

No. 719,917.

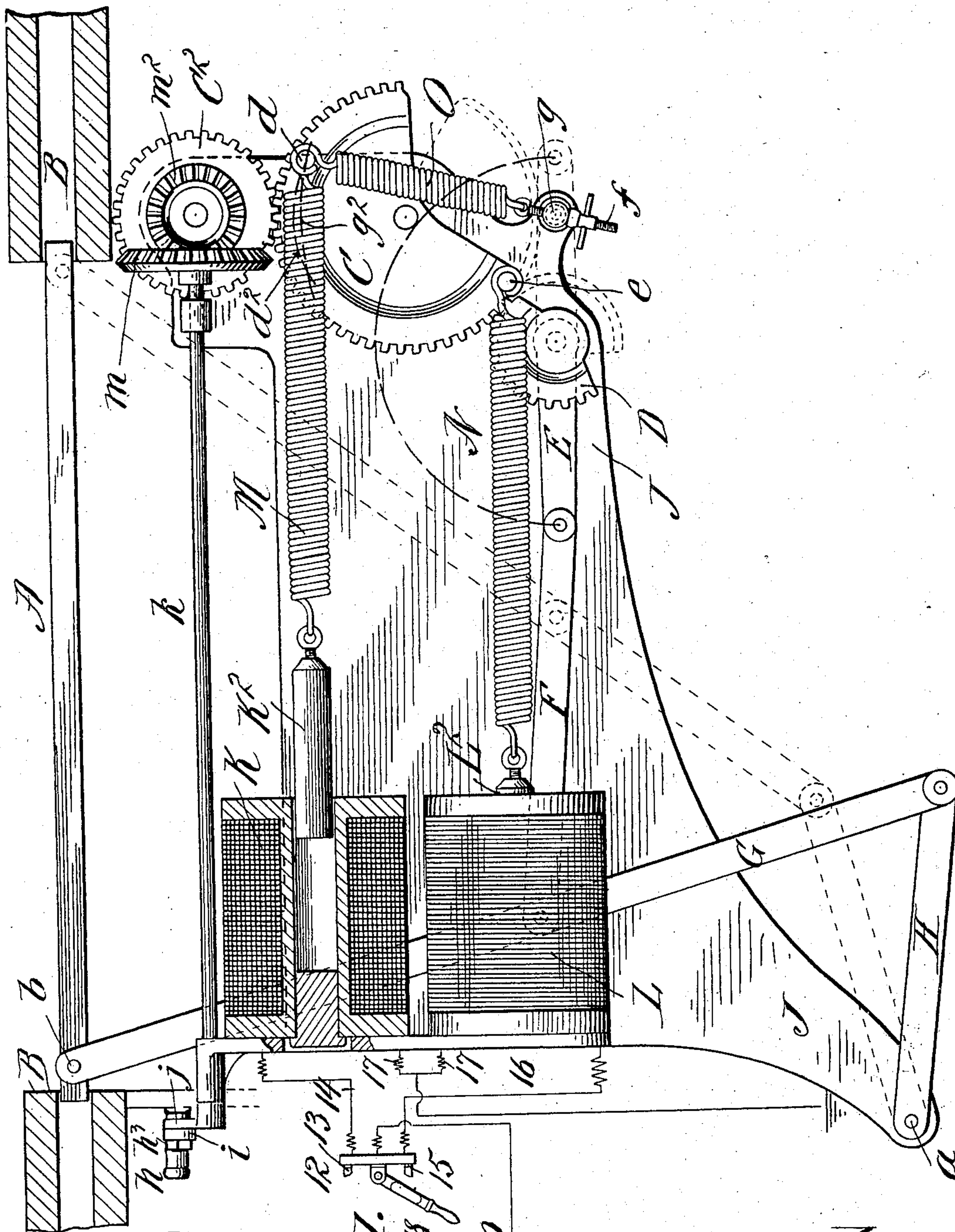
PATENTED FEB. 3, 1903.

G. T. WARWICK & R. R. MACDONALD.
DOOR OPERATING MECHANISM.

APPLICATION FILED JULY 12, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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Fig. 1.

