Dec. 29, 1931. V. W. MORAY 1,839,045

DOOR AND OPERATING MEANS THEREFOR

Filed Dec. 12, 1929 2 Sheets-Sheet 1

Fig. 1.

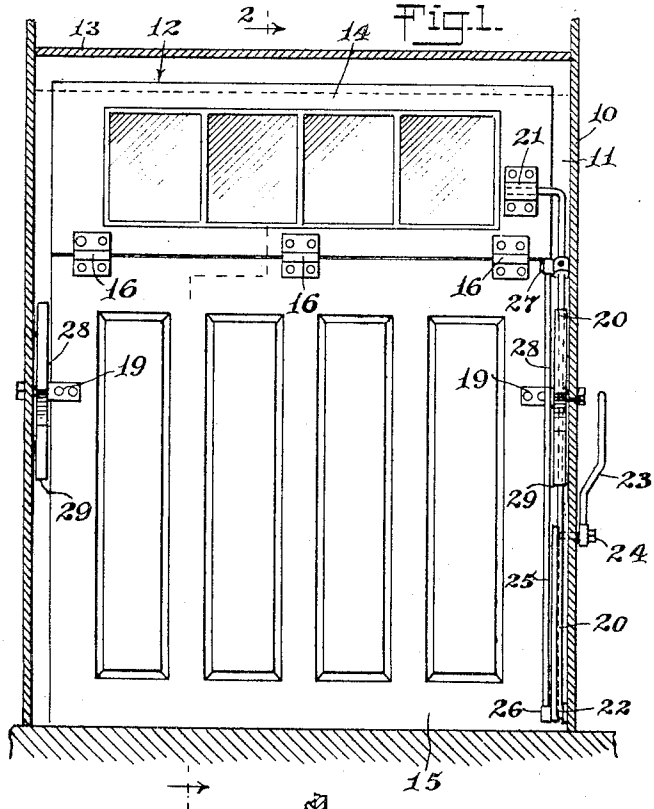


Fig. 2.

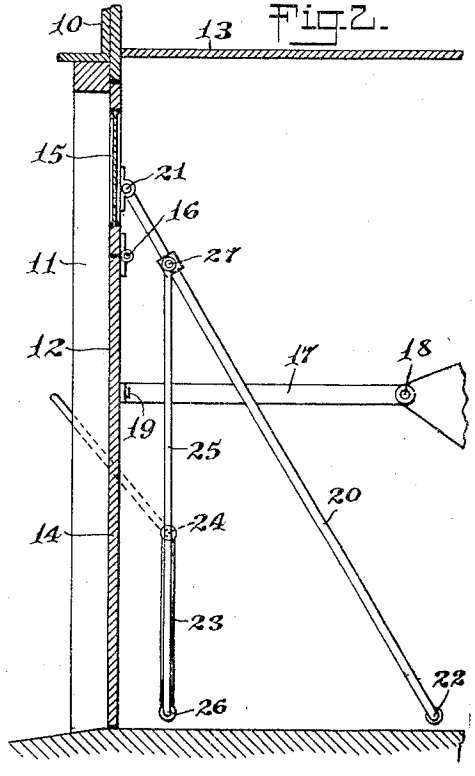
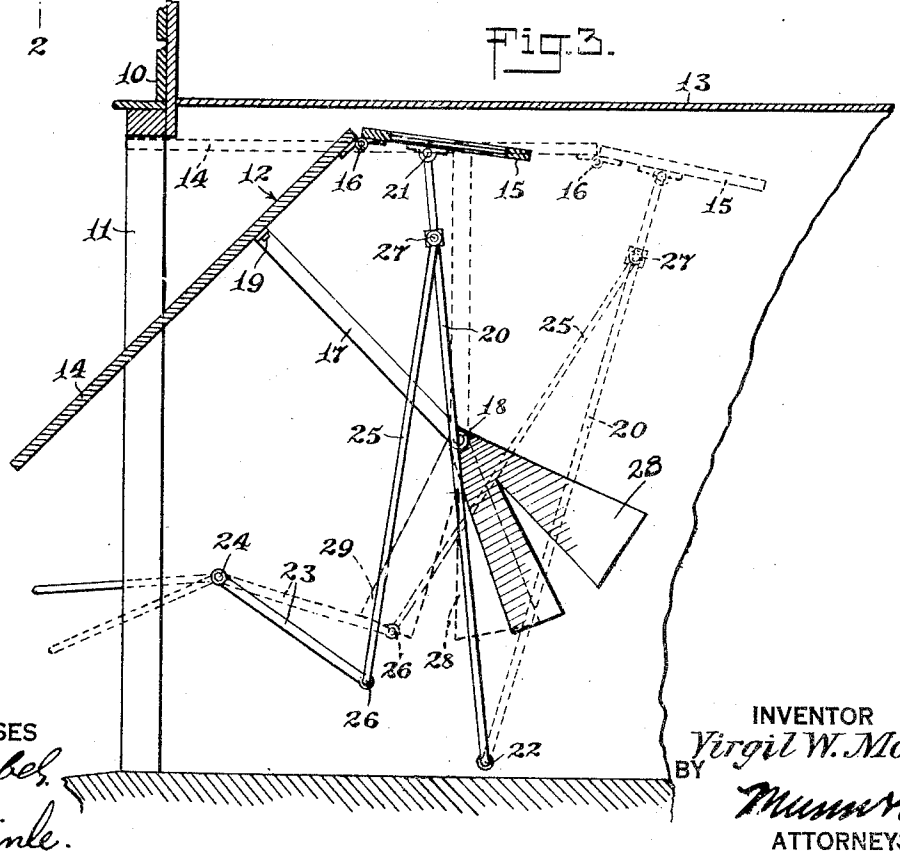


