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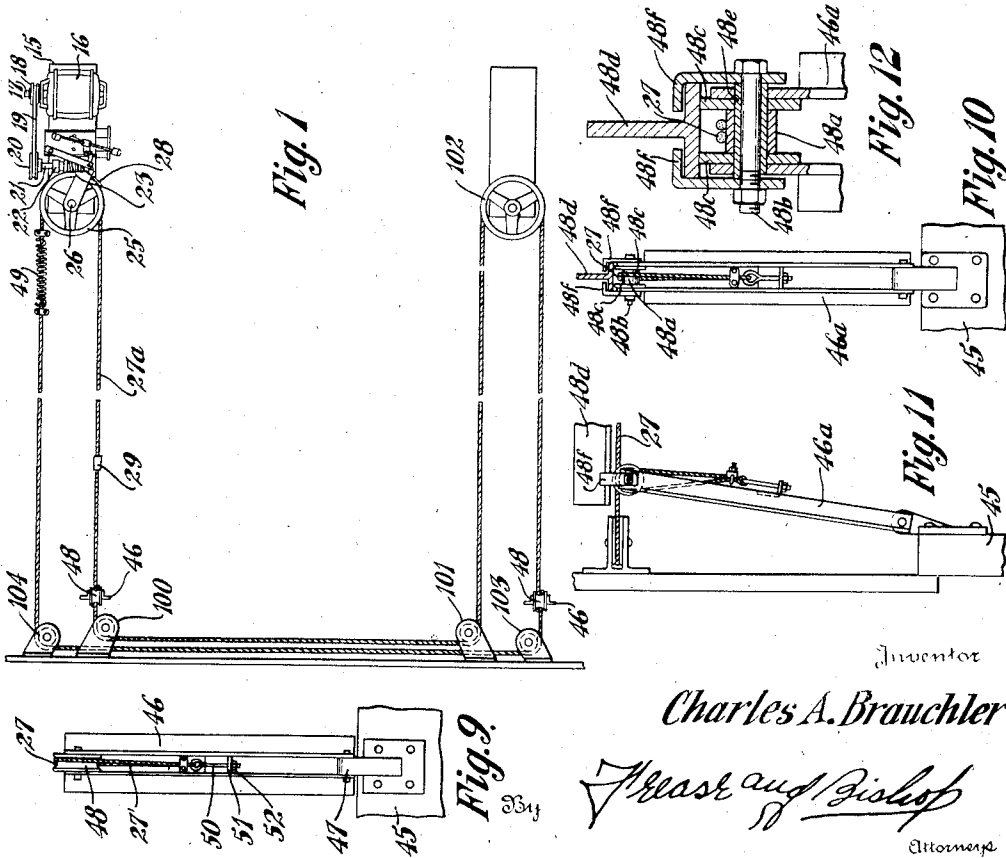
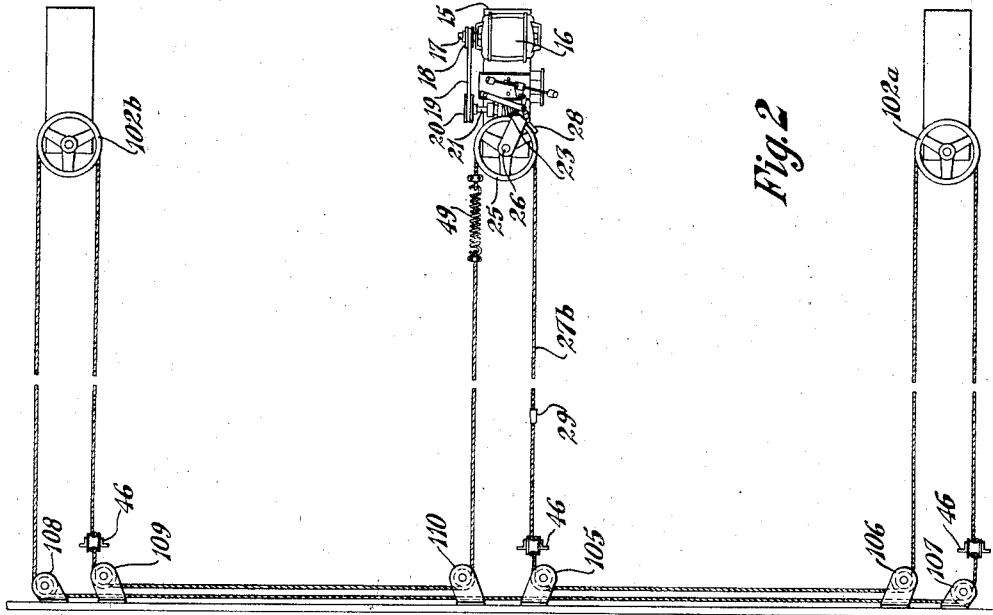
C. A. BRAUCHLER

