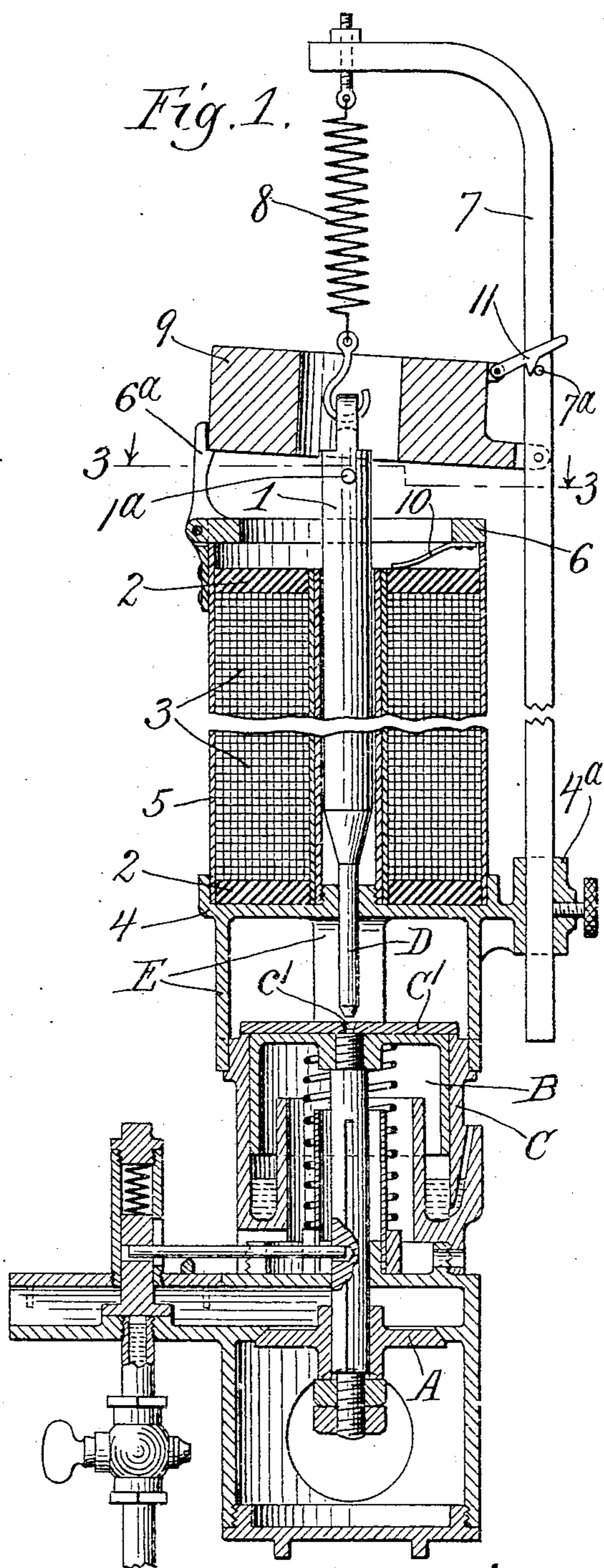
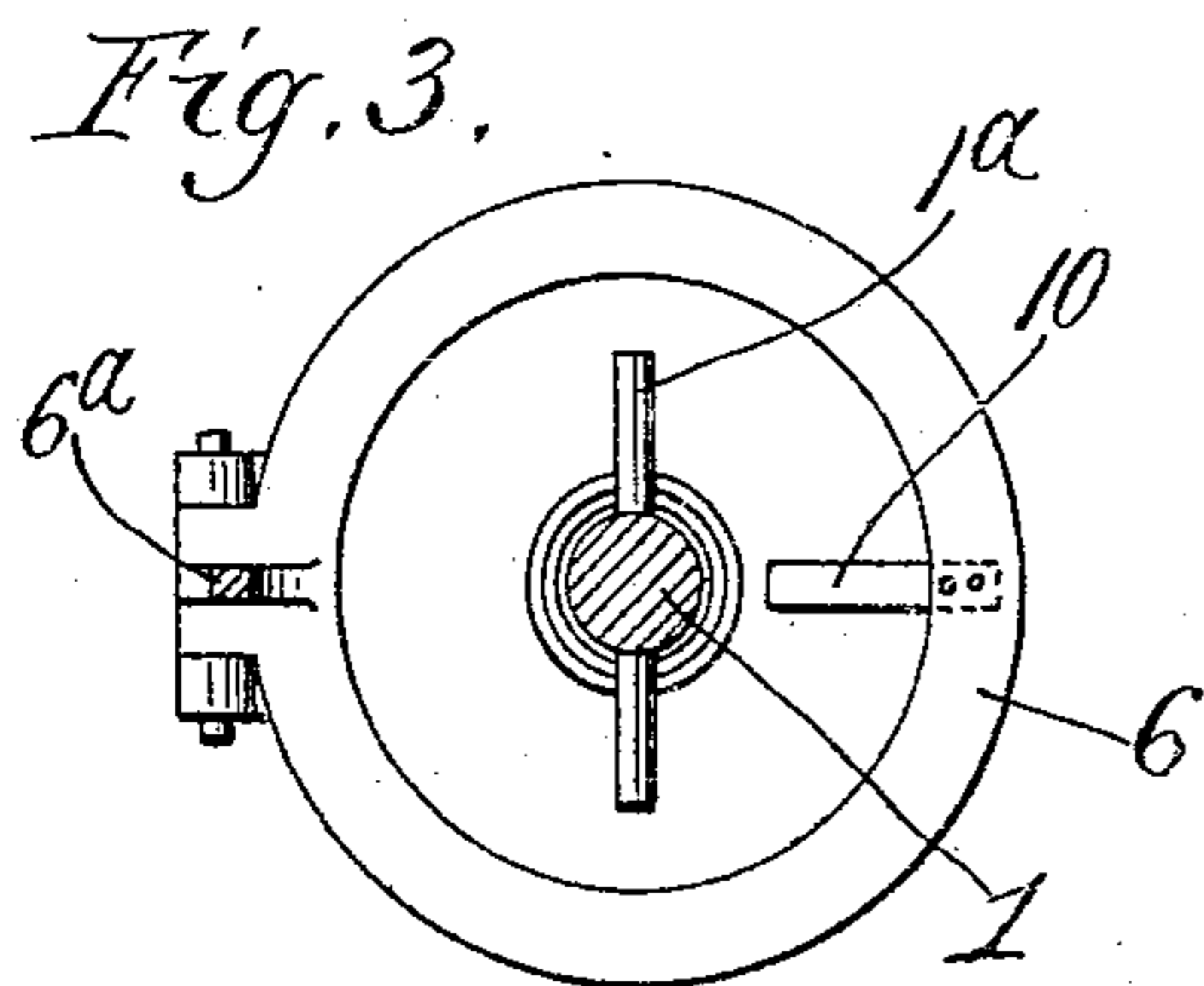