Fig. 3.



WITNESSES

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DOOR AND OPERATING MEANS THEREFOR

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Fig. 4.

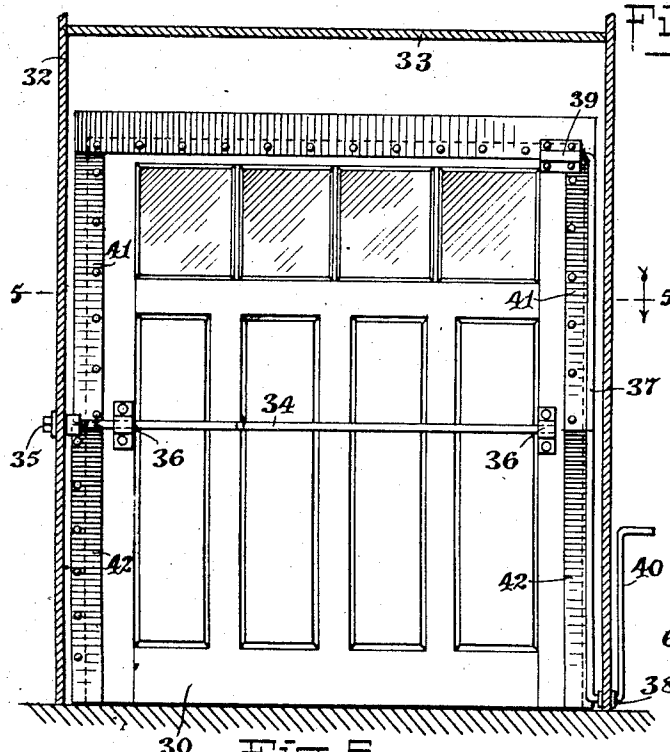


Fig. 5.

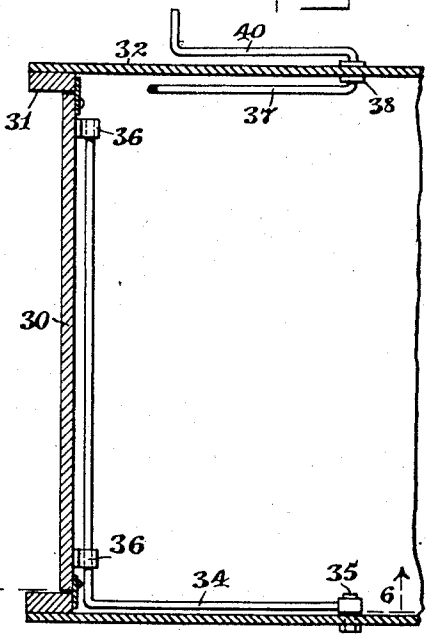


Fig. 6.

