(No Model.)

2 Sheets—Sheet 1.

M. A. REPLOGLE.

ELECTRICAL GOVERNOR.

No. 565,032. Patented Aug. 4, 1896.

Fig. 2.

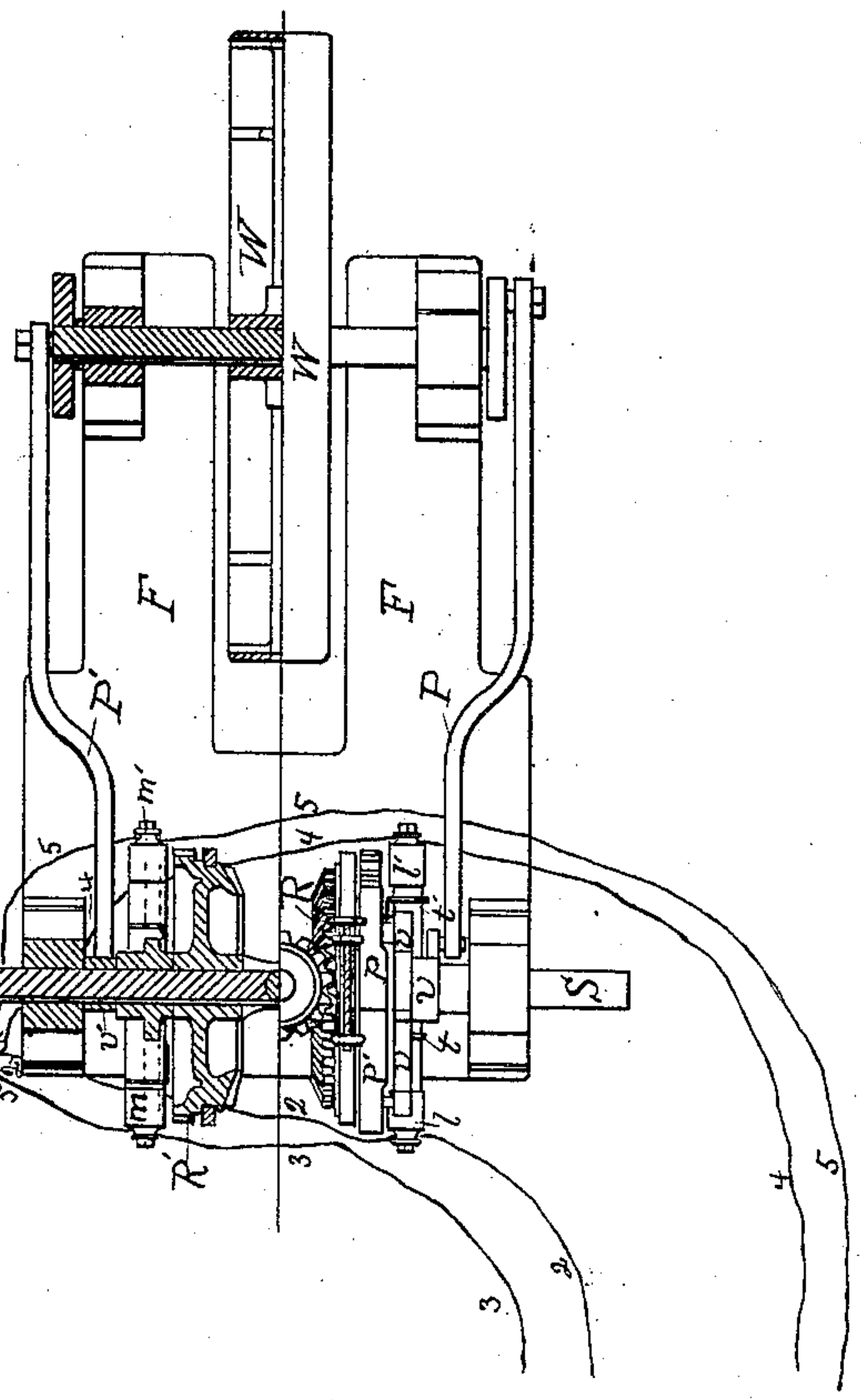

Fig. 1.

