No. 627,471. Patented June 27, 1899.

M. K. BOWEN & G. W. KNOX.

A. D. BOWEN, Executrix of M. K. BOWEN, Dec'd.

CONTROLLER FOR MOTORS.

(Application filed Nov. 7, 1898.)

(No Model.) 3 Sheets—Sheet 1.

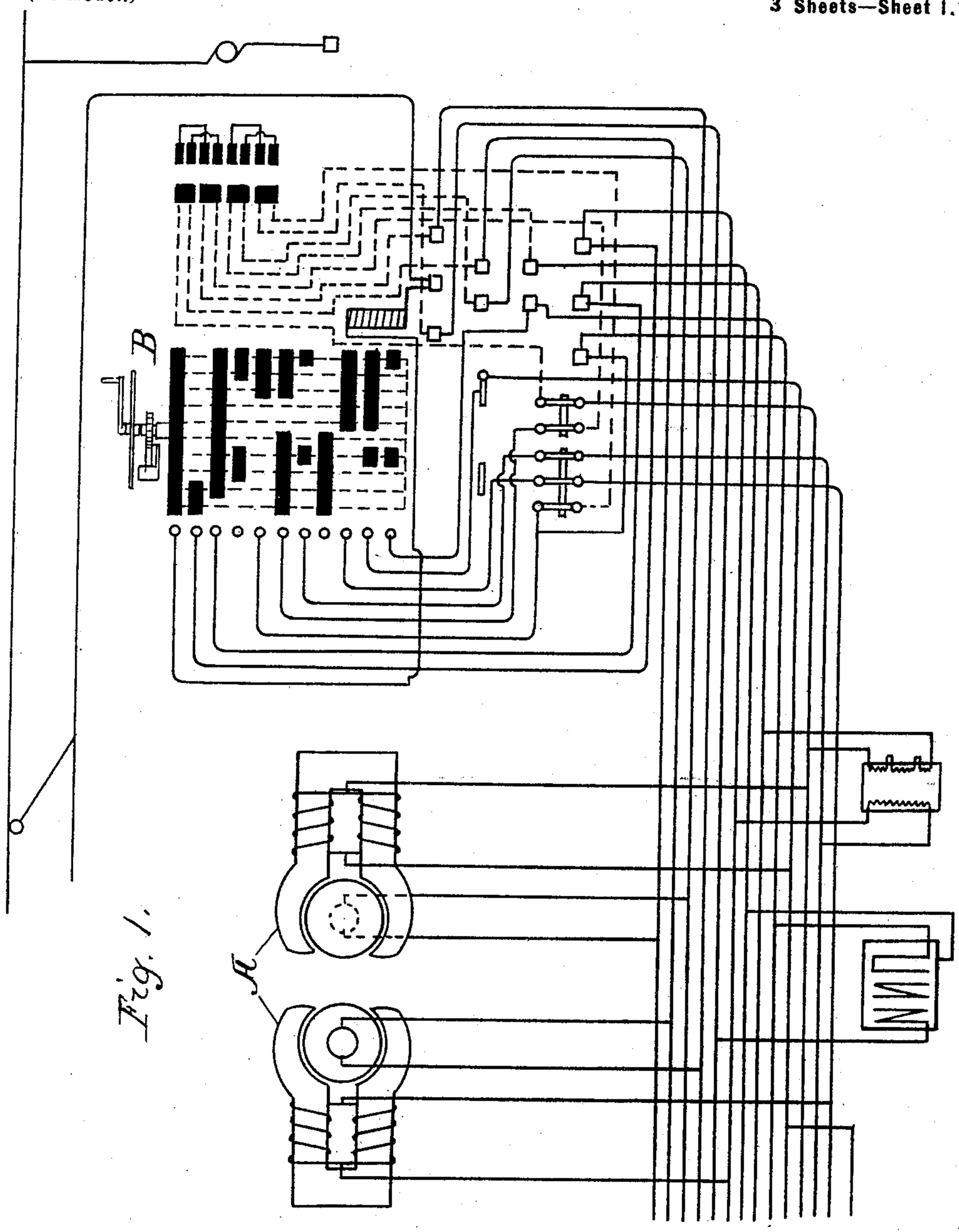

Fig. 1.