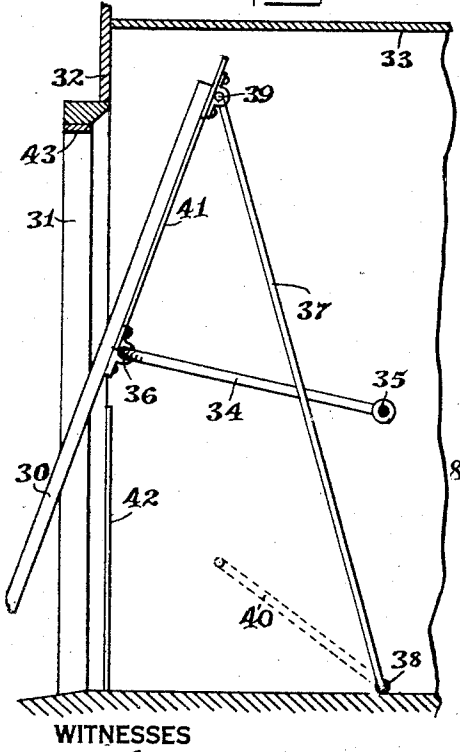


Fig. 7.

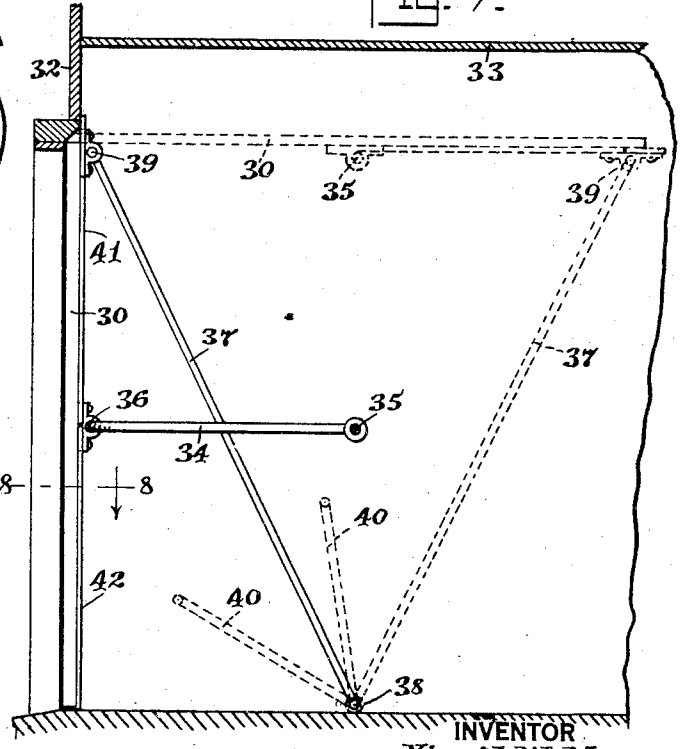
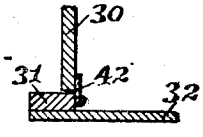


Fig. 8.



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1,839,045

UNITED STATES PATENT OFFICE

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DOOR AND OPERATING MEANS THEREFOR

Application filed December 12, 1929. Serial No. 413,665.

This invention relates to doors and mechanism for operating the same.

One of the objects of the invention is the provision of a door adapted to be put away overhead to conserve space, and which may therefore be used advantageously as a part of a garage.

Another object of the invention is the provision of a door of the indicated character having improved features of construction, whereby the door may be moved in a curvilinear path into and out of an overhead opened position adjacent a ceiling, within a small radius to thereby conserve space.

Another object of the invention is to provide an improved form of mechanism for operating a door of the indicated character.

With the foregoing and other objects in view the invention resides in the particular provision, construction, operation and combination of the parts hereinafter fully described and illustrated in the acompanying drawings, in which:

Figure 1 is an inside view of one form of door and one form of operating mechanism therefor constructed to operate in accordance with the invention;

Figure 2 is a section taken on the line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 2 but showing the door in a partly opened position in full lines, and in a fully opened position in dotted lines;

Figure 4 is an inside view of another form of door and another form of operating means therefor constructed to operate in accordance with the invention;

Figure 5 is a horizontal section on the line 5—5 of Figure 4;

Figure 6 is a section on the line 6—6 of Figure 5, but showing the door in a partly opened position;

Figure 7 is a section similar to Figure 6, but showing the door in a closed position in full lines, and in the opened position in dotted lines;

Figure 8 is a detail section on the line 8—8 of Figure 7.