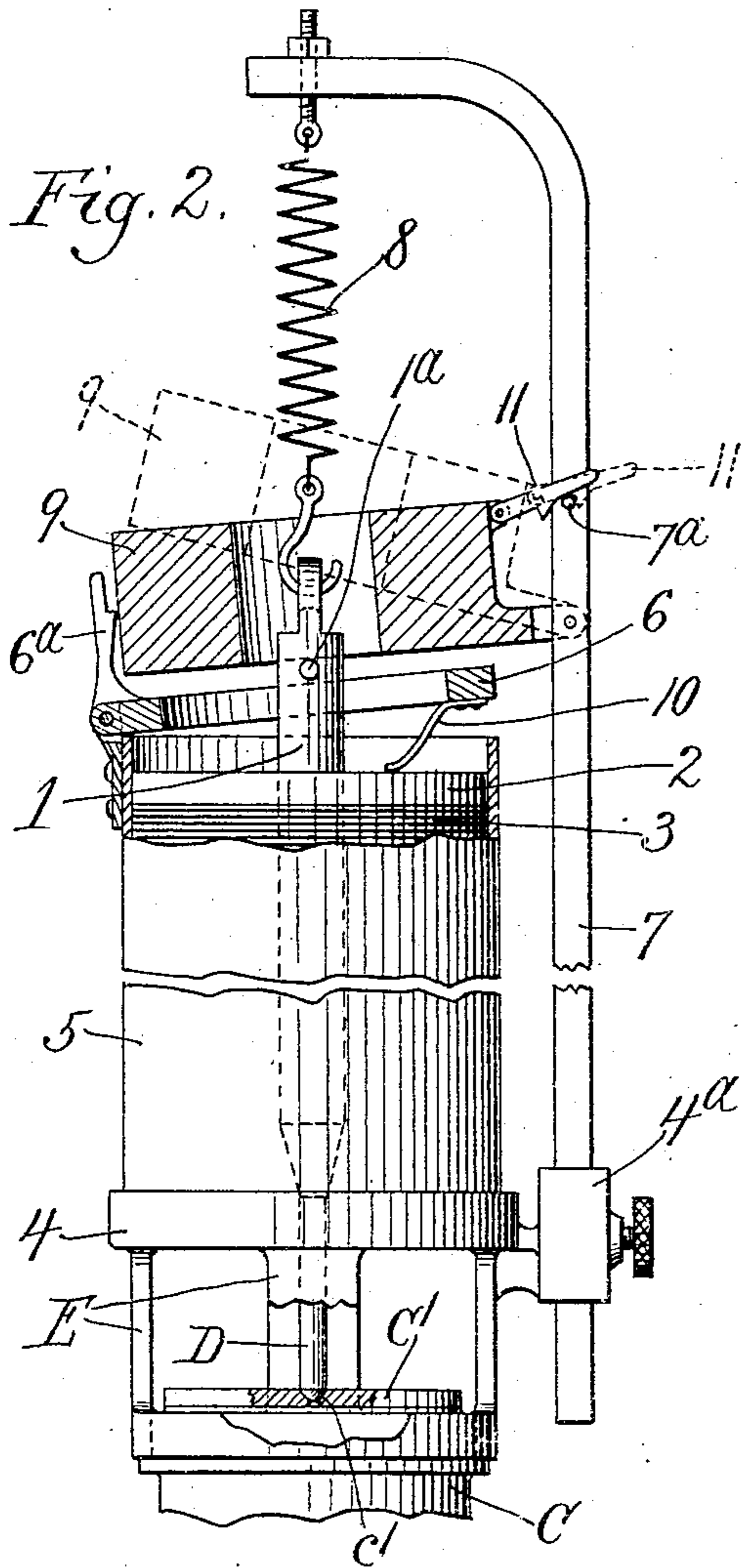


