

Nov. 24, 1936.

F. A. PURDY

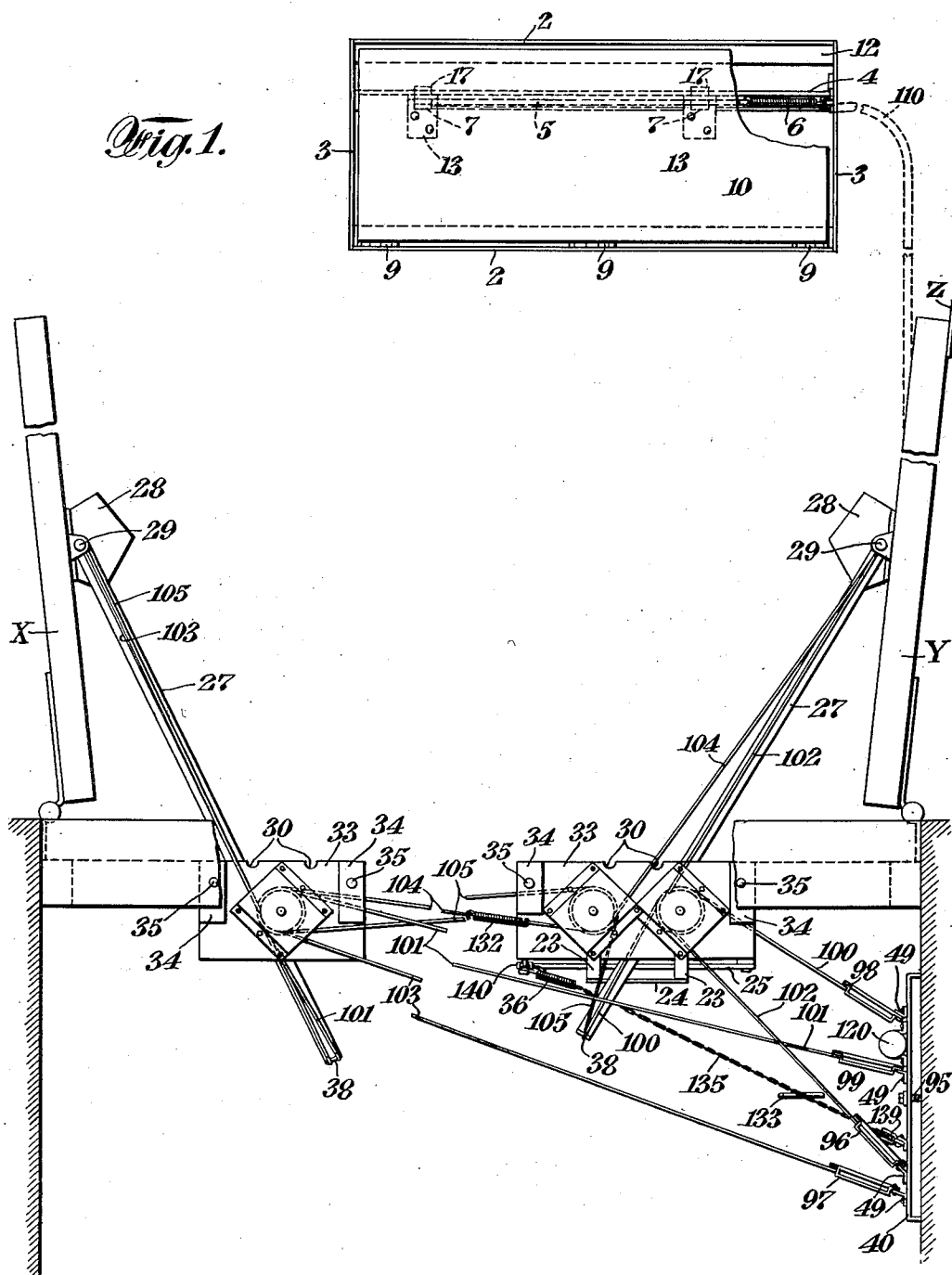
2,062,015

CLOSURE OPERATOR

Filed Dec. 14, 1923

4 Sheets-Sheet 1

Fig. 1.



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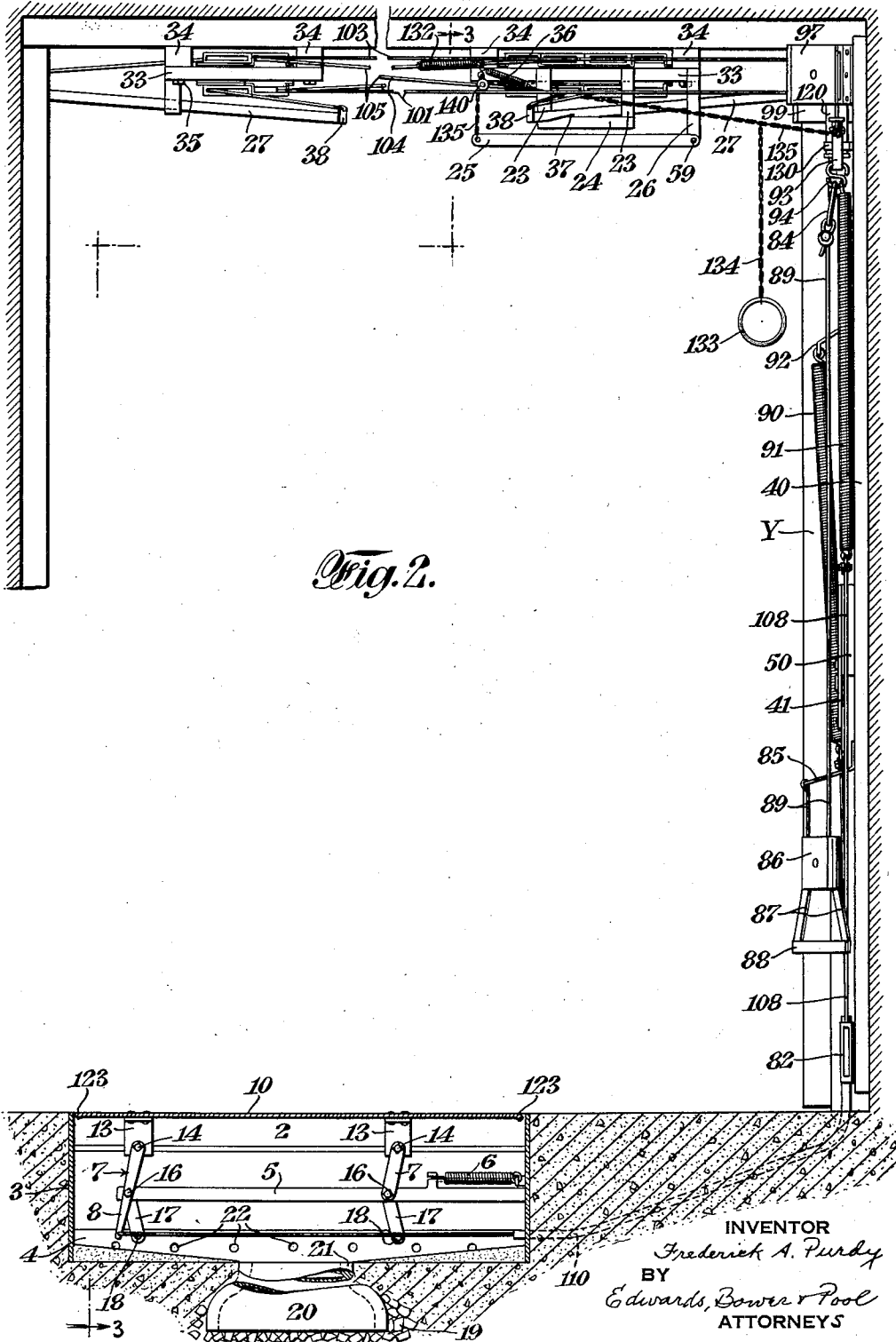
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CLOSURE OPERATOR