2,168,152

GARAGE DOOR OPERATOR

Filed April 8, 1937

3 Sheets-Sheet 1



Inventor

Charles A. Brauchler

Freese and Bishop

Attorneys

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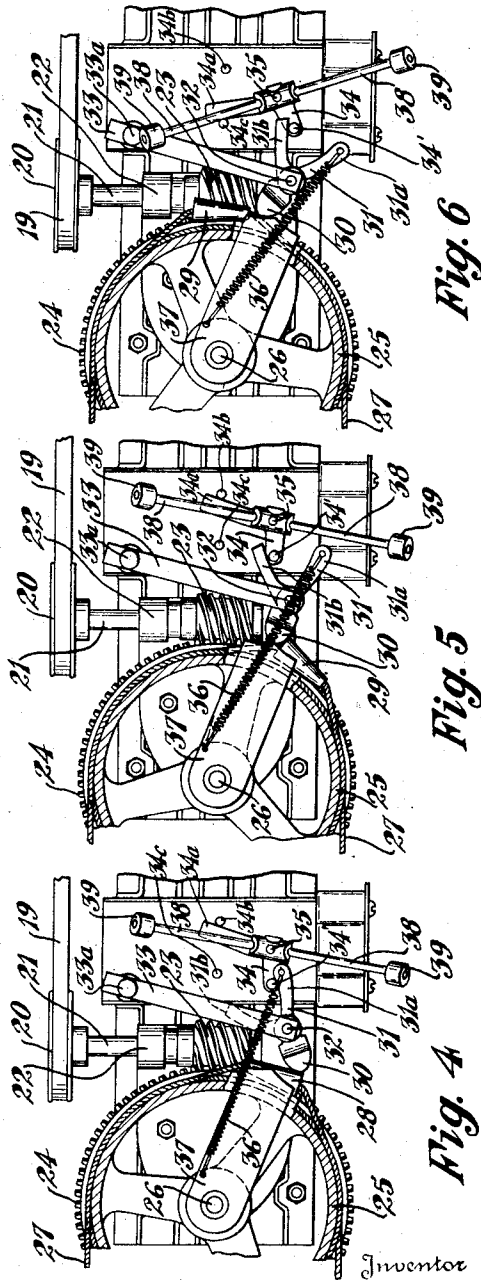
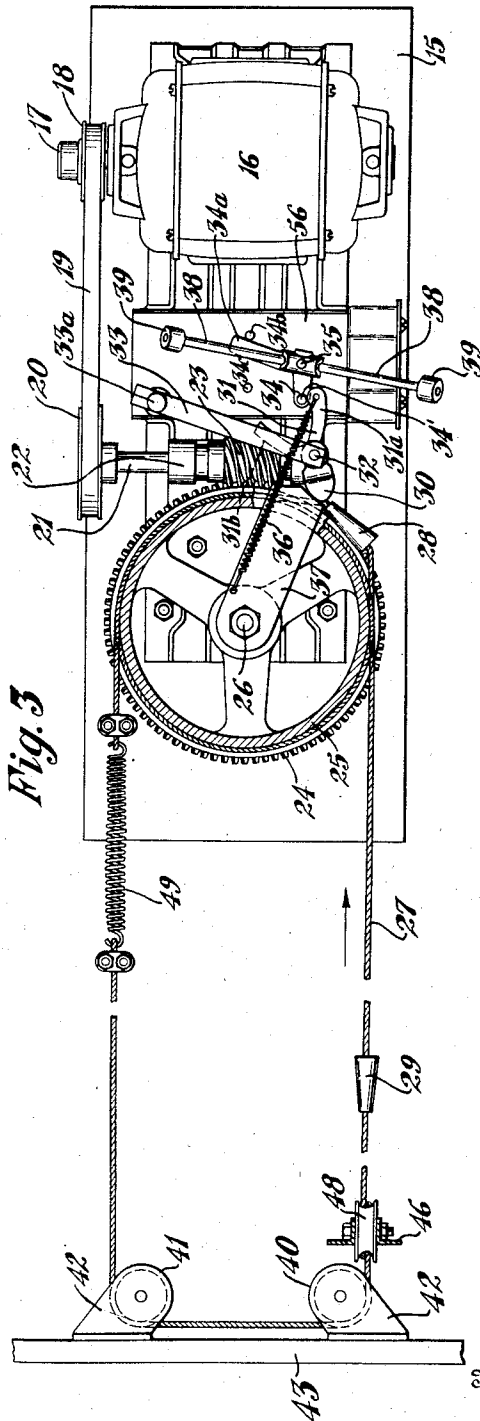
C. A. BRAUCHLER

