(No Model.)

F. E. PRICHARD.

ELECTRICAL GOVERNOR.

No. 380,817. Patented Apr. 10, 1888.

Fig. 2.

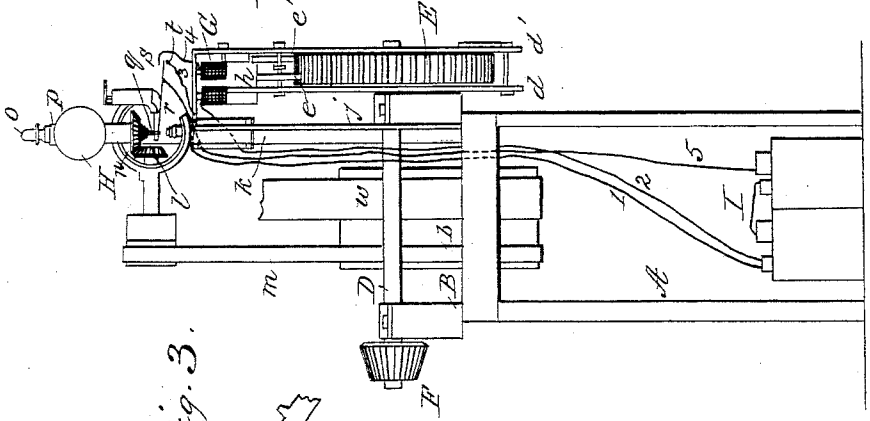


Fig. 3.

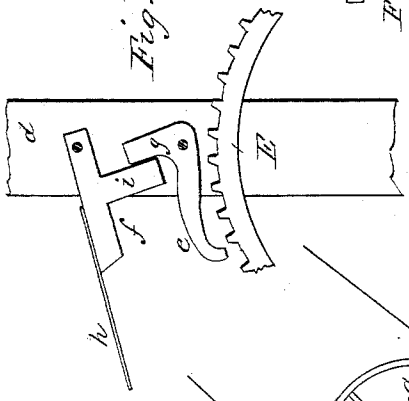


Fig. 4.

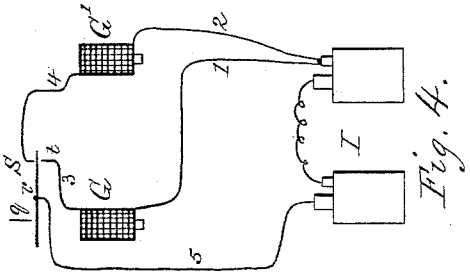
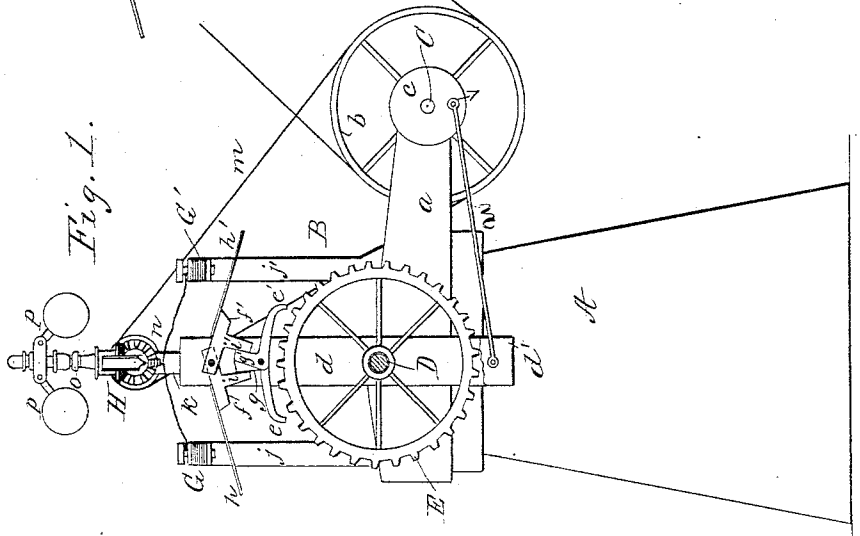


Fig. 1.



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FRANK E. PRICHARD, OF CEDAR FALLS, IOWA.

ELECTRICAL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 380,817, dated April 10, 1888.

Application filed July 27, 1887. Serial No. 245,434. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. PRICHARD, of Cedar Falls, in the county of Black Hawk and State of Iowa, have invented a new and Improved Electrical Governor, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation, partly in section, of my improved electrical governor. Fig. 2 is a side elevation of the same. Fig. 3 is a detail view of one of the pawls and pawl-levers, and Fig. 4 is a diagram of the electrical connections.

The object of my invention is to provide a simple and effective device for controlling the speed of water-wheels and other motors by means of an electric current.

My invention consists in the combination, with a ratchet-wheel connected with the controlling valve or gate of the motor and an oscillating lever carrying pawls adapted to engage the ratchet-wheel, of electro-magnetic mechanism for controlling the action of the pawls and a centrifugal governor for commuting the current, all as hereinafter more fully described.

To the base A is secured a frame, B, which supports the working parts of the machine. In arms *a*, extending horizontally from the frame B, is journaled the driving-shaft C, carrying the wide-faced pulley *b* and the crank-disk *c*. In the middle of the frame B is journaled the shaft D, having upon one end the ratchet-wheel E and upon the opposite end the bevel-pinion F, which is designed to engage the valve or gate mechanism of the motor to be regulated.