Referring now more particularly to Figures 1, 2 and 3, it will be apparent that there is shown a part of a structure, building or garage 10, having a door frame 11 which presents an opening affording ingress and egress. A door 12 is mounted for movement into a closed position against the frame 11, and to an opened overhead position adjacent the ceiling of the structure 10, such ceiling being designated 13. The door 12 in the present instance consists of a main lower section 14 and an upper section 15 hingedly connected as at 16 with the section 14. The sections 14 and 15 of the door are capable of fully closing the opening in the door frame 11. In the closed position, the opposite side edges and the top edge of the door abut against the corresponding portions of the door frame 11 on the inside thereof. The door 12 is mounted to move with arms 17, disposed respectively at opposite sides thereof, and each arm being pivotally mounted as at 18 and rigidly secured as at 19 to the section 14 of the door. An arm 20 has its upper end pivotally connected as at 21 with the section 15 of the door, and its lower end is pivotally mounted as at 22.

It is to be observed that the pivotal mounting or fulcrum 22 of the arm 20 is below the pivotal mountings or fulcrums of the arms 17 for a purpose to be explained. In order to move the door 12 to the opened or closed position there is provided operating mechanism presently to be described. A bell crank lever 23 is operatively positioned on one of the walls of the structure 10, the fulcrum thereof being designated 24. A rigid link 25 has one end thereof pivotally connected as at 26 with the lever 23, and its opposite end is pivotally connected as ot 27 with the arm 20 near the upper end thereof.

In Figure 2 of the drawings there is shown the relationship of the parts when the door 12 is in the closed position. It will be apparent that when the lever 23 is actuated downwardly movement will be imparted to the arm 20 through the intervention of the link 25. This will cause the door in its entirety to move on the pivots or fulcrums 18, and during the travel of the door to the opened overhead position, the arm 20 will exert a pulling force on the upper section 15 and move the same on

its hinges relatively to the lower section 14, as shown in Figure 3. Under this arrangement a small amount of clearance space below the ceiling will be sufficient to enable the door to be swung to the opened and closed positions. It will be apparent that the top edge of the door may travel in an approximately straight line. From the foregoing it will be apparent that the door 12 has translational movement along a curvilinear path. It will also be apparent that the door is constructed to operate in such a manner that it will conserve space, and that it will not be obstructed by steam pipes, radiators and other obstructions usually attached to the ceiling of a garage. It will also be apparent that the use of rollers, tracks, pulleys, etc. are obviated.

In accordance with another feature of the invention use is made of counterbalancing means for the easy and convenient movement of the door. The said means consists of a main counterbalancing weight 28 which is connected with one of the arms 17 and has equal portions at opposite sides of the longitudinal axis of said arm, and an auxiliary counterbalancing weight 29 wholly disposed at one side of said longitudinal axis. Both of the weights 28 and 29 act in moving the door 12 to the opened position. It will be apparent that the arms 17 move substantially 90°. The weights 28 and 29 are so disposed that the weight 28 will aid in overcoming the effect of the weight 29 after it has reached a vertical position during the movement of the door to the opened position. When the door 12 is in the fully opened position, as indicated in dotted lines in Figure 3, both weights 28 and 29 hold the door 12 in the opened position. As the door 12 is moved to the closed position, the auxiliary weight 29 aids in this movement until such time when the weight of the door will be counterbalanced by both weights 28 and 29.

In Figures 4 to 7, inclusive, there has been shown a modified form of door and operating means therefor. In this form of the invention the door 30 consists of but one part having translational curvilinear movement on two axes into and out of closed position with respect to a door frame 31 constituting a part of a building or garage 32. The door 30 is swingable to an overhead open position adjacent below the ceiling 33. The door is supported for movement by one or two arms, one arm 34 being shown in the present instance. The arm has pivotal movement on a fulcrum 35 and the opposite end of the arm 34 is pivotally connected as at 36 with the door 30. An arm 37 is fulcrumed or pivoted as at 38 at a point below the fulcrum 35, and the upper end of the arm is pivotally connected as at 39 with the upper edge of the door 30. The arm 37 serves for the purpose of tilting the door slightly on the pivotal connection 35 of the arm 34 with the door 30 during the travel of the door from the opened and closed positions. In order to move the door 30 to the opened and closed positions there is provided a crank handle 40 operatively connected with the pivot 38 of the arm 37. When the crank handle 40 is moved downwardly the arm 37 will be swung on its pivot 38 causing the door to move upwardly and inwardly on the arm 34 which will swing on its pivot 35. During the travel of the door 30 to the opened position, the arm 37 will rock or tilt the door on the pivotal connection 35. In this way the upper edge of the door will move approximately in a straight line to the opened position, and in closing the door a similar action will take place. It will therefore be understood that the present construction and operation require but a small clearance space beneath the ceiling for the door to move into and out of overhead opened position.

