G. R. LEACH.

DOOR OPERATING MECHANISM.

APPLICATION FILED AUG. 1, 1917.

1,338,379. **Patented Apr. 27, 1920.**

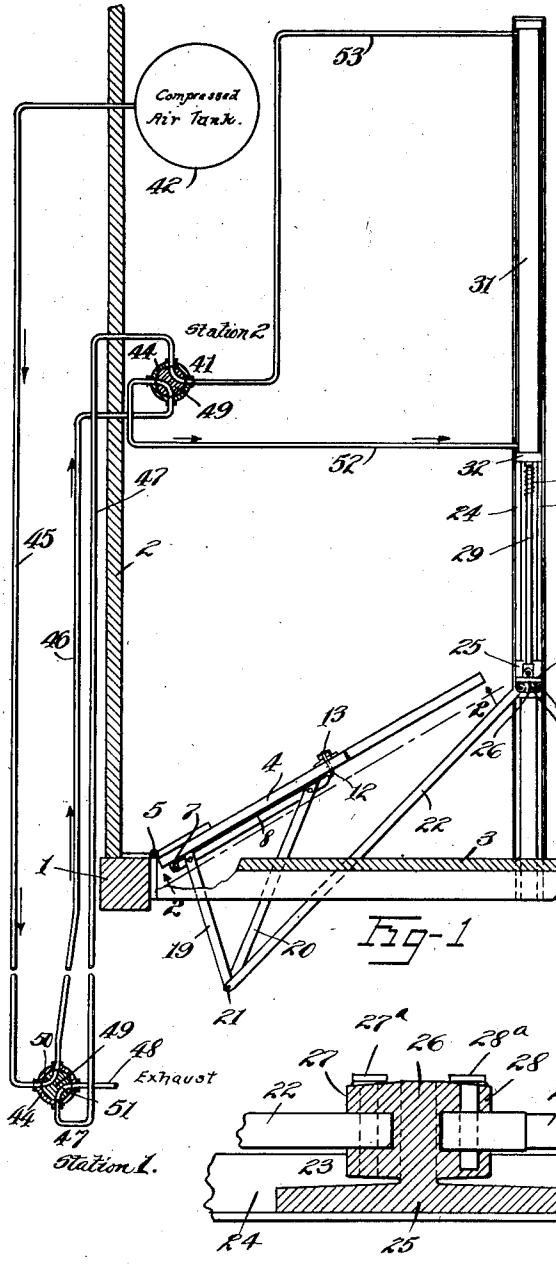


Fig-1

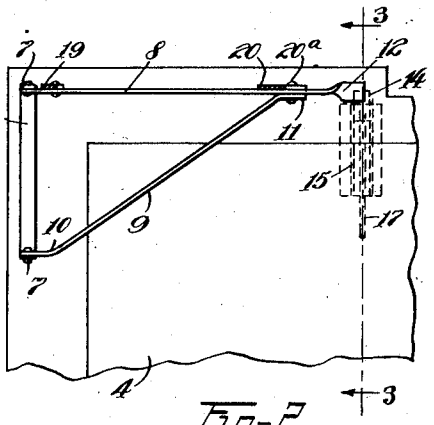


Fig-2

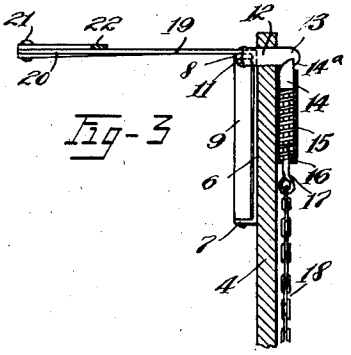


Fig-3

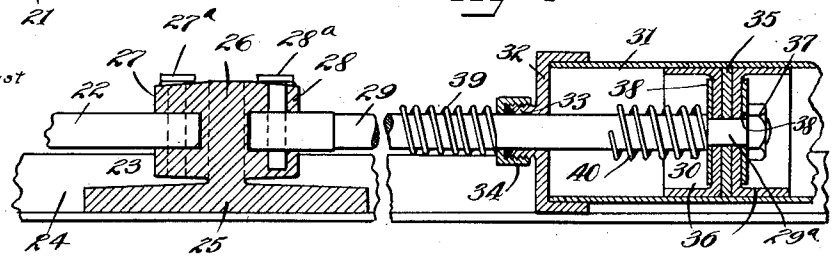


Fig-4

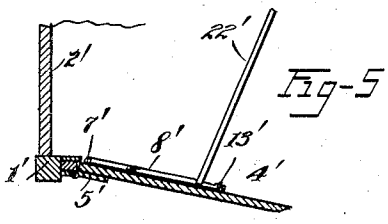


Fig-5

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UNITED STATES PATENT OFFICE.

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DOOR-OPERATING MECHANISM.

1,338,379. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed August 1, 1917. Serial No. 183,851.

To all whom it may concern:

Be it known that I, GLEN R. LEACH, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Door-Operating Mechanism, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to operating and control mechanisms particularly adapted for the opening and closing of doors and similar closures. The object of this invention is an improved apparatus of this character wherein the doors may be opened or closed at either of a multiplicity of remote points and wherein the operating and controlling mechanisms and constituent parts thereof are of simple construction and may be easily and quickly installed and efficiently operated after installation. To this end I have devised a door control and operating mechanism which may be standardized and installed on doors of standard construction, the installation being easily and quickly accomplished without necessitating the employment of expert mechanics. For a better understanding of the various features of this invention reference may be had to the accompanying drawing wherein Figure 1 is a plan view of the operating mechanism as attached to a specific type of door, the novel features of the controlling mechanism being more or less diagrammatically illustrated; Fig. 2 is a sectional view of Fig. 1 taken on the line 2—2; Fig. 3 is a sectional view on Fig. 2 taken on the line 3—3; Fig. 4 is a longitudinal sectional view through a part of the operating mechanism; and Fig. 5 is a view illustrating my invention as applied to an outwardly swinging door.

Referring to the drawings where like numerals refer to similar parts throughout, a portion of a garage is illustrated as embodying a vertically disposed corner post 1, a side wall 2 and a front cross beam 3 which rests on the vertical posts 1, one of these posts being omitted from the drawing for convenience of illustration. In the embodiment illustrated the garage is provided with two inwardly swinging doors 