Witnesses

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Fig. 2.

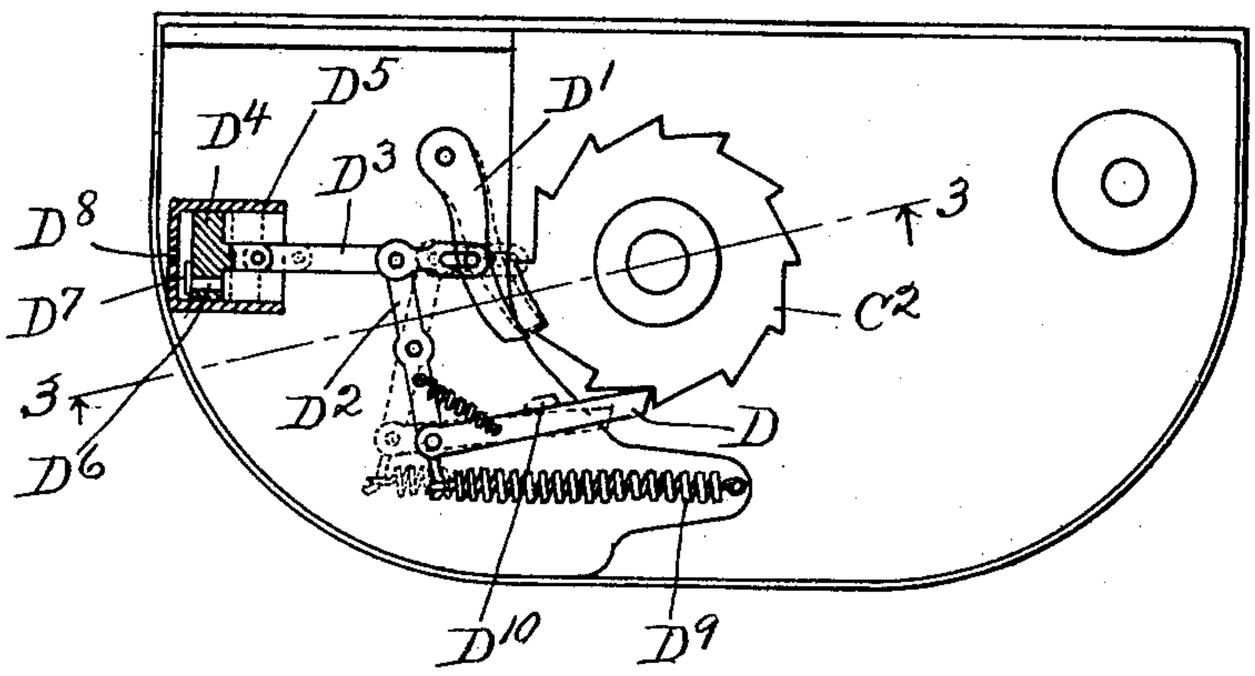

Fig. 3.

