

1,194,482.

Patented Aug. 15, 1916.

5 SHEETS—SHEET 1.

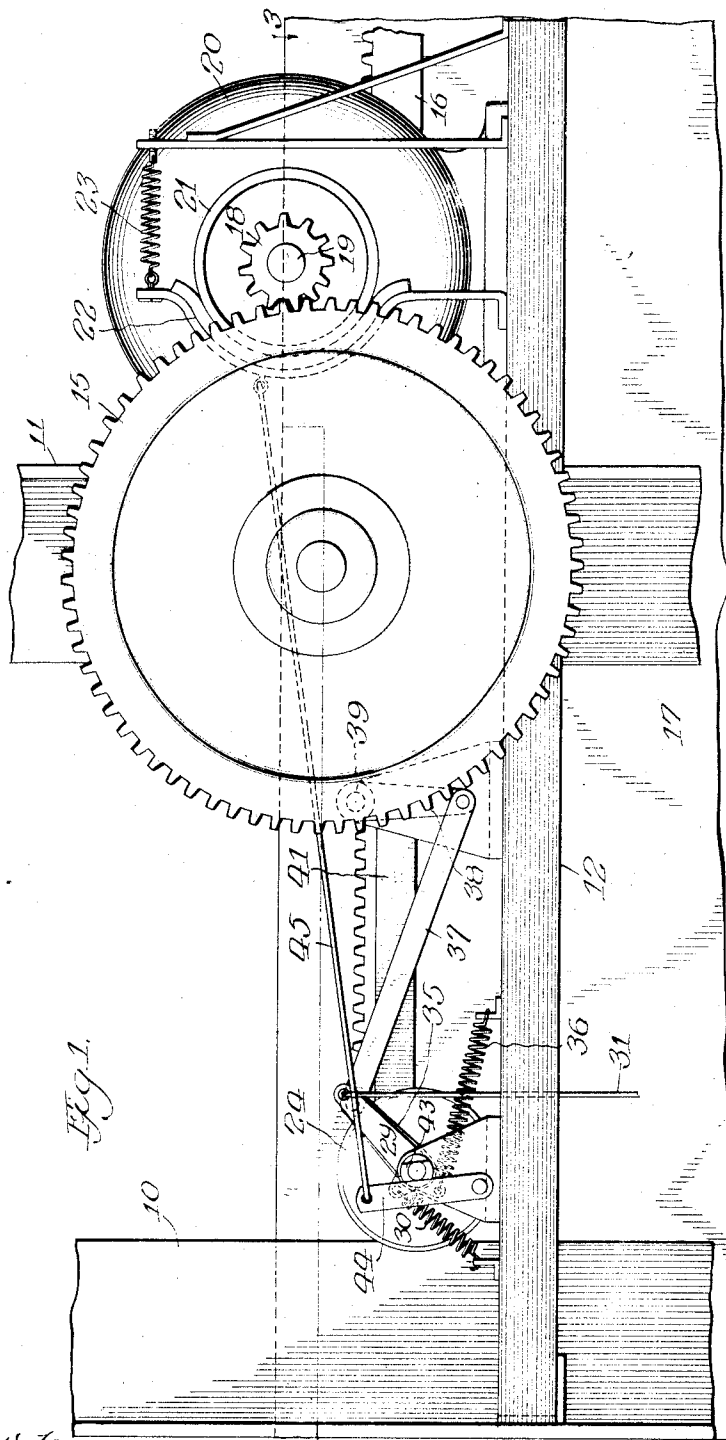


Fig. 1.

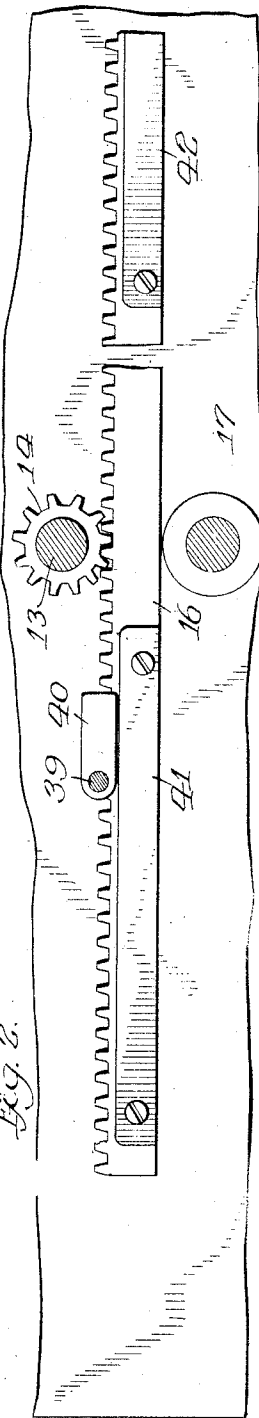


Fig. 2.

