

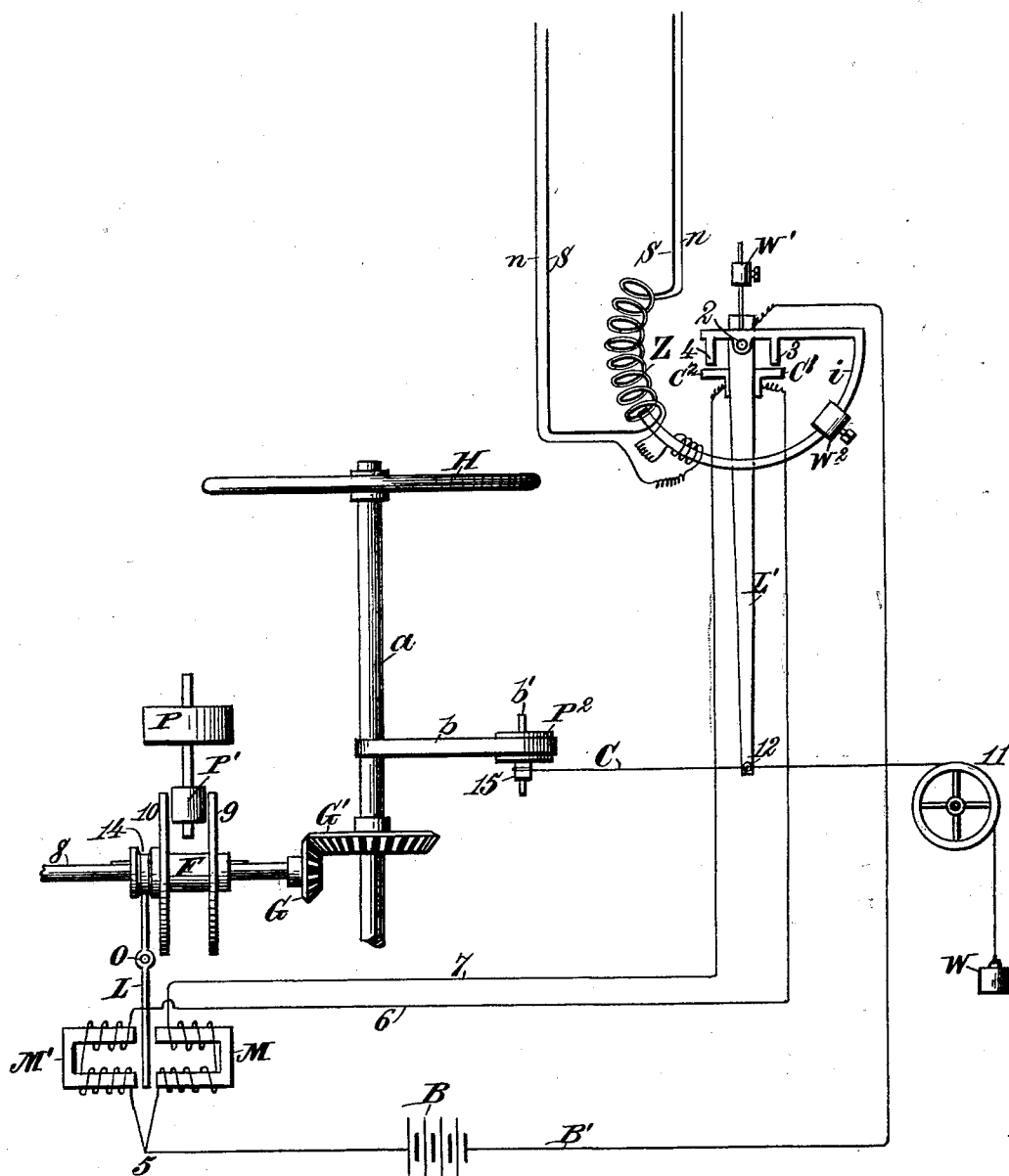
(No Model.)

C. S. ENGLISH.

ELECTRICAL GOVERNOR FOR WATER WHEELS.