4, one hinged to each of the posts 1 by means of hinges 5 for inwardly swinging movement on a vertical pivotal axis, these doors swinging about the posts 1 and beneath the cross beam 3. Fixed to the outer side of the door 4 and adjacent the upper hinge 5 is a vertically disposed metallic bar 6 the upper and lower ends of which are bent outwardly in a horizontal direction to form lugs or bearings 7 for the reception of a swinging frame comprising a horizontally disposed bar 8 and an angle iron bracing bar 9. The metallic bar 8 is pivotally secured at one end to the upper lug 7 while the corresponding end of the angle iron 9 is bent at 10 to form a horizontal portion pivotally attached to the lower lug 7 of the vertical bar 6. The upper end of the angle iron 9 is also bent to form a horizontal portion 11 for engagement with the under side of the horizontal bar 8 near its outer end and thereby supporting the same and preventing sagging. The portion 11 may be attached to the bar 8 in any suitable manner as by the riveted connection illustrated, it being understood that the connection is preferably a rigid one. The outer end 12 of the bar 8 is preferably twisted at right angles to the main body of the bar 8 so that the width of this end extends vertically. The outer end 12 is further bent at right angles to the main body of the bar to form a latch 13, the latter coöperating with an opening formed in the upper part of the door and being adapted to pass therethrough to be locked in position by a coöperating latch member 14. The latter is mounted for vertical movement in a cylindrical member 15 and a spring 16 is interposed between the latch member 14 and the bottom of the cylindrical member 15 for urging the latch member 14 into engaging relation with the latch 13, the cylindrical member 15 being fixed to the inside face of the door. For withdrawing the latch member 14 from the latch 13 a pull rod 17 is fixed to the under side of the latch member 14 and projects downwardly through the bottom of the cylindrical member 15, the lower end thereof being formed into an eyelet for the reception of a pull chain 18. The metallic bar 8 has fixed to the upper side thereof at a point adjacent its hinged end a horizontally disposed metallic strip 19, the latter being disposed at an angle to the bar 8 which is slightly greater than a right angle. The bar 8 also has fixed near its outer end and to the upper side thereof a bracing strip 20, the outer end of which is securely fixed as by means of a rivet 21 to the outer end of the strip 19,

