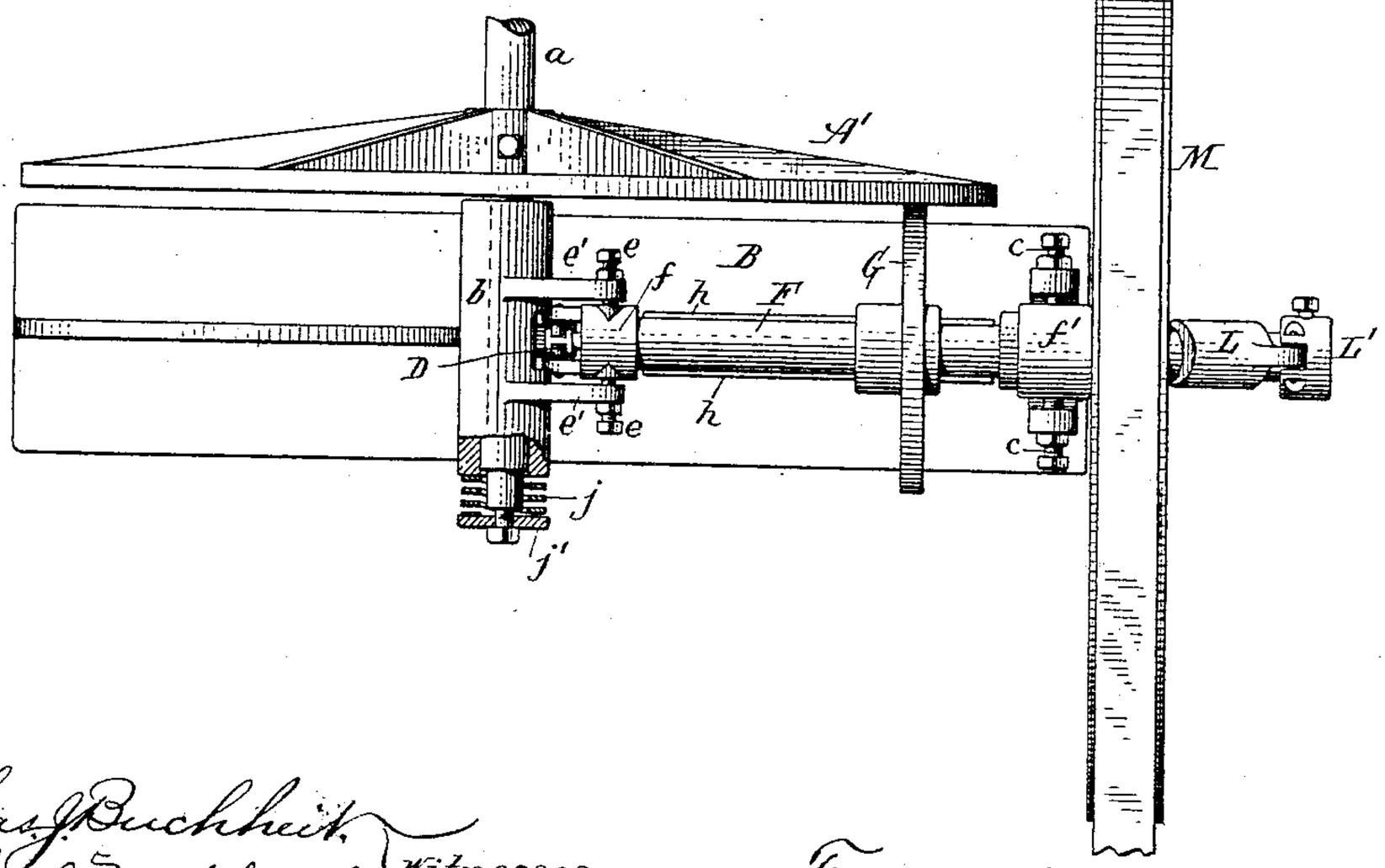


Fig. 2.