No. 521,085.

Patented June 5, 1894.



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UNITED STATES PATENT OFFICE.

CARL S. ENGLISH, OF LOWELL, MICHIGAN, ASSIGNOR OF ONE-HALF TO
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ELECTRICAL GOVERNOR FOR WATER-WHEELS.

SPECIFICATION forming part of Letters Patent No. 521,085, dated June 5, 1894.

Application filed December 23, 1893. Serial No. 494,599. (No model.)

To all whom it may concern:

Be it known that I, CARL S. ENGLISH, a citizen of the United States, residing at the village of Lowell, in the county of Kent and State of Michigan, have invented a certain new and useful Electrical Governor for Water-Wheels, of which the following is a specification.

This invention relates to a new and useful governor for water-wheels.

The invention has for its object to provide novel mechanism for automatically regulating the supply of water to a water wheel that is utilized to generate power for an electric dynamo, in such manner that the amount of water supplied to the wheel, and consequently the power developed by the wheel, shall be increased and diminished in proportion to the amount of work required to be performed by the dynamo, and to this end my invention consists in the novel construction, arrangement and combination of parts hereinafter fully described and afterward definitely pointed out in the claims following the description, reference being had to the accompanying drawing forming a part of this specification.

In the drawing I have shown in elevation a portion of the conductors used in connection with a dynamo, together with suitable mechanism for controlling secondary currents generated by means of a battery or other suitable electrical power, together with connecting mechanism for operating upon the shaft which controls the gate that allows the water to flow upon the water-wheel or water-motor.

I have not illustrated the dynamo nor the water-wheel, for the reason that I make no claim to the form or shape of the dynamo or water-wheel, it being well understood that any form of gate or gates may be used for the purpose. I have also shown my preferred form of applying power, but it will be evident that various changes of form may be used without departing from the spirit of the invention.

In the drawing Z, represents a coil composed of a coarse wire and a fine wire, the coarser coil wires being shown by S, and the finer one by *n*. The object of using the coarse and fine wires is for the purpose of obtaining

a more accurate adjustment, as hereinafter more fully described.

i represents the needle or arm which is acted upon by the magnetic influence of the coil Z. The arm *i*, is pivoted at 2, and is provided with projections 3 and 4, which projections are adapted to come in contact with the contact points C' and C², in order to connect the electric circuit, as hereinafter described. By winding the needle *i*, with a suitable wire coil, it is made an electro-magnet, and the current of electricity in coil S, will greatly increase the force or influence upon needle *i* when so wound either to repel or retract the same, depending upon the manner of winding the coil, as is well understood.

L' is a swinging lever or arm, which may also be pivoted at 2.

C is a cable or flexible connection which attaches the lower end of the lever L', to the axle or hub of the wheel P², and also projects over the wheel 11, and supports the weight W.

B represents an electric battery, or any well-known means for generating a current of electricity.

B' is a conductor connecting the arm *i*, to the junction 5; 5 being the junction between the coils of the electro-magnets M and M'.

6 is a return wire from the electro-magnet M', and 7 is a return wire from the electro-magnet M.

M and M' represent electro-magnets, each wound with coils, as shown. These electro-magnets may be constructed in any well-known form.

8 is a shaft for the friction gear-wheel F. The friction wheel F is provided with two friction surfaces or disks 9 and 10, and the friction wheel F is supported upon the shaft 8 by means of a key or spline which will allow F to have a longitudinal movement upon the shaft 8, but compel it always to revolve with the shaft.

G and G' are gearings whereby the movement of the shaft 8 is conveyed to the shaft *a*. The shaft *a* extends downward, and is connected in any suitable manner with the gate so that the revolution of the shaft *a* in one direction opens the gate, and a counter

revolution shuts the gate. Any suitable attachment for opening and shutting the gate may be applied to the lower end of the shaft *a*.