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GARAGE DOOR OPERATOR

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3 Sheets-Sheet 2



Inventor

Charles A. Brauchler

By *Thurston and Bishop*
Attorneys

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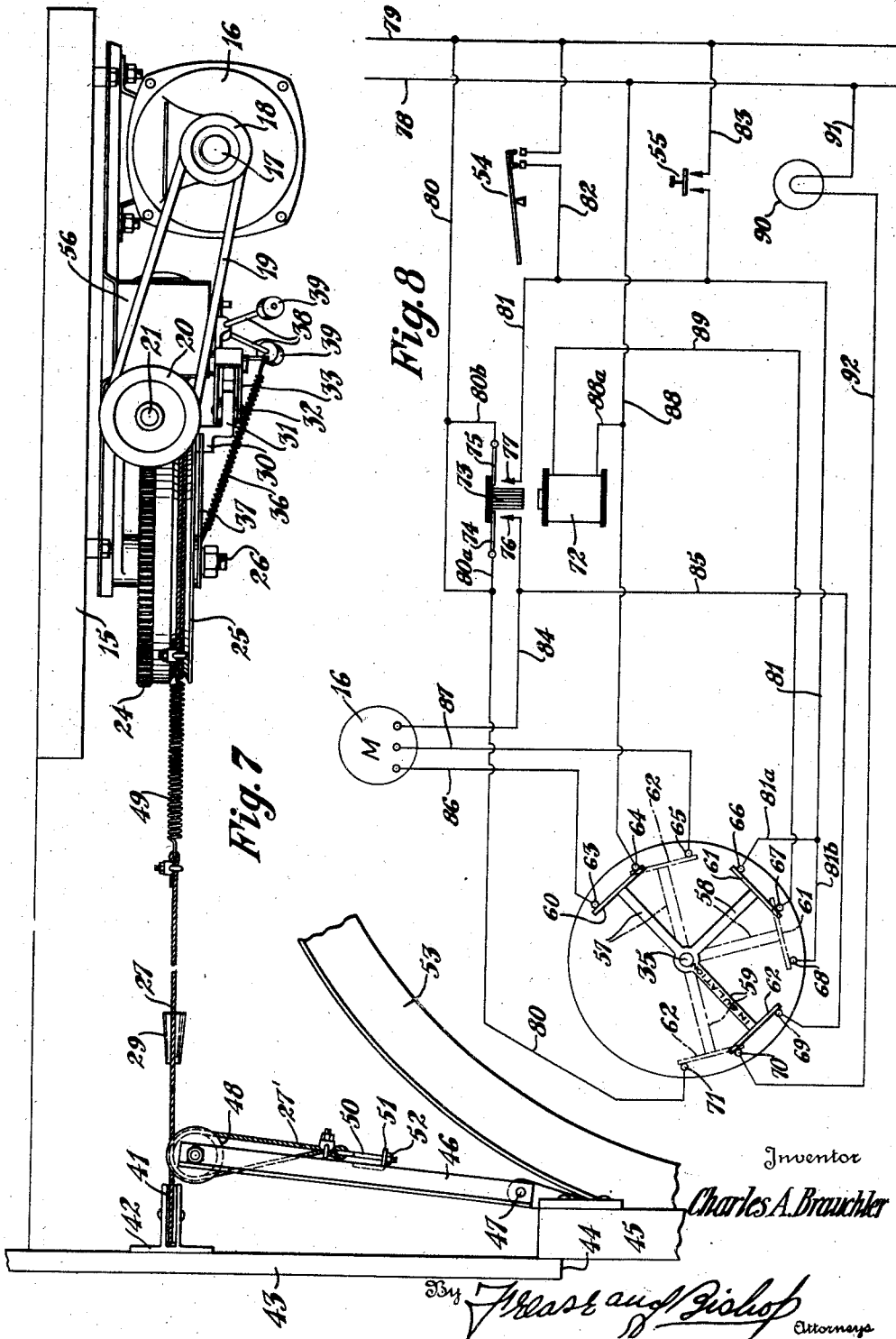
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GARAGE DOOR OPERATOR

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UNITED STATES PATENT OFFICE

2,168,152

GARAGE DOOR OPERATOR

Charles A. Brauchler, Canton, Ohio

Application April 8, 1937, Serial No. 135,735

8 Claims. (Cl. 200—47)

The invention relates to door operating means and more particularly to power operated mechanism for opening and closing heavy doors such as are used upon garages and similar buildings.

5 An important object of the invention is to provide a door mounting and operating means of such a nature and construction that upon actuation of a switch located in the driveway approaching the door, or a second switch located 10 within the garage or other convenient place, the door will be automatically opened or closed as the case may be.