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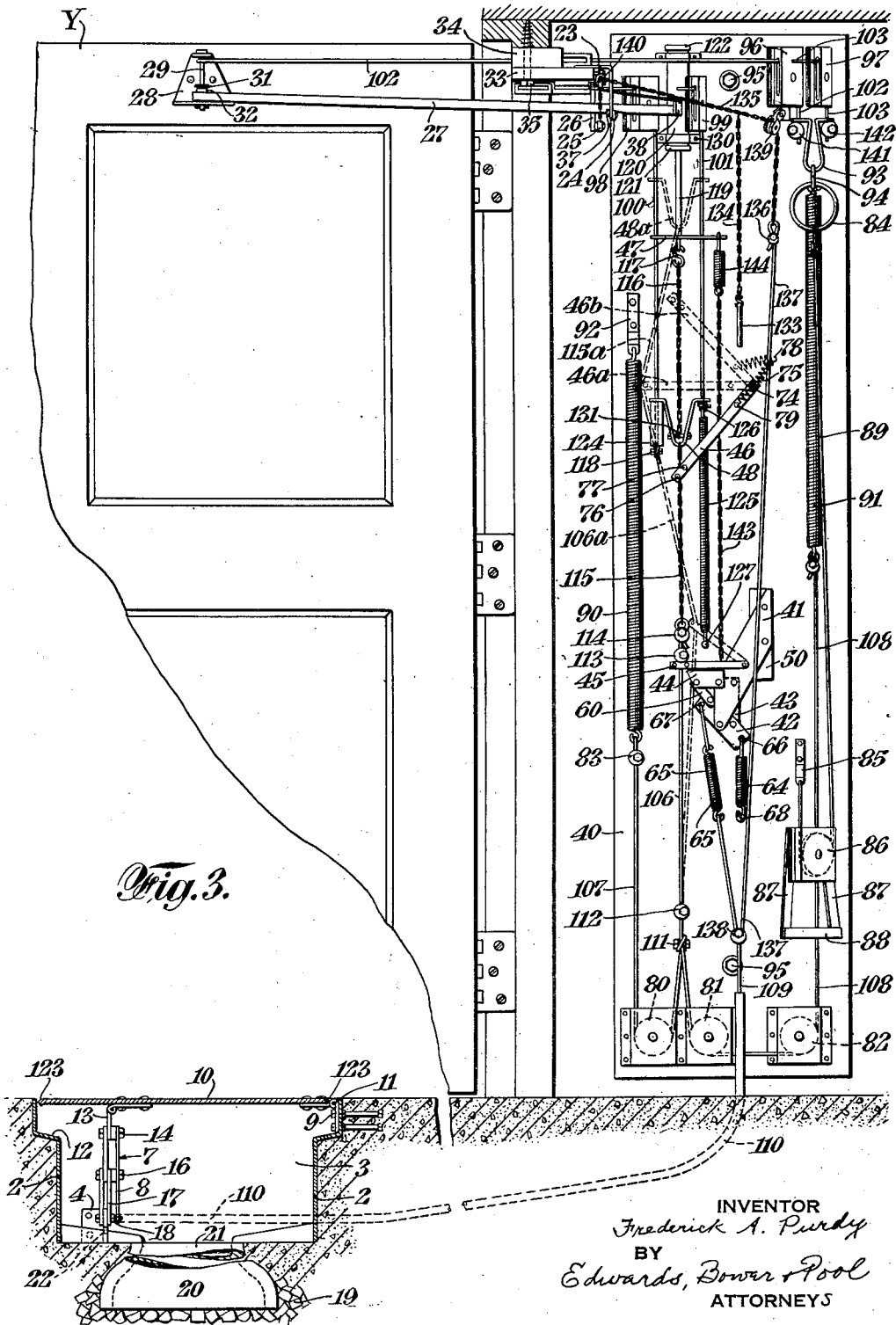
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CLOSURE OPERATOR

