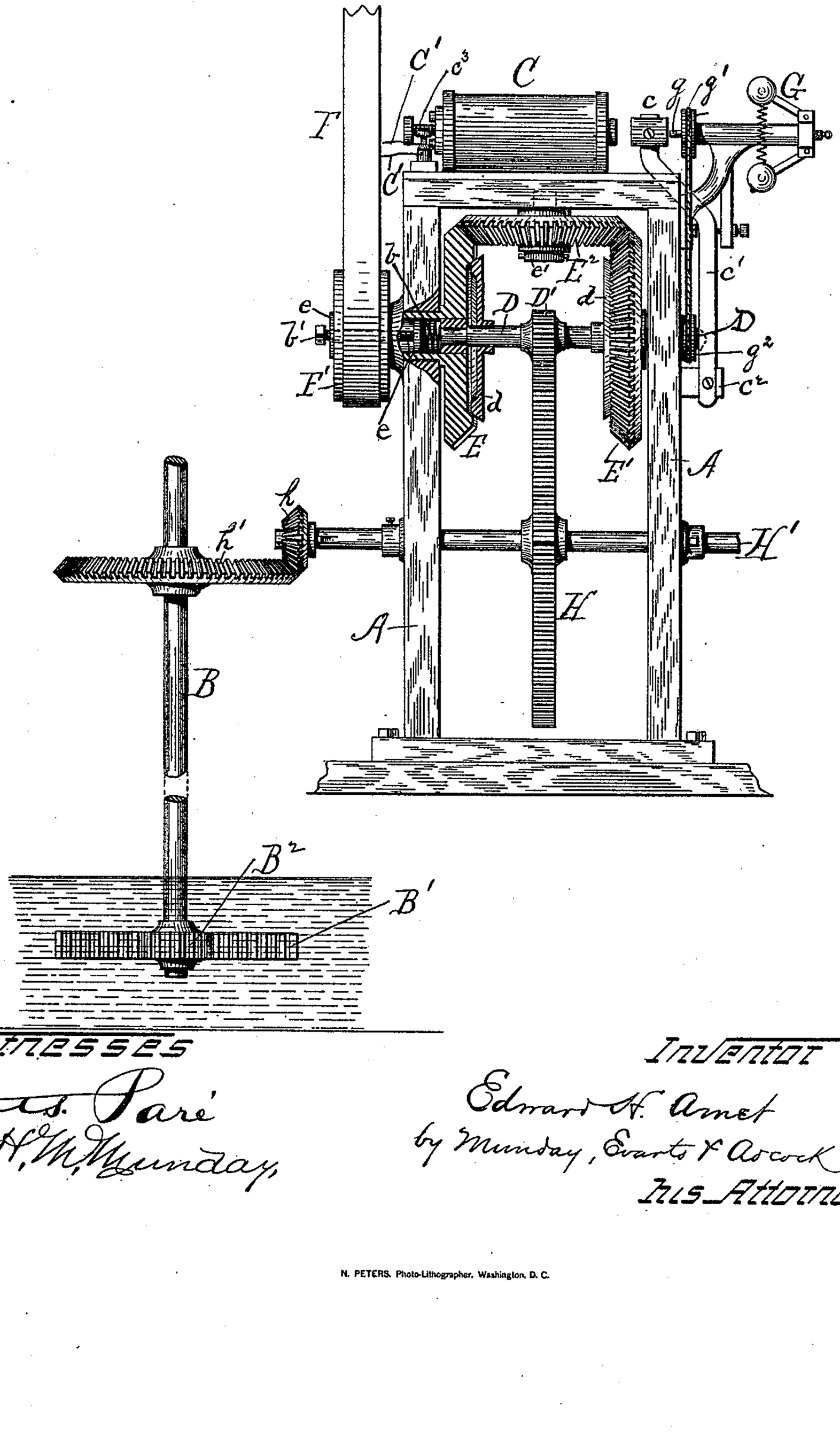
(No Model.)

E. H. AMET.

ELECTRIC WATER WHEEL GOVERNOR.

No. 326,934. Patented Sept. 29, 1885.



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ELECTRIC WATER-WHEEL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 326,934, dated September 29, 1885.