15 Another object is the provision of door operating mechanism by means of which the door is moved to open or closed position by a reversing motor having a reversing switch automatically operated with each operation of the door to stop the motor as the door reaches the fully open or fully closed position and to set the parts in position 20 for the opposite movement of the door upon the closing of either of the operating switches.

25 A further object is the provision of mechanism of the character referred to in which one or more doors are operated by an endless cable wrapped one and one-half times around a power driven drum and connected at one or more points to each door.

30 A still further object is the provision of a tension spring in the cable so as to hold the cable under tension when the drum is rotating in a direction to open the door but to permit the cable to become slack around the drum as the door is closing, so as to prevent injury to a person or vehicle in the doorway.

35 Another object is to provide a spaced pair of tapered trip members, upon the endless cable, for engagement with a pivoted yoke through which the lever controlling the reversing switch is operated.

40 Still another object is to provide governor arms upon the shaft of the reversing switch to regulate the operation thereof.

45 A further object is the provision of a relay in the circuit controlling the mechanism, adapted to hold the circuit to the motor closed, after a momentary closing of an operating switch, until the mechanism has completed a complete opening or closing movement of the door.

50 A still further object of the invention is the provision of means for simultaneously operating one, two or more doors by the same mechanism.

55 Another object is to provide means for lighting an electric lamp as the door is moved to open position and for breaking the circuit to said lamp as the door is moved to closed position.

A further object is to provide a pivoted bracket upon the door for connecting the endless cable thereto.

5 An additional object is to provide a track co-operating with the door bracket for maintaining the cable in proper alignment during the operation of the mechanism.

10 Still another object is the provision of mechanism of the character referred to which will be comparatively simple and inexpensive to manufacture and install, efficient in use and durable in service.

15 The above objects together with others which will be apparent from the drawings and the following description, or which may be later referred to, may be attained by constructing the improved door operating mechanism in the manner illustrated in the accompanying drawings, showing an embodiment of the invention as applied to overhead doors, in which 20

Figure 1 is a bottom plan view of the improved garage door operator arranged to operate double overhead sliding doors or one large door;

25 Fig. 2, a similar view showing the mechanism arranged to operate three doors or one extremely large door;

30 Fig. 3 is a bottom plan view on a larger scale showing the mechanism adapted to operate one small overhead door, showing the parts in the position assumed when the door is in closed position;

35 Fig. 4 is a fragmentary bottom plan view of the mechanism showing the parts in the positions they assume as they start to operate to open the door;

40 Fig. 5, a similar view showing the parts in the position they assume when the door is almost open;

45 Fig. 6, a similar view showing the same parts in the position they assume as the door reaches the fully opened position;

Fig. 7, a side elevation of the mechanism shown and in the same position as in Fig. 3;

50 Fig. 8, a wiring diagram of the electric circuit controlling the mechanism;

55 Fig. 9, an elevation of the hinged bracket upon the door for connection of the endless cable;

Fig. 10, a view similar to Fig. 9 of a slightly modified form of bracket;

Fig. 11, a side elevation of the bracket shown in Fig. 10; and

Fig. 12, an enlarged fragmentary sectional view of the upper portion of the bracket shown in Figs. 10 and 11 and the track with which it co-operates.

Similar numerals refer to similar parts throughout the drawings.

For the purpose of illustration, the improved garage door operating mechanism is shown in the accompanying drawings as applied to overhead doors arranged to slide upwardly in the doorway, over a curved track at the top of the doorway and horizontally adjacent to the ceiling of the garage, but it should be understood that this is merely for the purpose of illustration of one embodiment of the invention and that the same mechanism may be used for operating various types of doors such as are commonly used upon garages and the like.

The operating mechanism may be suspended from a base 15 arranged to be attached to the ceiling of the garage in any convenient position. A reversing motor 16 is suspended from this base and the shaft 17 thereof is provided with a pulley 18 connected as by the belt 19 with the pulley 20 upon the worm shaft 21 journaled in bearings 22 suspended from the base 15.

The worm 23 is fixed upon the shaft 22 and meshes with the worm gear 24 fixed to or formed upon the drum 25 which is journaled upon a short vertical shaft 26 suspended from the base 15.

The endless cable 27 which operates the garage door or doors is wrapped one and one-half times around the drum 25, as best shown in Fig. 3 and has fixed thereon a spaced pair of tapered or conical trip stops 28 and 29 oppositely disposed, as also shown in Fig. 3.

These trip stops are adapted to engage the toe 30 of a yoke 31 pivoted as at 32 upon a bracket 33 suspended from the base to operate the reversing switch through a lever 34 fixed upon the shaft 35 of said switch.