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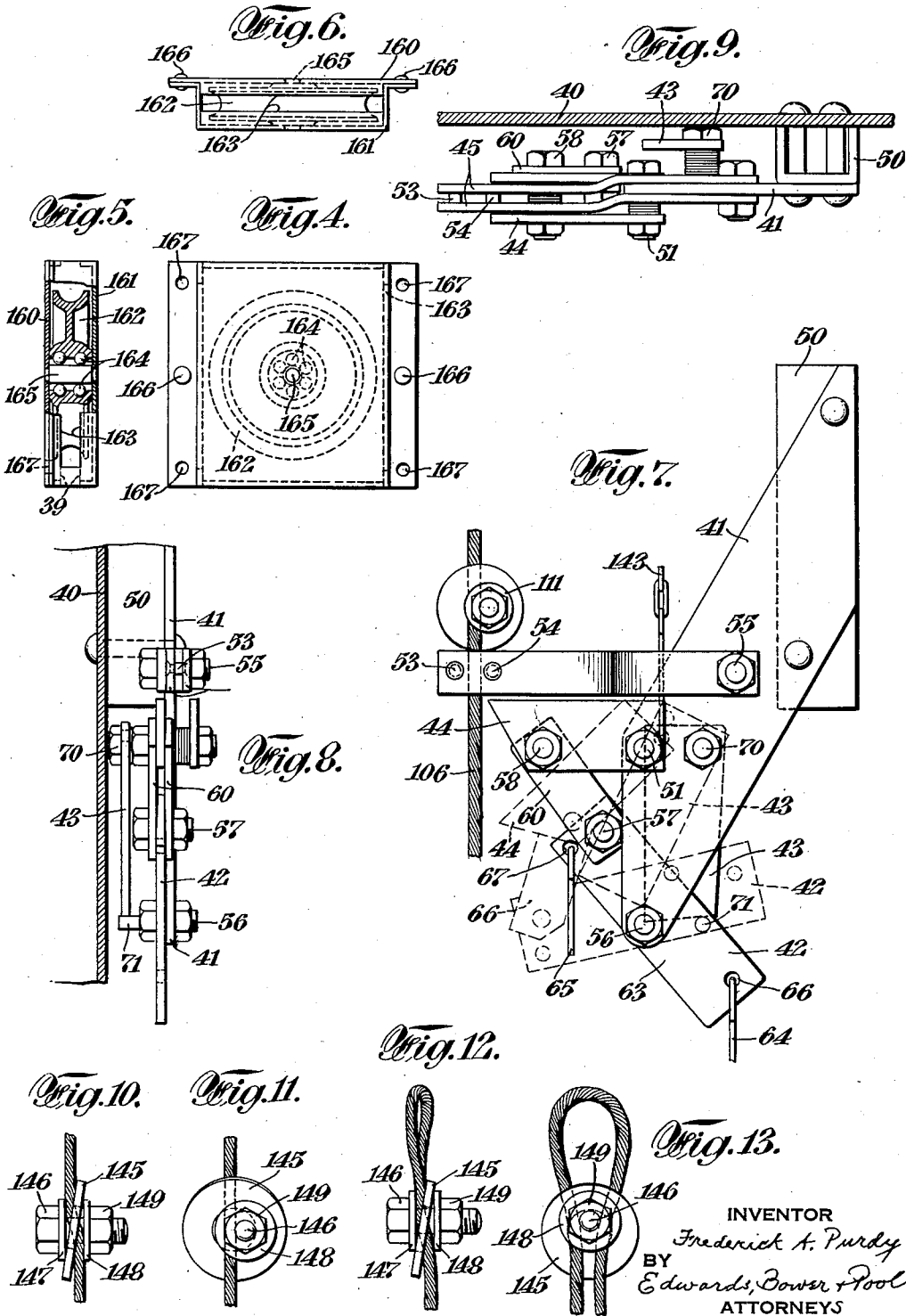
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UNITED STATES PATENT OFFICE

2,062,015

CLOSURE OPERATOR

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25 Claims. (Cl. 268—35)

This invention relates to closure-operators, and has particular application to devices for opening, closing, and controlling the operation of doors of garages, and similar building structures.

Objects of the invention are increased convenience and economy. Other objects will become apparent in the development of the description.

In the drawings:

A preferred form of the invention is illustrated in the accompanying drawings, in which

Fig. 1 is a plan view of a doorway and doors as at a residence-garage, showing, in relative locations, the assemblies and interconnections that make up the door-operator;

Fig. 2 is an elevation view of the doorway as seen from the inside of garage, showing the same door-operator assemblies and interconnections in relative positions;

Fig. 3 is an elevation view crosswise of the runway and doorway from the line 3—3 of Fig. 2, showing the same door-operator assemblies and interconnections in relative positions;

Figs. 4, 5, and 6 are face, side, and end views, respectively, of a protective housing with a sheave mounted in it;

Figs. 7, 8, and 9 are face, side, and top views, respectively, of trap-assembly drawn on an enlarged scale;

Figs. 10 and 11 are side and face views, respectively, of a button-mounting or anchorage on a single strand of cable;

Figs. 12 and 13 are side and face views, respectively, of an anchorage for a cable in the form of a loop.

Each character of reference represents the same part in all drawings in which it appears.

General description

Superficially, the device consists of a wheel-contact platen 10 depressible by the wheel of a vehicle, connected to mechanism adapted to apply a pull upon a cable 109 extending into the garage through the pipe or hose 110; a wall assembly on a panel 40 carrying a spring 90 as an energy storing or inherently energized motive means for door opening, a spring 91 as an energy storing or inherently energized motive means for door closing, an air-cylinder as a time-delay means for door-closing and a cushioning means to yieldingly terminate the movement of doors when approaching each limit of travel at open and closed positions, a displacement-arm 46 to automatically take up excess cable sufficiently to compensate for cable-stretch occurring in re-setting, and a trap-assembly having jaws 44 to en-

gage connections to each motive means, also suitable sheaves, chains, etc., connected to these main parts; and four door-drive cables, two cables to apply door-opening drive as 100 to door Y and 101 to door X, passing from the wall-assembly over sheaves in lintel assemblies to the free ends of respective drive-arms 27, and two cables to apply door-closing drive, as 102 to door Y and 103 to door X, passing from the wall-assembly over sheaves in lintel-assemblies to the respective pins 29 in door-brackets 28; doors X and Y being of the hinged type closing together at their free edges, one lapping over the other as by the lap-strip Z.

The terms "energy storing motive-means" or "inherently energized motive-means" are intended to define motive-means which by positioning are put into condition to deliver energy for motivation of the door; as by the deflection of a spring, the raising of a weight, or the positioning of the door itself to move by its own weight. A motive-means to which the motivating energy is delivered as consumed, such as an electric motor, is not regarded as energy storing motive-means or inherently energized motive-means in the sense in which used here.