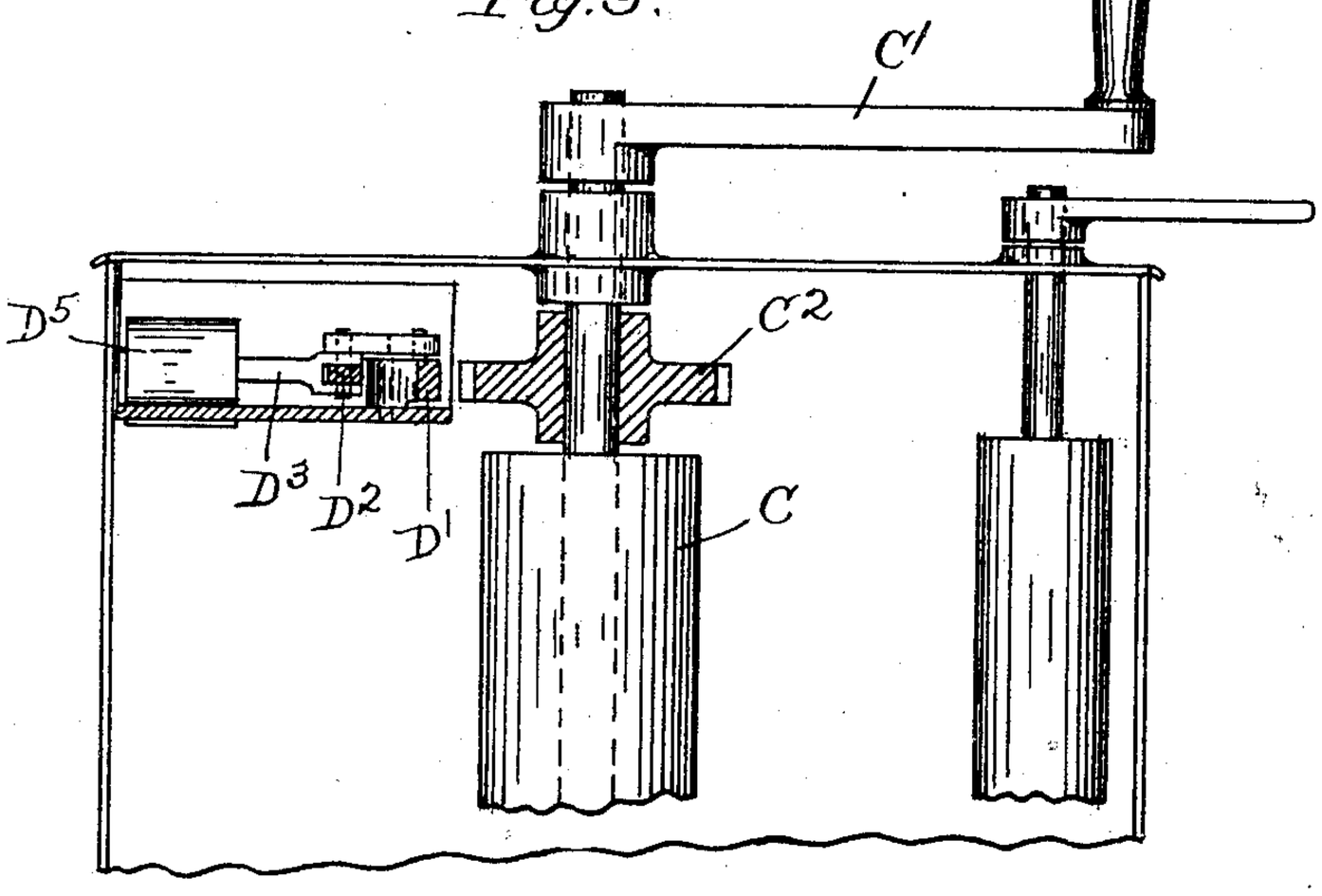

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Fig. 4.