For the purpose of causing the yoke 31 to be quickly moved to either limit of its movement when tripped by one of the trip stops, a spring 36 is connected to the yoke and to a bracket 37 and arranged to quickly throw the yoke to either position as soon as it is moved over center. In order to control the movement of the switch shaft 35 and to prevent extreme shock in the movement of the same when the lever 34 is struck by the yoke 31, a pair of governor arms 38 may be connected to the switch shaft 35 at diametrically opposite positions and provided at their ends with small weights 39.

The endless cable 27 may pass around two spaced pulleys 40 and 41 mounted upon brackets 42 connected to the front wall of the garage or other building, as indicated at 43, at a point located centrally above the door opening 44, when the mechanism is designed for opening a single small door as illustrated in Fig. 3.

Connection of the endless cable to the door 45 may be through a hinged bracket 46, the lower end of which is hinged as at 47 to the upper end of the door. This bracket may carry a pulley or the like indicated at 48 at its upper end and the endless cable is passed over said pulley and down, forming a loop 27' and up over the other side of the pulley 48, then continuing around the pulleys 40 and 41 and back to the drum 25, a tension spring 49 being interposed in said cable between the pulley 41 and the drum.

An adjusting screw 50 is connected to the looped portion 27' of the cable and located through a flange 51 upon the hinged bracket 46, being provided with a nut 52 by means of which the tension upon the cable 27 may be adjusted.

A curved track 53 may be provided adjacent to the top of the doorway for the door 45 to ride

upon as it is moved to open position by the door operating mechanism.

In Fig. 8 is shown the electric circuit controlling the door operating mechanism. The mechanism may be operated through a magnet operated switch of the type shown in Davis Patent No. 1,795,477 adapted to be located in the driveway leading to the garage and indicated generally at 54 in the diagram; and is also arranged to be operated by a manually operated switch indicated at 55 which may be located within the garage or within the house. It should be understood of course that one manually operated switch such as shown at 55 may be located within the garage and a similar switch may also be located in the house.

The shaft 35 of the reversing switch extends into the switch box 56 and has fixed thereon a plurality of arms indicated at 57, 58 and 59 upon the ends of which are fixed the movable contact members 60, 61 and 62 respectively, each adapted to bridge across two fixed contacts within the switch box as will be later described.

For instance, the movable contact 60 is adapted to close the circuit between the fixed contacts 63 and 64 when the switch is in the position shown in full lines in Fig. 8 and between the fixed contacts 64 and 65 when the reversing switch is moved to the dotted line position shown in said figure.

The movable contact 61 in like manner is adapted to close the circuit between the fixed contacts 66 and 67 when the switch is in the full line position and between the contacts 67 and 68 when in the dotted line position. The movable contact 62 closes the circuit between the fixed contacts 69 and 70 when the switch is in the full line position and between the contacts 70 and 71 when in the dotted line position.

Also located within the switch box 56, is a relay comprising the solenoid or magnet 72 and the armature 73 which operates the switch blades 74 and 75 to close the circuit through the fixed contact points 76 and 77 respectively when the armature is attracted by the magnet.

The wires of the power line are shown at 78 and 79. A wire 80 leads from the power wire 79 to the fixed contact 71 of the reversing switch and is connected to the switch blades 74 and 75 as indicated at 80a and 80b respectively. A wire 81 leads from the fixed contact 77 of the relay switch and is connected to the fixed contacts 66 and 68 of the reversing switch as at 81a and 81b respectively.

A wire 82 leads from the power line 79 through the magnet operated switch 54 to the wire 81 and a similar wire 83 leads from the power line 79 through the manually operated switch 55 to the wire 81. A wire 84 leads from the fixed contact 76 of the relay switch to the motor 16 and a wire 85 leads therefrom to the fixed contact 69 of the reversing switch. Wires 86 and 87 lead from the motor to the fixed contacts 63 and 65 respectively of the reversing switch.

A wire 88 leads from the power line 78 to the fixed contact 64 of the reversing switch and is connected as at 88a to the magnet 72, a wire 89 leading from said magnet to the fixed contact 67 of the reversing switch.

An incandescent lamp indicated at 90 may be located within the garage and arranged to be lighted as the door is opened. This lamp is connected by a wire 91 to the power line 78 and by a wire 92 to the fixed contact 70 of the reversing switch.

Upon the closing of the switch 54 by a magnet equipped automobile passing over the driveway to the garage, or by the manual closing of the switch 55, the circuit will be closed from the power line 79 through the wires 82, 81 and 81a to the fixed contact 66 of the reversing switch, through the movable contact 61 and fixed contact 67 and wire 89 through the relay 72, wire 88a and wire 88 to the other side 78 of the power line.

