No. 671,244. Patented Apr. 2, 1901.

S. B. STEWART, JR.

AIR PUMP GOVERNOR.

(Application filed Jan. 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

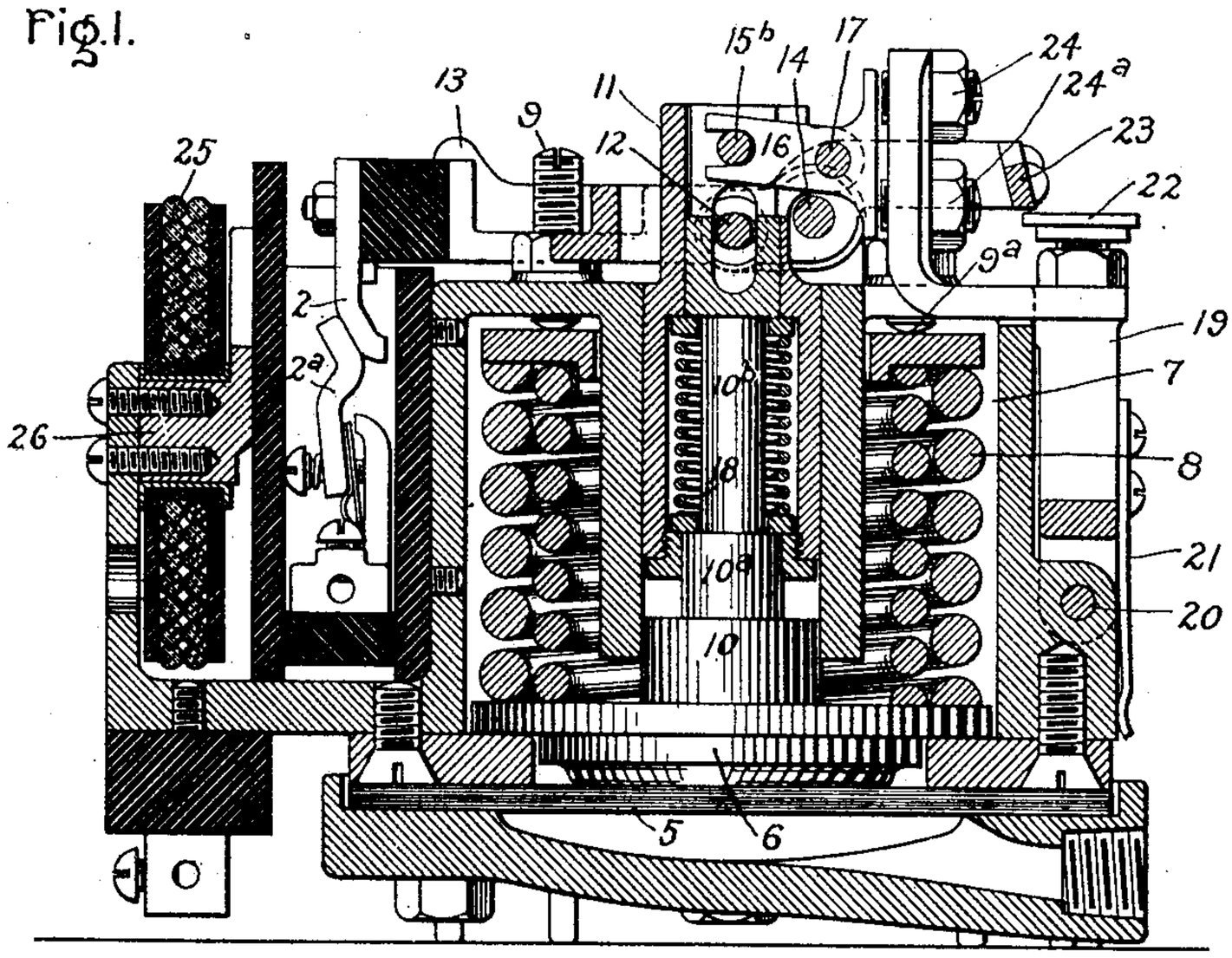

Fig. 2.