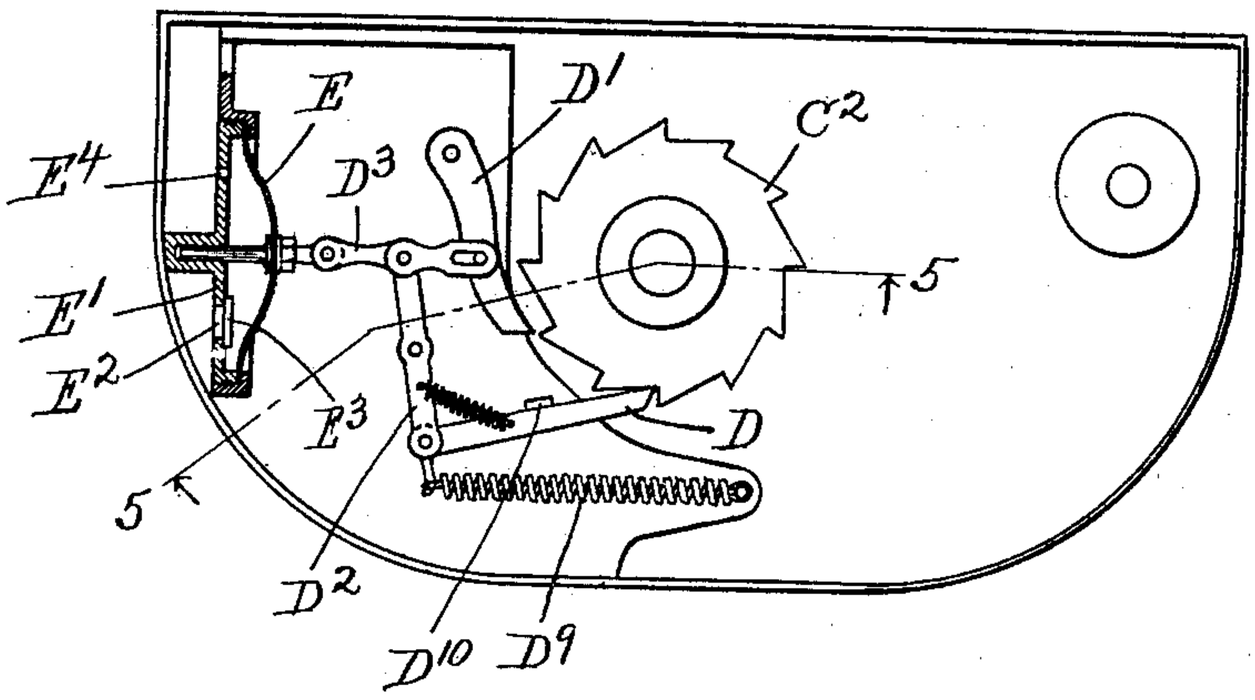