As the magnet 72 is energized and attracts the armature 73, the switch blades 74 and 75 will be moved thereby into contact with the fixed contact points 76 and 77. The circuit through the magnet is thus held closed after the switch 54 or 55 is opened, the circuit through the magnet being from the power line 79 through the wires 88 and 88a to the magnet, then through the wire 89, contacts 67, 61 and 66 of the reversing switch, wires 81a and 81, contact 77, switch blade 75, wire 88b and wire 80 to the power line 79.

The switch blade 74 closes the circuit to the reversing motor 16 from the power line 79 through the wires 80 and 80a, switch blade 74, contact 76, wire 84, through the motor, wire 86, contacts 63, 60 and 64 and wire 88 to the power line 78, starting the motor in the direction to rotate the drum 25 counterclockwise as viewed in Fig. 3, to cause the cable 27 to travel in the direction of the arrow shown in Fig. 3.

At the same time the circuit to the lamp 90, within the garage, will be closed through the power line 78, wire 91 to lamp 90, wire 92, contacts 70, 62 and 69 of the reversing switch, wires 85 and 84, contact 76 and switch blade 74 of the relay switch, wires 80a and 80 to the other side of the power line 79 as the door starts to open.

As the drum 25 thus starts to rotate the conical limit stop 28 will pass under the toe 30 of the yoke 31, swinging the bracket 33 slightly back upon its pivot 33a, as shown in Fig. 4, thus not operating the yoke 31 and through it the lever 34 of the reversing switch.

When the conical limit stop 28 passes beyond the nose 30 of the yoke the spring 36 will pull the bracket 33 and yoke 31 back to the position shown in Fig. 3, with the toe of the yoke in the path of the other conical limit stop 29.

During this time the reversing switch remains in the position of Figs. 3 and 8, the pull of the spring 36 upon the yoke 31 holding the arm 31a of said yoke in contact with the stud 34' upon the lever 34 of the reversing switch shaft 35, and holding the arm 34a, upon the reversing switch shaft 35, against the stop pin 34b.

As the cable 27 continues to be moved in the direction of the arrow in Fig. 3, the garage door 45, connected to said cable through the hinged bracket 46, will be pulled upward, over the curved portion 53 of the usual track, and backward in a horizontal position as is customary with overhead doors.

Just at the time the door reaches the fully opened position, the conical limit stop 29, upon the cable 27, will strike the toe 30 of the limit yoke 31, as indicated in Fig. 5, throwing said yoke to the reverse position and bringing the arm 31b of the yoke into contact with the stud 34' upon the lever 34 of the reversing switch. Further movement of the drum and cable carries the conical limit stop 29 to the position shown in Fig. 6, the spring 36 passing over center and throwing the yoke 31 into the position shown in said figure.

The arm 31b of the yoke in engagement with the stud 34' upon the reversing switch lever 34

throws said lever into the position shown in said figure, oscillating the shaft 35 to reverse position, the arm 34a upon said shaft being moved into contact with the stud 34c, reversing the switch and stopping the movement of the parts in this position.

This reversing movement of the switch moves the parts to the positions shown in broken lines in Fig. 8, the movable contact blade 62 passing out of contact with the fixed contact 63 and bridging the gap between the fixed contacts 64 and 65. In the same manner, the movable contact blade 61 moves out of contact with the fixed contact 66 and makes contact between the fixed contacts 67 and 68; and the movable contact blade 62 moves out of contact with the fixed contact 69 and bridges the gap between the fixed contacts 70 and 71.

If the circuit is broken between the fixed contacts 66 and 67 of the reversing switch, the relay magnet 72 is deenergized, permitting the armature 73 to move away from the same to the position shown in Fig. 8, breaking the circuit between the blades 74 and 75 and the contacts 76 and 77 respectively. This breaks the circuit to the motor 16, stopping the same, but the circuit through the lamp 91, although momentarily interrupted as the contact is broken at 69, 62 and 70, will be again closed as the movable blade 62 makes contact with the fixed contacts 70 and 71 so that the lamp remains lighted during the time the garage door is open. The circuit through the lamp is then from the power line 78 through wire 91, lamp 90, wire 92, fixed contact 70, movable blade 62, fixed contact 71 and wire 88 to the power line 79.

With the parts in this position, when it is desired to close the door, either of the switches 54 or 55 may be momentarily closed. This will close the circuit from the power line 79 through either of the wires 82 or 83, wire 81, fixed contact 68, movable blade 61 and fixed contact 67 of the reversing switch, wire 89, relay 72, wire 88a and wire 88 to the other side 78 of the power line. As the relay is energized, the armature 73 will be pulled toward the same, moving the switch blades 74 and 75 into contact with the fixed contacts 76 and 77.