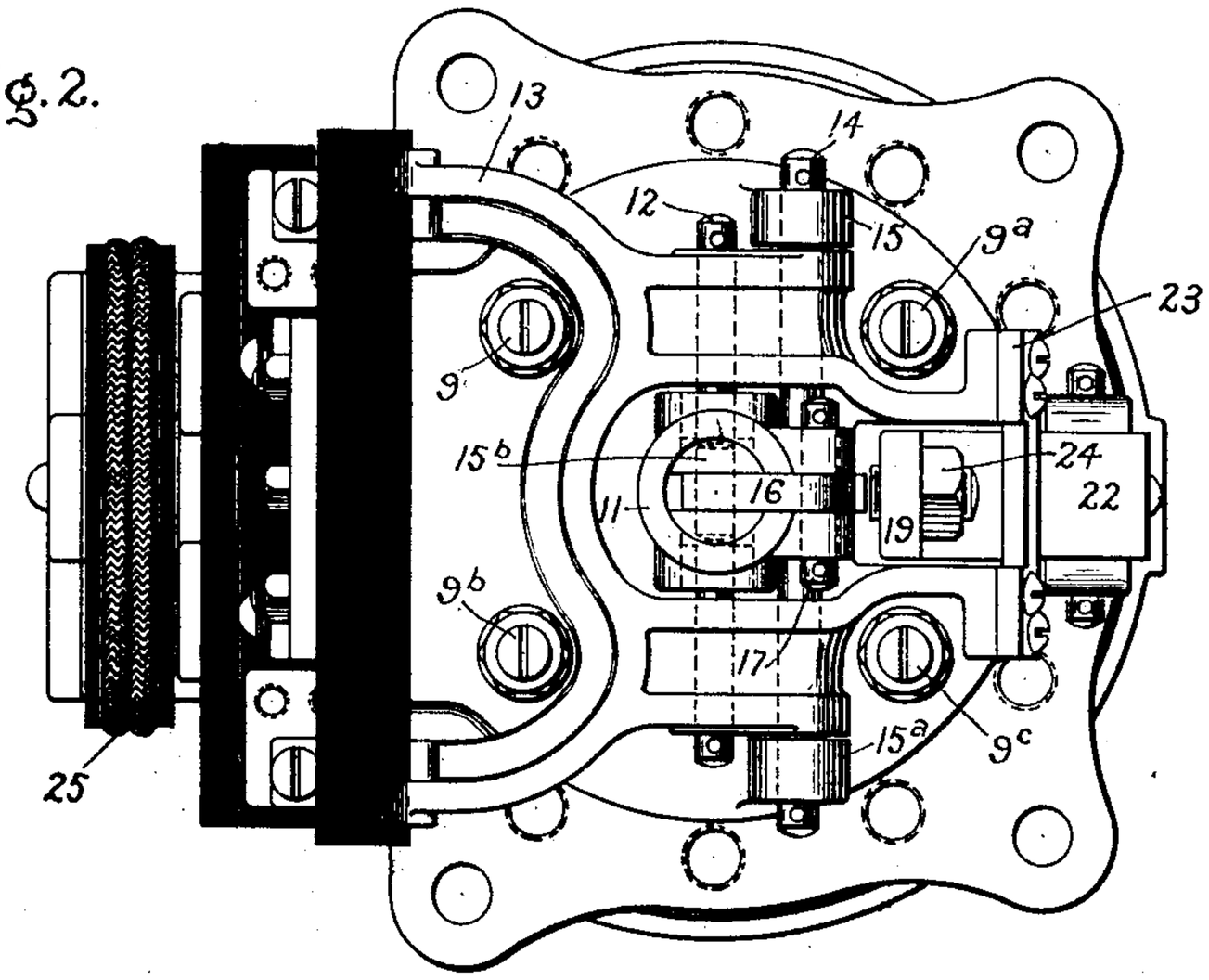

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Fig. 3.

