

(No Model.)

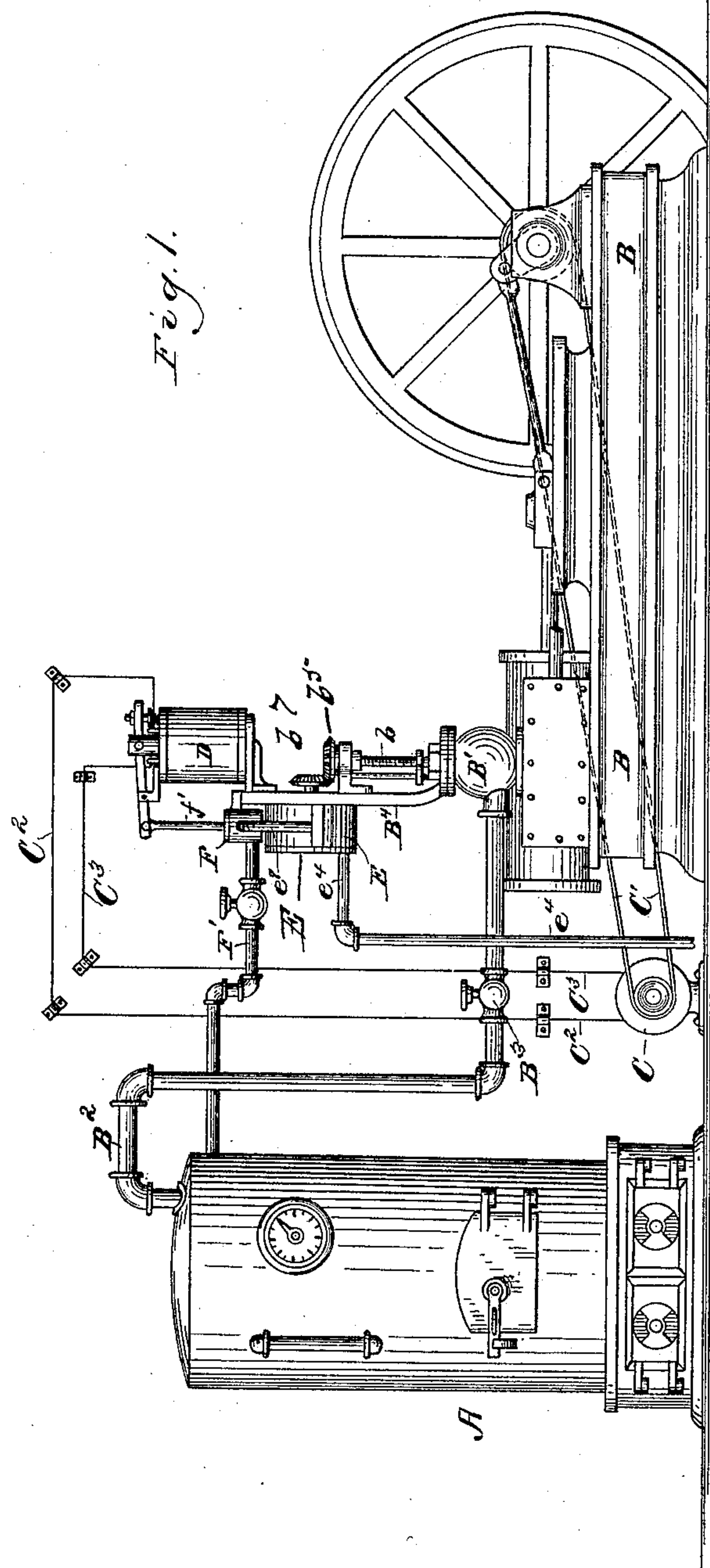
2 Sheets—Sheet 1.

E. H. AMET.

ELECTRICAL GOVERNOR FOR STEAM ENGINES.

No. 300,338.

Patented June 17, 1884.