E. HUBBARD.
ELECTROMAGNETIC GOVERNOR FOR INTERNAL COMBUSTION ENGINES.

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927,541.

Patented July 13, 1909.



Witnesses,
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Inventor,
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UNITED STATES PATENT OFFICE.

EBER HUBBARD, OF CHICAGO, ILLINOIS.

ELECTROMAGNETIC GOVERNOR FOR INTERNAL-COMBUSTION ENGINES.

No. 927,541.

Specification of Letters Patent.

Patented July 13, 1909.

Application filed August 24, 1908. Serial No. 449,895.

To all whom it may concern:

Be it known that I, EBER HUBBARD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Electromagnetic Governors for Internal-Combustion Engines, of which the following is a specification, reference being had to the drawings forming a part thereof.

The purpose of this invention is to provide an improved device for governing the action of an internal combustion engine by an electric current which it generates, and adapted to deenergize the engine entirely when from any cause the electric circuit is broken or the current short-circuited so that the work is not being performed.

It consists in the features of construction shown and described as indicated in the claims.

In the drawings:—Figure 1 is a vertical axial section of a governing device embodying this invention and a portion of the engine adjacent thereto in connection with which it operates, the parts being shown at a position occupied when the engine is running. Fig. 2 is a similar view, showing the parts at position occupied when the circuit is broken and the engine deenergized by the action of the governor. Fig. 3 is a section at the line 3—3 on Fig. 1.

