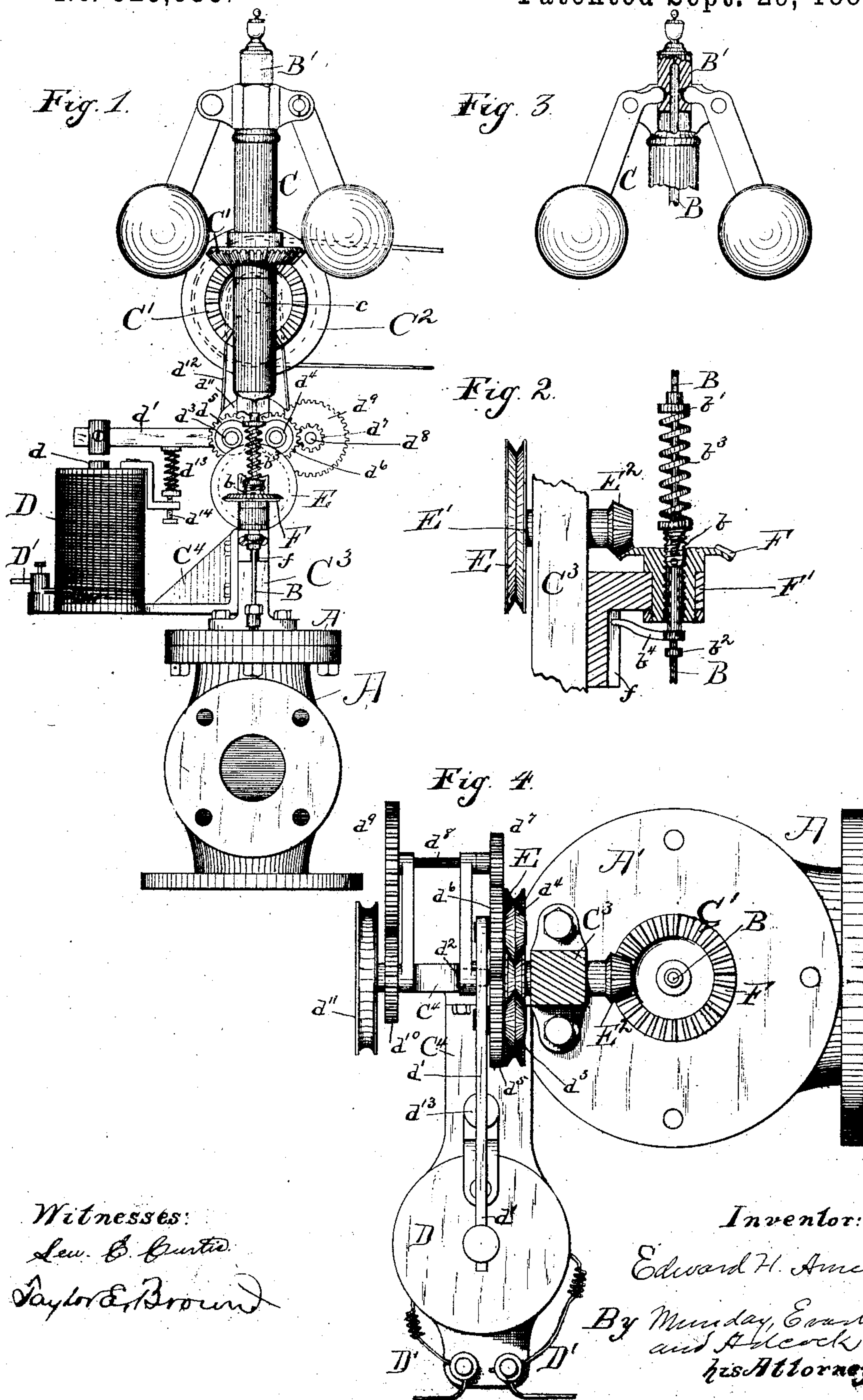


(No Model.)

E. H. AMET.
ELECTRIC STEAM GOVERNOR.

No. 326,933.

Patented Sept. 29, 1885.



UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF CHICAGO, ILLINOIS, ASSIGNOR TO HERBERT A. STREETER, OF SAME PLACE.

ELECTRIC STEAM-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 326,936, dated September 29, 1885.

Application filed December 27, 1884. (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 Steam-Governors, of which the following is a specification.

The object of this invention is to provide a positive and accurate means for automatically adjusting the speed of the driving-motor to the amount of current or electrical energy required.

The present invention consists in combining with the valve or device which controls the speed and power of the motor a centrifugal governor and a secondary-governor mechanism controlled by an electro-motive device actuated by the current produced, which secondary governor mechanism has a yielding or spring connection with the valve-stem, so that the centrifugal governor may, in case of accidents, control the valve and maintain the normal speed of the engine. The secondary-governor mechanism is also arranged or adjusted to open the valve to only a certain prescribed extent, after which limit is reached the valve is under the sole control of the centrifugal governor. The centrifugal governor operates to regulate the speed of the engine to the work required of it within certain limits; but the valve is operated to regulate the speed of the engine, and the dynamo driven from the same, to the requirements of the electric current generated by the dynamo, by means of an ordinary electro-magnet connected with the external circuit, the armature-lever of which carries on opposite sides of its pivot a pair of friction-gears, constantly driven in opposite directions, one or the other of which is brought in contact with and operates the valve-stem-moving mechanism, according as the armature-lever is elevated or depressed by a decrease or increase in the force of the current. When the required current is being generated by the dynamo and the armature-lever occupies its normal position, neither of the frictions touch the valve-stem operating-wheel, and the valve of course remains stationary. Motion is communicated from these two revolving friction-wheels to the valve-stem by means of an externally-threaded non-rotary sleeve, which fits

loosely on the valve-stem and abuts against collars or stops above and below it secured rigidly to the valve-stem, and which threaded sleeve works in a threaded bevel-gear journaled on a stationary bracket, and which is operated by the friction-wheels on the armature-lever. A spring is inserted between the threaded sleeve and the upper stop or collar on the valve stem to prevent any sudden or jumping movement, and by its compression permit the valve-stem to respond to the centrifugal governor. The connection between the valve-stem and the centrifugal governor is such that when being depressed by operation of the threaded gear and sleeve the centrifugal governor will not impede the movement, and thus not only the centrifugal governor, but the mechanism set in motion by the electro-magnet, can independently control the movement of the valve-stem. The latter serves to alter the speed of the engine and dynamo to correspond to any material change in the amount of current required, occasioned, for example, by the lighting or extinguishment of some or all of the lamps, or other cause which increases or diminishes the resistance of the external circuit; and the centrifugal governor is set or adjusted to take effect only when the speed of the engine is increased above that required to produce the current necessary to maintain the whole number of lamps, as in the case of an accidental breaking of the circuit, in which the engine would "run away" but for the centrifugal governor. The threaded sleeve is made of a limited length, or its threaded portion is limited so that it will only operate to raise the valve to a certain and limited extent, after which limit is reached the valve is under control of the centrifugal governor alone. As the valve-stem slides freely through the threaded sleeve, and as the connection between the threaded sleeve and the valve-stem is through a compressible spring, the centrifugal governor may act whenever called into play, and all that is required to completely disconnect the electrical part of the governor and leave the engine under the sole control of the centrifugal governor is to simply remove the belt which communicates motion to the pair of friction-wheels on the armature-lever.

in the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a side elevation of my invention.

5 Figs. 2 and 3 are vertical sections taken through the valve-stem, the former being enlarged; and Fig. 4 is a plan view looking down from a line taken just above the electrical-governor mechanism.

10 In said drawings, A represents the valve of an ordinary steam-engine or other motor; B, the valve-stem, and C a centrifugal governor, which is or may be of any usual or well-known construction.

15 C' C' are bevel-gears, and C² a driving-pulley on the shaft c, through which the centrifugal governor receives its motion from the engine in the usual way. These parts are mounted on a standard, C³, which may preferably be secured to the head-plate A' of the valve A.