Witnesses,

*Henry Frankfurter,*  
*W. L. Baker.*

Inventor,

*Edward H. Amet,*  
*per Baker & Donlin,*  
*his Attorneys.*

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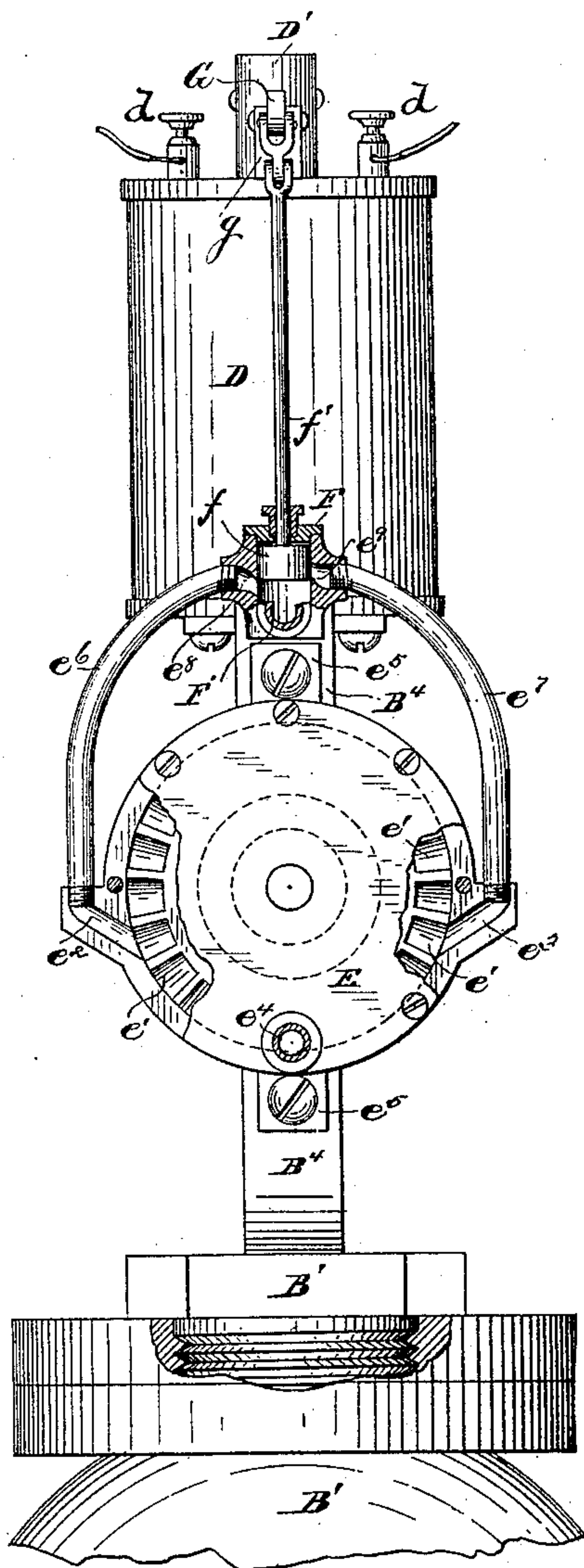


Fig. 2.