Application filed January 27, 1885. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Water-Wheel Governors, of which the following is a specification.

This invention relates to governors for regulating the speed of water-wheels to the amount of current or electric energy required from the dynamos driven thereby.

The object of the invention is to provide a simple, cheap, and efficient means for accurately and positively governing the speed of a water-wheel and of a dynamo-machine driven by it to the requirements of the electric current produced thereby, as the latter may change from time to time as the resistance in the external circuit changes by the lighting or extinguishment of some or all of the lamps or other causes.

In the present invention an electro-magnet is arranged in the external circuit, so that its core may be energized by the current produced by the dynamo-machine, and the movable armature of this electro-magnet operates to reciprocate a shaft in one direction when the current increases, and in the opposite direction when the current diminishes. This shaft is furnished with two beveled frictions, one of which engages a constantly-revolving wheel when the shaft is reciprocated in one direction, and the other of which engages another oppositely-revolving wheel when said shaft is reciprocated in the opposite direction, so that the shaft is caused to revolve in one direction or the other, according as it is reciprocated to the right or left by the action of the electro-magnet. The shaft is connected by appropriate gearing or mechanism with the gate-shaft of the water-wheel, which operates to open or close the gate. When the current being generated by the dynamo is at its normal or required amount, the friction-wheel shaft occupies an intermediate position, so that neither of its frictions come in contact with either of the constantly-revolving wheels, and the water-wheel gate of course remains stationary; but when the current generated becomes too weak or too strong, the friction-wheel shaft is pushed one way or the other, and the gate-operating mechanism put in motion to open or close the gate, as may be required, to increase or diminish the power or speed of the dynamo driven by it until the required amount of current is again reached, when the gate will again become stationary. A safety device consisting of a centrifugal governor is connected to the mechanism, so as to control the speed in case of the circuit breaking or other accident.

In the accompanying drawing, which forms a part of this specification, I have shown in side elevation a device embodying my invention.

In said drawing, A represents the frame or standards upon which the mechanism is mounted; B, the water-wheel gate-shaft; B′, a rack attached to the gate for sliding the same, and B² a pinion on the gate-shaft for operating the rack one way or the other, according to the direction in which the gate-shaft is revolved.

C is an electro-magnet suitably mounted on the frame A, its coil being connected with the external circuit-wires, C′ C′, of the dynamo-machine, so that its core will be energized by the current generated by the dynamo driven by the water-wheel. The movable armature *c* of the electro-magnet is attached to or mounted upon a lever, *c′*, pivoted to a bracket, c^2, on the frame of the machine.

D is a sliding shaft provided with two friction-wheels, *d*, rigidly secured thereto, so as to reciprocate and revolve with said shaft.

E E′ are two oppositely-revolving beveled gears, suitably journaled on the frame of the machine on opposite sides of the beveled frictions *d*. The gears E E′ are constantly driven in opposite directions by a belt, F, and pulley F′, from any suitable or convenient part of the machinery actuated by the water-wheel. The pulley F′ is keyed on the extended hub or hollow shaft *e* of the bevel-gear E. The center of the gear E and its shaft *e*, which preferably are cast in one solid piece, are bored out to form a bearing for the shaft D, or for the extended hub *d′* of the bevel-friction *d*, secured thereto, and also to form a chamber for the spring *b*, which operates to

reciprocate the shaft D in one direction, while the armature-lever c' moves it in the other direction. b' is an adjusting-screw extending through the bored-out and threaded end of the shaft e, which serves to adjust the force or tension of this spring, so as to just balance the attractive force of the electro-magnet when the current is at the required or normal amount. The bevel-gear F′ is constantly driven in the opposite direction from the bevel-gear F by means of the intermediate bevel-gear, E^2, journaled on the pin e', secured to the frame of the machine. The face of each of the bevel-gears E and E′ conforms to the face of the friction-wheels d, so that when one of the latter is pressed against either of these revolving gears motion will be communicated to the shaft D in one direction or the other. The shaft D extends entirely through the hollow hub e of the bevel-gear E′, and its end bears against the armature-lever c', so that when said armature-lever is pulled up by the electro-magnet it will push the shaft D to the left, and thus engaging the friction d with revolving gear E, cause the shaft D to revolve in one direction, the one necessary to close the gate or diminish the supply of water through the same.

