Oct. 12, 1937. F. W. RIVERMAN ET AL 2,095,267

OPENER AND CLOSER FOR GARAGE DOOR AND OTHER CLOSURES FOR OPENINGS

Filed Aug. 23, 1935 2 Sheets-Sheet 1

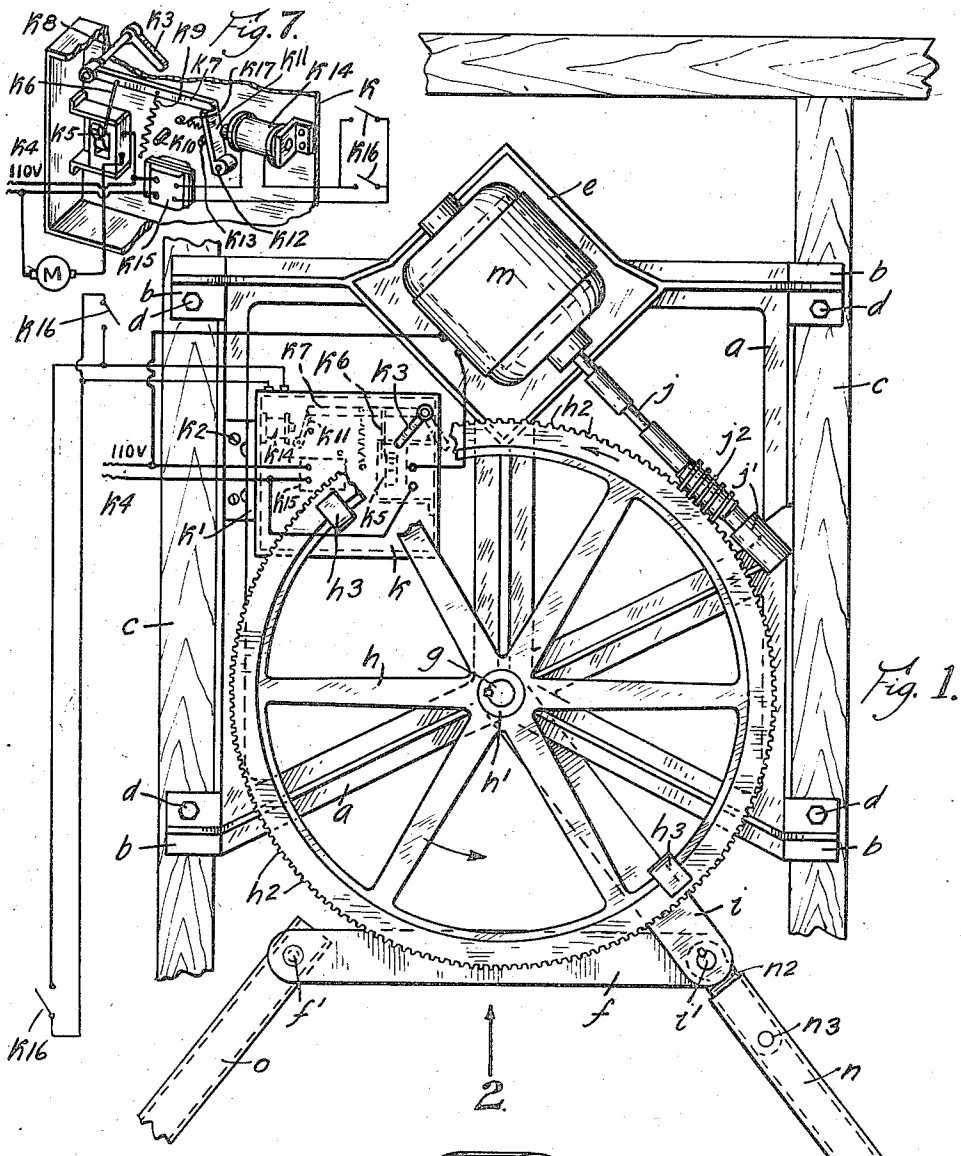

Fig. 1.