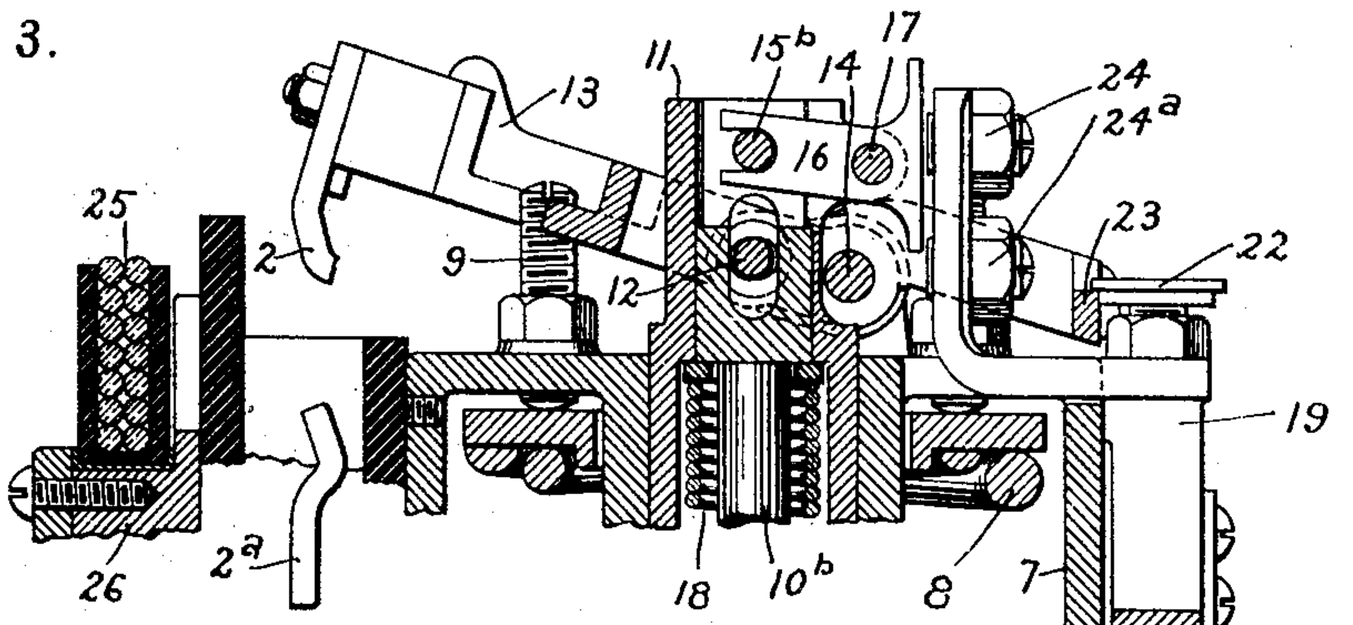
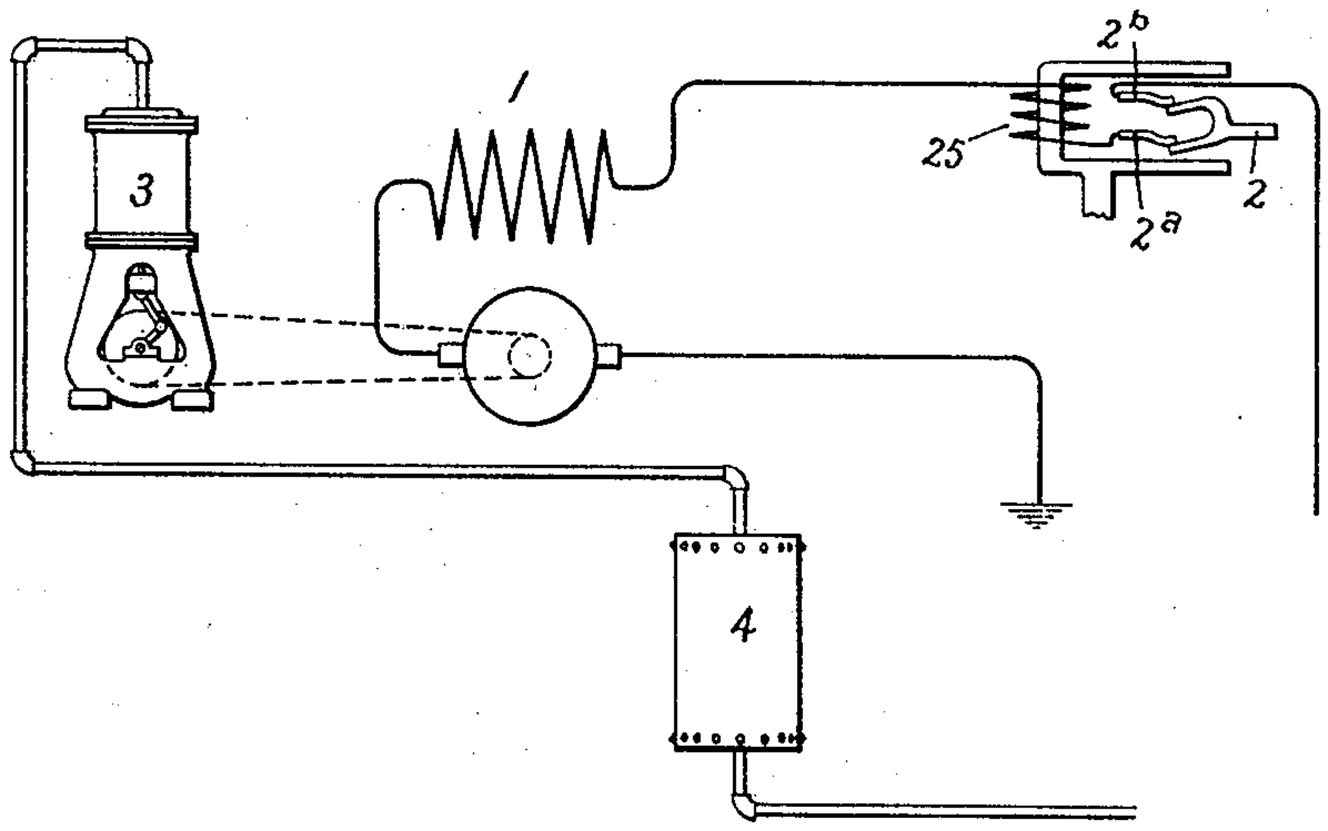