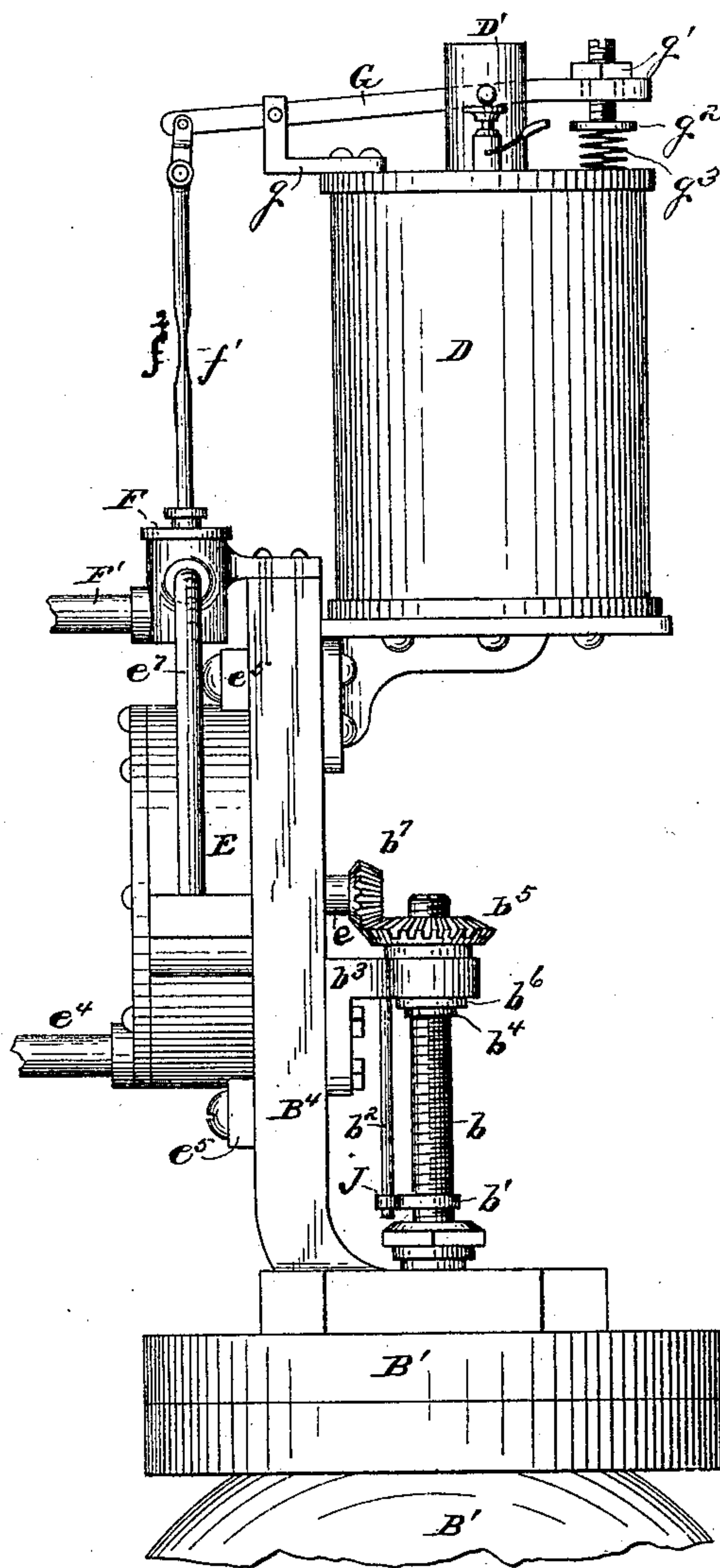


Fig. 3.

Witnesses

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# UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF LA GRANGE, ILLINOIS.

## ELECTRICAL GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 300,338, dated June 17, 1884.

Application filed January 25, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing at La Grange, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electrical Governors for Steam-Engines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

The object of my invention is the application of an electric current to a steam-motor in such manner and through such devices as shall automatically control the supply of steam thereto, and thus regulate the speed of the motor, so that its operation will be smooth and at all times in accordance with the labor it is performing, and so that changes in the amount of labor required of the motor and the effects of such changes thereupon shall in themselves produce the desired action of the electric current. With this object in view I employ an electric solenoid, the yieldingly-supported movable core of which is connected to an independent motor, which controls the supply of steam to the main motor, somewhat in accordance with the principle of construction and operation set forth in my Letters Patent No. 292,397, granted January 22, 1884. In this instance I employ a secondary independently-supplied steam-motor for regulating the supply of steam to the main or primary motor, which latter, in this instance, is utilized to operate a dynamo from which a current of electricity is derived, and conducted to the solenoid for its operation; and my invention consists, broadly, in this combined co-operative arrangement of the principal elements mentioned.

My invention also consists in certain features of construction, in the separate devices employed, and in their combination and co-operative arrangement, as hereinafter fully described, and specifically set forth in the claims.

Referring to the drawings forming a part hereof, in which like letters of reference indicate like parts in all the figures, Figure 1 is a side elevation of a steam-motor provided with my improved electrical governor. Fig. 2 is an enlarged side elevation of the governor de-

tached, and Fig. 3 is a similar elevation of a side adjacent to that shown in Fig. 2.

A represents a steam-generator, which may be of any desired type; B, a steam-motor, also of any desired type; C, a dynamo, which is connected by any suitable means—as a belt, C'—to the main motor, so as to be operated thereby to produce a current of electricity which is directed by the conductors C<sup>2</sup> C<sup>3</sup> to the solenoid D. B' is any suitable supply-pipe valve, preferably of that class known as "balanced," and it may be located at any point between the motor and the generator. In this instance it is secured to the steam-chest, and the main supply-pipe B<sup>2</sup> extends from the valve to the generator, as shown, and may, if desired, be provided with an ordinary stop cock or valve, B<sup>3</sup>.

As thus far described, it will be apparent that the speed of the motor B may be varied, when the valve B<sup>3</sup> is open, by opening to a greater or less extent the valve B', to vary the quantity of steam passing therethrough to the motor. This variation of supply is produced by raising and lowering the valve, and for this purpose its stem *b* is screw-threaded at that portion outside of the usual stuffing-box; and upon the exposed unthreaded portion of the stem there may be, as shown, a sleeve or guide, *b'*, (see Fig. 2,) on a rod, *b<sup>2</sup>*, secured to any suitable fixed support.