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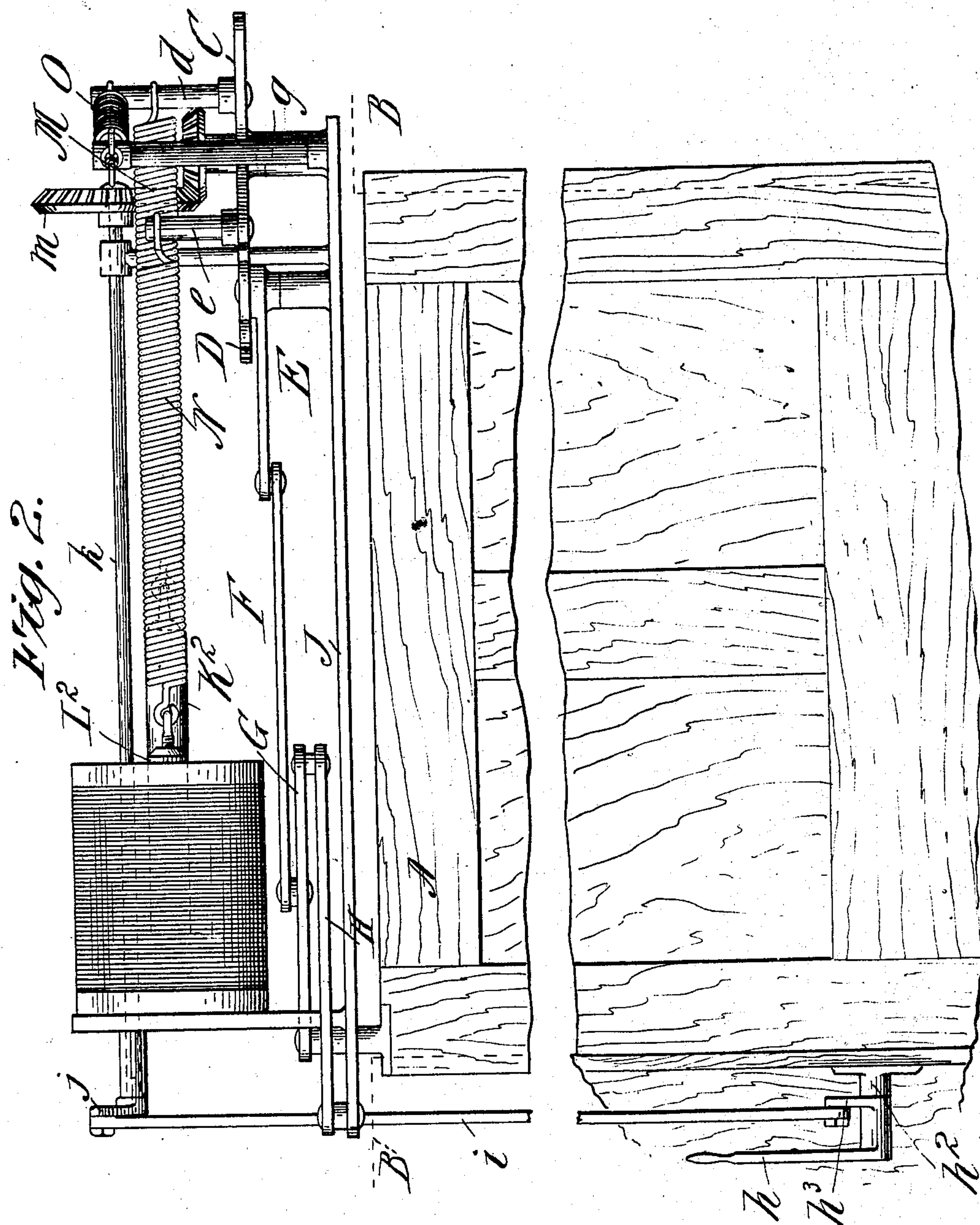
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DOOR OPERATING MECHANISM.

APPLICATION FILED JULY 12, 1902.

2 SHEETS--SHEET 2.

NO MODEL.



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UNITED STATES PATENT OFFICE.

GEORGE T. WARWICK AND ROB R. MACDONALD, OF SPRINGFIELD,
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DOOR-OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 719,917, dated February 3, 1903.

Application filed July 12, 1902. Serial No. 115,203. (No model.)

To all whom it may concern:

Be it known that we, GEORGE T. WARWICK, a subject of the King of Great Britain, and ROB R. MACDONALD, a citizen of the United States of America, both residents of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Door-Operating Mechanism, of which the following is a full, clear, and exact description.

This invention relates to improved means for opening and closing doors, more particularly car-doors, although the devices are applicable in connection with doors in other structures than cars.

One object of the invention is to provide means whereby the motive agent or power for the propulsion of the car—such, for instance, as electricity—may be utilized for actuating the car-door-operating mechanism, which is also susceptible of being operated manually.

Another object of the invention is to combine the power-operated and the manually-operated door moving devices, so that parts in common to both may be utilized without affecting or being affected by certain other parts pertaining to the one or the other of the species of door-operating means.

Another aim of the invention is to devise means whereby the movements to be imparted to the door for opening and closing it, while positive and certain, shall be without violence and abruptness.