Witnesses:
Ed. G. Lavin
677th Ave

Inventor:
Herbert W. Crane
By C. B. Luthman 1114

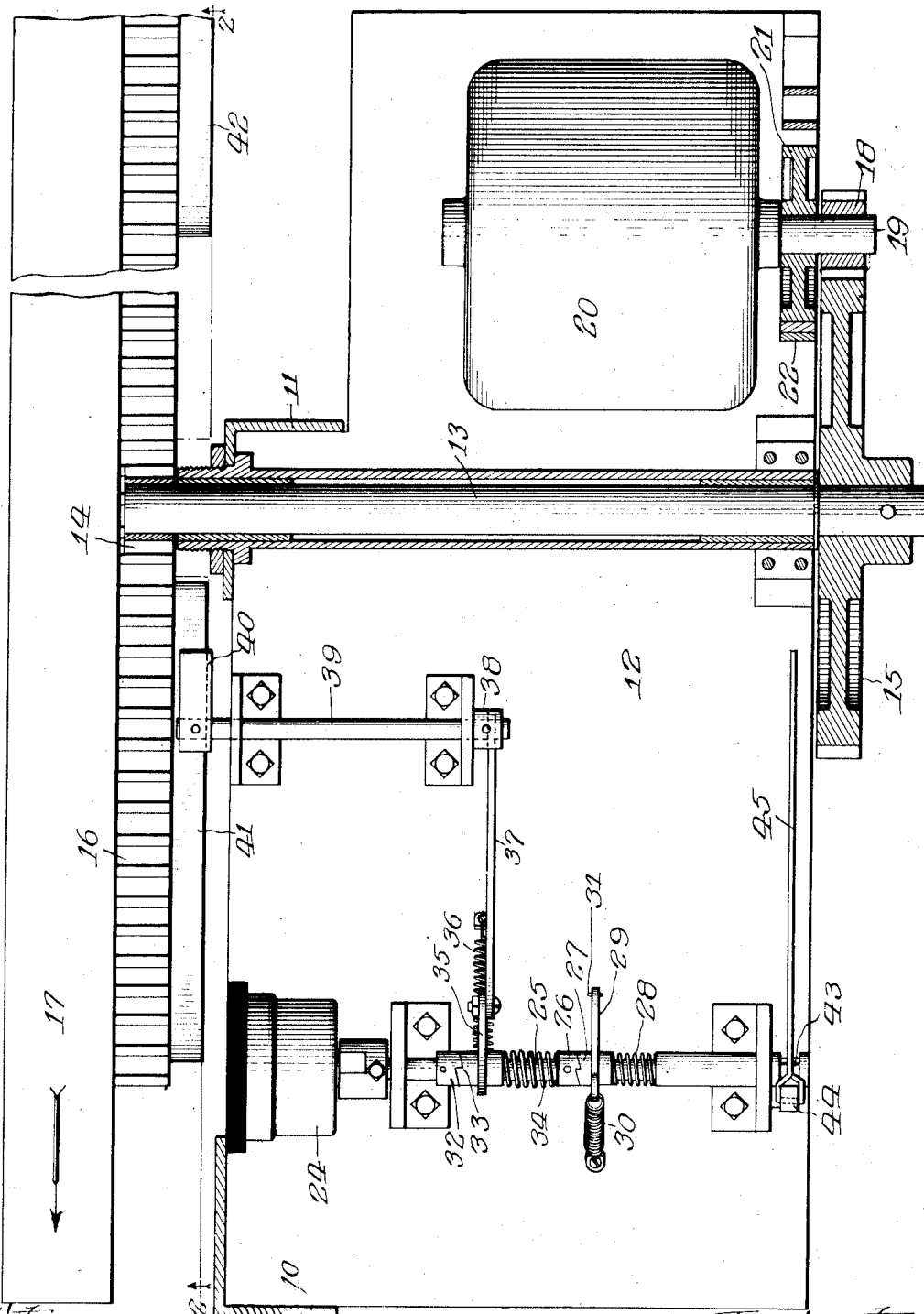
H. W. CRANE.
DOOR OPENER.