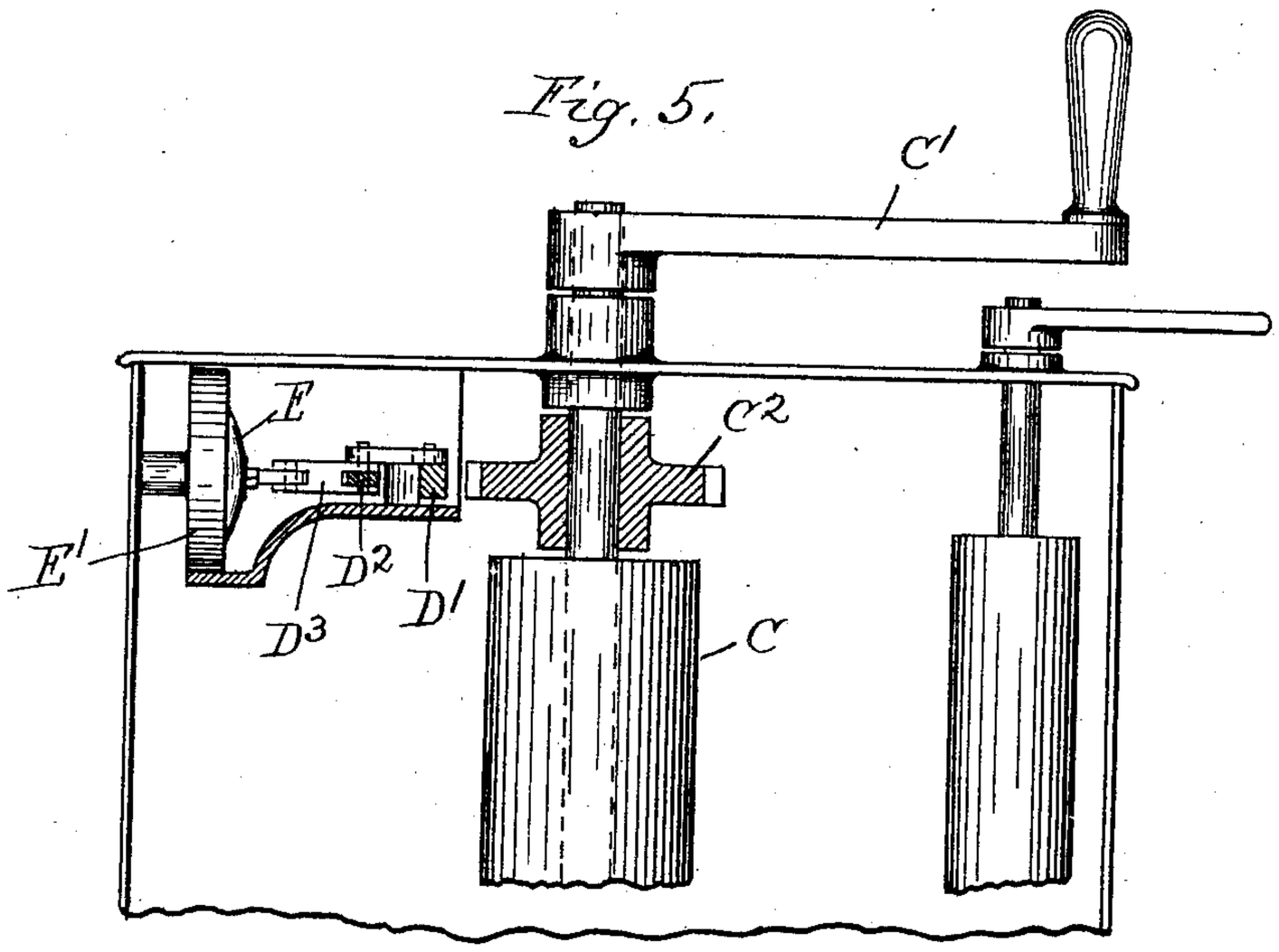