Wheel-contact assembly

Platen 10, sheared with a downward fin 123 to drop water at its edges, is attached by pins 11 in hinges 9 to a box made up of four walls, as 2 and 3, constituting a concrete outer form, and providing a ledge 12 to arrest downward movement of platen 10. An open bottom is provided in a concrete floor 21 into which is sunk a sump-pipe 20 supported below and around by rocks or other material 19 between the interstices of which water is stored pending seepage, the sump thus formed being carried down to a non-freezing depth according to climate so as to keep the mechanism below the platen 10 free of water and ice.

A base-rib 4 attached to walls 3 is sunk into the concrete floor 21 and has holes 22 for drainage through it to the mouth of the sump-pipe.

Links 17 are mounted pivotally at 13 to base-rib 4 and at 16 to connecting-bar 5 and to links 7, which links 7 are pivotally mounted at 14 to hinges 13 attached to platen 10.

An extension 8 on one of the links 7 has cable 109 attached to it, this cable 109 extending into the garage through the pipe or hose 110, where it connects on a wall-assembly to spring 65 and cable 137 later described.

Spring 6 attached to one end-wall 3 and to connecting-bar 5 normally tends to bring one end of connecting-bar 5 against the end-wall 3, and the length of this end of connecting-bar 5 determines the angular position assumed by the platen-supporting links 7 and 17 when platen 10 is in upward position, in which angular position of links 7 and 17 the pivots 16 are off center from a straight line between respective pivots 14 and 18, as appearing in Fig. 2.

It may be noted by way of illustration that a rhomboid figure is produced by this arrangement, in which the platen 10 and connecting bar 5 form two substantially parallel sides, and the links 7 the other two substantially parallel sides, these pairs of sides not being at right angles. A similar rhomboid is formed by the connecting bar 5 with the base 4 and links 17, the links 17 being slanted from the connecting bar oppositely as to links 7.

It may be noted further that the same result mechanically would be obtained by making all sides equal in the figure of a rhombus, or that a workable arrangement could be made with a single rhomb or rhomboid instead of the dual rhomboidal arrangement illustrated.

Either a rhomboidal or a rhombical arrangement above and below the connecting bar 5 serves to bring the pivots 16 away from or "off center" from a straight line between the pivots 14 and 18. The farther off center, the weaker is the resistance to a weight applied on platen 10, the maximum of resistance being at the highest position of platen 10 where the beginning of a depression occurs; and the distance off center is determined to afford sufficient resistance to depression by persons while permitting depression by one wheel of a vehicle.

The linkages made up of links 7 and 17 assume varying angular relations to connecting-bar 5, the angles becoming the more acute as the platen 10 depresses and moves connecting-bar 5 away from spring 6 to extend the latter. The more acute the angle, the greater is the strength of attack against the resistance of the spring, and resistance falls off rapidly after a weight is applied to the platen sufficient to overcome the maximum. This insures that a depression once started will be followed by a full collapse of the platen 10 to the ledge 12, insuring required adequate pull on cable 109 to actuate mechanism later described, and, as later noted, any depression of the platen 10, completed momentarily before the doors have gone through any or part of their movement, is sufficient to set into action the door driving mechanism.

This arrangement of a connecting-bar between a plurality of linkages of platen-supporting links 7 and 17 provides for a controlled similarity of action which distributes the resistance of the single spring uniformly throughout the wheel-contact range of the platen 10 from side to side.

Door-connections

Door drive arms 27 are mounted pivotally by pins 29, and cotter-pins 31 over adjusting washers 32, on brackets 28, Figs. 1 and 3, brackets 28 being suitably fastened at the tops of respective doors X and Y. Such positioning avoids interference with passing vehicles.

The free end of drive arm 27 on door Y lies above keeper 24 and between keeper-brackets 23 attached to a lintel assembly base 33. The arm 27 has at this free end a notch 37 to engage keeper

24 to hold the doors open when pulled to open position against resistance of the door closing spring 91. This constitutes a means for engaging the door-closing motive-means to hold its motive force from operating the door until selectively released, when the door is in open position, by release-bar 25. The bar 25, pivoted at 59 on bracket 26 attached to base 33, is lifted by a pull (against tensioning spring 36) on chain 135 running over pulley 140 attached to base 33. The chain 135 then passes over pulley 139 attached to panel 40 and connects at 136 (Fig. 3) to cable 137, which in turn connects at 138 to cable 109, already described, and is pulled by depression of platen 10 in the runway.

The chain 135, between pulleys 140 and 139, has hand-ring 133 (Fig. 2) pendant to it by chain 134, for optional actuation manually independently of platen 10.

Bases 33 of both lintel assemblies are spaced from the lintel by blocks 34, and attached to the lintel by fastenings 35.

The door drive arms 27 have on their free ends upturned lugs 38 to which there are attached respective door-opening drive-cables 100 and 101 which, as shown, pass over sheaves mounted on respective lintel-assembly bases 33, extend to and over respective sheaves 98 and 99, fastened by brackets 49 to panel 40, and extend to fastenings at the yoke 48, later described.

When the doors are opened manually, drive arms 27 are free from the driving stress of cables 100 and 101, and these drive arms normally tend to slant slightly downward toward their free ends, thus permitting drive arm 27 on door Y to engage keeper 24 by means of its notch 37; but, when under driving stress, as by spring 90 during and at termination of a mechanical operation the cables exert a lifting force on the free ends of arms 27 until lugs 38 are level with the sheaves over which the cables pass, and notch 37 on drive arm 27 at door Y is clear of keeper 24. This permits of manual resetting without obstruction after a mechanical opening.

In order to insure that the notch 27 will not latch on keeper 24, after a mechanical opening, the spring 90 is so adjusted that it will not drive the doors open quite as far as they may be opened manually.

Notches 30 in lintel assembly bases 33 are provided in order to bring the pins 29 into line with the peripheries of the respective sheaves over which cables 100 and 101 pass, this line being substantially at right angles to the door when closed. Since the wall-assembly may go on either wall, and the larger of the lintel assemblies goes nearer the wall-assembly, the notch 30 that is nearer the door-hinge is the one so lined up with pin 29. Each pivoted drive arm 27 is thus controlled at its unmounted and free end so that when the doors are in closed position the drive-arm is held substantially at a right angle to the door coinciding with the shortest distance that can be taken by cable 100 or 101, and is thus held clear of the side wall construction in the area served by the doors. Throughout the door-action the drive arms assume varying angular relations to the doors determined by the direction of pull by the respective cable 100 or 101.