APPLICATION FILED JAN. 17, 1916.

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5 SHEETS—SHEET 2.

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Witnesses:
Ed. J. Davidson
C. J. Murray

Fig. 3.

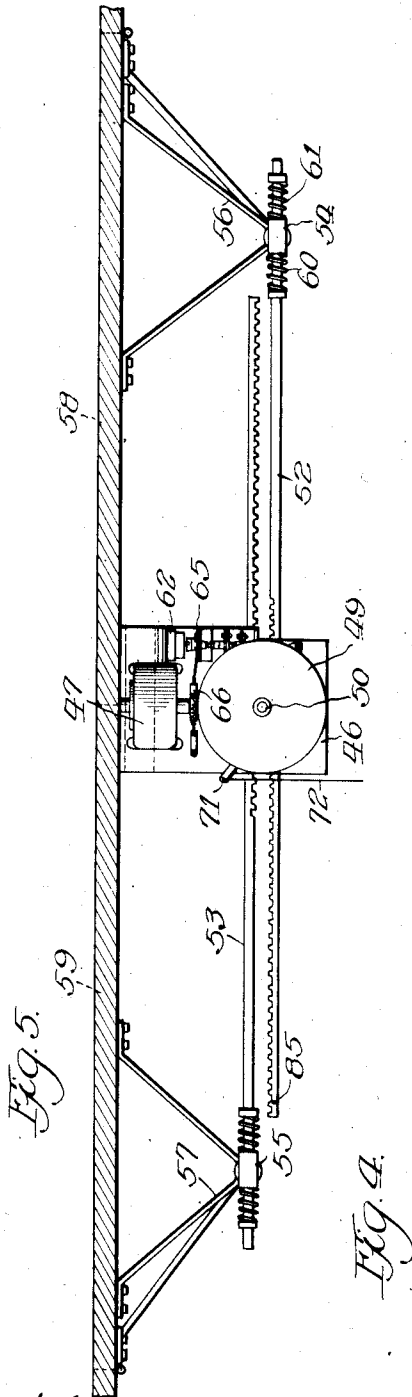
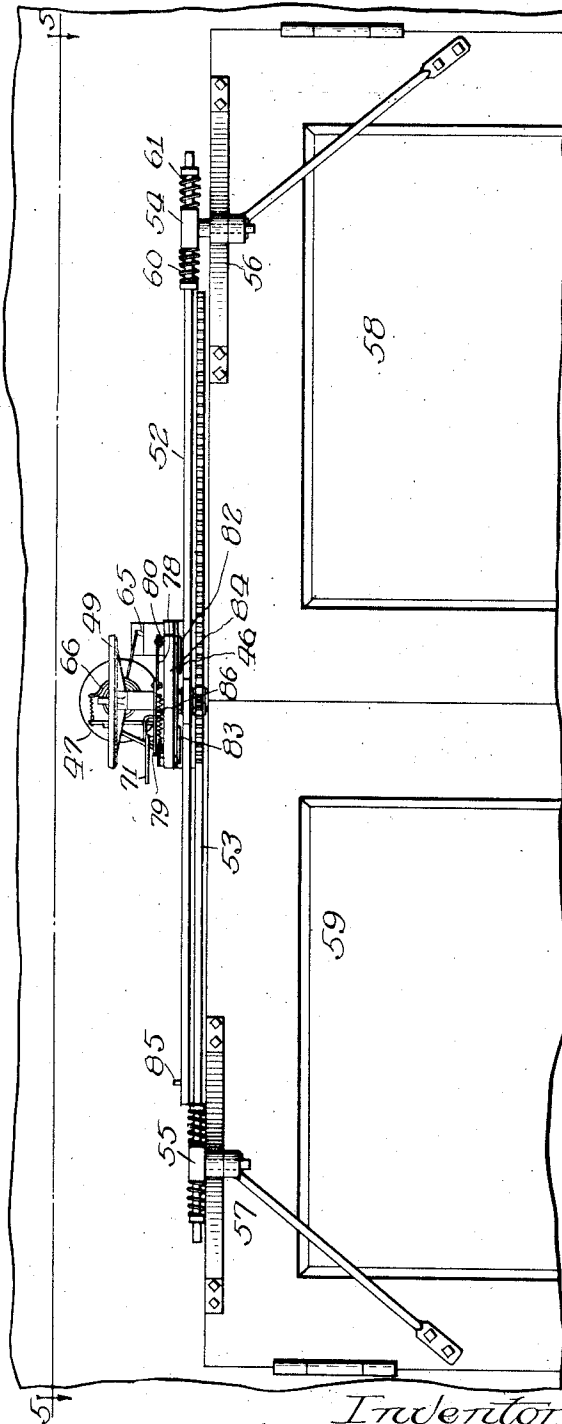
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Inventor:
H. W. Crane
C. C. Luthien, Atty.