Witnesses.
Chas. J. Buchheit.
Geo. J. Buchheit Jr.

Frederick Hart Inventor.
By Wilhelm & Bonner.
Attorneys.

(No Model.)

2 Sheets—Sheet 2.

F. HART.

SPEED REGULATOR.

No. 397,716. Patented Feb. 12, 1889.

Fig. 3.

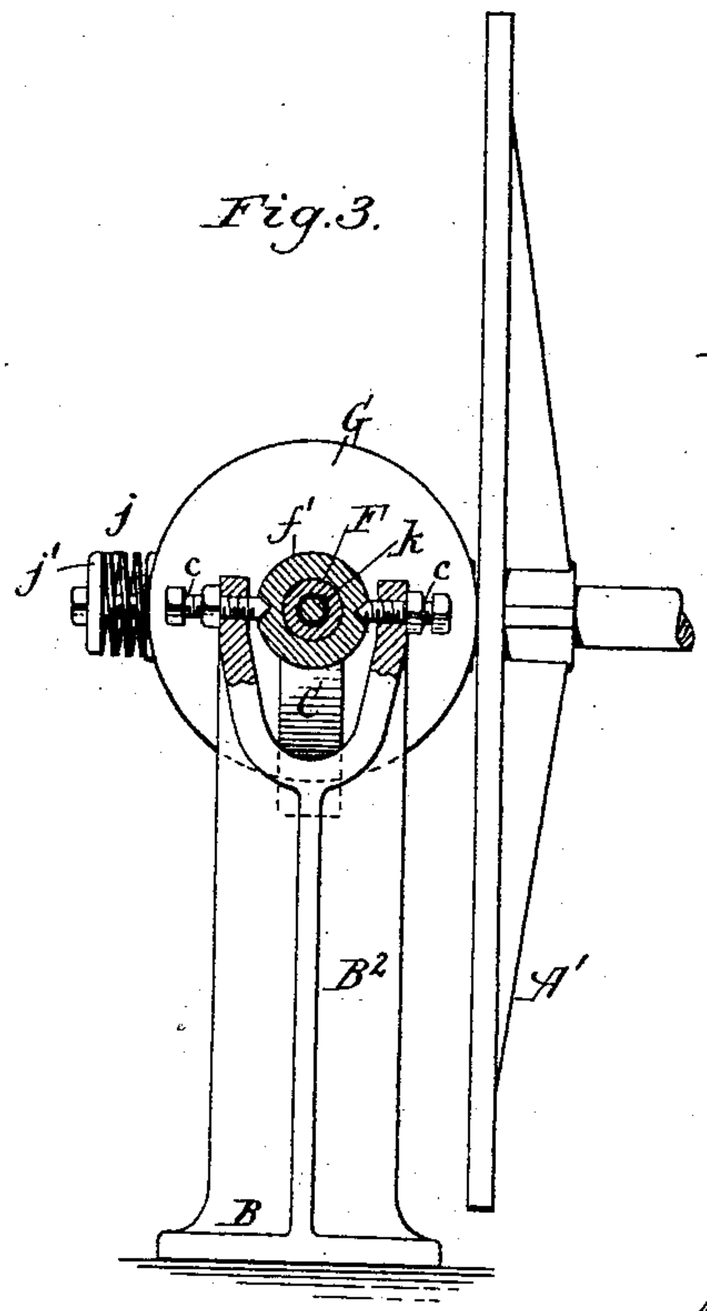


Fig. 4.