The strip 20 and the bracing strip 9 may be secured to the bar 8 by a rivet 20ª. There is also secured to the outer end of these strips 19 and 20 a connecting strip or link 22, this connection being a loose one and preferably secured by the same rivet 21. The other end of the connecting strip or link 22 is pivotally connected to a reciprocating head 23, the operating mechanism for which will now be described. The reciprocating head 23 is mounted for sliding movement in the raceway 24 the latter being fixed substantially on the level of the top of the door 4 and passing through the longitudinal center of the garage, or other housing slightly below the cross beam 3. The reciprocating head 23 is provided with a base 25 for sliding movement in the raceway 24 and is provided with a head 26 having a pair of forwardly extending jaws 27 and a pair of rearwardly extending jaws 28. The forward jaws 27 are adapted to receive therebetween the inner ends of connecting links 22, pins 27ª passing transversely therethrough for pivotally attaching the connecting links to the sliding head. The rear pair of jaws 28 are also provided with a transverse pin 28ª which is adapted to pivotally connect therebetween a connecting rod 29, the latter connecting a piston 30 with the sliding head. The piston 30 is mounted for sliding movement in an elongated cylinder 31 which is mounted in alinement with the raceway 24, the raceway 24 extending backwardly to a point beyond the rear end of the cylinder and the cylinder resting therein. The cylinder is provided with suitable cylinder heads 32. The forward cylinder head should have a suitable air tight closure where the connecting rod 29 passes through, in the specific embodiment shown this closure embodying a threaded nipple 33 and an internally threaded closing cap 34. The piston 30 comprises a central disk 35 and on either side thereof a cup 36 placed bottom to bottom thereon. The connecting rod 29 is provided with a reduced end 29ª and the piston 30 is inserted on this reduced end and clamped securely thereto by means of a nut 37, suitable washer plates 38 being interposed between the bottoms of the cups 36 and the nut 37 and shoulder on the connecting rod 29. I preferably interpose shock absorbing springs 39 and 40 to soften the blow or impact at the ends of the reciprocating movement, the spring 39 being adapted to cushion the reciprocating head 23, at the end of its movement toward the cylinder 31 and the spring 40 being adapted to cushion the piston 30 in its movement against the forward end of the cylinder 31. I provide for operating and closing the door by means of fluid pressure, preferably elastic fluid, as air, and I provide a novel arrangement for supplying this pressure to either end of the cylinder from a plurality of remote points. To this end I provide a number of stations where a controlling valve is illustrated and I connect these valves in series relation to each other, the valves being of the four-way type, whereby the fluid pressure may be reversed in the operating cylinder 31 at any one of these stations for either opening or closing the door 4, whichever happens to be necessary. In the specific embodiment shown I have illustrated two stations, but it is understood that any number of these stations may be provided, and in each of these stations I locate a four-way valve 41, and since these valves are all of similar structure it will be sufficient to refer in particular to but one of these, it being understood that all of these valves are connected in series relation between a source of fluid pressure 42 and the cylinder 31, that is, the air or other fluid pressure in passing from the source 42 to the cylinder 31 must pass through all of these valves and in like manner the exhaust from the cylinder 31 in its return to the exhaust 48 must pass through all of these controlling valves. These valves are for illustrative purposes only and are more or less diagrammatically illustrated, but essentially comprise a cylindrical casing 44 having four openings therein, these openings corresponding to the pipe connections 45, 46, 47, and 48 (station #1). The pipe 45 leads to the source of compressed air, the pipe 48 leads to the exhaust or atmosphere, and the pipes 46 and 47 lead to the next station. The valve 41 comprises an internally rotatable member 49 and this member 49 is provided with passageways 50 and 51, these passageways being adapted to establish communication between pipes 45 and 46 and between pipes 47 and 48 as illustrated in the drawings or upon operation of the valve to establish communication between the pipes 45 and 47 and between pipes 46 and 48. In the position of the valves illustrated the air currents are in the directions illustrated by the arrows, the air entering the forward end of the cylinder 31 through the pipe 52 while the rear end of the cylinder 31 is connected to the exhaust through the pipe 53 and the valves 41. The piston 31 and sliding head 33 are therefore being driven in a rearward direction to open the doors 4. It is noted that the air or other fluid pressure in its passage to the cylinder passes through the pipe 45, the valve at station 1, pipe 46, valve at station 2, and pipe 52 to the cylinder and that the exhaust in passing from the rear end of the cylinder 31 passes through the pipe 53, the valve at station 2, the pipe 47, the valve at station 1, and the pipe 48 to the exhaust. The fluid pressure therefore traverses all of the valves of the