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5 SHEETS—SHEET 3.



Witnesses:
Ed. J. Brown
C. J. Murray

Inventor:
Herbert H. Crane
By: C. C. Luthman
Atty

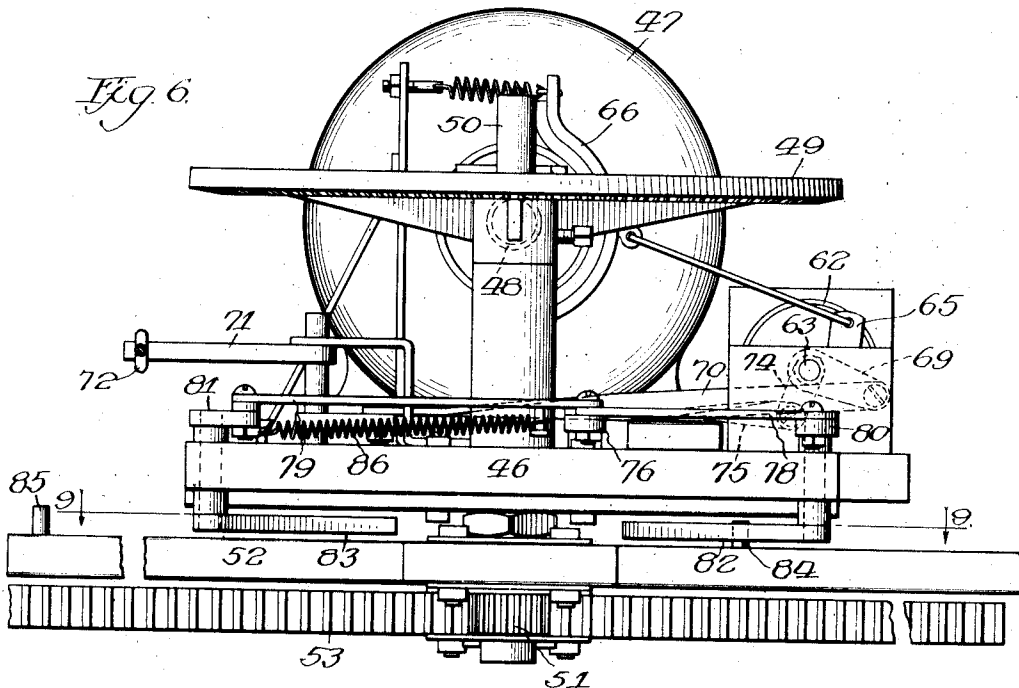
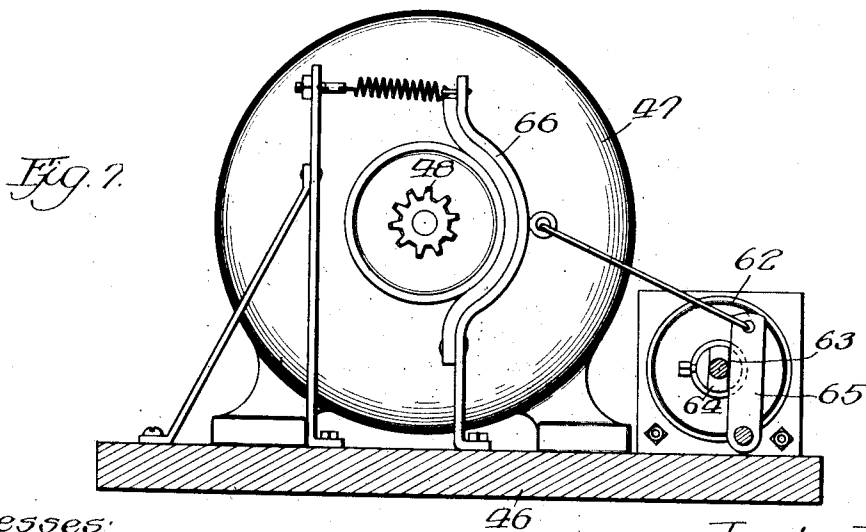
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5 SHEETS—SHEET 4.