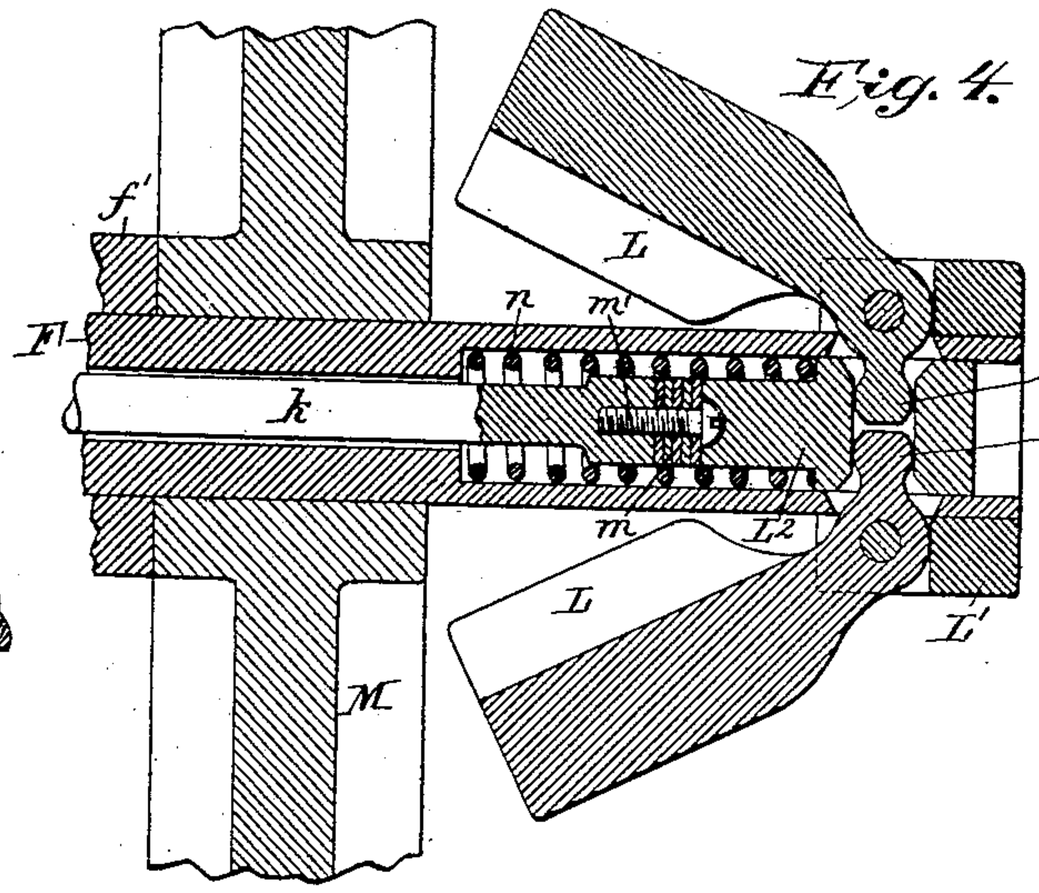


Fig. 6.

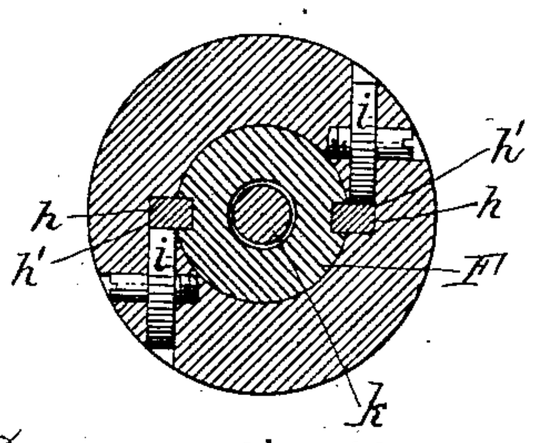


Fig. 5.