The switch 75 will thus hold the circuit through the relay closed as the switch 55 is again moved to open position, in the manner above described. The motor will be reversed, the circuit then passing through the same from the power line 79 through the wires 80 and 80a, switch blade 74, contact 76 and wire 84 to the motor 16, then through the wire 87, fixed contact 65, movable blade 62 and fixed contact 64 of the reversing switch and wire 88 to the power line 78, operating the motor in reverse direction.

As the drum 25 starts to rotate in the direction of the arrow shown in Fig. 6, the conical limit stop 29 will immediately pass under the toe 30 of the yoke 31, but will not swing said yoke upon its pivot, merely swinging the hinged bracket 33 backward upon its pivot 33a in the manner above described, all of the parts of the switch remaining in the position shown in Fig. 6, until the base end of the conical limit stop 28 strikes the toe 30 of the limit yoke 31 when said yoke will be swung back to the positions shown in Figs. 3 and 4 and through the stud 34' upon the lever 34, the shaft 35 of the reversing switch will be oscillated back to the former position, the arm 34a thereon contacting with the limit stud 34b, as shown in Figs. 3 and 4.

The reversing switch will then be moved back to the full line position shown in Fig. 8, and as the circuit through the relay 72 is broken, the circuits to the motor and through the lamp 90 will both be broken, stopping the parts in this position.

The cable 27 in the meantime will have moved back to the position shown in Fig. 3 and through the hinged bracket 46, the door 45 will have lowered to closed position. Should a person or vehicle, or any other obstruction be in the path of the door 45 as it is being lowered, as soon as the bottom edge of the door contacts with such obstacle, the spring 49 in the cable will come into play. This spring will be stretched or expanded, producing sufficient slack in the cable, as it passes one and one-half times around the drum, to permit the drum to slide within the cable without moving the cable so as not to injure the person or vehicle caught beneath the descending door.

As shown in Figs. 10, 11 and 12, the construction of the hinged bracket, which secures the door to the cable, may be slightly modified. The bracket may be made as indicated at 46a, connected to the door in the manner above described and having at its upper end a small tubular roller 48a mounted upon the bolt 48b between the washers 48c, forming a roller or pulley around which the cable is looped in the same manner as above described in connection with the hinged bracket 46. A horizontal inverted T-shaped track 48d may be provided in conjunction with this bracket 46a, the washers 48c rolling along the under surface thereof. It will be noted that these washers as well as the tubular roller 48a, are mounted upon a sleeve 48e extending through suitable apertures in the spaced side walls of the bracket 46a, as shown in Fig. 12 and forming a spacer for the angle members 48f connected to the bolt and located over the top of the T-shaped track 48d. This prevents the cable from being pushed upward by the hinged bracket as the door is pulled to open position.

Although in Fig. 3 is shown a simple form of connection of the cable to the center of the single garage door, it should be understood that there are many variations in which the cable may be arranged for double or triple doors, or for two or three point attachment to one large door.

For instance, as shown in Fig. 1, the cable is arranged for two point connection to spaced points of a large door, or to central points of two doors by means of the two hinged brackets 46. For such a construction, the cable 27a extends from the drum 25 to one of the hinged brackets 46, then over a pulley 100, then horizontally to another pulley 101, then backward horizontally and over large pulley 102, which may be of substantially the diameter of the drum 25, then forward where it is connected to the other hinged bracket 46, then over the pulleys 103 and 104 and back to the drum 25, the spring 49 being interposed between the pulley 104 and the drum, as shown in Fig. 3.

Or as shown in Fig. 2, the cable may be arranged for three point connection to an extremely large door, or to central points of three doors by means of the three hinged brackets 46. For such a construction the cable 27b extends from the drum 25 to the central hinged bracket 46, then over a pulley 105, then horizontally above the door opening to a pulley 106, then backward and around a large pulley 102a, then forward to the lowermost hinged bracket 46, then over a pulley 107,

then across the entire top of the door opening to the other side thereof and over the pulley 108.

From the pulley 108 the cable extends back and over a large pulley 102b, then forward where it is connected to the uppermost hinged bracket 46, then over the pulley 109, then above the door opening to the center thereof, over the pulley 110 and then back to and around the drum 25, around which it is wrapped as above described.

It should be understood that the arrangements shown in Figs. 1, 2 and 3 are only illustrations of a few of the many different arrangements of the cable which may be provided for meeting different conditions. Further, it is pointed out that the cable may be connected to the lower portion of the door instead of to the top thereof, so as to push the door upward from the bottom instead of pulling it upward from the top.