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per D. B. Replogle Atty

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

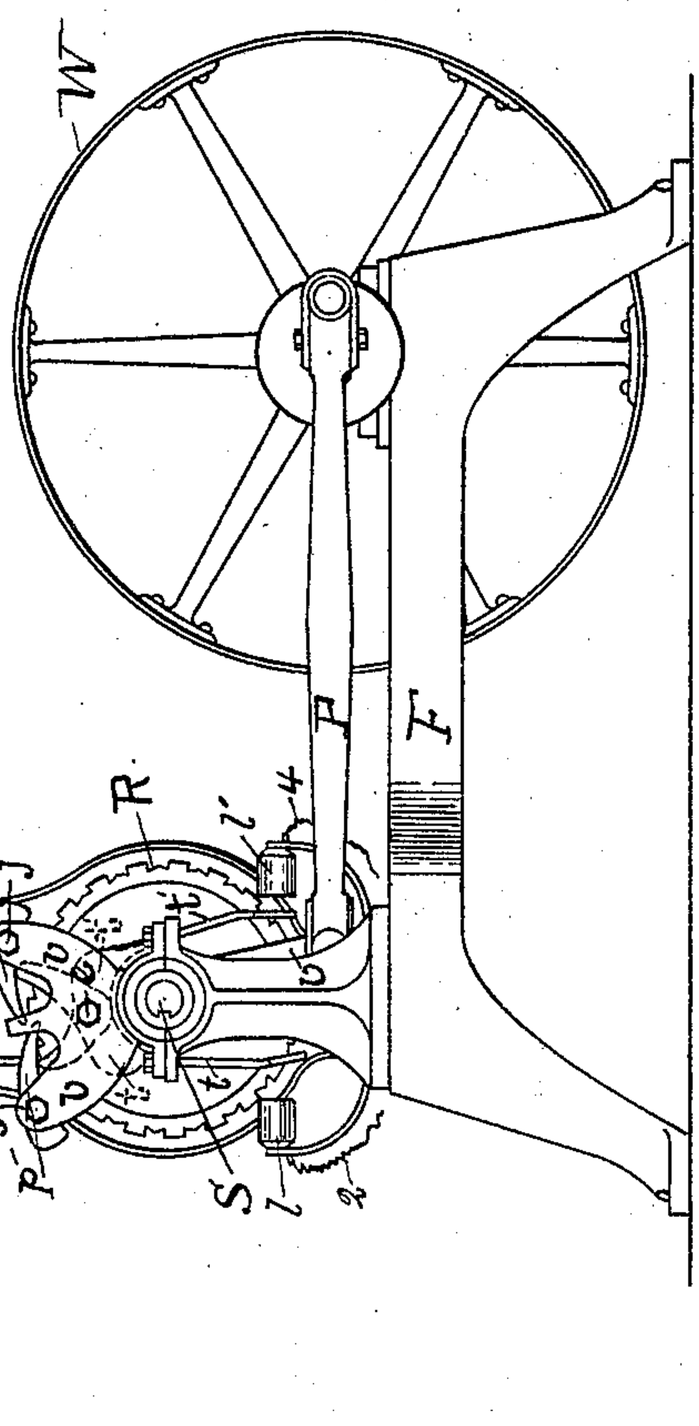
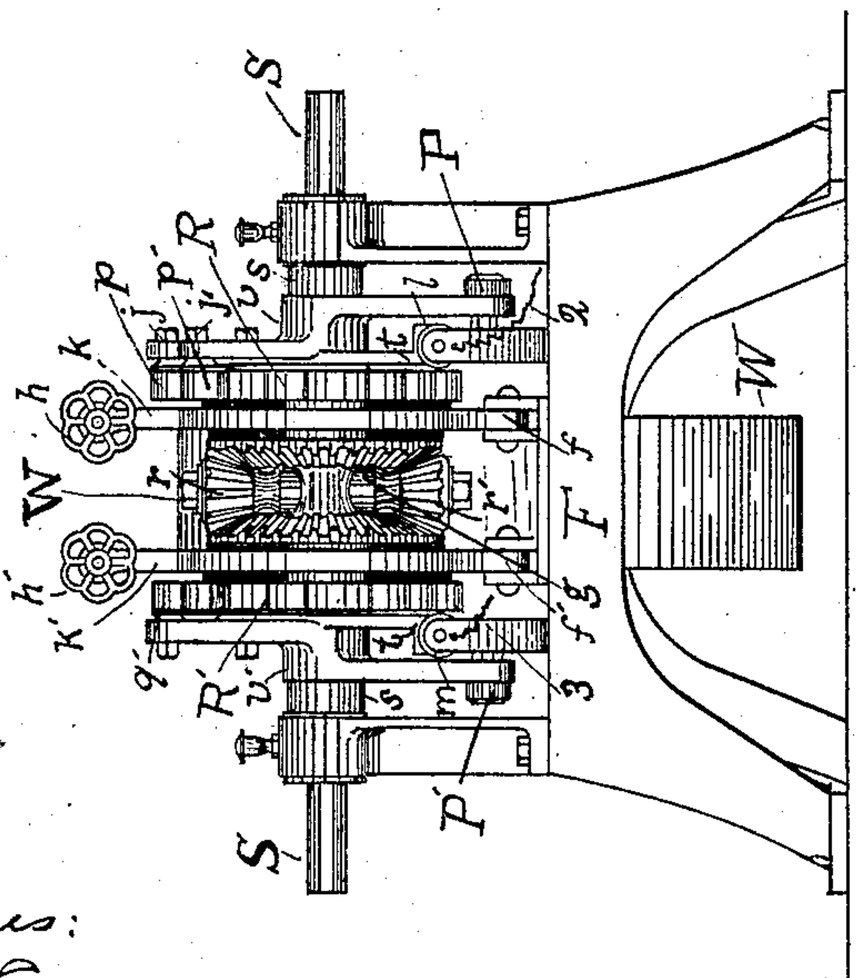