H is a hand-wheel by means of which the shaft *a* may be operated by hand should the user ever so desire to operate it. The hand-wheel *H* may be dispensed with, however, without interfering with the operation of my invention.

b is a belt connecting shaft *a* to belt pulley *P*², which belt pulley is provided with a hub 15 upon which the flexible connection *C* is adapted to wind, as hereinafter described.

b' is the journal of the band wheel *P*², which journal may be supported in any suitable bearings. It is immaterial whether the journal *b'* revolves with the band pulley, or whether the band pulley revolves upon the journal.

In the drawing I have shown a belt *b* operated directly from the shaft *a*, but it is evident that the band wheel may be applied upon the shaft *a*, if desired.

W is a counter-weight adapted to return the lever *L'* to its normal position as the flexible connection *C*, is unwound from the hub 15.

P is a pulley upon a suitable shaft which is revolved by any suitable machinery. Upon the same shaft is also the friction pulley *P'*.

P and *P'* are rigid with the same shaft, and when *P'* is brought in contact with the friction surface 9, it revolves the friction wheel *F*, in one direction, and when brought in contact with the friction surface 10, it revolves the wheel *F*, in another direction. The shifting of the wheel *F*, however, brings the friction surfaces alternately into contact with the pulley *P'*, the pulley *P'* having no shifting movement.

L is a lever armature adapted to turn upon the pivot *O*, as a fulcrum. What is shown to be the upper end of the lever *L*, engages with the circular groove 14, in the hub *F*, while the lower end of *L* acts as an armature for magnets *M* and *M'*.

W' is an adjusting weight placed upon an arm and preferably raised above the pivotal attaching point of the arm *i*. This weight *W'* is provided with a set-screw so that it may be raised and lowered and attached at any required point.

*W*² is an adjusting weight upon the arm *i*, which may be adjusted by means of a set-screw, or otherwise, to any required point.

12 represents the point of attachment for the flexible connection *C*, to the lower end of the lever *L'*.

I have described a connection between the arm *i*, and the operating parts which raise and lower the water-gate by means of a secondary battery *B*, and electro-magnets *M'* and *M*, which connection I deem to be the preferable form, but I do not wish to limit my invention to this form of connection; for the reason that the connection may be made directly between the arm *i*, and the mechanism which operates the shaft *a*, which shaft

a, may be properly termed the gate-stem, in which case the secondary battery *B*, and magnets might be dispensed with, and the power derived from the electro-magnetic influence of the coil *Z*, be made to operate the opening and closing of the gate.

In the example of my invention shown and described in the drawing, the operation is as follows: When the electric current from the dynamo passes through the coil *S*, the arm *i*, is drawn into the coil *S*, until the projection 3, comes in contact with the tangent point *C'*. This allows the electric current from the battery *B*, to flow through the junction 5, through the coil wound around the magnet *M'*, and thence back through the connection 6, across the contacts and back through *B'* to the battery, thus energizing the magnet *M'*, and moving the armature or lower end of the lever *L*, toward its contact point with the magnet *M'*. *L* turning upon the pivot *O*, as a fulcrum moves the friction wheel *F*, on its shaft 8, until friction surface 10 comes in contact with *P'*, the pulley *P'* revolving, then gives a revolving motion to *F*, and also conveys that revolution through gear-wheels *G* and *G'*, to the shaft *a*, and the shaft *a*, being connected to the water-wheel, raises the gate, increasing the flow of water and thereby the amount of electricity generated by the dynamo up to the required amount. The belt *b*, revolves the pulley *P'*, winding up the flexible connection *C*, its axle 15, drawing the lower end of the lever *L'*, toward shaft *a*, thereby breaking the contact between *C'*, and the projection 3. This will check the further opening of the gate at the point where the water, admitted upon the wheel or motor, is just sufficient to carry the required load or to impart the required energy to the dynamo. The breaking point should be where the arm or needle *i*, balances with relation to the coil *S*. If the current through the coil *S*, becomes too much weakened, the arm *i*, will swing back and projection 4, will come in contact with *C*², which will cause the electric current from the battery *B*, to circulate through the coil of magnet *M*, connecting conductor 7, thereby connecting points *C*² and 4, and connecting conductor *B'*, back to the battery *B*. This will draw the armature *L*, toward the electro-magnet *M*, turning the armature lever *L'*, on its fulcrum *O*, moving the friction wheel *F*, until friction surface 9, comes in contact with *P'*; *P'* revolving as above described will give a reverse action to the friction wheel *F*, and consequently through *F*, to shaft 8, gears *G* and *G'* and the shaft *a*, thereby reversing all the operating parts and shutting off the water from the water-wheel or motor so that only a proper amount of water will flow upon the wheel in order to carry the required load. It will be understood that the winding may be such that the action will be reversed, and the connection such that the reverse action will open the gate. Thus, the water supply for the wheel is always perfectly gaged by means