A standard, B<sup>4</sup>, is formed on or may be secured to the top of the valve; or it may be formed on or secured to any desired part of the motor, for the purpose of supporting the solenoid and the intermediate co-operative mechanism. To the standard is secured a bracket, *b<sup>3</sup>*, forming a bearing for a nut, *b<sup>4</sup>*, adapted to fit the thread of the valve-stem, and connected to or formed as a part of a bevel-gear, *b<sup>5</sup>*. The nut is so mounted in the bracket that the rotation of the gear in one direction causes the nut to raise the stem and valve, and, when rotated in an opposite direction, to lower the stem and valve, a collar, *b<sup>6</sup>*, secured to the nut below the bracket serving to prevent its being raised out of its bearing in the bracket. A bevel-gear, *b<sup>7</sup>*, meshes with the gear *b<sup>5</sup>*, and is mounted on the shaft *e* of a steam-fan, E, which, in this instance, consists of a disk having radial vanes or blades *e'*, and mounted



rigidly upon the shaft and inclosed in a case having in its peripheral or other shaped edge walls two oppositely-located ports,  $e^2$   $e^3$ , and in its outer side wall an exhaust port and pipe,  $e^4$ . The case is secured to the standard by lugs  $e^5$ ; or it may be, if desired, formed in one piece with said standard. Oppositely-located supply-pipes  $e^6$   $e^7$  connect the ports  $e^2$   $e^3$ , respectively, with similarly relatively located ports  $e^8$   $e^9$  in the walls of a steam chest or valve, F, which in this instance is supported by a bracket formed thereon, and secured to the top of the standard B<sup>1</sup>. If desired, the steam chest or valve may be formed integral with the case of the steam-fan, and the ports  $e^2$   $e^3$  and pipes  $e^6$   $e^7$  may be formed in or on the edge walls of the case by using suitable cores in casting the same, as is usual in fluid-motor construction. The inner ends of the ports  $e^8$   $e^9$  are arranged in different horizontal planes, so that the piston-head  $f$ , being of proper length or thickness, may close both ports when in the position shown, or close one only of said ports when elevated or depressed, as it may be by means of the connection of its piston or stem  $f'$  to a suitable lever, G, properly supported, and having an arm thereof connected to the movable core D' of the solenoid. The valve F is provided with a supply-pipe, F', connecting it with the steam-generator A, or it may be with the supply-pipe B<sup>2</sup>, at a point intermediate the valve B' and the generator, or forming any other connection, so as to provide a supply of steam unaffected by the said valve B'. Now, it is apparent that if the piston  $f$  be elevated, so as to open the port  $e^8$  and close the port  $e^9$  steam will operate the fan E by entering the port  $e^2$  and cause it to revolve from left to right, (see Fig. 2,) and by means of the bevel-gear  $b^7$   $b^5$  the stem  $b$  of valve B' will be lowered, and thus the supply of steam to the main motor will be diminished and its speed accordingly reduced, while if the piston  $f$  be depressed steam will be conducted to the fan through the opposite ports  $e^9$   $e^8$ , and it will be revolved in the opposite direction and cause the gear to rotate the nut so as to elevate the stem  $b$ , and thus increase the supply of steam to the motor, and accordingly the speed of the same. In this instance the piston or stem  $f'$  may be reduced in thickness at a point,  $f^2$ , between the valve and the lever G, so as to render it elastic and thus adapted to the curvilinear movement of the end of the lever, and said lever is pivoted to a bracket,  $g$ , secured to the solenoid, while its longer arm is pivoted in a slot in the core, as shown, and extends beyond the same and made to receive a threaded bolt provided with a nut,  $g'$ , which may be adjusted to determine the limits of the movements of the core in such manner that the piston  $f$  may be also confined in its movements, so as to perform the desired functions. A coiled spring,  $g^2$ , bears against a nut,  $g^3$ , on the bolt and against the solenoid, so as to yieldingly support the

core against the tendency of a current to draw the same within the solenoid.