To these ends the invention consists in the combinations and arrangements of parts and the construction of certain of the parts, all substantially as hereinafter described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is substantially a plan view of the car-door and combined electrically and manually operating mechanisms therefor, a part of the door-casing and a portion of the electromagnetic operating device being shown in horizontal sectional view. Fig. 2 is a front elevation of the same mechanism.

Similar characters of reference indicate corresponding parts in both of the views.

In the drawings, A represents a door for a car or other structure, indicated as adapted to slide in the casing B.

C is a gear-wheel, a segmental gear being sufficient, inasmuch as this element is designed to make only a part of a rotation in its operations. The gear-wheel C is in mesh with another gear-wheel D, also preferably a segmental gear-wheel, but of considerably-reduced diameter, and this segmental gear-wheel D, which is in proximity to the top or other appropriate portion of the door, has formed on or affixed as one thereto a lever or crank arm E, which is by the links F connected to a lever G, one end portion of which is pivotally connected to a link H, which is hung at *a* to a bracket or other fixture J, while the extremity of the lever G opposite the link is connected at *b* to the upper edge of the car-door. Electromagnetic devices are employed in conjunction with the segmental gear C, whereby the current transmitted in the feed-conductor for propulsion of the car may be utilized for imparting the partial rotary motion to said gear for operating to open or close the car-door, and, as shown, we preferably make use of a pair of solenoids K and L, for which K^2 and L^2 are the movable core-bars.

10 represents a feed-wire understood as having connection with the feed-conductor—such, for instance, as the overhead trolley-wire or a third rail—the same connecting into the switch 12, which is here shown as a common form of double-throw switch, and with one of the contacts 13 of the switch the wire 14 connects the winding-coil of the one solenoid K, while with the other contact 15 of the switch the wire 16 connects with the winding-coil of the other solenoid L, and the coils of both solenoids are by the wires 17 17 in connection with a suitable ground or return conductor, so that accordingly as the switch-arm 18 is thrown onto the contact 12 or the one 15 the power-current will energize the solenoid K or the solenoid L. Each of the solenoid-bars has connection with diametrically opposite studs *d* and *e*, affixed on the segmental gear C, there being connections between these studs and the core-bars of the

respective solenoids, such connections being preferably yielding connections, as may be constituted by the spiral springs M and N.

As shown in Fig. 1, the arrangement of the last-described parts is such that the core-bars of the solenoids operate alternately and reversely. To a stud on the segmental gear C (which advantageously may be the aforementioned stud d , to which the spring M is connected) another spiral spring O has by its one end a connection, its other end being connected to a screw-stem f , which is adjustable through an apertured post g , fixed on the bracket J or other suitable support therefor. The point of connection or anchorage at g for the spring O is understood as being a pivotal or swiveling one. The switch for controlling the currents through the solenoids, which may have its location conveniently accessible to the motorman or electrical engineer for the car or train of cars, on being closed onto the contact 12 to energize the solenoid K will cause thereby the drawing of the core-bar K^2 endwise inwardly into the solenoid, and through the yielding connection of the spring M will cause the starting of the rotational movement of the segmental gear-wheel C to operate the car-door-moving devices, hereinbefore described as intervening between said metal gear and the door, and it will be here explained that inasmuch as the point d of one end connection of the spring O moves in the arc indicated by the broken line d^2 , which initially diverges from the arc g^2 , generated from the point of pivotal connection g , the spring O is necessarily in the first part of the door-actuating motion, and when the spring M is stretched to its maximum and when, therefore, such spring M is of its greatest reaction or power, stretched slightly, not only augmenting the resistance to the too abrupt starting of the movement of the door, but becoming effective in the latter part of the door-moving operation by its reaction and when the spring M is at its lower degree of reactive efficiency assisting in the latter stage of the door-moving operation. In other words, when, for instance, the solenoid K^2 is being drawn into its magnet the line of the connection which its spiral spring M has with a portion of the rotatable gear C at a point in a radial line from the center of the gear C and the line between the point where the spring O is "anchored" and its connection also with the gear-wheel at a point in a radial line from its center are at acute angles to each other, so that the movement of the spring O, whereby it may come perpendicular to the line of draft of the reciprocatory part M^2 , necessitates a stretching of the spring O; but the right-angular relations having been reached the further half of the motion is continued under an obtuse angular arrangement of the spring O to the line of draft, so that the spring O becomes an assisting factor in respect of the gear-wheel C. It will be understood the solenoid-bar has its movement into the solenoid

instantaneously and that the rotational movement of the gear C is comparatively gradual. Of course it is apparent that when the core-bar K^2 has moved into the solenoid K the other core-bar L^2 will have moved out from the solenoid L, so that the reversal of the current will reversely operate the mechanism to have in the same manner the action as already described, but to close the then open door.