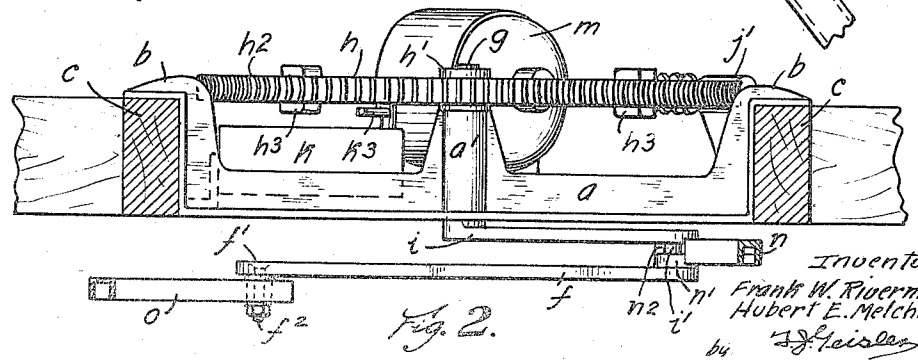

Fig. 2.

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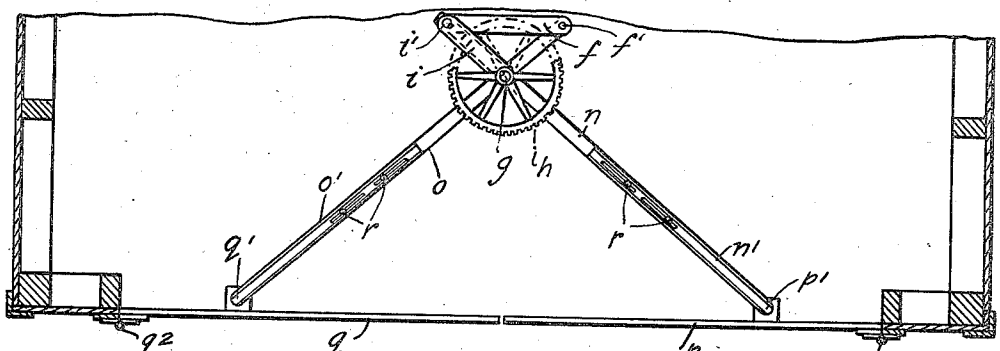

Fig. 4.

Fig. 3.