I claim:

1. A reversing switch for a motor-driven appliance including a reversing motor and a flexible member movable in either direction thereby, said switch comprising fixed contact members and a movable contact member cooperating therewith, a pivoted yoke for operating the movable contact member and a spaced, oppositely disposed pair of conical limit stops upon the flexible member, each limit stop being adapted for swinging the yoke upon its pivot when moving in one direction and for sliding under the yoke without moving the same when moving in the other direction.

2. A reversing switch for a motor-driven appliance including a reversing motor and a flexible member movable in either direction thereby, said switch comprising fixed contact members and a movable contact member cooperating therewith, a pivoted yoke for operating the movable contact member, a spaced, oppositely disposed pair of conical limit stops upon the flexible member, each limit stop being adapted for swinging the yoke upon its pivot when moving in one direction and for sliding under the yoke without swinging the same when moving in the other direction, and a spring cooperating with the yoke to throw it over center when moved by one of said conical limit stops.

3. A reversing switch for a motor-driven appliance including a reversing motor and a flexible member movable in either direction thereby, said switch comprising fixed contact members and a movable contact member cooperating therewith, a pivoted bracket adjacent to the movable contact member, a yoke pivoted upon said pivoted bracket for operating the movable contact member, and a spaced, oppositely disposed pair of conical limit stops upon the flexible member, each limit stop being adapted for swinging the yoke upon its pivot when moving in one direction and for sliding under the yoke without swinging the same when moving in the other direction.

4. A reversing switch for a motor-driven appliance including a reversing motor and a flexible member movable in either direction thereby, said switch comprising fixed contact members and a movable contact member cooperating therewith, a pivoted bracket adjacent to the movable contact member, a yoke pivoted upon said pivoted bracket for operating the movable contact member, a spaced, oppositely disposed pair of conical limit stops upon the flexible member, each limit stop being adapted for swinging the yoke upon its pivot when moving in one direction and for sliding under the yoke without swinging the same when moving in the other direction.

the same when moving in the other direction, and a spring cooperating with the yoke to throw it over center when moved by one of said conical limit stops.

5 5. A reversing switch for a motor-driven ap-
pliance including a reversing motor and a flexible
member movable in either direction thereby, said
switch comprising fixed contact members and a
movable contact member cooperating therewith,
10 a shaft upon which the movable contact member
is mounted, a lever upon said shaft, a pivoted
yoke for operating said lever, and a spaced, op-
positely disposed pair of conical limit stops upon
the flexible member, each limit stop being
15 adapted for swinging the yoke upon its pivot
when moving in one direction and for sliding
under the yoke without swinging the same when
moving in the other direction.

20 6. A reversing switch for a motor-driven ap-
pliance including a reversing motor and a flexible
member movable in either direction thereby, said
switch comprising fixed contact members and a
movable contact member cooperating therewith,
25 a shaft upon which the movable contact member
is mounted, a lever upon said shaft, a pivoted
yoke for operating said lever, a spaced, oppositely
disposed pair of conical limit stops upon the
flexible member, each limit stop being adapted
for swinging the yoke upon its pivot in moving in
30 one direction and for sliding under the yoke
without swinging the same when moving in the
other direction, and a pair of radially disposed
weighted arms upon said shaft for governing the
movement of the shaft.

35 7. A reversing switch for a motor-driven ap-

pliance including a reversing motor and a flexible
member movable in either direction thereby, said
switch comprising fixed contact members and a
movable contact member cooperating therewith,
5 a pivoted bracket adjacent to the movable con-
tact member, a yoke pivoted upon said pivoted
bracket for operating the movable contact mem-
ber, a spaced, oppositely disposed pair of conical
limit stops upon the flexible member, each limit
10 stop being adapted for swinging the yoke upon its
pivot when moving in one direction and for
sliding under the yoke without swinging the same
when moving in the other direction, and a pair
of radially disposed weight arms upon the mov-
15 able contact member for governing the movement
of said reversing switch.

8. A reversing switch for a motor-driven ap-
pliance including a reversing motor and a flexible
member movable in either direction thereby, said
20 switch comprising fixed contact members and a
movable contact member cooperating therewith,
a pivoted bracket adjacent to the movable con-
tact member, a yoke pivoted upon said pivoted
bracket, a shaft upon which the movable contact
member is mounted, a lever upon the shaft
25 adapted to be operated by the yoke, a spaced op-
positely disposed pair of conical limit stops upon
the flexible member, each limit stop being adapted
for swinging the yoke upon its pivot when moving
in one direction and for sliding under the yoke
30 without swinging the same when moving in the
other direction, and a spring cooperating with
the yoke to throw it over center when moved by
one of said conical limit stops.

CHARLES A. BRAUCHLER. 35