20 D is an electro-magnet connected with the external-circuit terminals D' D' of the dynamo-machine, so that the current generated by the dynamo will pass through the coil of this magnet and energize its core d. The armature lever d' is pivoted by a pin, d², to the bracket C⁴ on which the magnet is mounted. Suitably journaled on this armature-lever, on 30 opposite sides of its pivot, are a pair of double-cone friction-wheels, d³ d⁴, which are constantly driven in opposite directions by a pair of intermeshing gears, d⁵ d⁶, operated by a gear, d⁷, on a shaft, d⁸, through the gears d⁹ d¹⁰ and pulley d¹¹, which may preferably receive its motion by a belt, d¹², from the driving-shaft c of the centrifugal governor. The force of the magnet on the armature-lever is counteracted by a spring, d¹³, the tension of 40 which is adjusted by means of a screw, d¹⁴, to just balance the force of the magnet and hold the armature-lever in its proper or horizontal position when the normal or required current is being generated by the dynamo; but when 45 the amount of the current happens to be for any cause increased above its normal amount, the magnet will depress the armature-lever, thus pulling the friction-wheel d³ into contact with the grooved wheel E; and when the current, on the other hand, falls below its normal amount, the spring d¹³ raises the armature-lever, thus bringing the other friction-wheel, d⁴, into contact with the grooved friction E, thus moving the valve-stem in the opposite 55 direction. The shaft E', to which the grooved friction-wheel E is secured, is journaled in suitable bearings on the standard C³, and carries on its opposite end a beveled gear, E², which meshes with an internally-threaded hollow beveled gear, F, journaled in the bracket F', which is secured to the standard C³.

65 Fitting loosely on the valve-stem B is an exteriorly-threaded sleeve, b, which works in the threaded gear F, and which is held in position longitudinally on the valve-stem by stops or collars b' b², rigidly secured to the

valve-stem above and below it. A coiled spring, b³, is inserted between the end of the threaded sleeve b and the upper collar, b', so 70 that by compression of said spring the valve-stem may respond to the centrifugal governor and to raise the valve-stem. The threaded sleeve b is prevented from rotation by an arm or projection, b⁴, the end of which fits in a 75 vertical slot or groove, f, in the bracket F'. The sleeve b, or, rather, its threaded portion, is of limited length, so that it will operate to raise the valve-stem only to a certain prescribed extent, after which limit is reached 80 the further revolution of the beveled gear F will of course have no effect upon the valve, which will then be under the sole control of the centrifugal governor.

The upper end of the valve-stem B rests 85 loosely in the vertically-moving socket-piece B' of the centrifugal governor, so that when the valve-stem is being depressed by action of the threaded sleeve b and revolving nut F, the centrifugal governor will not impede 90 the movement of the valve-stem. When the friction-wheel d³ on the armature-lever is pressed against the grooved friction-wheel E by reason of an increase in the current generated, it causes the threaded gear F to lower 95 the sleeve b and valve-stem B, thus diminishing the supply of steam to the engine and lowering its speed and that of the dynamo driven by it until the current reaches its normal amount, when the spring d¹³ restores the ar- 100 mature-lever to its original position, and the friction-wheel E and threaded gear F of course cease revolving. The moment the speed of the engine and dynamo are thus adjusted to the new condition of the current, it then 105 serves to compensate for any minor changes in the work and to maintain the speed of the engine and dynamo at its new or altered rate. In case an additional light is turned on in the circuit or for other cause its resistance 110 is increased, the current is of course weakened, and the spring d¹³ will then force up the armature-lever, and thus press the other friction-wheel, d⁴, against the friction-wheel E, and consequently revolve the threaded gear 115 F in the opposite direction and raise the valve-stem, thus increasing the speed of the engine and dynamo until the current is restored to its normal amount, when the core d will pull the armature-lever back to its origi- 120 nal position. In this way I make use of the electrical part of the governor to compensate for any changes in the resistance of the circuit—that is to say, to increase or decrease the current generated to the requirements 125 of the circuit, as some or all of the lights are lighted or extinguished, or other changes occur, and at the same time leave the engine under the full control of the centrifugal governor, in case of accident, to maintain the en- 130 gine and dynamo at the normal speed.