Fig. 4



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UNITED STATES PATENT OFFICE.

SAMUEL B. STEWART, JR., OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, OF NEW YORK.

AIR-PUMP GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 671,244, dated April 2, 1901.

Application filed January 21, 1901. Serial No. 44,320. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL B. STEWART, Jr., a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Air-Pump Governors, (Case No. 1,634,) of which the following is a specification.

This invention relates to governors for air-compressors, the object being, as usual in this class of devices, to maintain air-pressure in an air-brake or other fluid-pressure system within certain determinate limits.

The invention especially refers to systems in which the compressor is operated by an electric motor, the object being to permit the motor to be cut in and out of circuit at a determinate pressure in the system, so as to keep the pressure always within certain specific limits.

The invention comprises novel features of construction whereby the governor which cuts in and out the motor may be made more compact without sacrificing strength or certainty of operation.

The novel features will be more particularly hereinafter described, and will be definitely indicated in the claims appended to this specification.

It is common in operating air-compressors to cut in and out the moter which drives the compressor after the pressure has fluctuated over a definite operating range commonly fixed at ten pounds—that is to say, the difference of pressures in the system when the motor is cut in or out is ten pounds. The working range of pressure may vary, but is commonly from eighty to one hundred pounds, the governor being capable of adjustment so that the motor, for example, can be cut in when pressure declines to eighty pounds and cut out at ninety pounds, or cut in at, say, eighty-five pounds and cut out at ninety-five pounds.

The governor employed for determining the operation of the electric motor is constructed to operate a circuit-controller at the predetermined pressure limits, so as to make or break the circuit. These have been variously constructed, sometimes being actuated mechanically by the air-pressure at both limits and sometimes employing the assistance of electromagnetism to govern the circuit-controller. It is desirable in such devices to provide a positive lock for the controller, so that in any position in which it may be set by the governing-piston it will be free from liability of displacement, and this is an imperative requirement where the pump is installed on a railway-car. My invention attains these various desiderata by a simple and effective construction.

In the accompanying drawings, which illustrate my invention, Figure 1 is a sectional elevation; Fig. 2, a top plan view; Fig. 3, a view on a plane similar to that shown in Fig. 1, showing the circuit-controller open; and Fig. 4, a diagram showing the relation of the circuit-controller to an electric motor and air-compressor.

Referring first to Fig. 4, 1 represents a series motor which when employed in connection with trolley systems may be a five-hundred-volt motor without external resistance and connected in circuit through a circuit-controller operated by the governor and represented in detached form at 2. 3 represents a pump driven by the motor by being geared or belted thereto, and 4 a reservoir for compressing air. By means hereinafter to be described the circuit is automatically closed or opened by the contact 2, and the pump 3 is operated by the motor until the pressure in the system rises to a determinate maximum, when the contacts at the point 2 are automatically opened, the arc at the opening points of contact being blown out by the blow-out magnet in the field of which they are located.

