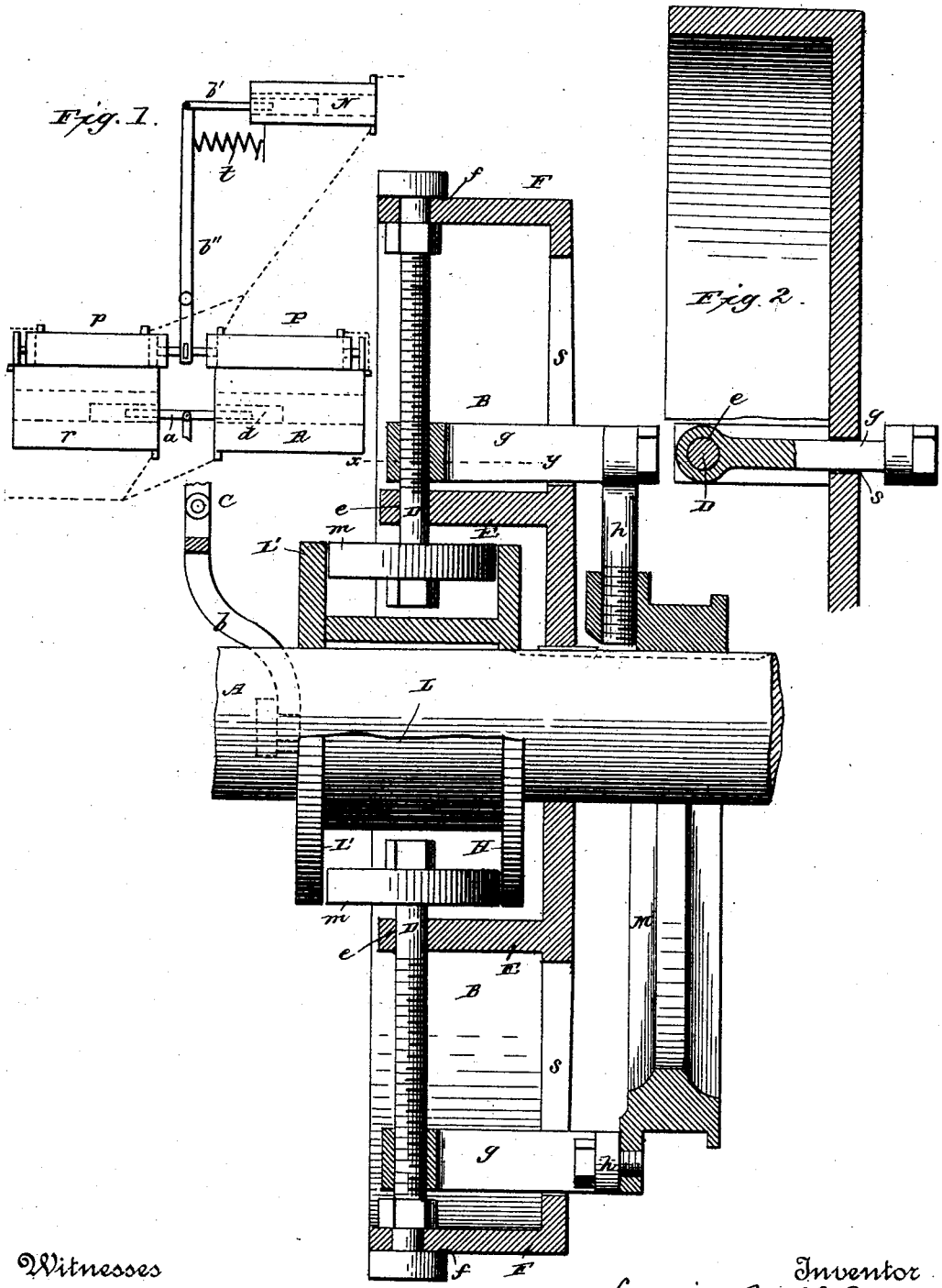
(No Model.)