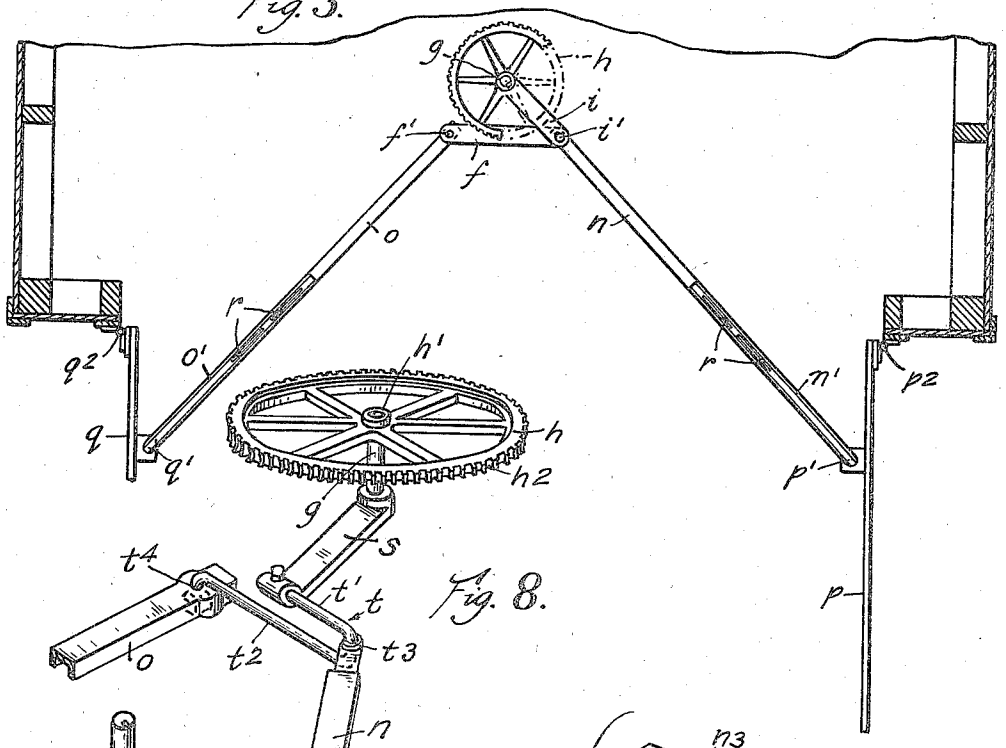

Fig. 8.

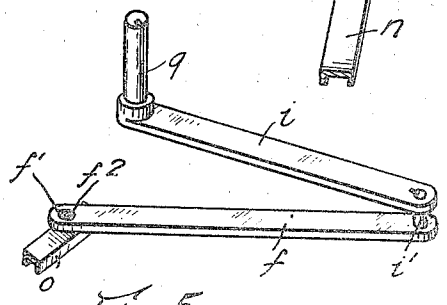

Fig. 5.

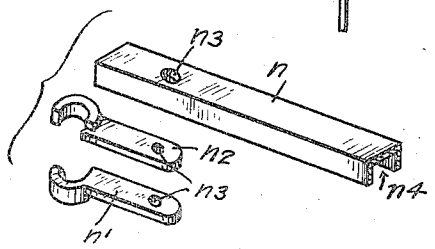

Fig. 6.

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OPENER AND CLOSER FOR GARAGE DOOR AND OTHER CLOSURES FOR OPENINGS

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Application August 23, 1935, Serial No. 37,543

4 Claims. (Cl. 268—63)

Our invention relates to improvements in garage door opening and closing mechanism.

The object of our invention is to provide a simple, preferably electrically operated mechanism, located inside of a garage, but controlled from points outside or inside of the garage, and suitable for opening and closing the garage doors and securing the doors against reopening except by said mechanism, thus dispensing with a separate door lock; also to hold the doors firmly open against being blown shut by the wind.

A further object of our invention is to provide an opening and closing device suitable for the ordinary type of garage doors which swing on hinges, and open outward.

Another object of our invention is to provide such a device having a minimum number of parts, so that the said device will require only a minimum amount of care in its upkeep, will be comparatively inexpensive to manufacture, and can be quickly and easily set up in any ordinary garage by an ordinary mechanic.

Another object of our invention is to provide a mechanism which will dispense with all unnecessary gears and unnecessary parts in sliding and frictional engagement, which require frequent oiling and care and which might have a tendency to bind or stick or to become blocked, thus interfering with the satisfactory operation of the device.

Another object of our invention is to provide a garage door opener for garages provided with doors of unusual size as well as for garages with doors of the usual size.

A particular object of our invention is to construct and set up a rotatable arm, to which the garage doors may be connected, in such manner that the rotation of such arm within the garage will alternately open and close the garage doors together, and which may be adjusted to be adapted both for garage doors opening outward and garage doors opening inward.

Our further object is to provide a combination consisting of a device of the character mentioned located within a garage, an electric motor operating said device and a simple electric trip-switch by which the operation of the said device will be automatically halted when the doors are closed, or when the doors have been opened the desired distance.