Door-closing drive cables 102 and 103 attach to respective drive-arm pivot pins 29, and, as shown, pass over sheaves mounted on lintel assembly bases 33, cut-outs 39 in the sheave-housings, as in Fig. 5, allowing for wide range of movement of the cables, and these cables extend to

and over sheaves 96 and 97 (Fig. 3) fastened by brackets 49 to panel 40, and extend to adjustable anchorages at yoke 93 in the wall-assembly. These anchorages at yoke 93 are adjustable for controlling the exact positions of the doors when closed, to compensate for warping, or to bring the lap-strip, as Z, on one door to lap precisely over the other door.

The doors are interconnected by cables 104 and 105. Cable 104 attaches to pin 29 on door Y and extends over sheaves in both lintel-assemblies, as shown, to an anchorage at lug 38 of drive arm 27 on door X, and cable 105 attaches to pin 29 on door X and extends over sheaves in both lintel-assemblies, as shown, to an anchorage at lug 38 of drive arm 27 on door Y. These provide for similarity in door actions, and for countering winds. Spring 132 inserted between sections of cable 104, as shown, permits opening of door Y a limited distance for the passage of persons when door X is bolted in closed position.

Wall-assembly

The wall-assembly, mounted to the wall by fastenings 95, has an air-cylinder dash-pot 120 attached to panel 40 by straps 130. The air-cylinder is of conventional design having two piston leathers, one sealing compression in each direction. Escape of air is adjustably controlled by turning caps 121 and 122 tighter or looser on their screw-threads on either end of the cylinder.

The air-cylinder, as shown, is of a length that corresponds to about one-quarter of the effective travel of the cables.

When platen 10 is set close to the doors, as in a sidewalk, so that a vehicle backing out of the garage engages it to set up a door-closing action before the vehicle is clear of the doorway, this air-cylinder is made longer to correspond to the full effective travel of the cables and other door drive connections. It then acts throughout the door movement as a time-delay means to delay closing of the door to enable the vehicle passing therethrough to clear the moving range of the doors.

On the lower end of air-cylinder piston-rod 119, bumper 47 is mounted, also chain 116, by S-hook 117. Chain 116 is attached at its lower end by pin 131 to yoke 48.

Cables 100 and 101, already noted, thread through holes in bumper 47 and yoke 48, and cable 100 is anchored to a weight 124. The weight 124 holds cable 100 in tension to prevent the cable from hanging into the doorway when the doors are opened by hand. Similarly cable 101 is held in tension by spring 125 fastened to panel 40 at 127 and tied to cable 101 by a knot 126 in the cable, which knot prevents the cable from passing out of the hole in yoke 48.

Yoke 48 connects to chain 115 which in turn is anchored at 114 to cable 106 which carries buttons 113 and 112 for setting guide 45 later described. The cable 106 passes over sheave 80 and is connected, as cable 107, by anchorage 83 to door-opening spring 90 attached by bracket 92 to panel 40.

Cables 102 and 103, already noted, are held by anchorages 141 and 142 at yoke 93, to which yoke is attached by S-hook 94 the door-closing spring 91 anchored at its bottom end to cable 108 which passes over sheaves 82 and 81 to clutch or button 111 by which it is fastened to cable 106.

Jaws 44 of the trap assembly pivot on bracket 41 at 51, bracket 41 being fastened through spacer

50 to panel 40, as shown in enlarged views in Figs. 7, 8, and 9.

Jaws 44 are supported pivotally at 58 by links 60 pivoting at 57 on trigger 42 supported pivotally at 56 on bracket 41. Spring 64 fastened at 68 to panel 40 engages trigger 42 at 66 and normally tends to hold trigger 42 so that the center of pivot 57 is beyond a straight line 63 between pivots 56 and 58. The links 60 are stopped against bracket 41 by a suitably cut off corner of one of the links 60.

Jaws 44 are adapted to support clutch or button 111 when in manual closing of the doors the door-opening spring 90 is extended, as later noted under the heading "operation", and this support of clutch or button 111 affords a means for engaging door-opening spring 90 and for holding its motive force from operating the door until selectively released as later described.

Guide 45, pivoted to bracket 41 at 55, confines cable 106 between cross members 53 and 54, member 54 being so placed that when the guide 45 is set in horizontal position, as shown in the drawings, by button 113, it brings cable 106 out beyond the jaws 44. When guide 45 is lifted by button 112, member 53 is then effective to introduce cable 106 precisely between the two jaws 44.

Latch 43, pivoting at 70 on bracket 41, is lifted by chain 143 (Fig. 3) attached to it and extending up to attachment with spring 144 on bumper 47, this lifting being timed to occur when the doors are within a predetermined range of closed position. When the doors are opened out of this range and chain 143 is freed, the lower slanting edge of latch 43 engages over a pin 71 fast in trigger 42 and extending therefrom, as shown in Figs. 8 and 9. When latch 43, governed by the door-position as described, is pulled by chain 143 out of engagement with pin 71, trigger 42 may be pulled at 67 by spring 65 attached to cable 109 controlled by depression of platen 10, and thus the support of jaws 44 may be made to collapse and allow the door-opening motive-means to become operative.

Optionally the spring 65 may be manually pulled for actuation independently of platen 10.

The wall-assembly has also a displacement-arm 46 pivoting at 74 and embracing chain 115 between cross members 76 and 77; it has mounted on it at 79 a spring 75 which fastens to panel 40 at 78.

There is a hand-ring connected to yoke 93 by the S-hook 94, and to this there attaches a cable 89 which passes down over stirrup-sheave 86 to attachment on bracket 85 fastened to panel 40. Hangers 87 on sheave 86 support foot-stirrup bar 88.

Sheaves in sheave-housings

Where sheaves are mentioned in this description, they are in the form shown in Figs. 4, 5, and 6, having a sheave-wheel 162 on ball-bearings 164 turning on pin 165 mounted in two housing members 160 and 161, formed as shown, and held together by rivets 166, and having mounting holes 167. These housings provide slots 163, for the introduction and passage of the cables. As already mentioned, part of the metal, as at 39, Fig. 5, is cut out in certain sheave housings in the lintel assembly to allow for a required broad range of traverse by cable 100.