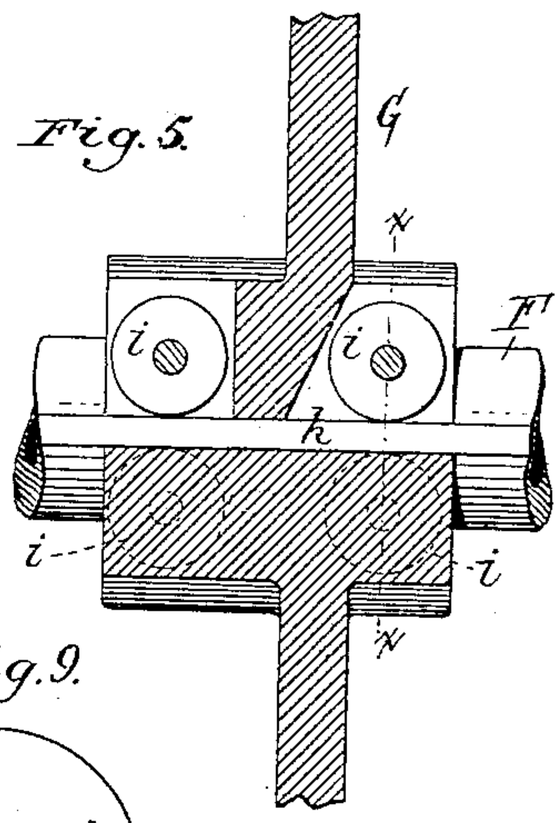


Fig. 8.

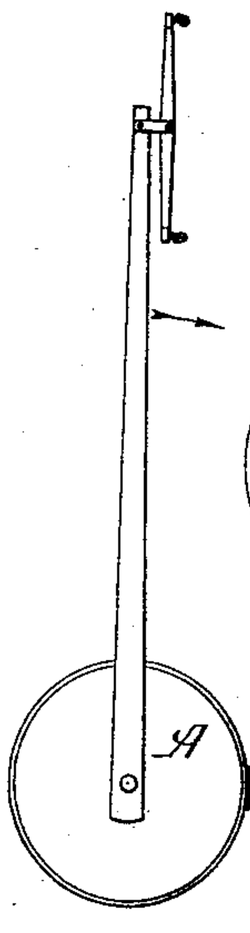


Fig. 10.

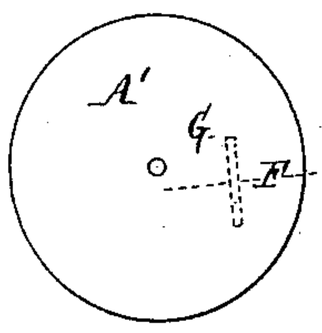


Fig. 9.

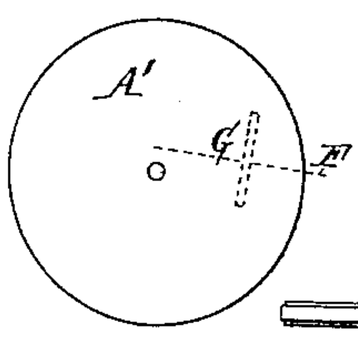
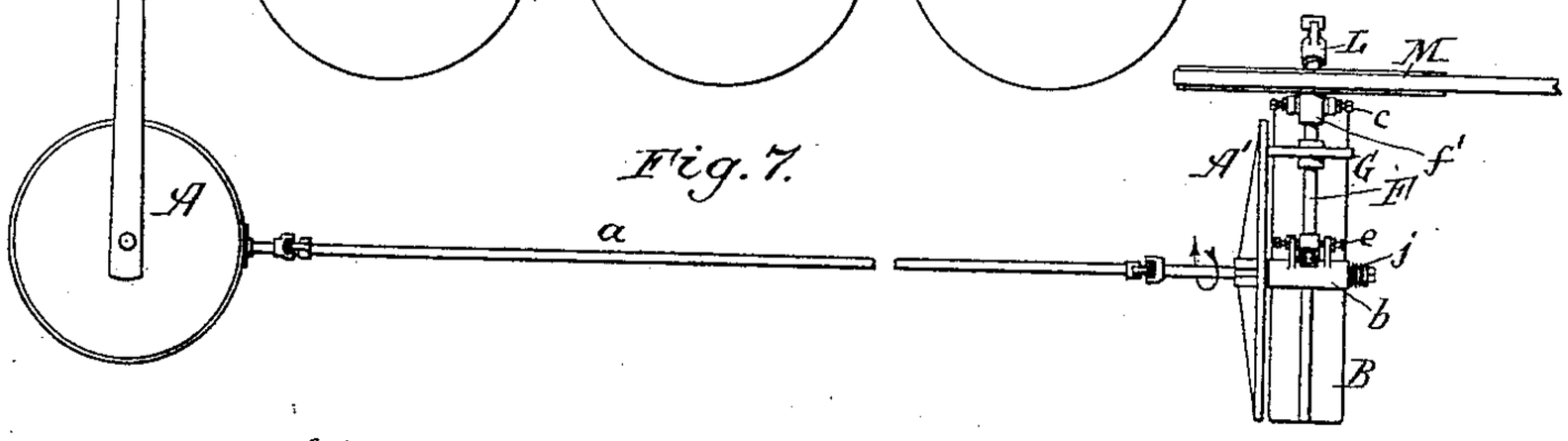