L. BELL & W. H. P. CREIGHTON.

GgovernOR FOR STEAM ENGINES.

No. 418,602. Patented Dec. 31, 1889.



Witnesses
E. F. Smith
Alex. F. Stewart.

Inventor
Louis Bell and
William H. P. Creighton
By his Attorneys
Church & Church

UNITED STATES PATENT OFFICE.

LOUIS BELL AND WILLIAM H. P. CREIGHTON, OF LAFAYETTE, INDIANA.

GOVERNOR FOR STEAM-ENGINES.

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Application filed April 15, 1889. Serial No. 307,381. (No model.)

To all whom it may concern:

Be it known that we, LOUIS BELL and WILLIAM H. P. CREIGHTON, of Lafayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Governors for Steam-Engines; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

Our invention relates to an improvement in that class of governors particularly adapted for application to engines which drive dynamo or other electric generating machines, and which, as is well known, require an extremely sensitive governor in order that the current or potential of the current generated may be constant under all conditions, the objects of the invention being to effectually control the speed of the engine in such manner that the current generated may be kept sensibly constant by changing the speed of the generator, and hence its electro-motive force, in accordance with the demands of the external circuit. The same method of control we also propose to apply to keeping the electro-motive force of the generator constant by varying its speed in such manner as to counteract the magnetic reactions produced by a varying current through said generator, so that racing or any harmful increase or decrease of speed under varying conditions of load, due to the interruption, resistance, or abnormal increase of the line-current, will be entirely obviated.

To these ends the invention consists, primarily, in connecting the valve and eccentric to move in unison in each direction and controlling the extent of movement of said valve by means of the current generated, whereby the cut-off is changed in accordance with the electrical demands of the system before the change in load acts on the engine, preventing it from racing or slowing down except as the electrical condition demands it.

The invention consists, secondly, in shifting the valve-eccentric to vary the movement of the valve by means of the current generated.

It consists, thirdly, in a novel form of eccentric-shifting mechanism adapted to be moved positively in one direction or the other by an abnormal change in the line-current; and, finally, it consists in certain novel details of construction and combinations and arrangements of parts, as will be hereinafter described, and pointed out particularly in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a sectional and diagrammatic view of a governing mechanism constructed in accordance with our invention, and Fig. 2 is a detail section.

A indicates the crank-shaft of the engine or a shaft driven thereby, and B a drum or wheel keyed or otherwise rigidly connected thereto. Bearings *f e* are formed in the flanges F E of the drum B, and in said bearings are journaled screw-rods D, having friction-wheels *m* on their inner ends, for a purpose to be presently explained, and suitable nuts on the outer ends to retain them in proper position, and in the face of the drum are formed corresponding slots or guideways *s*, through which project arms or elongated nuts *g*, engaging the screws D at one end and having the links *h* secured to the opposite ends. The eccentric M, with which the valve-rod engages, is rigidly mounted on the links *h* and adapted to be shifted thereby with relation to the shaft A, being for this purpose formed with a large aperture in the center, as will be readily understood. With this construction it will be seen at a glance that when the screws D are turned the eccentric will be shifted, and it is a mere matter of computation and experiment to determine what positions the parts should occupy when the engine is working under normal conditions.

Now, in order to shift the eccentric by abnormal changes in the line-current, we provide a collar L, loosely mounted on the shaft A and kept from rotation by the forked lever *b*, mounted on a fixed pivot at C, said collar having flanges L′ H, extending outward on each side of the friction-wheels *m* and adapted to engage all of said wheels simultaneously to insure the movement and uniform rotation of all the screws to shift the eccentric. The outer end of the lever *b* is controlled by the electro-magnets R *v*, which, through the medium of