Cable attachment fixtures

In Figs. 10 and 11, a cable-attachment is shown which may form a slug to hold one end of a cable

from passing through a hole, or may form a button such as 112 and 113; and in Figs. 12 and 13 a loop attachment is shown, such as at 83 on spring 90.

Both these attachments consist of a middle washer 145 through the hole of which the cable passes and becomes held in a slightly S-formation by the tightening of the washers 147 and 148 against it when nut 149 is drawn up tightly on bolt 146.

Operation

The door operator is designed to operate in the main from depression of the wheel-contact platen to close the doors when the user drives away from the garage and to open the doors when he drives back.

It is designed to be re-set by the manual operation of the doors when the user, having alighted from the vehicle, closes the doors and, optionally, locks them, and when, in going to get the vehicle out of the garage, he opens the doors.

The automatic service is had when the user is in the vehicle under movement outside the garage, and the manual operations occur when the user is on his feet to conveniently perform them.

Assuming that the position of the mechanism as shown in the drawings is that taken immediately after a door opening movement under action of spring 90 has been had, the user having driven into the garage, the user alights from the vehicle and pulls one of the doors closed by hand. The other door follows through control by inter-connecting cables 104 and 105.

In this hand-operation the drive arms on the doors pull the cables 100 and 101 anchored to their free ends, and through these and the connections described the spring 90 is brought into extended position, while clutch or button 111 engages over jaws 44, and displacement-arm 46, engaged by button 114 is brought to position 46a. In position 46a the displacement arm forces a greater take-up in the train of cable 116 and chain 115 above guide 45 and below yoke 48 than would be taken in a straight line between the guide and yoke. The extra take-up is illustrated by broken lines 106a—115a.

These positions, with clutch or button 111 over jaws 44 and with displacement-arm at 46a correspond to the termination of movement of the doors into closed position in hand-operation. Upon releasing the doors, the clutch or button 111 settles upon, and is held by, jaws 44, while displacement-arm 46, now free of tensional friction by chain 115, assumes position 46b under pull of spring 75. In this position it frees the excess length, taken up in the train of cable and chain, as described, and the slack thus afforded allows the settling of clutch or button 111 on jaws 44 and also allows the cables to recoil from the stretching that takes place under the hand-resetting operation. This settling and recoil from cable-stretch would otherwise hold the doors slightly open.

Such manual operation of the doors into closed position stores up energy in spring 90 and this is done independently of the storing up of energy in the spring 91, for, as the doors closed, cables 102 and 103, connected to spring 91, yielded with the door-movement and allowed spring 91 to idle downward while cable 108 was allowed to travel over sheaves 82 and 81 as the clutch or button 111, to which cable 108 attaches, moved upward.

The clutching of the clutch or button 111 on the

jaws 44 prevents spring 90 from operating the doors until selectively released, as later noted, and it also engages the spring 91 to cause the same to bear continuously on the doors to keep them normally closed. Spring 91 is released when button 111 is released from jaws 44 and at the same time spring 90 is released.

Instead of having pulled the doors closed by manual operation applied directly upon them, the hand-ring 84 could have been pulled by hand to give the same re-setting effect, or the foot-stirrup could have been depressed by foot to give the same effect, or both these could have been actuated together as a manual operation of the door in re-setting.

Opening the doors by manual operation applied directly to them, as when going to get the vehicle out of the garage, stores up additional energy in spring 91, and this is done independently of the storing up of energy in spring 90, since the energy already stored up in that is held by the clutching of clutch or button 111 on jaws 44. The storing of energy in spring 91 is effected by the cables 102 and 103 which are pulled by pins 29 in door-brackets 28, which brackets move as the doors are opened by hand. These cables raise yoke 93 and extend spring 91 upward while its lower end is held against movement through the engagement of clutch or button 111. When the doors reach fully open position the notch 37 in arm 27 engages keeper 24 and the spring 91 is held from operating the door until selectively released as now to be noted.

Upon the vehicle being driven out of the garage, its first wheel on one side depresses the platen 10 effecting a pull on cables 109 and 137 and chain 135 to lift release-bar 25 and clear the notch 37 from keeper 24, allowing spring 91 to close the door—and this has been done selectively as against opening spring 90, for the latch 43, locking trigger 42 until the doors are within a predetermined range of closed position, has prevented spring 65 from pulling trigger 42 out of the position in which it supports the engagement of jaws 44 with clutch or button 111 which prevents spring 90 from operating the door.

When the doors reach within a predetermined range of closed position, the latch 43 is disengaged from pin 71 on trigger 42 by the pull effected on chain 143 and spring 144 on bumper 47. This bumper is driven upward by yoke 48 which is lifted by cables 100 and 101 which are pulled upon by the door-drive arms as the doors close. Within this predetermined range of closed position, any depression of platen 10, such as will occur when a vehicle returns to get into the garage, pulls spring 65 downwardly by means of cable 109, and lowers the trigger 42 and jaws 44 to the positions indicated by dotted outlines in Fig. 7, wherein button 111 is released or unclutched from jaws 44 allowing the motive means 90 to drive the doors into open position. It can be seen that this is done selectively as against closing motive means 91, for this latter motive means is, by the very release or unclutching of button 111, detached from operable effect and left to travel idly upward as the cables 102 and 103, to which it is attached, follow with the doors in opening.

The operation described, completed with the doors in open position, brings the mechanism back to the position shown in the drawings.

In the operations observed in the several preceding paragraphs it will be noted that the automatic door-closing action may be had independ-

ently of whether any automatic door-opening action occurs before or after, and vice-versa.

Either action, door-closing or door-opening, may be taken as a separate and independent phase.

The door-closing phase takes effect through the raising of arm 27 from keeper 24 by the release-bar 25, freeing the motive-spring 91 to close the doors; and the door-opening phase takes effect by the tripping of jaws 44 by the trigger 42, freeing the motive-spring 90 to open the doors.

Thus the manual opening of doors and the automatic closing thereafter is in no way involved with the occurrence of an automatic opening, and may be repeated as often as desired (as for several cars leaving a garage before one returns) without the occurrence of an automatic door-opening having any bearing on this phase of the operation.