Fig. 7.



Chas. J. Buchheit.
Geo. J. Buchheit Jr.
} Witnesses.

Frederick Hart Inventor.
By Wilhelm Bonner.
Attorneys.

UNITED STATES PATENT OFFICE.

FREDERICK HART, OF POUGHKEEPSIE, NEW YORK.

SPEED-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 397,716, dated February 12, 1889.

Application filed April 12, 1888. Serial No. 270,448. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HART, of Poughkeepsie, in the county of Dutchess and State of New York, have invented new and useful Improvements in Speed-Regulators, of which the following is a specification.

This invention relates to a regulator whereby motion is transmitted to the driven machinery at a practically uniform rate of speed irrespective of the variations of speed in the motor.

The object of my invention is to produce a simple regulator of this character; and my invention consists of the improvements which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of my improved regulator. Fig. 2 is a top plan view thereof, partly in section. Fig. 3 is an end view of the regulator, partly in section. Fig. 4 is a sectional elevation of the movable weights of the regulator and connecting parts on an enlarged scale. Fig. 5 is a longitudinal sectional elevation of the hub of the friction-wheel mounted on the driving-shaft of the regulator on an enlarged scale. Fig. 6 is a cross-section in line $x\,x$, Fig. 5. Fig. 7 is a top plan view showing my improved regulator connected with a sweep horse-power. Figs. 8, 9, and 10 are diagrams illustrating the different angles of the friction-wheel and its shaft.

Like letters of reference refer to like parts in the several figures.

a represents the main driving-shaft, which receives its motion from a horse-power, A, or any other motor. The shaft *a* may be composed of two or more sections connected by universal joints in a well-known manner.

A′ is a large friction wheel or disk rigidly secured to the main driving-shaft *a* near the end thereof.

B represents the base or supporting-frame of the regulator, which is formed with two standards, B′ B². The outer portion of the main shaft *a* is mounted in a bearing, *b*, arranged at the upper end of the standard B′.

C represents a U-shaped frame arranged between the standards B′ B², and pivoted at its outer end to the upper end of the standard B², so that the inner end of the frame can swing or vibrate vertically. The upper end of the standard B² is bifurcated, as shown in Fig. 3, and the outer end of the frame C is pivoted between the jaws of the standard by horizontal pivot-bolts *c*, arranged in said jaws and entering depressions formed in opposite sides of the frame.