of the magnetic energy exerted through the coil Z, to the swinging arm or needle *i*. In case a heavy load is put upon the circuit suddenly, a slight lagging of speed sometimes happens, thus lowering the voltage of the current and lessening the amount of current which flows through the coil *n*. This allows the arm or needle *i*, to go farther into the coil or to swing farther toward the attracting point and thus opening the gate a little farther before the contacts break. This brings the speed quickly back to its normal position and corrects the voltage of the current. This is found desirable for the reason that water does not move as quickly or readily as steam or air, it having greater specific gravity and greater momentum. If the current is in large volume thrown off, a slight increase in speed and voltage may occur, thus increasing the current in coil *n*, thereby allowing the arm or needle *i*, to withdraw farther out of the coil than it would normally, thus closing the gate more than it would normally and thereby lowering the voltage to the proper point. In case the needle *i*, is so wound as to be repelled, the repulsion or reverse action of *i*, will produce the result last above described.

I have shown what I deem to be the most preferable method of applying the electro-magnetic force, generated by the electric current passing through the connections, from the dynamo, but any other suitable form may be applied, it being well-known that a current of electricity passing through any conductor will produce this electro-magnetic power, which power I desire to utilize for the purpose hereinafter specified.

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

1. In an electrical water wheel governor, the combination of the dynamo conductor having a coil S, a pivoted arm or needle carrying two contacts, a pivoted oscillating arm carrying contacts adapted to engage the contacts carried by said arm or needle, suitable connections between said oscillating arm and the water wheel gate, a circuit breaking device actuated by the movement of the gate mechanism, and means for actuating the gate operating mechanism, substantially as described.

2. The combination of the coil S, and the coil *n*, a needle *i*, suitable connections between said needle and the gate of the water-wheel whereby the flow of water is automatically controlled through the magnetic energy exerted from the dynamo connections, substantially as described.

3. The combination of the coils S and *n*, the needle *i*, the swinging lever L', the flexible connection C, pulley P² with its hub 15, the weight W, a battery, electro-magnets, conductors connecting said magnets and battery, circuit closing devices actuated by the needle for closing the circuit through either of said magnets, an armature actuated by said magnets, and gearing for actuating a water gate controlled by said armature, substantially as described.

4. The combination of the coils S and *n*, the needle provided with contact points for opening and closing the electric current, the battery B, the electro-magnets M' and M, suitable coils thereon, connections between such coils and the battery, an armature as 11, shifting device as F, provided with friction disks 9 and 10, revolving pulley P', and suitable mechanism connecting the shaft of F to the water-wheel, substantially as described.

5. The combination of the coil of the dynamo, a needle turning upon a pivot having contact points adapted to open and close an electric current, a battery as B, electro-magnets as M, M', suitable conductors extending from said electro-magnets to said battery whereby the current may be directed through either one or the other of said electro-magnets at pleasure, a lever armature as 11, a shifting mechanism as F, operated by means of a pulley as P, suitable mechanism connecting said shifting mechanism F, with the gate of the water-wheel, a band as *b*, pulley P², lever L, flexible connection C and weight W, all constructed substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

CARL S. ENGLISH. [L. S.]

Witnesses:

EDWARD TAGGART,
CHRISTOPHER HONDELINK.