The governing device herein is shown associated with the supply valve of the gas engine, the extent of whose opening for admitting the motive fluid is controlled by the extent of opening of a vent valve which governs a partial vacuum produced by the opening movement of the engine supply valve; and a portion of the structure of the gas engine involving the supply valve, the parts for producing the partial vacuum and the vent valve are necessarily shown and will be briefly described.

A represents the supply valve which is connected with a supplemental piston, B, playing in a cylinder, C, in which it is withdrawn from the head of the cylinder by the opening movement of the supply valve with a tendency to produce a partial vacuum beyond the piston between the same and the cylinder head, C¹, a vent aperture, c¹, in said cylinder head being controlled by a governing valve, D.

The construction, as thus far described, is

that which is shown in patent to J. R. Hubbard, No. 800,614. The present invention is provided for operating the governor valve, D, which, in order to be operated for the purpose of controlling the vent aperture in accordance with the requirements of the work, is mounted as a terminal of the movable core, 1, of a solenoid, whose spool, 2, having the winding, 3, is lodged upon a fixed frame or carrier, 4, mounted above the cylinder, 2, upon a skeleton stool, E, provided to space the solenoid at a suitable distance above the cylinder head to accommodate the movement of the valve, D, with the solenoid core and afford convenient access to and view of said valve. The solenoid spool is preferably provided with an exterior magnetizable casing, 5, at the upper end of which at one side there is fulcrumed an annular lever, 6, which faces the marginal portion of the upper head of the solenoid spool, being adapted to oscillate about its fulcrum toward and from said head.

The solenoid frame, 4, has at one side a sleeve, 4^a, vertically apertured for receiving the stem of the bracket or gibbet arm, 7, which at its upper end overhangs the movable core, 1, and serves for the upper end connection of the spring, 8, whose lower end is connected with the upper end of the core, 1, and which operates to yieldingly retract the core upward for taking the valve, D, out of action, such retractile action of the spring being in opposition to the magnetic pull of the solenoid upon said movable core when the solenoid is energized. At the side of the solenoid opposite that at which the lever, 6, is fulcrumed, and conveniently, as shown, upon the bracket, 7, there is fulcrumed an annular weight, 9, which overhangs the annular lever, 6, its central aperture accommodating the movable core, 1, and its spring connections. The lever, 6, has an upstanding detent arm, 6^a, which at its upper end is adapted to engage the annular weight, 9, at the side opposite its fulcrum and to uphold it in position shown in Fig. 1. The movable core, 1, is provided with a cross-pin, 1^a, below the weight long enough to afford a lodgment for the latter when it is released from the detent arm, 6^a, and the weight is designed to be sufficient to depress the movable core, 1, and seat the valve, D, in opposition to the tension of the spring, 8. A spring, 10, is preferably provided operating upon the

lever, 6, tending to swing it up from the end of the spool and to carry the detent, 6^a, out from engagement with the weight.

The operation of the structure shown is that when the engine is in action and developing electric current by which the solenoid is energized, the magnetic pull of the solenoid upon its movable core, 1, operates in opposition to the spring, 8, and tends to move the valve, D, toward its seat, thereby diminishing the vent and increasing the partial vacuum above the piston, B, and thereby diminishing the extent of opening of the valve, A, and thus preventing the action of the engine beyond a speed which will be determined by the tension of the spring, 8, which when increased will increase the speed by requiring a stronger magnetic pull to seat the valve, D. During such operation of the engine, the weight, 9, will be locked out of action by the detent, 6^a, which will be held in locking position by the magnetic attraction of the solenoid spool holding the annular lever, 6, down on to the pole of the spool, as shown in Fig. 1. Any accident which breaks the circuit and causes the solenoid to be de-energized, would, in the absence of any provisions to the contrary, such as the weight above described, cause the valve, D, to be opened to its widest extent and thereby cause the engine to run with the maximum motive fluid supply, although it would be doing no work by reason of the breaking of the circuit in which the work was to be done. But with the construction described, such energizing of the solenoid causing the lever, 6, to be released from magnetic attraction of the solenoid spool and permitting it to swing up from the spool under the action of the spring, 10, will disengage the detent, 6^a, from the weight, and the latter falling, encountering the cross-pin, 1^a, of the movable core, 1, will depress the latter, seating the valve, D, and cutting off the motive fluid supply from the engine. In starting the motor, before any current is generated, it is necessary, obviously, to lock the weight, 9, out of action otherwise than by the detent which requires the magnetic influence to hold it in weight-engaging position; and for this purpose a grooved catch, 11, may be pivoted to the weight at the upper corner above its pivotal support on the bracket, 7, on which a stud, 7^a, is provided for engagement of the catch when it is swung up to a position a little higher than that at which it is adapted to be engaged by the detent, 6^a. The catch, 11, will thus be engaged when the weight is engaged with the detent, 6^a, but only when it is swung to a little higher position, as shown in dotted line in Fig. 2.