Similarly, the manual closing of doors and the automatic opening thereafter is in no way involved with the occurrence of an automatic closing, and may be repeated as often as desired quite independently of the automatic closing phase of operation.

Taking the doors for example in closed position, it is immaterial in the design of the device whether the doors are next re-set for an automatic closing, or whether an automatic opening is directly obtained. Either may be done, according to the needs of the user or users. The door-closing and the door-opening actions are in two independent phases, each phase being served by an independent motive-means, and holding and releasing means therefor.

As alternative applications, the door-opening parts may be used in a mechanism made up without parts related to door-closing, or the door-closing parts may be used in a mechanism made up without parts related to door-opening.

Thus a door-opening device may be used to open the door upon approaching it without having a door-closing device in combination with it. Or a door-closing device may be used to close the door upon driving away from the garage without having a door-opening device to open the door upon coming back.

In such a door-closing device, the unclutching of the element 111 from the jaws 44 serves to free the door from the bearing of the closing motive means, which affords various conveniences, such as permitting of the door being opened by hand without resistance by the motive means, permitting of the door being set in any desired position between fully closed and open positions, and permitting of the door being left in fully open position without danger of its being driven closed by accidental setting off or otherwise in case of children playing within the moving range of the door.

Motive means 90 acts to open the doors with a relatively rapid movement, and, when they approach the limit of travel at open position, chain 116 pulls the air-cylinder piston-rod downward in the air-cylinder against air-compression, and this acts as a cushioning means to yieldingly terminate the movement. Motive means 91 acts to close the doors with a relatively rapid movement, and, when they approach the limit of travel at closed position, bumper 47, engaged by yoke 48 traveling upward with cables 100 and 101 as these follow with the closing action, pushes piston rod 119 upward in the air-cylinder against air-compression and this acts as a cushioning means to yieldingly terminate the movement.

Each of the two springs 90 and 91 operates the doors without resistance by the other. Button 111 is attached to both of the cables that are connected to these springs, and when this button is trapped on jaws 44 it prevents the door-opening spring 90 from having any effect and affords an anchorage for the lower end of spring 91. When the doors are opened manually, spring 91 extends, and, according to the office of latch 103 on trigger 42, described, spring 91 must contract again and bring the doors into closed position before spring 90 can be brought into action. Thus spring 90 applies no resistance to spring 91. Then when spring 90 is released, to open the doors, by release of button 111 from jaws 44, the driving movement pulls button 111 downward, and it thus gives off to spring 91 required slack in cable 102 to permit spring 91 to idle upward, inert, as the cables 102 and 103, following with the door, lift it. Spring 91 thus offers no resistance to the door driving effort applied by spring 90.

Since neither motive means resists the action of the other, both may be made of substantially the same power, and this may be held at a minimum, while avoiding interconnecting friction also, so as to require a minimum of effort in the re-setting of the mechanism by manual operation of the doors.

The door drive actions of springs 90 and 91 continue to completion when once started by the release of their respective holding means, and since any momentary release of these holding means is effective to release the motive means, this release being in both cases effective by pulling cable 109 from depression of platen 10, any depression of platen 10 completed momentarily before doors have gone through any or part of their movement is sufficient to set into action the door driving mechanism.

I claim:

1. A door operator comprising, in combination, a door, a door-operating mechanism, energy storing motive means for closing and opening the door, means connecting the motive means to the door adapted to completely reset said motive means upon manual operation of the door, means for engaging said motive means when reset to hold the motive force from operating the door, and a single contact operable by contact with a vehicle to release the said holding means and allow the motive means to operate the door.

2. A door, a door-driving mechanism, an energy storing motive means for door-closing, another energy-storing motive means for door-opening, each of said motive means being arranged to operate without resistance by the other, and control means adapted to apply either motive means, and to determine which motive means is to be applied for operation of the door from a given position.

3. A door operator comprising, in combination, a wheel-contact member depressible by the wheel of a vehicle, a motive means normally tending to open the doors, another motive means normally tending to close the doors, means for engaging each of said motive means to hold its motive force from operating the doors, means connected with the wheel-contact member for releasing either motive means, and means for determining which motive means is to be released to effect appropriate operation of the door.

4. A door operator comprising a door driving mechanism adapted to drive doors open and closed, a motive means normally tending to open

the doors, another motive means normally tending to close the doors, means for engaging each of said motive means to hold its motive force from operating the door means for releasing each of said holding means, and means controlled by the position of the doors for governing the releasing means to release—when doors are in open position—the holding means associated with the door closing motive means to allow the latter to close the doors, and to release—when doors are in closed position—the holding means associated with the door opening motive means to allow the latter to open the doors.

5. A door operator comprising a door driving mechanism, an energy storing motive means normally tending to open the doors, means for engaging the motive means to hold its motive force from operating the door means for releasing the last mentioned means, and means controlled by the position of the door for confining the release of said holding means to the time when doors are within a predetermined range of closed position.

6. A door operator comprising in combination, a door, a mechanism to drive the door open and closed, two motive means one for door opening and the other for door closing means for applying either motive means as required for appropriate operation of the door, means for re-setting each of said motive means independently of the application of power by the other, one of said motive means being re-set by manual closing of the door, and the other being re-set by manual opening of the door.

7. A door operator comprising a drive member connected to a door, a motive means for door opening, another motive means for door closing, two traveling members between the said drive member and the respective motive means above mentioned, re-setting means for the motive means whereby manual closing of the door re-sets the door opening motive means, and manual opening of the the door re-sets the door closing motive means, clutching means to grab one of the said traveling members to engage the door closing motive means at the termination of the manual closing of the door, by which clutching means the said door closing motive means is anchored to apply its bearing normally to close the door and hold it closed.

8. A door operator comprising a drive member connected to a door, a motive means for door opening, another motive means for door closing, two traveling members between the said drive member and the respective motive means above mentioned, re-setting means for the said motive means whereby manual closing of the door re-sets the door opening motive means and manual opening of the door re-sets the door closing motive means, clutching means to grab one of the said traveling members to engage the door closing motive means to anchor the latter to apply its bearing upon the door, means to hold the door in open position against the stress of the door closing motive means, means to hold the door opening motive means in re-set position, and selective releasing means actuated by the pull of a cable connected from a wheel-contact member in the runway whereby, when such pull occurs with door open the means that holds the door in open position is released to allow the door to close, but whereby the door opening motive means is released only when the cable pull from contact member in runway occurs with doors within a predetermined range of closed position,

in which position the said pull from contact member disengages also the said clutching means to disengage from anchorage the door closing motive means.