The above described objects and incidental features we attain by the construction hereinafter described with reference to the accompanying drawings, in which:

Fig. 1 is a plan view looking down on the top of the mechanism controlling the operation of our garage door opener and closer;

Fig. 2 is an end elevation corresponding to Fig. 1 and looking in the direction indicated by the arrow 2 in Fig. 1;

Figs. 3 and 4 are partial smaller-scale plan views illustrating the operation of our device, Fig. 3 showing the garage doors opened, and Fig. 4 the garage doors closed;

Figs. 5 and 6 show details of parts of our device hereinafter described;

Fig. 7 is a fractional view, partly diagrammatic, showing the switch control for our device when operated by an electric motor; and

Fig. 8 is a view in perspective illustrating a possible modification in the construction of the crank arm which is an essential part of our device.

Referring first to Figs. 1 and 2, *a* denotes the supporting skeleton frame which is preferably made with a number of claws or raised flanges *b*, adapted to rest on top of girders *c* in the ceiling of the garage; the raised flanges *b* being secured in place on the girders *c* by bolts or screws *d*. The supporting frame includes an integral section *e* for supporting an electric motor *m*. At the center of the frame *a* is provided an upwardly extending boss *a'* constituting a journal bearing for a stub shaft *g*, to the upper end of which stub shaft the hub *h'* of the worm wheel *h* is keyed. A crank arm *i* is keyed to the lower end of said stub shaft *g* below the frame *a*.

The horizontal shaft *j* driven by the motor *m* is journaled in a bearing *j'* on the frame *a*, and said shaft *j* has a worm *j2* adapted to engage with the teeth of the worm wheel *h* and thus to revolve the latter, and thereby rotate the crank arm *i* in one direction. In Fig. 1 the direction of rotation of the crank arm *i* and wheel *h* is indicated by the arrow as counter-clockwise. However, our apparatus would work equally well if the wheel and crank arm were rotated in clockwise direction instead.

A switch-box *k* containing various switch elements indicated in Fig. 7, described below, is supported at one side of the frame *a* by bracket *k'* and screws *k2*.

On the rim of the worm wheel *h* are provided contact lugs *h3*, arranged to engage the contact finger *k3* of the electric trip switch located within switch-box *k* so as to cause the electric circuit of the motor *m* to be opened, as hereinafter explained, in order to stop the motor and thus arrest further revolution of the wheel *h*. The lugs *h3* are adjustable, being preferably fastened

in place by screws which can be loosened from below. Generally these lugs will be located approximately at diametrically opposite points. The exact location, however, would depend upon several factors including the speed of the motor *m* and the extent to which the motor *m* will "coast" after the power has been shut off.

Allowance for the "coasting" is not so important in the opening of the doors but must be carefully determined for the closing of the doors so that they will fit tightly against the jamb when closed.

At the outer end of the crank arm *i*, as shown in Figs. 1, 2 and 3, a second horizontal arm *f* is rigidly attached but spaced from the crank arm *i* by a wrist pin *i'*. The angle between the members *i* and *f* is an acute angle so that the member *f* will be perpendicular at its middle point to a plane passing thru the axis of rotation of the stub shaft *g*, the extremities *f'*, *i'* of the member *f* being located equi-distant from the axis of rotation of the shaft *g*, but so that member *f* will not cross said axis of rotation.

The members *i*, *f* thus together form a V-shaped crank arm with the wrist-pin *i'* located at the vertex of the angle the said members make with each other.

To the wrist-pin *i'* is pivotally connected a channel rod *n*—preferably longitudinally adjustable—the other end of which is attached to the garage door *p* at *p'* (see Figs. 3 and 4). A similar channel rod *o* is pivoted to the member *f* at *f'*; the other end of the rod *o* being attached to the garage door *q* at *q'*. As a convenient means of attaching the end of rod *n* to the wrist-pin *i'*, we provide a pair of split-links *n'* and *n2* (see Fig. 6) with the shanks adapted to fit one over the other within the interior *n4* of the channel rod *n*, and to be held in place by a bolt passing thru the registering holes *n3*. The free ends of the said split-links *n'*, *n2* have semi-circular hooks fitting around the wrist-pin *i'*, thus pivotally connecting rod *n* to said member *f*.