Fig. 3.



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UNITED STATES PATENT OFFICE.

MARK A. REPLOGLE, OF CEDAR FALLS, IOWA.

ELECTRICAL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 565,032, dated August 4, 1896.

Application filed January 26, 1894. Serial No. 498,097. (No model.)

To all whom it may concern:

Be it known that I, MARK A. REPLOGLE, a citizen of the United States, residing at Cedar Falls, in the county of Black Hawk and State of Iowa, have invented a new and valuable Improvement in Electrical Governors, of which the following is a specification.

This invention relates to that class of electrical governors in which a motor-controlling device is set into and out of operation by means of magnets, which are charged by electrical circuits, which are made and broken by means of common speed-governors; and this present invention is an improvement and a compound form of the device for which United States Letters Patent were granted to me June 7, 1892, numbered 476,311.

The object of my invention is to increase the efficiency of electrical governors, and it is comprised in the means or device for that purpose herein described, and illustrated in the accompanying drawings, in which—

Figure 1 is a common speed-governor to which is attached that part of my device which I use for making and breaking the electrical circuits required in operating my invention. It also shows in diagram part of my method of wiring. Fig. 2 is a top view, partly in cross-section, of a gate-controlling device for water-motors or water-wheels; also showing a part of my wiring not shown in Fig. 1. Fig. 3 is a front elevation of the gate-controlling device used as a part of my invention. Fig. 4 is a side elevation of the same.

Referring to the drawings, A is a common speed-governor arranged so as to tilt the oscillating rod or lever B on the pivot *c*. The lever B has fitted into its outer end the flexible metal strip or tongue *x*, adapted to aid in making the electrical connections required.

The letters *a a'* and *b b'* indicate contact-points, the width and vertical positions of the pairs being adjustable by means of the small screws which constitute the said points.

Z is a battery or other source of an electric current, and the figures of reference 1 2 3 4 5 designate the wires through which the electric currents are passed in operating the device.

In the gate or motor-controlling device, S is the shaft, having immediate control of the gate by which the water supply or power supply is regulated, the gate being opened by revolving the shaft in one direction and closed by revolving it in the opposite direction.

To the framework of the motor-controlling device (designated F) is journaled the shaft S, having on each side of its middle a complete motor-controlling device with parts exactly corresponding and alike, so that the explanation of one set of them here following is sufficient explanation for both.

The pawls *p* and *p'* are pivoted to the upper ends of the bifurcated vibrating or oscillating arm *v* by means of the pins *j* and *j'*, and they are vibrated by the pitman P, which connects the lower end of the arm *v* with a crank on the shaft of the belt-wheel W, which is belted to a proper shaft of the machinery of the plant to be governed. The said pawls *p* and *p'* at normal speed are held out of engagement with their ratchet-wheel R by means of the armature-levers *t* and *t'*, respectively, and these armature-levers are controlled by the magnets *l* and *l'*, respectively. Thus if the magnet *l*, for example, is electrically charged, the lever *t* is held away from its normal position, and the pawl *p*, which at normal speed is supported by it, is allowed to drop into engagement with the ratchet-wheel and at each vibration of the arm while the magnet *l* is thus charged the gate or supply of water or power is opened or increased by the turning of the shaft S in the direction of the said pawl *p*.

When the magnet *l'* is charged, the lower end or armature of the lever *t'* is attracted against it, allowing the pawl *p'* to engage and turn the shaft S in the opposite direction, closing the supply of water or power at each vibration of the arm *v*, while the magnet *l'* is thus charged. A corresponding ratchet-wheel R', also for turning the shaft S, a similar pair of pawls, and means actuating them are controlled by the similarly-disposed pair of electromagnets *m* and *m'*.