In accordance with another feature of the invention to obtain a storm-proof and heat retaining closing of the door there are provided weather strips 41 respectively on opposite side edges of the door 30 on the inside thereof. The strips 41 extend from the upper edge of the door to a point midway down on the door. Weather strips 42 are also provided and these strips are attached respectively to the vertical stiles of the frame 31 on the inside thereof. Each strip 42 extends from the floor to a point to meet the lower edge of the strip 41 on the same side when the door 30 is in the closed position. The door 30 is of a size to fit the opening presented by the frame 31. When the door 30 is in the closed position, the strips 41 will be in contact with the side stiles of the frame 31, and the side edges of the lower part of the door will be in contact with the strips 42. The upper edge of the door 30 will be in contact with a stop or weather strip 43 on the under side of the head rail of the frame 31.

It is to be understood that the door 30 in the form of the invention shown in Figures 4 to 7, inclusive, may be operated by mechanism of the form shown in Figures 1, 2 and 3.

It is to be understood that the invention is not restricted to the precise arrangement of parts shown and described, as details of construction may be modified and rearranged without departing from the spirit of the invention, the scope of which is limited only by the terms of the appended claims.

What is claimed is:

1. The combination with a structure having a door opening, of a door mounted for translational movement in a curvilinear path into a vertically disposed position to close said opening and also into a horizontally disposed opened position, and means for causing the movement of said door to the opened and closed positions comprising a bell-crank lever and rigid link members pivotally con-

nected together and also pivotally connected with said bell-crank lever and the door.

2. The combination with a structure having a door opening, of a door having upper and lower relatively movable sections, an arm swingable on a fixed horizontal axis, said arm being connected with said lower section, and a second arm swingable on a fixed horizonal axis which is offset in relation to said first mentioned axis, said second arm being pivotally connected with said upper section, said first arm being swingable to guide the lower section for translational movement in a curvilinear path as the door is moved into and out of said opening, said second arm being swingable to cause the translational movement of the door into and out of said opening and also to cause movement of the upper section relatively to said lower section.

3. The combination with a structure having a door opening, of a door having upper and lower relatively movable sections, an arm swingable on a fixed horizontal axis, said arm being connected with said lower section, and a second arm swingable on a fixed horizontal axis which is offset in relation to said first mentioned axis, said second arm being pivotally connected with said upper section, said first arm being swingable to guide the lower section for translational movement in a curvilinear path as the door is moved into and out of said opening, said second arm being swingable to cause the translational movement of the door into and out of said opening and also to cause movement of the upper section relatively to said lower section, and counterbalancing means for the door connected with said first arm.

4. The combination with a structure having a door opening, of a door of a size to fully close said opening, an arm swingable on a horizontal axis, said arm being connected with said door on the inside thereof, and a second arm swingable on a horizontal axis which is offset with respect to the first mentioned axis, said second arm being pivotally connected with said door near the top and on the inside thereof, said first arm being swingable to guide said door for translational movement in a curvilinear path into and out of said opening, and said second arm being swingable for the purpose of causing the translational movement of the door and also its movement on its pivotal connection with said first arm, during the travel of the door into and out of said opening, and lever means connected with said second arm to swing it.

5. The combination with a structure having a door opening, of a door of a size to fully close said opening, an arm swingable on a horizontal axis, said arm being connected with said door on the inside thereof, and a second arm swingable on a horizontal axis which is offset with respect to the first mentioned axis, said second arm being pivotally connected with said door near the top and on the inside thereof, said first arm being swingable to guide said door for translational movement in a curvilinear path into and out of said opening, and said second arm being swingable for the purpose of causing the translational movement of the door and also its movement on its pivotal connection with said first arm, during the travel of the door into and out of said opening, lever means connected with said second arm to swing it, and a counterbalancing means for the door connected with said first arm.

6. The combination with a structure having a door opening, of a door of a size to fully close said opening, an arm swingable on a horizontal axis, said arm being connected with said door on the inside thereof, and a second arm swingable on a horizontal axis which is offset with respect to the first mentioned axis, said second arm being pivotally connected with said door near the top and on the inside thereof, said first arm being swingable to guide said door for translational movement in a curvilinear path into and out of said opening, and said second arm being swingable for the purpose of causing the translational movement of the door and also its movement on its pivotal connection with said first arm, during the travel of the door into and out of said opening, lever means connected with said second arm to swing it, and a counterbalancing weight for the door connected with said first arm.

Signed at New York in the county of New York and State of New York this 10th day of December 1929.

VIRGIL W. MORAY.