Referring now to Figs. 1, 2, and 3, which show the detail mechanism of the governor, 5 represents a pressure-flexed diaphragm, formed of thick rubber or similar material, connected with a cavity, communicating on one side with the air system supplied by the pump, while on the other side it presses against a piston moving freely in a cast-iron casing or barrel 7, under the stress of a heavy helical spring 8, the tension of which may be regulated by set-screws 9 9^a 9^b 9^c, the spring being adjusted to yield through a range sufficient to open the circuit-breaker when the maximum pressure—say one hundred pounds—has

been attained in the system. Rigidly connected to the piston 6 is a stem 10 10^a 10^b, the first part of which is guided in a sleeve forming a part of the spring-casing and the outer part of which is guided in a movable sleeve 11, normally locked against movement by a pin 12, fastened in the two sides of a circuit-controlling lever 13, pivoted on a rod 14, mounted in studs 15 and 15^a on the end of the casing. The pin 12 passes through a slot in the outer part of the stem, as indicated in Fig. 1, so that the latter may have a certain amount of lost motion with relation to the sleeve 11. The outer end of the stem is slotted, a pin 15^b passing across the slot and being anchored in its walls, which pin is engaged by the forked end of a T-shaped lever 16, which passes through the slotted end of the stem and is pivoted on a pin 17, fastened to lugs projecting from the sleeve 11. The stem is provided with shoulders at the ends of the narrow part 10^b, between which is an auxiliary helical spring 18, limited by two washers, as shown in Fig. 1. This spring is adjusted in tension so as to give a sufficient movement under the operating range of the system—say ten pounds—to trip the circuit-breaker 13, the trip movement being effected through the T-lever 16, which operates the tripping device of the circuit-breaker. This tripping device comprises an elbow-lever 19, pivoted on the bottom of the governor-casing, as indicated at 20, controlled by a leaf-spring 21, bearing on the side of the casing. The elbow-lever carries a trip-plate 22, coöperating with a hardened-steel plate 23, fastened to the lower end of the lever 13. The plate 22 is adjustable and may be fixed in any position of adjustment by a lock-nut, as shown in Fig. 1. In the end of the elbow-lever 19 are fastened adjusting-screws 24 24^a, governing the point at which the circuit-breaker should act. The lever 13 lies, as shown in the drawings, across the end of the casing or parallel to the operating-spring, thus forming a very compact arrangement of the parts, which is particularly desirable in car systems where the amount of available room is very limited. The circuit-breaker contacts are located on the side of the casing in an arc-rupturing chute, formed of fiber or other similar insulating material, across which is established a magnetic field by a coil 25 in circuit with the motor when the latter is operating, as indicated in Fig. 4. The core of this magnet, as indicated at 26, may be screwed to a projecting part of the governor-casing, and the latter with advantage may be made of cast-iron. An insulated contact 2 is rigidly fixed to the end of the lever 13, adapted to bridge the contacts 2^a 2^b, secured to the walls of the chute and spring-mounted, as indicated in Fig. 1.