Binding-posts  $d$   $d$  are provided for suitable conductors, C<sup>2</sup> C<sup>3</sup>, for the positive and negative of a current produced by the dynamo C, and as the strength of said current is dependent upon the rapidity of the rotation of the dynamo, and this rapidity of rotation is dependent upon the rapidity of the operation of the motor, it evidently follows that when, by reason of an increased load upon the motor or a falling below the normal quantity of the supply of steam to the same, the core is raised by the spring against the now weakened current, the piston  $f$  is depressed, the port  $e^8$  closed, the port  $e^9$  opened, and steam from the pipe F' is conducted to the fan through the port  $e^3$ , causing it, as an intermediate independent motor, to revolve the gears  $b^7$   $b^5$ , so as to raise the stem  $b$  of the valve B' and thus increase the supply of steam from the generator through the supply-pipe B<sup>2</sup> to the main motor in sufficient quantity and for a sufficient time until the retarding cause is overcome; and when, by reason of an opposite cause or combination of causes, the rapidity of the operation of the main motor is increased beyond a normal rate, as by a diminished load, the dynamo is likewise affected, and produces a current of increased strength, withdraws the core within the solenoid against the normally-adjusted spring and lever, and through the described means steam is conducted to the opposite side of the intermediate motor, and it effects the lowering of the stem  $b$  of the valve B' until the main motor is brought to a normal speed.

Although I have particularly described the construction of the steam-fan employed as the independent intermediate motor in this instance, I do not wish to be understood as limiting my invention in other respects to the use of a motor having such described construction; but I may substitute therefor a reciprocative steam or electric motor, or any suitable devices adapted to be operated by steam or electricity, the gist of this particular feature of my invention being the use of an independently supplied and operative steam-motor. So, also, I may vary the details of construction in the means for connecting the solenoid to an intermediate independent steam-motor and to the main motor, and in all respects, so far as details of construction are concerned, I may vary them to any extent and to any manner within the skill of persons conversant in the construction of electrical and steam operated mechanisms.

Having described my invention and its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a main and a secondary steam-motor, the latter provided with a controlling-valve comprising a cylinder, an upper and a lower opposite port, and a piston arranged to cover either or both of said ports, with an independent supply-pipe for each mo-



tor, and with a solenoid directly connected to said valve of the secondary motor, and electrically connected with a dynamo driven by the main motor, the secondary motor being adapted to control the steam supplied to the main motor, substantially as specified.

2. In an apparatus comprising a main motor, a dynamo operated thereby, a solenoid in circuit with said dynamo, and a secondary motor, the combination, with said solenoid and with said secondary motor, of a supply-valve comprising a chest or valve body having opposite ports in different planes, and a valve or piston head adapted to cover either or both of said ports, substantially as shown and described.

3. The combination of a main steam-motor, an independent rotary steam-motor provided with oppositely-located ports, and a valve having separate connections with each of said ports, with a solenoid connected with said valve and with the valve of the main motor, substantially as specified.

4. The combination of a governing-valve of a steam-motor, the stem of which is screw-threaded and provided with a nut, with an independently-supplied steam-motor, a suitably-connected solenoid, and mechanism for rotating said nut in opposite directions, as specified.

5. The combination of the valve B', stem *b*, gears *b*<sup>5</sup> *b*<sup>7</sup>, and motor E, with the solenoid D, substantially as shown and described.

6. The combination of the valve B', stem *b*, guide *b*', bracket *b*<sup>3</sup>, nut *b*<sup>4</sup>, gear *b*<sup>5</sup>, and collar *b*<sup>6</sup>, with an electrically-governed motor, substantially as shown and described.

7. The combination of the valve B', standard B<sup>4</sup>, and motor E, and solenoid D, supported on the standard, substantially as shown and described.

8. The combination of the valve B', standard B<sup>4</sup>, motor E, and solenoid D, substantially as shown and described.

9. The combination of the motor E, pipes *e*<sup>7</sup> *e*<sup>6</sup> F', valve F, and solenoid D, substantially as shown and described.

10. The combination of the motor E, having ports *e*<sup>2</sup> *e*<sup>3</sup>, valve F, having ports *e*<sup>8</sup> *e*<sup>9</sup>, pipe F', piston *f*, and solenoid D, substantially as shown and described.

11. The combination of the valve F, piston *f*, elastic stem *f*', lever G, and solenoid D, substantially as shown and described.

12. The combination of the valve F, stem *f*', lever G, bracket *g*, core D', spring *g*<sup>2</sup>, and a bolt provided with adjusting-nuts *g*<sup>1</sup> *g*<sup>2</sup>, substantially as shown and described.

In witness whereof I have hereunto subscribed my name.

EDWARD H. AMET.

Witnesses:

WILLIAM J. DONLIN,  
FREDERICK S. BAKER.