The distance between the points *i'*, *f'*, the distance of said points *i'*, *f'* from the axis of rotation of the stub-shaft *g*, the length of the rods *n*, *o* and the location of the points of their attachment *p'*, *q'* to the doors *p*, *q*, must be such that when the doors are in closed position as shown in Figs. 4, the rods *n*, *o* will intersect each other at a point coinciding with the axis of rotation of the stub-shaft *g*.

The points *p'*, *q'* at which the rods *n*, *o* are attached to the doors *p* and *q* must further be so located with respect to the hinges *p2*, *q2* that the distance traveled by the points *p'*, *q'* when the doors are opened or closed will be approximately equal to the diameter of the circle described by the points *i'*, *f'*.

In order that our invention may be used in garages which have doors of unusual size, we have found it desirable to make the rods *n*, *o* longitudinally adjustable as mentioned. For this purpose the rods *n*, *o* have extensions *n'*, *o'* respectively, which extensions may be secured in place by suitable means indicated at *r*.

Since the V-shaped crank arm *i*—*f*, is rigidly keyed to the stub-shaft *g*, to which worm wheel *h* is also keyed, the turning of the worm wheel *h* causes the points *f'*, *i'*, to move in the same circular path about *g* as a center. During the rotation of the V-shaped crank arm the rods *n* and *o*, pivotally fastened at *i'* and *f'*, respectively, will not interfere with each other, since the end of rod *n* will pass above the end of rod *o*, and the ends of both rods will pass below the stub-shaft *g*.

From Figs. 3 and 4 it is apparent that when the worm wheel *h* and V-shaped crank arm *i*—*f* are revolved, the garage doors *p* and *q* will be opened and closed—opened when the member *f* of the V-shaped crank-arm is in its forward position as illustrated in Fig. 3, and closed when said member is in its opposite or rear position, as illustrated in Fig. 4.

As a means of controlling the turning of the worm wheel *h* and the V-shaped crank arm *i*—*f* (such turning being caused by the rotation of shaft *j* driven by a motor *m*), an electric trip-switch is provided in switch box *k*, see Figs. 7 and 1. *k4* designates some suitable source of electric power to be used to operate the motor *m*. In one of the circuits of the motor *m* a mechanical switch *k5* is placed operatively connected by a link *k6* to an arm *k7*. This arm is rigidly attached to the lower end of a vertical shaft *k8*, journaled in the switch-box *k*, and the contact finger *k3* is rigidly mounted on the upper end of said shaft *k8* above the top of the switch box. A tension spring *k9* is arranged normally to pull the bar *k7* toward the lug *k10*. When this occurs the switch *k5* is closed, and the motor *m* consequently is caused to operate. Fig. 7 illustrates the switch *k* in open position. A latch *k11*, pivoted at *k12* in the switch box *k*, and held by a spring *k17* against lug *k13* serves for the purpose of holding the arm *k7* in the position shown in Fig. 7, against the pull of the spring *k9*, and thus keeping the switch *k5* open.

A solenoid *k14* connected to a suitable transformer *k15*, and adapted to be energized when one of the switches *k16* is closed, causes the latch *k11* to be pulled out of engagement with the arm *k7* upon the closing of either of the switches *k16*. The pulling of the latch *k11* by the solenoid *k14*, when the latter is energized as mentioned, causes the arm *k7* to be pulled by spring *k9* against lug *k10*, and this movement of the arm *k7* in turn closes the switch *k5* of the motor *m*, causing the motor *m* to be operated. When this occurs, the contact finger *k3* is moved to the right as shown by the broken line in Fig. 1. However, when contact finger *k3* is engaged by one of the lugs *h3* on the wheel *h*, the arm *k7* is again pushed into its position as shown in Fig. 7, and the latch *k11* will again operate to hold it in such position, so long as the solenoid *k14* is not energized, and thus during such time the switch *k5* of the motor *m* will remain open.