The gate-shaft B is operated from the shaft D by means of a spur-gear, D′, thereon, which meshes with the gear H on the shaft H′, said shaft carrying also a beveled gear, h, that meshes with the beveled gear h' on the gate-shaft.

In order to provide against accidents and afford means of safety to the mechanism in case the circuit should, for example, break, I provide a safety device, which may preferably consist of a centrifugal governor, G, the reciprocating stem g of which operates to push up the lever c', and thus close the gate, when the speed reaches a certain fixed limit. This centrifugal governor may preferably be driven by a belt, g', from a pulley, g^2, on the shaft or hub e of the revolving gear E′. This centrifugal governor is so adjusted that it will not operate until the speed is increased above a certain fixed limit.

c^3 is a screw for adjusting the position of the magnet or its core in relation to the armature-lever.

In place of the mechanism indicated in the drawing for communicating motion from the friction-wheel shaft D to the gate, any other well-known or suitable mechanism may be used; and the electric-governor mechanism may be used for regulating the speed of other motors than water-wheels, though it has been specially designed and adapted for that particular purpose.

While it is preferable to employ two friction-wheels d d, it is obvious that a single friction-wheel having a double face may be used.

I claim—

1. The electric water-wheel governor consisting in the combination, with the gate-shaft or devices for operating the gate, of a sliding shaft provided with friction-wheels, a pair of wheels constantly revolving in opposite directions, and an electro-magnet energized by the current generated by the dynamo driven from the water-wheel for sliding said shaft so that its friction-wheels will engage one or the other of said constantly-revolving wheels according as it may be required to increase or diminish the power, substantially as specified.

2. The electric governor consisting in the combination of electro-magnet C, its armature-lever c', sliding shaft D, provided with frictions d d, oppositely-revolving wheels E E′, spring b, gate-shaft B, and intermediate gearing or mechanism connecting said gate-shaft with said sliding shaft D, substantially as specified.

3. The combination of electro-magnet C, armature-lever c', sliding shaft D, provided with bevel friction-wheels d d, bevel-gears E E′ E^2, spring b, gears D, H, h, and h', gate-shaft B, rack B′, and pinion B^2, substantially as specified.

4. The combination, with the speed or power controlling device of a motor, of a sliding shaft provided with a wheel, a pair of wheels constantly revolving in opposite directions, and an electro-magnet energized by the current generated by the dynamo driven from said motor for sliding said shaft so that its wheel will engage one or the other of said constantly-revolving wheels according as it may be required to increase or diminish the speed or power of the motor, substantially as specified.

5. The combination, with a pair of oppositely-revolving wheels, of a sliding shaft provided with a friction-wheel engaging one or the other of said oppositely-revolving wheels according as said shaft is reciprocated one way or the other, and an electro-magnet for sliding said shaft, and a centrifugal governor for sliding said shaft in case of a failure of the electro-magnet to act, substantially as specified.

6. The electric water-wheel governor consisting in the combination, with the gate-shaft or devices for operating the gate, of a sliding shaft provided with friction-wheels, a pair of wheels constantly revolving in opposite directions, and an electro-magnet energized by the current generated by the dynamo driven from the water-wheel for sliding said shaft so that its friction-wheels will engage one or the other of said constantly-revolving wheels according as it may be required to increase or diminish the power, and a centrifugal governor for reciprocating said shaft in case of a failure of the electro-magnet to act, substantially as specified.

7. The combination of an electro-magnet with its armature-lever, constantly-revolving gears E E′ E^2, and a sliding shaft, D, pro-

vided with bevel friction-wheels *d d*, a spring, *b*, and adjusting-screw *b'*, substantially as specified.

8. The combination of bevel-gear E, provided with hollow hub or shaft *e*, bevel-gear E^2, and bevel-gear E', provided with hollow hub or shaft *e*, sliding shaft D, provided with bevel-frictions *d d*, coil-spring *b*, lever *c*, and electro-magnet C, substantially as specified.

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