D represents an elbow-lever pivoted in a vertical position to the inner end of the movable frame C and having its lower arm, *d*, arranged loosely in a socket or recess, *d*′, formed in the adjacent side of the standard B′. The elbow-lever D supports the inner end of the frame C in such a manner that the same is capable of a limited vertical movement by moving the upper arm, *d*², of the lever inwardly or outwardly, the inner end of the lower arm, *d*, of the lever acting as a fulcrum on which the lever swings. The inner end of the rocking frame C is guided in its vertical movements between two horizontal bolts, *e*, which are arranged in threaded lugs or ears *e*′, formed at the upper end of the standard B′ on the inner side thereof. The inner ends of the bolts *e* bear against the flat sides of the frame C and hold the latter against lateral movement.

F represents a hollow shaft journaled in bearings *f f*′, arranged at opposite ends of the movable frame C, and G is a friction-wheel mounted on the shaft F and running in contact with the friction-disk A′. The friction-wheel G is held against rotary movement on the shaft F, but is capable of longitudinal movement on the shaft F toward and from the periphery of the friction-disk A′, so that by placing the wheel G at a greater or less distance from the center of said friction-disk the rotary speed of the friction-wheel and shaft F is increased or diminished. The shaft F is provided on opposite sides with longitudinal feathers or ribs *h*, which engage in corresponding grooves, *h*′, formed in the hub of the friction-wheel G.

i represents anti-friction rollers journaled in recesses formed in the hub of the friction-wheel G and bearing against the feathers *h*, so as to reduce the friction between the parts. These anti-friction rollers are arranged on opposite sides of the shaft F, so as to bear against

those sides of the feathers against which the pressure is principally exerted in transmitting power from the friction-wheel to the shaft, as represented in Figs. 5 and 6.

j represents a spiral spring surrounding the outer end of the main shaft *a* and interposed between the end of the bearing *b* and a collar, *j'*, secured to the end of the shaft. The spring *j* tends to draw the main shaft with the friction-disk A′ toward the friction-wheel G and retains the disk in forcible contact with the friction-wheel at all times.

k represents a shifting-rod arranged within the hollow shaft F and connected at its inner end to the upper arm, d^2, of the elbow-lever D, so that upon moving the rod *k* inwardly or outwardly the inner end of the rocking frame C will be raised or lowered through the medium of the elbow-lever.

L L represent two governor-weights pivoted to opposite sides of a collar, L′, which is secured to the outer end of the hollow shaft F. These weights are provided on the inner sides of their pivots with short arms *l*, which project into the hollow shaft F through openings formed in the same and in the collar L′.

L^2 represents a loose head, which is arranged within the hollow shaft F, and which is provided with a recess in which the arms *l* of the governor-weights engage. The adjacent outer end of the shifting-rod *k* is preferably provided with a number of detachable washers, *m*, held in place on the rod by a screw, *m'*. The inner end of the loose head L^2 bears against the outermost washer, so that the position of this head, the shifting-rod, and the governor-weights can be regulated by adding or removing one or more of these washers.

n represents a spiral spring, which is arranged in the hollow shaft F around the rod *k*, and which bears with its inner end against a shoulder in the shaft F and with its outer end against a shoulder on the head L^2, so as to retard the outward movement of the governor-weights.

When the speed of the hollow shaft F is normal, it stands in a radial position opposite the face of the driving-disk A′, and the friction-wheel G stands at right angles to the radius of the driving-disk at its point of contact with the latter, and consequently has no tendency to shift its position on the hollow shaft F in either direction. When the speed of the hollow shaft F increases above the normal, the governor-weights L L are thrown farther outwardly by centrifugal force, thereby moving the head L′ and rod *k* inwardly or toward the center of the driving-disk A′. This movement of the shifting-rod causes the lever D to raise the inner end of the rocking frame C with the shaft F, thereby placing the friction-wheel G at an inwardly-inclining angle with the radius of the disk A′, as indicated in Fig. 9. The friction-wheel now moves on the shaft F toward the center of the disk, whereby the speed is gradually reduced until the normal speed is restored and the frame C and shaft F have been returned to their normal position. When the speed of the shaft F falls below the normal, the governor-weights move toward the shaft, thus allowing the shifting-rod *k* to move outwardly and the inner end of the oscillating frame C and its shaft F to descend by gravity. As the frame C descends, the friction-wheel is placed at an outwardly inclined angle to the radius, as indicated in Fig. 10, whereby it is caused to move toward the periphery of the friction-disk A′. This causes the speed to increase until the normal speed is restored. In this manner the friction-wheel is moved toward the center of the driving-disk when the speed of the driving-shaft increases and toward the periphery of the disk when the speed decreases, thereby maintaining a practically-uniform normal speed of the hollow shaft F and the driven machinery connected therewith. The diagram Fig. 8 shows the position of the friction-wheel and its shaft in their normal position. The diagram Fig. 9 shows the friction-wheel and its shaft inclined inwardly, and the diagram Fig. 10 shows these parts inclined outwardly.