The operation of our apparatus is as follows:

Let it be assumed that the garage doors are open, as illustrated in Fig. 3, the V-shaped crank arm *i*—*f* being in the position shown in Figs. 1 and 3. A switch *k16*, assumed to be operated by a button, is located outside of the garage, or, for convenience, within the adjoining residence of the owner of the garage. The closing of such switch *k16* energizes the solenoid *k14* and causes the latch *k11* to be pulled to the right by the solenoid, out of engagement with the end of the arm *k7*, permitting the latter to be pulled against lug *k10* by spring *k9*, and closing switch *k5*, causing motor *m* to operate and the worm wheel *h* to make a partial revolution in a counter-clockwise direction. (As mentioned before, our apparatus would work equally well if the worm wheel *h* turned in a clockwise direction, but in such case a slight alteration in the arrangement of the contact finger *k3* and other switch elements would be necessary.) The revolution of the wheel *h* continues until the lug *h3* which it carries adjacent to the arm *i* comes into contact

with, and moves the finger *k3*. When this occurs, switch *k5* is again opened, as already explained, cutting off the electric circuit to motor *m*, and causing it to stop. The wheel *h* then slows down and comes to a complete stop a slight distance further. The V-shaped crank arm *i—f* is now in the position illustrated in Fig. 4, and the garage doors *p* and *q* are closed. A repetition of said operation effected causes the wheel *h* to complete its revolution and the doors to be opened again, and once more to assume their open position, as shown in Fig. 3.

Our device is simple in construction, is practically "fool-proof"; can be easily shipped by detaching the rods *n* and *o*, and is quickly and easily installed in the ordinary garage. There are no parts sliding on each other requiring constant lubrication in order to prevent undue friction and wear, and the upkeep and care required are practically reduced to a minimum.

In Fig. 8 we have illustrated a modified form of crank-arm which might be substituted for the V-shaped crank arm *i—f* above described. In the construction illustrated by Fig. 8 the crank arm consists of a radial member *s* rigidly mounted on the lower end of stub-shaft *g*, the worm wheel *h* being keyed to the upper end of said stub shaft as previously described. A U-shaped rod *t*, composed of sections *t'* and *t2*, the section *t2* being approximately twice the length of the other parallel section *t'*, is rigidly fastened to the end of arm *s*, by any suitable means, so that the sections *t'*, *t2* will both lie in the same vertical plane.

The outer end of section *t2* is turned downward perpendicularly as indicated at *t4*, and on this end rod *o* is pivoted. Thus the rod *t* forms a double-throw arm. Rod *n* is pivoted on the connecting portion *t3* of the sections *t'*, *t2*. It is necessary in this construction, as in the construction previously described, that points *t3* and *t4* be equi-distant from the shaft *g* and that section *t2* and points *t3* and *t4* be in a plane perpendicular to a plane passing thru the axis of rotation of the shaft *g*, and thus the points *t3* and *t4* be caused to follow the same circular path about the axis of *g* as a center as the wheel *h* is turned. As apparent the rods *n* and *o*, attached to the garage doors, operate in the same way in this construction as in that first above described, and that in all other respects the operation is identical.

While we have shown our device as used with garage doors opening outward as is customary, it is also adapted for use with doors opening inward. In such case the closed garage doors would be connected by means of rods to the points *f'* and *i'* when the member *f* is in the forward position shown in Fig. 3. Then as the V-shaped crank arm *i—f* is rotated to the position shown in Fig. 4 the doors would be caused to open inward. Actually, in such case, our device would be placed further back inside the garage and at a comparatively greater distance from the doors than the partial plan views 3 and 4 would indicate.