Witnesses:

Ed. G. L. L. L.
67 Murray

46

Inventor.

Herbert H. Crane

By

66 Luthium

Atty.

H. W. CRANE.
DOOR OPENER.

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5 SHEETS—SHEET 5.

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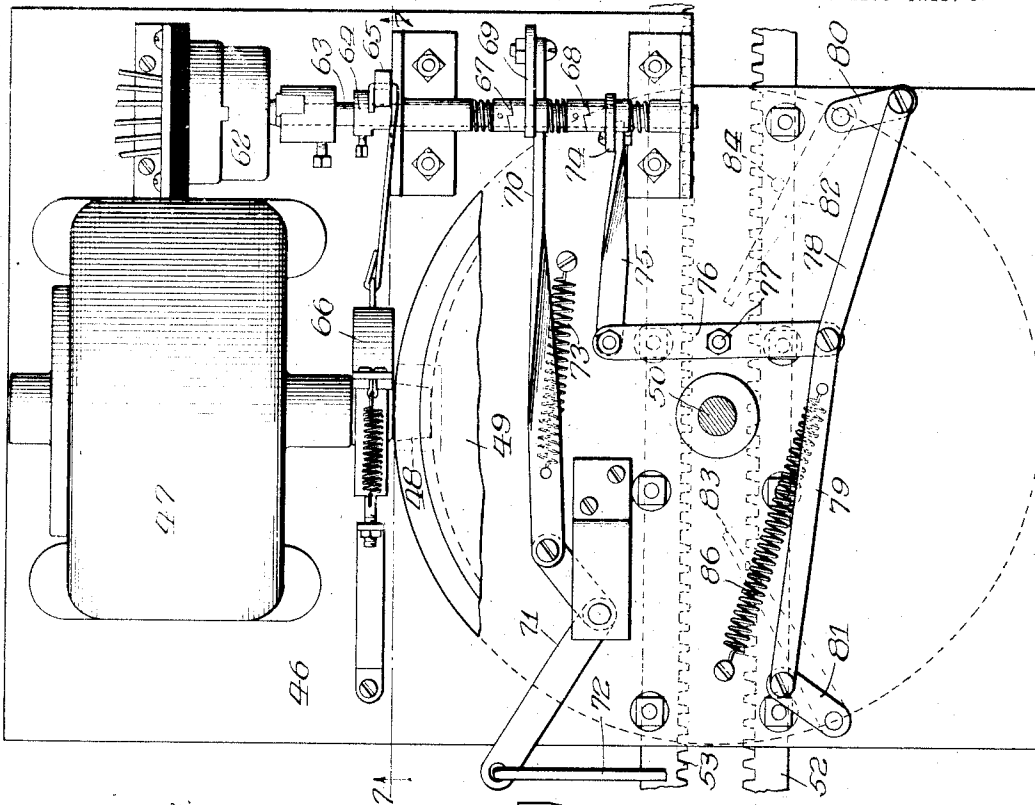
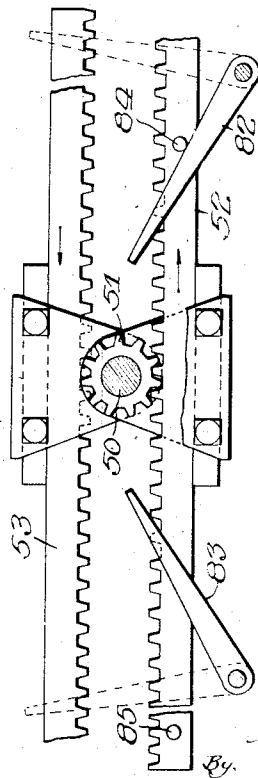


Fig. 8.