The wheels R and R' are each a similar combined ratchet, brake, and beveled cog wheel, turning loosely on the shaft S, with the beveled sides facing each other and geared in common to the pinions *r* and *r'* on the arm *g*, which is rigidly attached to the middle part and at right angles to the shaft S. The wheels R and R' are furnished, respectively,

with the brakes *k* and *k'*, which are attached to the framework F at *f* and *f'*. The brakes are tightened by turning the handle *h* or *h'*, the screw-thread *i* serving to draw the upper ends together, while the lower ends hinge at *f* and *f'*, thus clasping the wheels R and R' so that they may not be turned without using more force than half enough necessary to open or close the gate to be controlled.

Collars *s s*, disposed on each end of the shaft S immediately inside the journals, are fitted so as to give the proper width for the working parts of the machine and hold the beveled cogs in gear with the pinions on the arm *g*.

In the operation of the device the gate or motor-regulator shown in Figs. 2, 3, and 4 is of course placed near the gates or motors to be controlled and is kept in continual motion by being belted or geared with the jack-shaft or other suitable shaft near the motor. The centrifugal speed-governor A in Fig. 1 should be placed near the machinery to be run, and is kept in continuous motion by being belted or geared to a suitable shaft of that machinery. The centrifugal governor A is then adjusted so that at the speed required the lever B is disposed midway between the contact-points *a b* and *a' b'*. Now the adjustment of the centrifugal governor A is such that at the slightest variation below the normal or required speed the inner end of the lever B is depressed, so as to raise the outer end of the said lever until the flexible tongue *x* is brought into contact with *a*, thus completing the electrical circuit through the wires 1 2, charging the magnet *l;* and likewise if the variation in speed is slightly above the normal or required speed, the tongue *x* is brought into contact with *a'*, completing the circuit through the wires 1 4 and charging the magnet *l'*, the proper corrections in speed being made by the said magnets setting into action the mechanisms described for turning open or closing the gate or power supply of the water wheel or motor. In slight variations above or below normal speed the contacts *a* and *a'* with the circuits and mechanisms controlled by them are all that is required to make the needed corrections; but when, for example, the speed becomes so slow that the centrifugal governor presses the flexible tongue *x* against *a* until the tongue springs sufficiently, as shown by dotted lines, to allow the additional contact *b*, an additional circuit through the wires 1 3 is formed, thus charging the magnet *m*, which magnet controls a pawl *q'*, vibrated by the arm *v'* and adapted to reinforce the pawl *p* of the arm *v* in opening the gate or supply of power. Likewise, when there is sufficient variation above normal speed, the strip *x* is bent until the contact *b'* is made, completing an additional circuit through the wires 1 5, charging the magnet *m'*, by which a pawl is controlled, adapted to reinforce *p'* in turning off the supply of power.

When the ratchet-wheel set in operation by the *l* set of magnets is turned, the ratchet-wheel adjacent to the *m'* set is held from turning backward by the friction of its brakes aforesaid, and likewise when the ratchet-wheel adjacent to the *m* set of magnets is turned, the ratchet-wheel set in operation by the *l* set of magnets so held by its brakes as aforesaid, the power applied in turning the wheel being sufficient to overcome the friction of the brake on the wheel to which it is applied, while by means of the differential gear constituted by disposing the pinions *r r'*, attached to the arm *g*, enables the wheel turned to turn the shaft S without applying but half the force to the opposite ratchet-wheel. When both wheels are turned, the shaft S is turned bodily with them. The cranks, however, on the shaft of the belt-wheel W are disposed at right angles to each other, so that the pitman P', which oscillates the arm *v'*, makes its strokes intermediate of those of the pitman P, which oscillates the arm *v* on the pivot or bolt *e*.

It will be noticed that in the correction of variations of speed the operation of the several magnets and the mechanisms controlled by them are withdrawn in the inverse order from that in which they engaged, thus contributing to uniform speed by making changes gradually without any sacrifice of promptness.

What I claim, and desire to secure by Letters Patent, is—

In an apparatus for governing power supply, the oscillating lever B having extended from its outer end the flexible tongue *x*, the said lever and tongue adapted to vibrate between two lines of fixed contact-points oppositely arranged in pairs, the said contact-points arranged in such position that the lever and tongue aforesaid being pressed toward a line of them will make contacts with them in consecutive order, and break contact in inverse order when pressed away from the same, and said contact-points in one line adapted to set into successive and combined action a series of mechanisms for increasing the power supply, and the contact-points in the opposite line adapted to set into similar action a corresponding series of mechanisms for decreasing the power supply, by means of electrical currents and electromagnets substantially as specified.

In witness whereof I affix my signature in the presence of two witnesses.

MARK A. REPLOGLE.

Witnesses:
H. C. HEMENWAY,
ALFRED GRUNDY.