While we have described the use of our invention particularly with regard to garage doors, it is to be understood that we do not limit our invention to such use, but the same may also be used for the opening and closing of windows, gates and any closure; or for the opening and closing of factory doors and windows; and the term "garage doors" is to be understood as including such other and further uses of our invention.

We claim:

1. An operating device adapted to be located within a garage for opening a pair of garage-doors outwardly, comprising a supporting frame below the roof of the garage, a vertical shaft journaled in said frame, said shaft having a crank-arm, a horizontal cross-arm carried by said crank-arm, said cross-arm being spaced from said crank-arm and from the axis of rotation of said shaft, said cross-arm being perpendicular to an intersecting radius extended from said axis, and said cross-arm being arranged parallel with said doors when said doors are closed, rods connected to said cross-arm at points equi-distant from said perpendicular intersecting radius, said rods free to move in horizontal planes one under the other and below said crank-arm, the extremities of said cross-arm including wrist pins, means for imparting to said shaft successive half revolutions, on one movement placing the cross-arm in front of said axis of rotation, and in another movement behind the same, thereby causing said rods to be drawn in and projected out, and thus successively closing and opening said doors.

2. An operating device adapted to be located within a garage for opening a pair of garage-doors outwardly, comprising a supporting frame below the roof of the garage, a vertical shaft journaled in said frame, said shaft having a crank-arm, a horizontal cross-arm carried by the extremity of said crank-arm and making an acute angle therewith, said cross-arm being spaced from said crank-arm and from the axis of rotation of said shaft, said cross-arm being perpendicular to an intersecting radius extended from said axis, and said cross-arm being arranged parallel with said doors when said doors are closed, rods connected to said cross-arm at points equi-distant from said perpendicular intersecting radius, said rods free to move in horizontal planes one under the other and below said crank-arm, the extremities of said cross-arm including wrist pins, means for imparting to said shaft successive half revolutions, in one movement placing the cross-arm in front of said axis of rotation, and in another movement behind the same, thereby causing said rods to be drawn in and projected out, and thus successively closing and opening said doors.

3. An operating device adapted to be located within a garage for opening a pair of garage-doors outwardly, comprising a supporting frame below the roof of the garage, a vertical shaft journaled in said frame, said shaft having a crank-arm, a horizontal cross-arm carried by the extremity of said crank-arm, said cross-arm being spaced from said crank-arm and from the axis of rotation of said shaft, said cross-arm being perpendicular to an intersecting radius extended from said axis, and said cross-arm being arranged parallel with said doors when said doors are closed, adjustable rods connected to said cross-arm at points equi-distant from said perpendicular intersecting radius, said rods free to move in horizontal planes one under the other and below said crank-arm, the extremities of said cross-arm including wrist pins, means for imparting to said shaft successive half revolutions in one direction, in one movement placing the cross-arm in front of said axis of rotation, and in another movement behind the same, thereby causing said rods to be drawn in and projected out,

and thus successively closing and opening said doors.

4. An operating device adapted to be located within a garage for opening a pair of garage-doors outwardly, comprising a supporting frame below the roof of the garage, a vertical shaft journaled in said frame, said shaft having a crank-arm, a horizontal cross-arm carried by said crank-arm, said cross-arm being spaced from said crank-arm and from the axis of rotation of said shaft, said cross-arm being perpendicular to an intersecting radius extended from said axis, and said cross-arm being arranged parallel with said doors when said doors are closed, adjustable rods connected to said cross-arm at points equi-distant from said perpendicular intersecting radius, said rods free to move in horizontal planes one under the other and below said crank-arm, the extremities of said cross-arm including wrist pins, said rods consisting of channel bars, co-operating half-links terminating in cooperating hooks secured in said channel bars, means for imparting to said shaft successive half revolutions in one direction, in one movement placing the cross-arm in front of said axis of rotation, and in another movement behind the same, thereby causing said rods to be drawn in and projected out, and thus successively closing and opening said doors.

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