As thus constructed, the operation of the governor is as follows: The circuit-breaker lever 13 is positively locked either in a closed or open position, being held locked by the steel bar 23, engaging plate 22 on either its front or rear side. On closing the circuit the contacts 2 2^a remain closed, and the motor therefore operates until the pressure on the diaphragm 5 has reached the maximum limit. While pressure is gradually increased from the minimum point, the pressure-flexed diaphragm forces the piston against the tension of the main spring 8 and gradually stores pressure in the auxiliary spring 18. The latter, however, is held from expanding by the pin 15^b, which rests in the notch in the end of the lever 16, pivoted at 17 in lugs on the sleeve 11. It will be evident, therefore, that the spring cannot expand until sufficient energy is stored to tilt the lever 16 against the adjusting-screw 24 and depress the elbow-lever 19 against the tension of spring 21. When the maximum pressure has been reached, the auxiliary spring will have stored sufficient energy to lower the tripping-plate 22 and free it from engagement with the steel bar 23. The lever 13 being then free to rock on its axis 14 under the tension of the auxiliary spring 18 is thrown quickly outward at the upper end, thereby opening the circuit, the arc being blown out by the magnetic field in which the contacts are mounted. The range of movement necessary to effect release may be anything desired; but I have found a compression of approximately three-sixteenths of an inch of the springs 8 and 18 is sufficient to effect good practical results. When the circuit-breaker is tripped, sleeve 11 is shifted forward relatively to the piston, so that they occupy the same relative positions as when closed, as will be evident from a comparison of Figs. 1 and 3. As seen in Fig. 3, the inner end of the T-lever 16 is in a position ready to engage the adjusting-nut at 24^a. In closing the circuit-breaker the same action takes place as in opening, except that the movements are in an opposite direction, the auxiliary spring 18 being compressed against the inner shoulder of the sleeve 11 and the tripping-lever 16 being gradually tilted until it lowers the trip-plate 22 and clears the edge of the steel bar 23, when the lever 13 is released and free to permit the inward extension of the spring, thereby closing the circuit. The parts should be so constructed that when the circuit is closed a small amount of clearness—say one thirty-second of an inch—will exist between the trip-plate 22 and the inner edge of the bar 23, so as to allow a slight movement toward opening as the pressure increases, thus giving a certainty of action to the tripping devices. A similar clearance should exist between the outer edge of the bar 23 and the inner edge of the plate 22 when the circuit is closed, thus rendering absolutely certain the locking of the circuit-breaker in an open or closed position. By adjusting the screws 9 9^a the operating range of the governor may be varied. By adjusting the screws 24 and 24^a the working range may be varied.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An air-pump governor, comprising a pressure-operated device for opening and closing the circuit of a driving electric motor, a spring resisting the movement of said device, an auxiliary spring strained by such movement, and a tripping device for the controller operated by said spring.

2. An air-pump governor, comprising a pressure-operated device for opening and closing a circuit controlling a driving electric motor, a spring resisting the movement of said device, an auxiliary spring strained by this movement, an elastically-yielding tripping device for the circuit-controller and means for releasing the same when the auxiliary spring has been given a determinate strain.

3. An air-pump governor, comprising a pressure-operated device for opening and closing the circuit of a driving electric motor, a spring resisting the movement of said device, a circuit-controller governed by the spring, a detent for the circuit-controller, and a tripping device for releasing the detent, to open or close the motor-circuit at determinate points of stress of the spring.

4. An air-pump governor, comprising a pressure-flexed diaphragm, a circuit-controller governed thereby mounted in a plane substantially parallel to the diaphragm, a coil-spring, an operating-stem between the two, a blow-out magnet having its chute between the planes of the circuit-controller and diaphragm and at one side of the spring, and arcing contacts within the chute.

5. An air-pump governor, comprising a pressure-flexed diaphragm, a circuit-controller for a driving electric motor, an operating-stem for the controller controlled by the diaphragm, a coil-spring strained by the movement of the stem, a tripping device for the circuit-controller released by a determinate strain of the spring, and a rigid connection between the spring and the circuit-controller held stationary by the tripping device while the spring is being strained.

6. An air-pump governor, comprising a pressure-flexed diaphragm, a spring-casing over the diaphragm, a spring-pressed stem within the casing, a circuit-controller for a driving electric motor operated by the stem extending across the end of the casing, circuit-contacts above the casing, and a spring-pressed latch for the circuit-controller on the bottom of the casing.

7. An air-pump governor, comprising a pressure-flexed diaphragm, an operating-stem, a coil-spring 18, sleeve 11, T-lever 16, trip-plate 22, and an operating-lever for the circuit-controller engaging said trip-plate.

8. An air-pump governor, comprising a pressure-flexed diaphragm, a piston operated thereby, T-lever 16, spring-pressed tripping-lever operated by the piston when tripped by the lever.

9. An air-pump governor comprising a pressure-operated piston, a circuit-breaker for an electric motor, lever 16, yieldingly pressed by the piston, and a tripping device for the circuit-breaker operated by the lever.

10. An air-pump governor, comprising a pressure-pressed piston, spring engaging the same, auxiliary spring, a tripping-lever operated thereby and a circuit-breaker connected with the piston through the auxiliary spring and adapted to be closed or opened upon determinate ranges of movement of the piston.

In witness whereof I have hereunto set my hand this 21st day of January, 1901.

SAMUEL B. STEWART, JR.

Witnesses:
BENJAMIN B. HULL,
MARGARET E. WOOLLEY.