I claim:—

1. In an electric governor for an internal combustion engine, in combination with a governing device; an electro-magnetic con-

troller for such device; mechanical means for actuating said device for deenergizing the engine; a detent for holding said mechanical means out of action, and means subject to the influence of the electro-magnetic controller for operating the detent adapted to disengage it when released from such magnetic influence. 73

2. In an electric governor for an internal combustion engine, in combination with a valve governing the motive-fluid supply; an electromagnetic controller for the valve; mechanical means for actuating the valve for deenergizing the engine; a detent for holding such mechanical means out of action, and means subject to the influence of the electro-magnetic-valve controller for operating the detent adapted to disengage the latter when released from said magnetic influence. 80 85

3. In an electric governor for an internal combustion engine, in combination with a device for governing the motive-fluid supply; a solenoid whose movable core is operatively connected with such governing device; yielding means for opposing the magnetically induced movement of such core; mechanical means for actuating the core to deenergize the engine adapted to overpower said yielding means; a detent held in action by the energized solenoid for detaining the mechanical means out of action, and adapted when released from the solenoid to release said mechanical means. 90 95

4. In an electric governor for an internal combustion engine, in combination with a governing device, an electro-magnetic controller for such governing device; a weight for actuating said governing device for deenergizing the engine; a detent for holding the weight out of action, and means subject to the influence of the electro-magnetic controller for operating the detent adapted to disengage it when released from said magnetic influence. 100 105 110

5. In an electric governor for an internal combustion engine, in combination with a governing device, an electro-magnetic controller for such governing device; a weight for actuating said governing device for deenergizing the engine; a detent for holding the weight out of action; means subject to the influence of the electro-magnetic controller for operating the detent adapted to disengage it when released from said magnetic influence, and additional means engageable and disengageable at will and independently of magnetic influence for locking the weight out of action. 115 120

6. In an electric governor for an internal combustion engine, in combination with a governing device, a solenoid whose movable core is operatively connected with the governing device; yielding means for opposing the magnetically-induced movement of such 125 130

core; mechanical means for actuating the
core to deenergize the engine adapted to
overpower such yielding means; a lever po-
sitioned for attraction by one pole of the
5 solenoid when the latter is magnetized, said
lever having a detent arm which engages
said mechanical means for detaining it out
of action when the lever is attracted by the
spool and adapted to release the same when
10 the lever is released from such magnetic at-
traction.

7. In an electric governor for an internal
combustion engine, in combination with a
governing device; a solenoid whose movable
15 core is operatively connected with such gov-
erning device; a spring connected with the
movable core for yieldingly holding said gov-
erning device out of action; an annular
weight fulcrumed at one side of the solenoid
20 and encompassing the movable core, the

solenoid having a magnetizable casing situ-
ated and connected for being magnetized
when the solenoid is energized; an annular
lever opposed to the casing fulcrumed at the
opposite side thereof from said annular 25
weight and having a detent arm at the side
at which it is fulcrumed engaging the annu-
lar weight at the side opposite its fulcrum,
and a spring reacting on the annular lever
to retract it from the casing and disengage its 30
detent arm from the weight.

In testimony whereof I have hereunto set
my hand, in the presence of two witnesses,
at Chicago, Illinois, this 18th day of August,
1908.

EBER HUBBARD.

In the presence of—

EDWARD T. WRAY,
M. GERTRUDE ADY.