M represents the driving pulley or wheel, secured to the hollow shaft F, and from which the power is transmitted to the desired point by a belt or in any other suitable manner.

It is obvious that my improved regulator may be used in connection with all kinds of machinery in which it is desired to transmit the varying speed of a driving-shaft to the driven part at a practically-uniform speed.

My improved speed-regulator is particularly desirable for use in connection with sweep-powers, in which case it serves not only as a regulator, but performs also the function of the jack in increasing the speed.

I claim as my invention—

1. In a speed-regulator, the combination, with the driving-disk, of a friction-wheel running in contact with said disk, a shaft which is rotated by said wheel and on which the wheel can move toward and from the center of the driving-disk, and a frame in which said shaft is mounted and which is movable in a plane parallel with the working-face of the driving-disk on one side of the center thereof, whereby said shaft can be placed at an angle to the radius of the driving-disk and the friction-wheel can be placed at an angle to the direction of motion of the driving-disk at its point of contact with the friction-wheel, substantially as set forth.

2. In a speed-regulator, the combination, with the driving-disk, of a friction-wheel running in contact with said disk, a shaft which is rotated by said wheel and on which said wheel can move toward and from the center of the driving-disk, a pivoted bearing supporting said shaft near the periphery of the driving-disk, and a movable bearing supporting the shaft near the center of the driving-

disk and capable of movement toward and from the radial line of the driving-disk, substantially as set forth.

3. In a speed-regulator, the combination, with the driving-disk, of a friction-wheel running in contact with said disk, a shaft which is rotated by said wheel and on which the wheel can move toward and from the center of the driving-disk, a movable frame in which said shaft is mounted, and whereby said shaft can be placed at varying angles, and a governor whereby the position of the frame is automatically adjusted, substantially as set forth.

4. The combination, with the driving-disk A′, of a stationary frame, B, an elbow-lever, D, supported in said frame, a movable frame, C, pivoted at one end in said frame and attached at its opposite end to said elbow-lever, a hollow shaft, F, journaled in said frame, a shifting-rod, *k*, arranged in said shaft and connected at one end with said elbow-lever, a governor connected with the opposite end of the shifting-rod, and a friction-wheel, G, mounted on the shaft F, substantially as set forth.

5. The combination, with the driving-disk A′, of the movable frame C, a hollow shaft, F, journaled in the same and provided with a feather, *h*, and a friction-wheel, G, mounted on the shaft F and provided in its hub with an anti-friction roller, *i*, bearing against said feather, substantially as set forth.

6. The combination, with the driving-disk A′, of the stationary frame B, the movable frame C, the elbow-lever D, the hollow shaft F, journaled in the frame C, the shifting-rod *k*, arranged in the shaft F, the governor-weights L, pivoted to the shaft F, the head L′, arranged in said shaft and connected with the governor-weights, and the washers *m*, interposed between the shifting-rod *k* and the head L′, substantially as set forth.

Witness my hand this 6th day of April, 1888.

FREDERICK HART.

Witnesses:
J. I. WAKELEE,
A. SEDGWICK.