Fig. 9.



Witnesses:

Ed. G. Landon
67 Murray

Inventor:
H. W. Crane
W. C. Latham
Atty.

UNITED STATES PATENT OFFICE.

HERBERT W. CRANE, OF CHICAGO, ILLINOIS.

DOOR-OPENER.

1,194,482.

Specification of Letters Patent.

Patented Aug. 15, 1916.

Application filed January 17, 1916. Serial No. 72,446.

To all whom it may concern:

Be it known that I, HERBERT W. CRANE, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Door-Openers, of which the following is a specification.

My invention relates to door openers, and has particular reference to a novel opening device adapted for use in connection with large, heavy doors, either of the sliding or swinging type.

In garages, warehouses, freighthouses, etc., it is usual to provide relatively large and ponderous doors, both of the swinging and sliding types. The operation of these doors by a single person is often difficult and inconvenient; furthermore, it is at times desirable that such doors be operated from a distance. In garages, for instance, it is sometimes desirable to provide means for operating the doors, which means shall be actuable from the office or from a point in the garage removed from the door. In order to avoid injury to the doors and to obviate damage, means should be provided for automatically controlling the stopping of the door, either at its limit of opening movement or at any intermediate point, at the will of the operator.

A further object in the construction of devices of this sort is to provide operating means which shall be compact, self-contained and of such simple construction as to be of relatively low cost. To this end I have illustrated, in the accompanying drawings, mechanism which has been found to operate with the desired result and to possess the requisites referred to.

The invention will be more readily understood by reference to the accompanying drawings, wherein—

Figure 1 is a side elevation of a door-operating means as contemplated by me, the device being applied to a sliding door; Fig. 2 is a sectional view on the line 2—2 of Fig. 3; Fig. 3 is a sectional view on the line 3—3 of Fig. 1; Fig. 4 is an elevation of a somewhat modified construction as applied to a pair of swinging doors; Fig. 5 is section on the line 5—5 of Fig. 4; Fig. 6 is an enlarged view of the operating mechanism as shown in Fig. 4; Fig. 7 is a sectional view on the line 7—7 of Fig. 8; Fig. 8 is a plan view with the large gear broken away, and Fig. 9

is a fragmentary sectional view taken on the line 9—9 of Fig. 6.

Referring more particularly to the construction shown in Figs. 1 to 3 inclusive, it will be seen that on suitable supports 10, 11, I mount a platform, or base, 12. Mounted in suitable bearings on the platform 12 and support 11 is a shaft 13, carrying at one end a pinion 14 and at the opposite end a large gear 15. The pinion 14 engages a rack 16 rigidly secure to the sliding door 17. The large gear 15 is engaged by a pinion 18 rigid with the armature shaft 19 of a motor 20 secured to the base 12. Also secured to the armature shaft is a brake drum 21 adapted to be engaged by a brake 22, the lower end of which is secured to the base 12, and the upper end of which is engaged by a spiral spring 23, which normally tends to urge the brake against the brake drum.

The means for operating the electric motor include a snap switch of the reversing type, the same being indicated at 24 in Fig. 3, and such operating mechanism is arranged for both automatic and manual control. The switch operating mechanism includes a shaft 25, mounted in suitable bearings on the base 12, one end of which engages the switch key. A pair of clutch elements 26, 27, cooperate with the shaft, the element 26 being rigidly secured thereto, while the element 27 is slidable thereon and is urged into engagement with the element 26 by a spiral spring 28. Connected to the clutch element 27 is an arm 29, normally held in position as shown in Figs. 1 and 3 by means of a spring 30. Connected to the free end of the arm is a rod or chain 31, intended for manual operation and which may extend to any point in or about the garage and may have extensions or connections whereby it may be operated from a plurality of points. It will be seen that a pull exerted on the rod 31 will cause a partial rotation of the shaft 25 and the actuation of the switch 24, whereupon the spring 30 will retract the arm to its original position. Also mounted on the shaft 25 are clutch elements 32, 33, the former being rigidly secured to the shaft, while the latter is slidable thereon and engages the elements 32 under the action of the spring 34. To the element 33 is connected an arm 35, normally held in the position shown by means of the spiral spring 36. To the free end of the arm is connected

a link 37, and to the other end of the link is connected an arm 38, best shown in Fig. 1, which arm serves to operate a shaft 39, mounted in suitable bearings and carrying a dog 40 on one end. The arm 38 and the dog 40 are adapted for movement through an arc of 180° under the action of the cams or tripping devices 41, 42, shown in Fig. 3 and in detail in Fig. 2.