the armature *a*, serve to move it in one direction or the other, causing the collar to shift laterally and one of the disk L′ H to come in contact with the friction-wheels, which latter, being caused to revolve around the shaft, are rotated by contact with the disks, as just indicated, the wheels and disks, if desired, being provided with friction-surfaces. The current passing through the magnets R *v*, which may be the whole or a part of the main-line current, preferably the latter, as shown, is controlled by the solenoid N, which in the preferred construction is located in the same branch with the magnets, the latter being arranged in said branch in parallel with each other and in series, respectively, with the resistances P *p*. Any variation of the current passing through the solenoid N varies the resistances P *p* through the medium of the armature *b′* and lever b^2, destroying the normal equilibrium of the current passing through the magnets and causing the lever *b* to move accordingly, which movement shifts the collar L into contact with the wheels, as before stated, and retains it until the equilibrium of the current is re-established. If desired, the solenoid may operate to move the lever b^2 in but one direction and the spring *t* relied upon to give the reverse movement.

We are aware that prior to our invention governors have been constructed for steam-engines controlled by the line-current generated by a generator driven by the engine, and we do not wish to be understood as claiming such broad idea; but

What we do claim as new, and desire to secure by Letters Patent, is—

1. In an engine-governor, the combination, with the engine-valve and a shifting eccentric for moving the same, of an electro-magnet controlling the position of said eccentric, substantially as described.

2. In an engine-governor, the combination, with the engine-valve and a shifting eccentric for moving said valve, of a movable eccentric-adjusting mechanism and an electro-magnet controlled by the line-current for moving said mechanism to adjust the eccentric, substantially as described.

3. In a steam-engine governor, the combination, with the eccentric mounted on a movable support and the wheels controlling said support, of the longitudinally-movable collar engaging said wheels and the lever for moving said collar, substantially as described.

4. In a steam-engine governor, the combination, with the eccentric mounted on movable supports and a screw-shaft engaging said supports to move the eccentric, having a friction-wheel thereon, of a longitudinally-movable collar engaging said wheel to rotate the screw and shift the eccentric.

5. In a steam-engine governor, the combination, with the eccentric mounted on movable supports and screw-shafts mounted in guides rigidly connected to the engine-shaft and having friction-wheels at their inner ends, of a longitudinally-movable collar mounted on the engine-shaft and engaging said wheels to rotate the screw-shafts and shift the eccentric and the lever for moving said eccentric, substantially as described.

6. In a steam-engine governor, the combination, with the eccentric mounted on movable supports, the drum on the engine-shaft, having the screw-shafts engaging the eccentric-supports journaled therein, the guides in said drum for the supports, and the friction-wheels on the screw-shafts, of the longitudinally-movable collar on the engine-shaft, having the disks engaging the friction-wheels on opposite sides, and the lever for shifting said collar, substantially as described.

7. In a steam-engine governor, the combination, with the eccentric mounted on movable supports, the drum on the engine-shaft, having the two flanges and slots, the screw-shafts journaled in said flanges and engaging the supports projecting through the slots, and the friction-wheels on the screw-shafts, of the longitudinally-movable collar mounted loosely on the engine-shaft, the disks on said collar projecting on each side of the friction-wheels, and the lever for shifting said collar to bring one or the other of said disks into contact with the friction-wheels, substantially as described.

8. In a steam-engine governor, the combination, with the eccentric mounted on movable supports and screw-shafts mounted in guides rigidly connected to the engine-shaft and having friction-wheels on the inner ends, of a longitudinally-movable collar mounted on the engine-shaft and having the disks engaging said wheels, a lever for moving said collar, and an electro-magnet for moving said lever, substantially as and for the purpose specified.

9. The combination, with a steam-engine having its valve moved by a shifting eccentric and an electrical generator driven by said engine, of an electro-magnet in the circuit of said generator, having an armature controlling the shifting of the engine-eccentric, whereby the cut-off of the valve is regulated by the current passing on the line, substantially as described.

LOUIS BELL.
W. H. P. CREIGHTON.

Witnesses:
MICHAEL GOLDEN,
W. P. TURNER.