9. A door operating mechanism arranged to open and close doors, including a door opening motive means and a door closing motive means, and means for engaging said door closing motive means to cause the same to bear continuously on the doors to keep them normally closed, engaging means for holding the motive force of said door opening motive means from operating the doors, and means for simultaneously releasing both said engaging means whereby the door closing motive means is rendered ineffective to resist the door opening motive means.

10. A door and motive means to close and open it, a traveler connected to the door and to motive means to close the door, another traveler connected to motive means to open the door, and automatically engaged holding means to hold the last named traveler while the first named traveler is under movement.

11. A door operator comprising a mechanism to drive doors open and closed, an energy storing motive means connected to said mechanism and normally tending to open the doors, another energy storing motive means connected to said mechanism and normally tending to close the doors, means for engaging each of said motive means to hold its motive force from operating the doors, vehicle-actuated means to release either of said holding means to allow such motive means as required for appropriate operation to operate the doors, and cushioning means to yieldingly terminate the movement of the doors when approaching either limit of travel at the open and closed positions.

12. A door operating mechanism for driving a door open and closed, comprising an energy storing motive means connected to said mechanism normally tending to open the door, another energy storing motive means connected to said mechanism normally tending to close the door, means operable by manual handling of the doors to store up energy in each of said motive means to supply power to operate the door, means for engaging connections to each of said motive means to hold its stored up motive force from operating the door, and means depressible by the wheel of a vehicle for selectively causing the door closing motive means to become operative when the door is in open position, and causing the door opening motive means to become operative when the door is in closed position, and cushioning means to yieldingly terminate the movement of door when approaching limit of travel at closed and open positions.

13. A door, an operator for the door, motive means for the operator to apply closing and opening movements to the door, cushioning means for cushioning the door movements limited in application to the termination of the door movements, adapted to act in two directions, one direction for each movement of the door, and connections with the cushioning means for re-setting the latter in either direction, so arranged that when the cushioning means cushions the door-movement in one direction the cushioning means is re-set for effectiveness in the other direction.

14. In combination, a door, a door-closing motive means, a door-opening motive means, a clutching means, an engageable member upon

which the said clutching means engages to anchor the door-closing motive means, and means for clutching and unclutching the said clutching means so arranged that when the clutching means is unclutched the door-opening motive means is set into action, and that when doors are open it is independent of any release actions.

15. In a door operator a motive means normally tending to close the door, another motive means normally tending to open the door and means for setting it into action, a clutching means on a member connected to the door, said clutching means being connected to the motive means tending to close the door, and means for unclutching the said clutching means at the same time as the door-opening motive means is set into action.

16. A door and closing and opening motive means therefor, a member connected to the door, a clutching means on the said member and connected to the door closing motive means, a traveler connected to the door opening motive means and associated with the said member to drive the door open, and a trigger to disengage said clutching means and set the door opening motive means into action.

17. In a door operator, a door closing motive means, a door opening motive means, automatic holding means for the motive means, a traveler arranged as a door-driving member, a clutch for the traveler connected to the door closing motive means, another traveler connected to the door opening motive means and associated with the first named traveler in driving the door, and a trigger arranged to unclutch the door closing motive means and at the same time to release the door opening motive means.

18. In a door operator, a door closing motive means, a door opening motive means, drive arms pivotally attached to doors and yoked to a traveler, a clutch for the traveler connected to the door closing motive means, holding means for holding the doors when brought to open position and releasing means therefor, another traveler connected to the door-opening motive means and holding and releasing means therefor, and a trigger arranged to unclutch the door-closing motive means and at the same time to release the holding means for the door opening motive means.

19. A door operator comprising a mechanism to drive doors open and closed, and connected to and actuated from a wheel-contact member depressible by the wheel of a vehicle, said wheel-contact member being supported by linkages that assume varying angular relations to a spring connection throughout the operable movement of the wheel-contact member, the angular relation when the wheel-contact member is at a position corresponding to the beginning of depression affording a maximum of resistance by the spring, said resistance falling off after said maximum has been overcome.

20. A door operating mechanism and a con-

trol means therefor, said control means including a contact member positioned for actuation by external contact and yieldingly so held through linkages by a spring, said linkages being positioned at a weak angle of attack against the spring at the beginning of actuation of the contact member, and throughout the actuation that follows upon the initial movement of the contact member, being positioned in progressively stronger angles of attack against the spring.

21. A door operator comprising mechanism to drive doors closed and open, and connected to and actuated from a contact assembly including, with suitable supporting and contact members, horizontal and upright linkages substantially in one plane, arranged to be collapsed under contact and to be retrieved upon the removal of the contact.

22. A door operator comprising mechanism to drive doors open and closed and connected to and actuated from a depressible contact member, a spring-pressed intermediate member, a plurality of links supporting said intermediate member, and a plurality of links pivotally connected to said contact member and to said spring-pressed member, the two pluralities of links being relatively movable.

23. A door operator comprising mechanism to automatically close and open a door, a contact member connected to and actuating said mechanism, and an assembly supporting said contact member comprising a plurality of sets of links and a spring resistive intermediate member, one set of links having stationary pivots and also being pivotally connected to said intermediate member, and another set of links being independently pivoted to said intermediate member and also being pivotally connected to said contact member, the two sets of links extending in opposite directions from said intermediate member.

24. Door actuating mechanism which comprises, in combination, door opening means, door closing means, means operable upon manual closing and opening of the door to store and retain energy in said opening and closing means, a single releasing means operable to release the energy for closing the door and to release the energy for opening the door, and means preventing the operation of the releasing means to open the door until after the door has been closed thereby.

25. Door actuating mechanism which comprises, in combination, a door opening spring, a door closing spring, means actuated by manual closing and opening of the door to place said springs under tension and latch them against release of their tension, a single actuating member for releasing the latching means for both springs, and means preventing the operation of the said releasing means on the opening spring until after the closing spring has been released.

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