The double-cone friction-wheels on the pivoted lever, in connection with the V-grooved friction-wheel E, enables me to reverse the

movement of or change the valve-stem by a very slight movement of the pivoted lever. The apparatus is for this reason capable of a very nice adjustment, and will respond quickly and accurately to very slight changes in the current.

I claim—

1. The combination, with a valve-stem, of a centrifugal governor having a loose connection with said valve-stem, so that it may be moved independent thereof, mechanism for operating the valve-stem having a yielding or spring connection therewith, and an electro-magnet actuated by the current produced for putting said mechanism in operation, substantially as specified.

2. The combination, with the valve-stem, of a centrifugal governor, and a secondary-governor mechanism put in operation by an electro-motive device actuated by the current produced, said secondary-governor mechanism having a yielding or spring connection with said valve stem, substantially as specified.

3. The combination, with a centrifugal governor, of a valve-stem actuated in one direction thereby, but not in the other, a spring for moving the valve-stem in the opposite direction, and a secondary governor controlled by an electro-motive device in the current produced, connected with the valve-stem through said spring for moving the valve in one direction, and rigidly with the valve-stem for moving it in the opposite direction, substantially as specified.

4. The combination, in a motor, of its speed or power regulating stem, with a centrifugal governor, and a secondary governor actuated or set in operation by an electro-motive device in the current produced, said secondary governor having a yielding or spring connection with said regulating-stem to move it in one direction, and a fixed connection in the opposite direction, substantially as specified.

5. The combination of a valve-stem with a centrifugal governor, a non-rotary externally-threaded sleeve fitting loosely on said stem, stops or collars secured to said valve-stem to limit the movement of said sleeve thereon, a spring between one of said stops and said sleeve, an internally-threaded hollow gear working on said sleeve journaled in a stationary bearing, a pivoted armature-lever provided with oppositely-driven gears on each side of its pivot, and gears or mechanism for communicating the motion of one or the other

of said oppositely-driven gears to said internally-threaded hollow gear, substantially as specified.

6. The combination, with valve-stem B, provided with shoulders or collars b' b^2 , of externally-threaded sleeve b , spring b^3 , internally-threaded hollow gear F, an electro-motive device, and mechanism put in operation by said electro-motive device for revolving said internally-threaded gear in opposite directions, substantially as specified.

7. The combination, with a centrifugal governor, and a reciprocating valve-stem fitting loosely in the movable socket-piece of said governor, of an externally-threaded sleeve fitting loosely on said valve-stem, a spring-connection with said valve-stem above and a fixed connection below said sleeve, and means for imparting motion in opposite directions to said threaded sleeve from an electro-motive device, substantially as specified.

8. The combination, with the valve-stem, of a friction-wheel adapted to revolve in either direction, mechanism for communicating motion from said friction-wheel to said valve-stem, a pivoted lever provided with a pair of oppositely-revolving friction-wheels on opposite sides of its pivot, mechanism for driving said friction-wheels, an electro-magnet for tilting said lever in one direction, and a spring or its equivalent for tilting it in the opposite direction, one of said oppositely-revolving friction-wheels engaging said valve-stem operating-wheel when said lever is raised, and the other when depressed, but neither engaging the same when said lever remains in its normal position, substantially as specified.

9. The combination, with a centrifugal governor, of a valve-stem, a sleeve fitting loosely on said valve-stem, a yielding connection or spring to prevent or limit its longitudinal movement on said stem, and an electro-magnet connected with said sleeve, substantially as specified.

10. The combination of a centrifugal governor with a valve-stem provided with stops or shoulders b' b^2 , spring b^3 , sleeve b , having a limited screw-threaded portion, and threaded gear F, and a secondary-governor mechanism controlled by an electro magnet for operating said threaded sleeve and gear, substantially as specified.

EDWARD H. AMET.

Witnesses:

H. M. MUNDAY,

JOHN W. MUNDAY.