Upon the shaft D, on opposite sides of the ratchet-wheel E, are placed arms *d d'*, which are connected together by bolts. The said arms *d d'* extend above the ratchet-wheel E and support the pawls *e e'* and armature-levers *f f'*. The pawls *e e'* are oppositely arranged with respect to each other and are provided with arms *g g'*, which project upward from the pawls approximately at right angles.

The armature-levers *f f'* carry armatures *h h'* and are provided with arms *i i'*, which extend downward and are capable of engaging the arms *g g'* of the pawls *e e'*.

Upon standards *j j'*, extending upward from the frame B, are supported electro-magnets G G' above the armatures *h h'*.

Upon a central standard, *k*, is supported a centrifugal governor, H, provided with a horizontal shaft, *l*, which receives motion from the pulley *b* through the belt *m*. The shaft *l* communicates motion through motor-gearing *n* to the hollow vertical shaft *o*, carrying the weighted governor-arms *p*, which act upon the rod *q*, extending through the hollow shaft, in the usual way. The lower end of the rod *q* engages a spring-pressed lever, *r*, fulcrumed on the standard *k*, so that the said lever is moved up or down according to the velocity of the centrifugal governor. Above and below the outer end of the lever *r* are arranged electrical contact-points *s t* in position to be touched by the end of the said lever as it is moved up and down.

In the base A is placed a galvanic battery, I, one pole of which communicates through the wire 1 with one terminal of the magnet G and through the wire 2 with one terminal of the magnet G'. The remaining terminal of the magnet G is connected with the contact-point *t* by the wire 3 and the remaining terminal of the magnet G' is connected with the contact-point *s* by the wire 4. The lever *r* is connected with the remaining pole of the battery by the wire 5. The arm *d'* is connected by a rod, *u*, with a crank-pin, *v*, projecting from the crank-disk *c*, so that the arms *d d'* are made to oscillate continuously while the shaft C revolves.

Motion is imparted to the shaft C by the belt *w*, which runs over the pulley *b*, and is driven by a pulley rotated by the motor to be governed.

Instead of the centrifugal governor driven by the power of the motor, I may, in the case of an electric motor or in the case of a generator driven by the water-motor, use an ammeter or analogous device to move the lever *r*, the ammeter being placed in the circuit or in a shunt of the dynamo or motor.

The operation of my improved governor is as follows: When the machine to be governed is working normally, the armature-levers *f f'* hold the pawls *e e'* out of engagement with

the ratchet-wheel, and the gate, valve, or other regulating device connected with the shaft D is unmoved; but when the lever *r* is moved by the centrifugal governor so as to bring the said lever into contact with the upper point, *s*, a current flows through the magnet G′, and the magnet raises the armature *h*′, liberating the pawl *e*′. The pawl *e*′, when thus liberated, engages the teeth of the ratchet-wheel E, and as the pawl is oscillated in the manner already described the ratchet-wheel E is revolved and the motor-controlling mechanism is moved in one direction until the increase or diminution of the motion causes the lever *r* to break contact with the point *s*, when the armature *h*′ is released, and the armature-lever *f*′ falls and withdraws the pawl *e*′ from the ratchet-wheel E, and the shaft D again remains stationary. When the lever *r*, by a change of velocity, is made to make contact with the point *t*, the pawl *e* is brought into action and the ratchet-wheel E is turned in the reverse direction, the turning continuing until the contact is broken between the lever *r* and the point *t*, when the pawl will be disengaged from the ratchet-wheel, as in the other case. In this manner the shaft D is made to turn in one direction or the other, as may be required.

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

1. In an electrical governor, the combination, with the ratchet-wheel and the shaft upon which it is fixed, of a continuously-oscillating vertical lever, the separate and independent pawls *e e*′, pivoted thereon above the ratchet-wheel and having upward-projecting arms *g g*′, respectively, the armature-levers *f f*′, pivoted above the pawls and having depending arms *i i*′, normally engaging the arms *g g*′ and holding the pawls out of engagement with the ratchet, the armatures *h h*′, projecting from said levers, and the magnets G G′ above the armatures, substantially as set forth.

2. In an electrical governor, the combination, with the ratchet-wheel and its shaft, of the pawls, the levers normally holding the pawls out of engagement with the ratchet-wheel, the armatures projecting from said levers, the electro-magnets to operate said armatures, the circuit-wires, the battery, the contact-points *s t* in said circuit, the lever *r*, connected with the battery and extending between the contact-points, and the centrifugal governor, the vertically-movable rod *q* thereof operating the lever *r*, substantially as set forth.

3. An electrical governor consisting in the frame, the horizontal shaft D, having a gear at one end and a ratchet-wheel, E, on the other, the vertical oscillating lever loosely mounted on the shaft D, the pawls *e e*′, the armature-levers *f f*′ above the pawls and normally holding them out of engagement with the ratchet, the magnets G G′, for actuating the armature-levers, electric circuit, the contact-points *s t* therein, the pivoted lever *r*, extending between the contact-points and connected with the battery, the centrifugal governor H, the horizontal shaft *l* operating the same, the vertical rod *q* of the governor to operate the contact-lever, the horizontal shaft C, having pulley *b* and crank-disk *c*, the rod *u*, connecting the crank-disk with the lower end of the oscillating pawl-carrying lever, and the belt *m*, leading from pulley *b* to a pulley on the governor-shaft *l*, combined and operating substantially as set forth.

FRANK E. PRICHARD.

Witnesses:
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