series in its passage to the cylinder and in its return therefrom again traverses all of the valves at the various stations in its passage to the exhaust. It is clear that the operator may either close or open door at any station which happens to be convenient, as the operation of any of the valves 41 will cause a reversal of the air pressure on the opposite sides of the piston 30.

In Fig. 5 is illustrated a door which swings outwardly instead of inwardly as in the previous figures, the pivoted frame comprising the members corresponding to the members 6, 7, 8 and 9 of the previous figures being mounted on the inside face of the door instead of on the outside and the connecting strips 19 and 20 being entirely omitted. The connecting link 22′ is pivotally connected directly to the top of the bar 8′. A latch for locking the pivoted frame to the door 4′ is conventionally illustrated at 13′ it being understood that the operation is similar to the operation of the device illustrated in the previous figures, for instance by withdrawing the latchkey and thereby releasing the pivoted frame from the door, the door is free to swing on a vertical pivot 7′. The doors may therefore be operated by hand independently of the power operating means, the connections being such that the power mechanism is not interfered with. It is noted too that when the doors 4 and 4′ have been released from the power operating mechanism to be manipulated by hand, it is not necessary in order to perform the latching operation to bring the door back into locking engagement with the operating mechanism, although this may be done if desired. In any position of the swinging door relative to the pivoted frames 7, 8 and 9, the latter may be brought back to locking engagement therewith by manipulating one of the valves at the various stations, the locking member 14 being provided with a bevel edge 14ª which is engaged by the beveled end of the latch 13 and caused thereby to be moved downwardly against the tension of the spring 16, the latter causing the coöperating latch member 14 to snap into engagement with the latch 13 when the pivoted operating frame is brought back to locking position. It is noted too that the various parts of the operating and controlling mechanism are of simple construction and may be standardized to be produced in large quantities with the consequent reduction of cost to a minimum, it being particularly noted that the whole mechanism may be installed on standard doors with a minimum expenditure of time and labor without requiring the employment of skilled workmen.

In accordance with the patent statutes I have set forth my invention in the specific manner required but it is understood that the claims hereto annexed are not to be limited to the specific devices illustrated except as is specifically recited therein or is rendered necessary by a consideration of the prior art.

Having thus described my invention, what I claim is:—

1. In an apparatus of the type described, the combination of a door, said door being hinged to swing about a vertical axis, a pivoted frame mounted on said door and hinged for pivotal movement about a vertical axis, means for locking said pivoted frame to said door, a reciprocating mechanism for operating said door and operating connections between said mechanism and said pivoted frame.

2. In an apparatus of the type described, the combination of a door hinged for swinging movement on a vertical axis, a frame pivoted adjacent to said hinges to said door for swinging movement about a vertical axis independently of the door, said frame having a latch coöperating with a latching member on said door whereby the pivoted frame may be fixedly locked to said door and an elongated fluid pressure cylinder having therein an operating piston, a reciprocating sliding head attached to said piston, and operating connections between said sliding head and said pivoted frame for actuating said pivoted frame.

3. In an apparatus of the type described, the combination of a door hinged for swinging movement on a vertical axis, a frame pivoted adjacent to said hinges to said door for swinging movement about a vertical axis independently of the door, said frame being adapted to swing against the face of said door and having a latch projecting therethrough coöperating with a latching member on the opposite side of said door, whereby the pivoted frame may be fixedly locked to said door, and an elongated fluid pressure cylinder having therein an operating piston, a reciprocating sliding head attached to said piston, and operating connections between said sliding head and said pivoted frame for actuating said pivoted frame.