The end of the shaft 25 is squared, as best shown in Fig. 1 and Fig. 3, and, as indicated at 43, this squared portion engages a lever 44 and causes the oscillation thereof. To the upper end of the lever 44 is connected a rod, or chain 45, which engages the brake 22. The operation of the mechanism thus far described is as follows: Assuming the sliding door 17 to be in the open position and that it is desired to move the same in the direction indicated by the arrow in Fig. 3, the operator pulls the manually operable rod 31, thereby causing rotation of the shaft 25 through substantially 90° . The first action is to cause the squared portion 43 to act upon the arm 44 and retract the brake 22 from engagement with the brake drum of the motor. The switch is operated practically simultaneously, and the motor is started in operation. Motion is thereby imparted to the pinion 14, which engages the rack 16, and the door is moved in the direction indicated by the arrow. As the door travels forwardly, the dog 40 rides off of the cam 41 and, under the action of the spring 36, drops to a position substantially 90° removed from that shown in Fig. 3, *i. e.*, into a vertical position. As the movement of the door continues and as it nears its closed position, the dog 40 is engaged by the cam, or trip, 42 and moves 90° , or into a position 180° removed from that shown in Fig. 2. The dropping of the dog into the vertical position causes a movement of the shaft 39, arm 38, link 37 and arm 35, the arm 35 being moved 90° to the left, as shown in Fig. 1, no motion being communicated to the shaft 25, the clutch elements 32, 33 not engaging in such a movement. However, it will be noted that the arm 38 assumes a horizontal position, as viewed in Fig. 1, and that as the dog 40 is actuated by the trip 42, the arm 38 is caused to travel toward a vertical position 90° removed from that shown in Fig. 1. This causes a reverse movement of the arm 35, and as the clutch elements 32, 33 engage, the shaft 25 is rotated and the switch operated to shut off the motor. At the same time, the shaft 25 has been so positioned as to permit the engagement of the brake 22 with the brake drum of the motor, due to the change at the point of engagement by the arm 44 from a high to a low point of the squared portion 43 of the shaft 25. Thus the door is closed and the motor is automatically stopped at the end of the closing move-

ment. If, however, it is desirable to stop the door at any intermediate points, a pull upon the manually operable rod 31 will accomplish the same result, the dog 40 and its associated parts being unaffected during actuation of the switch shaft by the manually operable arm. Assuming that the door has been closed and it is desired to open the same, the operation is exactly as has been described, it being understood that the reversing switch provides a plurality of contacts for sequential engagement, whereby the motor is alternately operated in either of two directions. It will be noted that the motor may be stopped, started or reversed manually, and a like action transmitted to the door, or, if desired, the operation of moving the door in either direction may be started manually and automatically discontinued.

The construction shown in Figs. 5 to 9 inclusive is similar in principle of operation, the improvement being applied to swinging instead of sliding doors. In such construction I provide a base or platform 46 suitably secured to the wall adjacent to the door opening, upon which base is mounted a motor 47, the armature shaft of which is connected by means of a bevel pinion 48 and large gear 49 to a vertical shaft 50. To the lower end of this shaft is secured a pinion 51, coöperating with a rack bar 52 and a similar pinion coöperating with a rack bar 53. At their other ends the rack bars 52, 53 engage sleeves 54, 55, carried by brackets 56, 57 mounted on the doors 58, 59 respectively. A spiral spring 60, 61 is provided at each side of the sleeves, the springs serving as shock absorbers, the necessity for which will be well understood.