Fig. 5.



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CONTROLLER FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 627,471, dated June 27, 1899.

Application filed November 7, 1898. Serial No. 695,646. (No model.)

To all whom it may concern:

Be it known that we, MENARD K. BOWEN and GEORGE W. KNOX, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Controllers for Motors, of which the following is a specification.

Our invention relates to devices for controlling the power-supply of motors and the like, and has for its object to provide a new and improved means for this and like purposes.

Our invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a diagrammatic view showing a controller in circuit. Fig. 2 is a view, with parts removed, of one form of controller embodying our invention as seen from above. Fig. 3 is a side elevation, in part section, on line 3 3, Fig. 2, showing the parts of the controlling device in operative relation. Fig. 4 is a view, with parts removed, of a modified construction embodying our invention. Fig. 5 is a side elevation, in part section, on line 5 5, Fig. 4, showing the parts of the controller in operative relation.

Like letters refer to like parts throughout the several figures.

Our invention is adapted to be used in connection with motors of any and all descriptions. In order to make our invention clear, we have illustrated its use in connection with a particular motor and system—such, for example, as used upon street-cars; but we wish it to be understood that we in no manner limit our invention by the drawings herewith presented, such drawings being simply for purposes of illustration.

Referring now to the drawings, Fig. 1 is a diagrammatic view showing the controller and associated circuits used upon the ordinary electric street-railway cars. The power-supplying medium to the motors A is controlled by the controller B. In controlling electric motors it is customary to insert a variable resistance in the circuit when the motor is started and cut out this resistance as the counter electromotive force of the motor rises. If this resistance in the motor-circuit be cut out at too rapid a rate—that is, before the motor has had time to create a sufficient counter electromotive force—an unnecessarily-large current will flow through the motor, and even though the motor is uninjured this current will be needlessly wasted. In the operation of street-railways, where a number of cars are used that are being continually stopped and started, this too-rapid admission of current to the motors is a source of great waste in the operation of the system. For purposes of illustration we have shown our invention as applied to a street-car system to prevent the too-rapid admission of current to the motors, thus obviating the great loss due to this source.

Referring now to Figs. 2 and 3, we have shown the controller as inclosed in a suitable casing, the controller being provided with a suitable operating-handle C′. This controller is provided with a suitable retarding device adapted to retard its operation, the retarding device acting to stop the movement of the controller at predetermined intervals, said retarding device being independent of variations in the force applied in operating the controlling device, so that when once set it acts in a predetermined manner and insures the proper admission of the current to the motor. This retarding device may be of various constructions, and for purposes of illustration we have shown two simple mechanisms for performing this function. As illustrated in Figs. 2 and 3, the retarding device comprises two engaging parts or pawls D D′, opposed to an engaging part C^2, associated with the controller. The engaging part in this instance is shown as a toothed wheel or part. The pawl D is movably connected to the lever D^2, pivoted near its middle, said lever in turn being movably connected with the arm D^3. This arm D^3 is connected with some suitable device preferably constructed to oppose its movement in a predetermined manner. As shown in this figure, the arm is connected with a piston D^4, working in the cylinder D^5. This piston is provided with an opening D^6, controlled by the valve D^7, and the cylinder is provided with a suitable opening or the like D^8 for admitting air thereto in a

predetermined manner. The arm D^3 is suitably connected to the pawl D', and a spring D^9 is connected with the system, said spring adapted to force the piston toward the inner end of its cylinder. A suitable guide or holding device D^{10} is provided for the engaging part D, so as to allow said engaging part to reciprocate. If now the handle of the controller is moved so as to begin to admit current to the motor, the engagement between the part C^2 and the part D forces the part D backward, moving the several parts connected therewith. This moving of the parts withdraws the piston from the bottom of the cylinder and moves the part or pawl D' into engagement with the part C^2. The motion of the controller is then stopped, and the movement of the piston from the bottom of the cylinder is facilitated by the opening of the valve D^7, which admits air into the cylinder back of the piston. When the parts are in the position shown in dotted lines and the motion of the controller-handle stopped, the spring D^9 forces the piston back to the end of its cylinder, thereby disengaging the part or pawl D' from the part C^2 and allowing the controller to be moved forward another step. This process is repeated until the desired admission of current is obtained. It will be seen that the withdrawal of the part D' from engagement with the part C^2 may be controlled by controlling the size of the opening D^8, which permits the escape of the air between the piston D^4 and the end of the cylinder. It will thus be seen that this construction is independent of the power applied to the handle of the controller and that said handle can only be moved a certain distance and is then checked or retarded, the operator being required to wait until the parts are so adjusted as to permit of another forward movement of the controller-handle.

Referring to Figs. 4 and 5, we have shown a modified construction wherein the arm D^3 is connected with a diaphragm E instead of the piston. This diaphragm is so arranged that while it moves freely in one direction its movement in the other direction is retarded, so that the release of the controller will take place at a predetermined time and in a predetermined manner. This result is accomplished by placing back of the diaphragm a plate E', provided with an inlet-opening E^2, controlled by the valve E^3, and an outlet E^4. The valve E^3 opens when the diaphragm moves toward the controller, but closes in the backward movement of the diaphragm, so that the air back of said diaphragm tends to prevent its return, the air being exhausted through the opening E^4 in the desired manner. This construction allows the spring D^9 to act in such a manner as to release the controller and allow its further advancement.