4. In an apparatus of the type described, the combination of a door and door support, said door being hinged at one edge to said support for swinging movement on a vertical axis; a horizontally disposed bar loosely attached at one end to said door for pivotal movement thereon on a vertical axis closely adjacent to said first named pivotal axis, and the other end of said bar having a latch which coöperates with a latching member fixed to the said door, a reciprocating operating mechanism and a link connection between said reciprocating mechanism and said bar.

5. In an apparatus of the type described,

the combination of an upright post, a door hinged thereto for swinging movement about a vertical axis, a horizontally disposed member loosely attached at one end to the opposite face of said door for pivotal movement in a horizontal plane, the point of attachment being closely adjacent the hinges of the door, the free end of said member being bent at right angles to the main body thereof to form a latch, said door having an opening for receiving said latch and having on the opposite side from the member a spring pressed coöperating latching member, whereby said horizontally disposed member may be disengaged for pivotal movement independent of the door or may be locked thereto for movement therewith, a horizontally disposed raceway mounted at right angles to said door and on a level with said horizontally disposed member, a reciprocating member slidable back and forth in said raceway and a link connection between said reciprocating member and said horizontally disposed member, said door having a slot therein for accommodating said link connection.

6. In an apparatus of the type described, the combination of an upright post, a door hinged thereto for swinging movement about a vertical axis, a horizontally disposed metallic strip loosely attached at one end to the opposite face of said door for pivotal movement in a horizontal plane, the point of attachment being closely adjacent the hinges of the door, the free end of said member being twisted into a vertical plane and being bent at right angles to the main body thereof to form a latch, said door having an opening for receiving said latch and having on the opposite side from the member a spring pressed coöperating latching member, whereby said horizontally disposed strip may be disengaged for pivotal movement independent of the door or may be locked thereto for movement therewith, a horizontally disposed raceway mounted at right angles to said door and on a level with said horizontally disposed strip, a reciprocating member slidable back and forth in said raceway, an elongated cylinder in alinement with said raceway, a piston therein connected with said reciprocating member, a link connection between said reciprocating member and said horizontally disposed member, said door having a slot therein for accommodating said link connection.

7. In a mechanism of the type set forth, the combination of a pivoted frame and a support therefor adapted to be attached to a swinging door at a point closely adjacent to the hinges thereof, said frame being adapted for pivotal movement in a horizontal plane on said support, of a latching member adapted to be attached to said door, said pivoted frame having a latch member coöperating with said first named latching member, a fluid pressure operating cylinder, a runway in alinement with and upon which said cylinder is adapted to be mounted, said cylinder having therein an operating piston and said runway having thereon a reciprocating head attached to said piston and a link connection between said pivoted frame and said reciprocating head.

8. In an apparatus of the type described, the combination of an upright post, a door hinged on one face thereof to said post for a swinging movement on a vertical axis, a vertically disposed supporting bar attached to the opposite face of said door and having its ends out-turned for the purpose described; a horizontally disposed member and a bracing member pivotally connected at one end to the said out-turn ends, the other end of said bracing member being attached to said horizontally disposed member at a point intermediate its ends, said door having a transverse opening adjacent to the free end of the horizontally disposed member, the outer end of said horizontally disposed member being bent at right angles to the main body thereof and adapted to enter said opening and engage a spring pressed latch on the opposite side thereof; a horizontally disposed elongated fluid pressure cylinder adapted to be supported on a level with said horizontally disposed member, a raceway in alinement therewith, a reciprocating head in said raceway and operatively connected with said cylinder, and a link connection between said horizontally disposed member and said reciprocating head.