The motor controlling, or switch operating means is very similar to that heretofore described and includes a reversing snap switch 62, operable by a shaft 63. To the shaft is secured a squared collar 64, which engages an arm 65, which operates the brake 66 in the same manner as heretofore described. The shaft 63 carries two clutches, 67, 68, the former being associated with an arm 69, a link 70 and a rocker 71, to which the manually operable pull rod or chain 72 is secured. A spring 73 maintains the parts in the position shown in Fig. 8.

To the clutch 68 is connected an arm 74 and a link 75. A lever 76 is pivoted at 77, one end of the lever being connected to the link 75 and the other end being connected to two links 78, 79. Each of the links 78, 79 is connected to a short arm 80, 81 and rigid with these arms are fingers 82, 83, best shown in Fig. 9. These fingers lie in the path of and are operated by pins 84, 85, fixed to the rack bar 52. A spring 86, normally maintains the fingers in the dotted-line position of Fig. 9, and, consequently, the parts of Fig. 8 in the position shown therein. The

positions shown in Figs. 8 and 9 are those which the parts will assume when the door is in closed position.

Assuming that the door is to be opened, a pull is exerted upon the rod 72, which, in turn, causes a rotation of the shaft 63 and the operation of the switch. The motor thereupon causes the travel of the rack bars 52, 53 in opposite directions. On the opening movement the motion of the rack bars will be as indicated by the arrows in Fig. 9. As the rack bar 52 moves to the right in Fig. 9, the pin 84 will move away from the finger 82 and permit it and the finger 83 to assume the dotted-line positions of that figure, in which positions they will remain until the finger 83 is contacted by the pin 85, whereupon motion will be imparted to the different links and levers, to the shaft 63 and the switch will be operated to stop the motor and apply the brake thereto. When the door has reached its open position, the fingers will again be in the position shown in full lines in Fig. 9, the pin 85, however, contacting the finger 83.

Obviously the construction is capable of much modification, and the form and arrangement of the parts will be varied to suit the requirements of each situation. The principal parts, however, may be built as a unit, making the same readily adaptable for application to doors of all kinds. The parts are of simple construction and not likely to become out of order.

I claim:

1. In a door-operating mechanism, the combination of a rack bar secured to a door, a motor having a pinion engaging said rack bar, a reversing switch, a switch operating shaft and a plurality of clutches arranged to move said shaft in one direction only, automatic means for actuating one of said clutches and manually operable means for operating another of said clutches, substantially as described.

2. In a door-operating mechanism, the combination of a rack bar, a motor having a pinion engaging said rack bar, a reversing switch for starting and stopping said motor, said switch being operable by a movement in one direction only, a pair of clutches co-operating with said switch, either of which clutches is adapted to operate said switch to operative and inoperative positions by an oscillating movement, automatic means for

actuating one of said clutches and manually operable means for operating another of said clutches, substantially as described.

3. In a door-operating device, the combination of a door, a motor, connections between said door and said motor, a reversing switch for operating said motor, a shaft for operating said switch, a pair of oscillating arms having clutches engaging said shaft, manually operable means for moving one of said arms and automatic means operable by the motion of said door for operating the other of said arms, substantially as described.

4. In a door-operating mechanism, the combination of a rack bar secured to a door, a motor having a pinion engaging said rack bar, a switch for operating said motor and switch-actuating means, said last-named means including a slideway carried by said door and a trigger coöperating with said slideway, substantially as described.

5. In a door operating mechanism, the combination of a rack bar carried by the door, a motor having a pinion engaging said rack bar through suitable gearing, a one-way reversing switch, a shaft for operating said switch, clutches for operating said shaft, said clutches causing a movement of said shaft by an oscillating movement of the clutch-operating arms, automatic means operable by said door for stopping said motor, manually operable means for starting and stopping the motor, and a motor brake operable by said switch-operating shaft, substantially as described.

6. In a door-closing device, the combination of a rack bar adapted to be secured to a door, a motor geared to said rack bar, a pair of stops secured to said rack bar, one near each end thereof, a switch for starting and stopping said motor and for reversing the same, manually operable means for actuating said switch to all of its circuit making and circuit breaking positions, and automatic means operable by the stops on said rack bar for moving said switch to its circuit breaking positions, substantially as described.

Signed at Chicago, Illinois, this 14th day of January, 1916.

HERBERT W. CRANE.

Witnesses:

HELENE C. JACOBS,
T. D. BUTLER.