It is of course evident that various constructions may be used to obtain the result desired, and we have not endeavored to set forth all these constructions, but have only shown two simple constructions, which we consider sufficient to make our invention clear. Other constructions for this purpose will of course readily suggest themselves to those versed in the art, and we therefore do not limit ourselves by the device we have shown for purposes of illustration. Neither have we thought it necessary to burden our specification with the many uses to which our invention may be put and the many fields in which it may be advantageously used, as such uses will depend upon the varying conditions and will readily suggest themselves.

We have used the word "motor" in the specification and claims; but we wish it to be understood that we do not use it in a technical sense, but use it with the understanding that it is to include any and all translating and similar devices.

We claim—

1. The combination with a controlling device of a retarding device independent of the current and adapted to retard the operation of said controlling device, said retarding device independent of variations in the force applied in operating the controlling device.

2. The combination with a controlling device, comprising a movable part, of a retarding device connected with said movable part so as to be moved to an operative position by the movement of said movable part, and a releasing device independent of the movement of said movable part for rendering the retarding device inoperative at predetermined intervals.

3. The combination with a controlling device, comprising a movable part, of a retarding device adapted to prevent the too-rapid movement of said controlling device, a connection between said controlling device and said retarding device, whereby the retarding device is responsive to the movement of the controlling device, and a limiting device associated with said retarding device adapted to limit the time of its effective action.

4. The combination with a controlling device, comprising a movable part, of an automatically-released locking device independent of the current, associated with said movable part and adapted to lock the same against motion.

5. The combination with a motor of a controlling device for controlling the admission of the power-supplying medium thereto, said controlling device provided with a retarding device adapted to lock the same against motion at predetermined times, and a limiting device adapted to limit the action of said retarding device, said limiting device independent of variations in the force applied to the controlling device to operate the same.

6. The combination with a controlling device, comprising a movable part, of a retarding device therefor comprising two parts, one adapted to engage the movable part so as to be actuated when the movable part is moved, the other associated with said first part so as

to be moved into engagement with the movable part to retard its forward movement.

7. The combination with a controlling device, comprising a movable part, of a retarding device therefor comprising two parts, one adapted to engage the movable part so as to be actuated when the movable part is moved, the other associated with said first part so as to be moved into engagement with the movable part to retard its forward movement, and a limiting device for limiting the retarding effect of said retarding device.

8. The combination with a motor of a controlling device for controlling the power-supply of said motor, a retarding device associated with said controlling device and connected therewith so as to be brought into operation by the movement of said controlling device, and a limiting device independent of the movement of said controlling device and adapted to limit the retarding effect of the retarding device.

9. The combination with a movable controlling device of a retarding device adapted to retard its movement, said retarding device connected therewith so as to be actuated by the movement of said controlling device, a releasing device associated with said retarding device and adapted to release it from engagement with the controlling device at predetermined intervals, said releasing device independent of the movement of the controlling device.

10. The combination with a movable controlling device of two engaging parts connected together, one adapted to normally engage the controlling device, the other adapted to be brought into engagement therewith after the controlling device has been moved a predetermined amount and prevent its further movement, and a releasing device associated therewith and adapted to release the part which prevents the movement of the controlling device so as to permit a further movement of the same.

11. The combination with a controlling device, comprising a movable part, of two opposed pawls movably connected together, one engaging the movable part associated with the controlling device, so as to be moved when said controlling device is operated, the other connected with the first part so as to be moved into engagement with the movable part associated with the controlling device and check its further movement, and a releasing device for said latter part adapted to release it and permit a further movement of said movable part.

12. The combination with a controlling device of a movable part under the direct control of the operator, a retarding device for said movable part, comprising an engaging part actuated by the movable part and adapted to engage said movable part and lock it against further movement, a releasing device associated with said engaging part and adapted to release it while the movable part is being held stationary.

Chicago, Illinois, October 27, 1898.

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GEORGE W. KNOX.

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