9. In an apparatus of the type described, the combination of an upright post, a door hinged on one face thereof to said post for a swinging movement on a vertical axis, a vertically disposed supporting bar attached to the opposite face of said door but adjacent the door hinge and having its ends out-turned for the purpose described; a horizontally disposed member and a bracing member pivotally connected respectively at one end to the said out-turn ends, the other end of said bracing member being attached to said horizontally disposed member at a point intermediate its ends, said door having a transverse opening adjacent to the free end of the horizontally disposed member, the outer end of said horizontally disposed member being bent at right angles to the main body thereof and adapted to enter said opening and engage a spring pressed latch on the opposite side thereof; a horizontally disposed elongated fluid pressure cylinder adapted to be supported on a level with said horizontally disposed member, a raceway in alinement therewith, a reciprocating head in said raceway and operatively connected with said cylinder, and connections between said horizontally disposed member and said

reciprocating head comprising a pair of bracing strips attached together at one end and having their free ends connected with the opposite ends of said horizontally disposed member and a link connection between said sliding head and the point where said bracing strips are connected together.

10. In an apparatus of the character described, the combination of a door hinged for swinging movement on a vertical axis, a frame pivoted adjacent to the hinged edge of said door for swinging movement about a vertical axis independently of the door, said frame being pivoted to the inner side of said door and being adapted to swing against the inner face thereof, said frame having a latch coöperating with a latching member fixed to the inner face of the door whereby the pivoted frame may be fixedly locked to the inner face thereof, an elongated fluid pressure cylinder having therein an operating piston, a reciprocating sliding head attached to said piston, and operating connections between said sliding head and said pivoted frame.

11. In an apparatus of the character described, the combination of a door hinged for swinging movement about a vertical axis, a frame pivoted adjacent to the hinged edge of said door for swinging movement about a vertical axis independently of the door, said frame being pivoted to the inner side of said door and being adapted to swing against the inner face thereof, said frame having a latch coöperating with a latching member fixed to the same side of said door whereby the pivoted frame may be fixedly locked to the inner side of said door, and power operating devices connected with said pivoted frame and mounted adjacent thereto.

12. In an apparatus of the type described, the combination of an upright post, a door hinged thereto for swinging movement about a vertical axis, a horizontally disposed member loosely attached at one end to the opposite face of said door for pivotal movement in a horizontal plane, the point of attachment being closely adjacent the hinges of the door, the free end of said member being bent at right angles to the main body thereof to form a latch, said door having an opening for receiving said latch and having on the opposite side from the member a coöperating latching member, whereby said horizontally disposed member may be disengaged for pivotal movement independent of the door or may be locked thereto for movement therewith, a horizontally disposed raceway mounted at right angles to said door and on a level with said horizontally disposed member, a reciprocating member slidable back and forth in a said raceway and a link connection between said reciprocating member and said horizontally disposed member, said door having a slot therein for accommodating said link connection.

13. In an apparatus of the type described, the combination of a swinging door, a frame pivotally mounted on said door and hinged for pivotal movement independent of the movement of said door, means for locking said pivoted frame to said door against independent swinging movement, a reciprocating mechanism for operating said door, and operative connections between said mechanism and said pivoted frame.

14. In an apparatus of the type described, the combination of a door hinged for swinging movement about an axis, a frame mounted on said door and pivoted thereto adjacent to the hinges of said door for independent swinging movement about an axis parallel to that of the swinging movement of the door, means for locking said frame to said door against independent swinging movement, a reciprocating mechanism for operating said door, and operating connections between said mechanism and said pivoted frame.

15. In an apparatus of the type described, the combination of a door for swinging movement, a frame pivoted adjacent to said hinges to said door for swinging movement about an axis independently of the door, said frame having a latch coöperating with a latching member on said door whereby the pivoted frame may be fixedly locked to said door and an elongated fluid pressure cylinder having therein an operating piston, a reciprocating sliding head attached to said piston, and operating connections between said sliding head and said pivoted frame for actuating said pivoted frame.

16. In an apparatus of the type described, the combination of a door and door support, said door being hinged at one edge to said support for swinging movement, a horizontally disposed bar loosely attached at one end to said door for pivotal movement thereon on an axis closely adjacent to said first named pivotal axis, and the other end of said bar having a latch which coöperates with a latching member fixed to the said door, a reciprocating operating mechanism and a link connection between said reciprocating mechanism and said bar.

In testimony whereof, I hereunto affix my signature.

GLEN R. LEACH.