We have also illustrated an additional mechanism for operating the car or other door, the same consisting of a manually-operated device which is effective to turn the aforementioned segmental gear C, the parts of which device will be pointed out as follows:

h represents a handle-lever mounted to rock on a suitable stud h^2 , located within the reach of a person on the floor or platform adjacent the door, and this handle-lever has a supplementary arm h^3 , to which one end of a connecting rod or link i is secured, the other end thereof having connection with the lever or crank-arm j of a rock-shaft k , at the opposite end of which is a bevel gear-wheel m , which meshes into the bevel gear-wheel m^2 , which is affixed to the gear-wheel C^2 , which is in mesh with the aforementioned segmental gear C. By turning the handle-lever h the then manually-operated mechanism will incidentally cause the solenoid core-bars to move one in the reverse direction from the other, and, on the other hand, when the mechanism is electrically operated the connections just described for hand operation will incidentally be moved.

The invention is susceptible of changes in detail of construction and arrangement of the parts without departing from the scope and spirit of our invention, and while the car-door-operating devices, comprising the gear C and connections intervening between it and the door, may advantageously be operated by electromagnetic means, substantially as described, or through the medium of other power available on the car or wherever the door has its location, the mechanism herein described and shown, consisting of the manually-operated shaft k and gearing connections between it and the gear C, regarded as in combination with the latter and the connections between the latter and the door, constitutes a desirable and efficient door-operating means in itself.

Incidental to this mechanism it may be stated that the car-door-operating device constitutes a locking means for the door whereby the door will not, when in its open or its closed position, be moved except as it is properly and wilfully moved through the operating mechanism as controlled either by the electromagnetic or other power device or by the manually-operating hand-lever.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In combination, a door and a rotatable part C, having a stud d a solenoid and its core-bar, a spring connecting the core-bar and said stud, a second spring connected to
 5 a part independent of the part C and removed from the axis thereof and connected also to the rotatable part C at another point beyond its axis, and arranged between its two points of connection in a line normally
 10 acute angular to the line of the first-named spring, for the purpose set forth.

2. In combination, a rotatable part C and connections between the latter and the door, a solenoid and a spring connecting its core-
 15 bar and the said rotatable part, at a point remote from its axis, a second spring connected to the rotatable part at a point coincident with the point of connection of the first spring and having a connection or anchorage
 20 at a point opposite and beyond the axis of said rotatable part, whereby the second spring may have a swiveling movement from a pivotal point eccentric to the axis of rotation of the part C for the purpose set forth.

3. In combination, a door, a rotatable part C, having the opposite studs d and e , connections between said rotatable part and the door,
 25 a pair of solenoids and their movable core-bars, spiral springs M and N connecting said bars and the opposite studs d and e , a post g adjacent said rotatable part C and nearly opposite the stud d and a spring O having a swiveling connection with said post g and an
 30 opposite end connection with the stud d substantially as and for the purposes explained.

4. In combination, a door, a gear, a second gear in mesh therewith carrying a lever, connections between the lever and the door, a
 35 power apparatus operatively connected to the first-named gear, means for controlling said power apparatus, whereby the power thereof is exerted as required, and an additional manually-operable means, non-effective on the
 40 means for controlling the power apparatus, connected with said gear for also rotating the latter.

5. A door, a door-operating device, power apparatus operatively connected with the

door-operating device, and means for controlling the power apparatus, in combination
 50 with manually-operable means having an actuating connection with the door-operating device, and non-effective on the means for controlling the power apparatus, for the purposes set forth.

6. In combination, a door, a gear-wheel C mounted for partial rotation, a second gear D having as a part thereof the lever E, the lever G pivotally hung to a link and connected to
 55 the door, and a link F connecting lever E and the lever G, and means for imparting a rotary reciprocatory movement to the gear C.

7. In combination, a door, a gear-wheel C, a second gear D having as a part thereof the lever E, connections between said lever and
 60 the door, a pair of solenoids and their core-bars and connections, between the latter and the gear C, a shaft and means for operating it manually, and gearing connections between said shaft and the gear C, for the purposes
 70 set forth.

8. In combination, a door, the gear C, the pair of solenoids and their core-bars, spiral springs connecting said bars to opposite parts
 75 of said gear, means for energizing the solenoids separately, connections between the gear C and the door, a shaft and means for manually operating it, and gearing connections between said shaft and said gear C, for the purposes set forth.

9. In combination, a door, the gear-wheel C, the gear D in mesh therewith, having the lever E, connections between the lever and
 80 the door, the rock-shaft k having an operating-handle and having a gear-wheel m , a gear-wheel C^2 in mesh with the gear-wheel C, and having connected therewith, the gear-wheel m^2 with which said gear-wheel m meshes substantially as described.

Signed by us at Springfield, Massachusetts, 90
 this 3d day of July, 1902.

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 ROB R. MACDONALD.

Witnesses:

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